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GCSE MATHS

Geometry and measures

Edexcel 1MA1 | Subtopic collection Topic 44

Volume and surface area

Higher tier

Answers and examiner comments

149	2003-2025	Higher
question groups	available papers	tier

Using this booklet

1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

Name _____ **Date** _____

Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

Original question 8

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Original question 1

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Original question 4

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Original question 12

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Original question 16

No matching mark scheme was available in the supplied archive for this question.

Original question 18

No matching mark scheme was available in the supplied archive for this question.

Original question 2

No matching mark scheme was available in the supplied archive for this question.

Original question 6

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Original question 19

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Original question 3

No matching mark scheme was available in the supplied archive for this question.

Original question 9

No matching mark scheme was available in the supplied archive for this question.

Original question 4

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Original question 20

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Original question 23

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Original question 15

No matching mark scheme was available in the supplied archive for this question.

Original question 21

No matching mark scheme was available in the supplied archive for this question.

Question		Working	Answer	Mark	Notes
9	(a)	(5×5)×6	150 cm^2	4	M1 for attempt to find the area of one face (eg 5×5 or 25) M1 for 6 faces with an intention to add A1 cao B1 (indep) for cm^2 (with or without numerical answer) NB Do not accept any calculation which should lead to 125
	(b)	125 × 10 × 10 × 10 or 50 × 50 × 50	125 000	2	M1 125×10^3 (oe) or 50^3 (oe) A1 cao
	(c) (i)		86.5	1	B1 cao for 86.5
	(ii)		87.5	1	B1 for 87.5, or $87.4\dot{9}$ or 87.499… (min with dots) or 87.49 with some indication of recurrence

1380 3H

1380/3H

Question		Working	Answer	Mark	Notes
9		$\frac{1}{2} \times 3 \times 4 \times 20$	120	2	M1 for ½ x 3 x 4 x 20 A1 cao

Question		Working	Answer	Mark	Notes
20	(a)		$\frac{a^2(c+b)}{4abc}$	2	B1 for a^2 $(c + b)$ B1 for $4abc$ [−1 for each additional incorrect answer, up to a minimum of 0]
	(b)	8 × 100 × 100 × 100	8 000 000 or 8 x 10^6 or 8 million	2	M1 for sight of 10^6 oe or $100\times100\times100$ or $200\times200\times200$ A1 for 8 000 000 or 8 x 10^6

Question	Working	Answer	Mark	Notes
23	50 : 18 = 25 : 9 Ratio of length = 5 : 3 Ratio of volume = 125 : 27 $500\times\frac{27}{125}$	108	4	M1 for ratio of length =√50:√18 or √25 : √9 (or 5 : 3 or 3 : 5 seen) or 1.66-1.67 or 0.6 M1 for ratio of volume (mass) = "5"^{3} : "3"^{3} or $25^{\frac{3}{2}}$: $9^{\frac{3}{2}}$ oe or 4.62-4.63 or 0.216 M1 (dep on at least M1) for 500 × "$\frac{9^{\frac{3}{2}}}{25^{\frac{3}{2}}}$" or 500 ÷"4.62" or 500÷"4.63" or 500×"0.216" A1 cao [NB: ratios do not need to be presented as ratios as long as the relationship is clear]

Question	Working	Answer	Mark	Notes
15		B and E	2	B2 for B and E (B1 for one correct)

16	(a)		(0, 3, 2)	1	B1 cao
	(b)		(5, 3, 0)	1	B1 cao

Question	Working	Answer	Mark	Notes
5	Triangular face: ½ × 5 × 12 = 30 Rectangular faces: (13×10), (12×10),(5×10) Area: 30 + 30 + 130 + 120 + 50 =	360 cm^2	4	M1 for ½ × 5 × 12 (= 30) oe M1 for 2 + of (13×10) and (12×10) and (5×10) oe A1 cao NB: No marks awarded for calculating volume B1 (indep) units stated (cm^2)

15	Unknown length = $x + 3 – x – x$ = $3 – x$ **Cross-sectional area** = $(x + 3)(x –1) + (x + 3)(x –1) + (3 – x)(2x)$ = $x^2 + 2x – 3 + x^2 + 2x – 3 + 6x – 2x^2$ = $4x – 6 + 6x$ = $10x – 6$ **Volume** =$(10x – 6)(x + 3)$ = $10x^2 + 24x – 18$ **OR** Unknown length = $x + 3 – x – x$ = $3 – x$ **Volume** = $(x + 3)(x + 3)(x –1) + (x + 3)(x + 3)(x –1) + (2x)(3 – x)(x + 3)$ = $(10x – 6)(x + 3)$ = $10x^2 + 24x –18$	$10x^2 + 24x – 18$	4	B1 for $x + 3 – x – x$ oe or $3 – x$ seen or $x – 1 + 2x + x – 1$ oe or $4x – 2$ seen M1 for correct expression for 1 area from cross-section or for 1 volume of cuboid(s) (brackets not needed) M1 for correct method for total cross-sectional area OR at least 2 volumes added OR volume of surrounding cuboid – at least 1 vol (brackets needed) A1 for $10x^2 + 24x – 18$ oe

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Question	**Working**	**Answer**	**Mark**	**Notes**
15 cont..	**OR** Unknown length = $(2x - 2) + 2x = 4x - 2$ **Surrounding area** $= (4x - 2)(x + 3) = 4x^2 + 10x - 6$ So A = $4x^2 + 10x - 6 - 4x^2 = 10x - 6$ So V = $(10x - 6)(x + 3) = 10x^2 + 24x - 18$ **OR** Unknown length = $(2x - 2) + 2x = 4x - 2$ **Surrounding volume** $= (4x - 2)(x + 3)(x + 3)$ $V = (4x - 2)(x + 3)(x + 3) - 2x(2x)(x + 3)$			

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10		$(7 \times 2 + 2 \times 5) \times 200 = 4800$ 4800×8	38 400 g	5	M1 for 7×2 or 2×5 or 7×7 or 5×5 or 2×2 M1 for "7×2" + "2×5" oe or "7×7" – " 5×5" M1 (dep on 1st M) for '24' × 200 or '0.0024' × 2 M1 for '4800' × 8 or '0.0048' × 8 000 000 or '0.0048' × 8000 A1 for 38 400g or 38.4kg SC B3 for any answer including digits 384

1380_3H

Question		Working	Answer	Mark	Notes
25		$\pi x l = 2\pi x^2$ $h^2 + x^2 = 4x^2$ $h^2 = 3x^2$ **Alternative** $\pi x\sqrt{h^2 + x^2} = 2\pi x^2$ $\sqrt{h^2 + x^2} = 2x$ $h^2 + x^2 = 4x^2$ $h^2 = 3x^2$	$\sqrt{3}x$	4	B1 for curved surface area of one of the shapes e.g. $\pi x l$ or $2\pi x^2$ M1 for for attempt to equate surface areas e.g $\pi x l = 2\pi x^2$ or $l = 2x$ M1 for attempt to connect h and x using Pythagoras's theorem e.g. $h^2 + x^2 = 4x^2$ A1 for $\sqrt{3}x$ or $\sqrt{3x^2}$ **Alternative** B1 for $h^2 + x^2 = l^2$ oe M1 for attempt to equate surface areas e.g. $\pi x\sqrt{h^2 + x^2} = 2\pi x^2$ oe M1 (dep) for attempt to square both sides of their formula e.g. $h^2 + x^2 = 4x^2$ A1 for $\sqrt{3}x$ or $\sqrt{3x^2}$ SC B1 for attempt to equate surface areas in terms of r, rather than x

Question		Working	Answer	Mark	Notes
9		$\frac{1}{2}(8\times 15)\times 2 + (17\times 10)$ $+ (15\times 10) + (8\times 10)$ $= 60 + 60 + 170 + 150 + 80$	520 cm^2	4	M1 a correct expression for area of one face M1 for five area expressions added (at least three correct) A1 cao NB: if volume calculated then no marks B1 (indep) for cm^2

Question		Working	Answer	Mark	Notes
19		$(6.21795 \times 10^{10}) \div 510\,072\,000$ $= 121.9(03378\ldots)$	1.22×10^{2}	3	M1 for SA Jupiter ÷SA Earth eg $(6.21795 \times 10^{10}) \div 510\,072\,000$ oe, eg 62000÷ 51 or digits 121 …. or digits 122 A1 for 121 – 122 A1 for 1.21×10^{2} – 1.22×10^{2}

Question		Working	Answer	Mark	Notes
16		½ (12 + 8) × 6 = 60 '60' × 20 = 1200 1200 × 5 = 6000 6000 ÷ 1000 = 6	6	5	M1 ½ (12 + 8) × 6 oe or 60 seen M1 (dep) '60' × 20 M1 (indep) '1200' × 5 A1 6000 cao A1 ft (dep on 1st or 3rd M1 scored) for 6

24		$3 \times \pi \times 8^2$	603	3	M1 for $\frac{1}{2} \times 4 \times \pi \times 8^2$ oe (=402(.12…)) M1 (dep) for '402' + $\pi \times 8^2$ or 192π A1 for 603 – 603.23

7		½ (4 x 3) x 7 = 6 x 7	42 cm^3	4	M2 for ½ × 4 × 3×7 oe (M1 for ½ (4 × 3) or 4 × 3 × 7 or 6 seen as an area or 7× 'cross sectional area' or 84 seen) A1 for 42 B1 (indep) for cm^3

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Original question 4

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Original question 12

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Original question 8

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Question		Working	Answer	Mark	Notes
17	(a)	$1:2^2$ or $2^2:1$ $80 \times 2^2 = 80 \times 4 =$	320	2	M1 for sight of $1:2^2$ or $2^2:1$ or 2^2 or $\frac{1}{4}$ for ratio of area or 80×4 or identification of 4 as the scale factor A1 cao
	(b)	$1:2^3$ or $2^3:1$ 171700×2^3 $= 171700 \times 8 =$ OR $h_a=\frac{171700\times 3}{\pi\times40^2}$ $=102.47589$ $h_b = h_a\times2=204.95..$ $vol_b= \frac{1}{3}\pi\times80^2\times204.95..$	1 373 600	3	M1for sight of $1:2^3$ or $2^3:1$ or 2^3 or $\frac{1}{8}$ for ratio of volumes or identification of 8 as the scale factor M1 for $2^3 \times 171700$ A1 cao OR M1 for complete calculation to find the height of A (=102.47589..) M1 (dep) for $h_a\times2$ and used to find vol_b A1 cao

9			380	3	M1 for 4×7 + 5×2 (=38) or 9×2 + 5×4 (=38) or 4×7×10 or (7×9 − 5×5) or 5×2×10 (=100) or 9×2×10 (=180) or 5×4×10 (=200) or 9×7×10 (=630) or 5×5×10 (=250) M1 (dep) for '38'×10 or 380 or 4×7×10 + 5×2×10 or 9×2×10 + 5×4×10 or ×10 A1 cao

Question		Working	Answer	Mark	Notes
25	(a)		640	2	M1 for $80\times\left(\frac{8}{4}\right)^3$ or $80\div\left(\frac{4}{8}\right)^3$ A1 cao
	(b)		40	2	M1 for $160\div\left(\frac{8}{4}\right)^2$ or $160\times\left(\frac{4}{8}\right)^2$ or ft their scale factor from (a) A1 cao

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Question		Working	Answer	Mark	Notes
11	(a)		show	2	M1 for $x\times x\times x$ **or** $2\times5\times x$ **or** vol of cube = x^3 **or** vol cuboid = $10x$ A1 correct completion leading to $x^3-10x=100$
	(b)	$x = 1$: -9 $x = 2$: -2 $x = 3$: -3 $x = 4$: 24 $x = 5$: 75 $x = 6$: 156 $x = 10$: 900 $x = 5.1$: 81.(651) $x = 5.2$: 88.(608) $x = 5.3$: 95.(877) $x = 5.4$: 103.(464) $x = 5.5$: 111.(375) $x = 5.6$: 119.(616) $x = 5.7$: 128.(193) $x = 5.8$: 137.(112) $x = 5.9$: 146.(379) $x = 5.35$: 99.6(30375) $x = 5.36$: 100.3(90656) $x = 5.355$: 100.0(101139)	5.4	4	B2 for a trial $5 \le x \le 6$ evaluated correctly (B1 for any **two** trials evaluated correctly for positive values of x) B1 for a different trial $5.3 < x < 5.4$ evaluated correctly B1 (dep on at least one previous B1) for 5.4 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 d.p., but correct to 1 d.p. (rounded or truncated) if the value of x is to 2 or more d.p. NB. Allow 100 for a trial of $x = 5.355$

1MA0_2H

Question		Working	Answer	Mark	Notes
23	(b)	Angle $ABO = 45^o$ Angle $DAB = 180 - 45 - 45$ **OR** In ΔBAD, $\cos A = \frac{10^2 + 10^2 - '\sqrt{200}'^2}{2 \times 10 \times 10} = 0$ **OR** In ΔBOA, $\cos B = \frac{'\sqrt{50}'}{10}$ Angle $BAD = 180 - $ '45' – '45' **OR** $\sin A = \frac{'\sqrt{50}'}{10}$ $A = 45$ Angle $BAD = 2 \times$ '45'	90	2	M1 Angle $DAB = 180 - 2 \times$ '45' A1 89.98 - 90 **OR** M1 $\cos BAD = \frac{10^2 + 10^2 - '\sqrt{200}'^2}{2 \times 10 \times 10}$ A1 89.98 - 90 **OR** M1 $\sin A = \frac{'\sqrt{50}'}{10}$ A1 89.98 - 90

1MA0_2H

11		$\frac{1}{2} \times 2x \times x \times (x + 10)$	$V = x^3 + 10x^2$	3	M1 for $\frac{1}{2} \times 2x \times x \times (x + 10)$ A1 for $x^3 + 10x^2$ or $x^2(x + 10)$ B1 for V = cubic expression in x

12	(a)		Q marked and labelled	1	B1 for Q placed correctly (professional judgement if no cross)
	(b)		(3, 2, 4)	1	B1 cao

Question		Working	Answer	Mark	Notes
9		$9 \times 7 - 4 \times 5 = 43$ 43×8 OR $9 \times 7 \times 8 = 504$ $5 \times 4 \times 8 = 160$ $504 - 160$ OR $9 \times 2 + 5 \times 5$ 43×8 OR $9 \times 2 \times 8 = 144$ $5 \times 5 \times 8 = 200$ $144 + 200$ OR $7 \times 5 \times 8 = 280$ $2 \times 4 \times 8 = 64$ $280 + 64$	344	3	M1 $9 \times 7 - 4 \times 5$ or 43 M1 "43" × 8 A1 cao OR M1 $9 \times 7 \times 8$ or 504 or $5 \times 4 \times 8$ or 160 M1 $9 \times 7 \times 8$ or 504 - $5 \times 4 \times 8$ or 160 A1 cao OR M1 $9 \times 2 + 5 \times 5$ or 43 M1 "43" × 8 A1 cao OR M1 $9 \times 2 \times 8$ or 144 or $5 \times 5 \times 8$ or 200 M1 $9 \times 2 \times 8$ or 144 + $5 \times 5 \times 8$ or 200 A1 cao OR M1 $7 \times 5 \times 8$ or 280 or $2 \times 4 \times 8$ or 64 M1 $7 \times 5 \times 8$ or 280 + $2 \times 4 \times 8$ or 64 A1 cao

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Question		Working	Answer	Mark	Notes
12		½litre = 500ml $500 = \pi \times 4^2 \times h$ $h = 500 \div (\pi \times 4^2)$	9.95	5	B1 ½litre = 500ml or 500 seen M1 $\pi \times 4^2 \times h$ (= 50.2.×.h)or $\pi \times 4^2$ (= 50.2..) M1 "500" = $\pi \times 4^2 \times h$ oe M1 (h =) "500" ÷ ($\pi \times 4^2$) oe A1 9.9 – 10.0

Question		Working	Answer	Mark	Notes
23			75π	3	M1 for $(4 \times \pi \times 5^2) \div 2$ oe M1 for $\pi \times 5^2$ oe A1 for 75π accept 235.5 Condone the use of π = 3.14…

Question		Working	Answer	Mark	Notes
9			1180	3	M1 for a correct method to find the area of the cross section M1 (dep) for a complete correct method for the volume of the prism A1 cao **OR** M1 for a correct method to find the volume of one cuboid M1 (dep) for a complete correct method for the volume of the prism A1 cao

Question		Working	Answer	Mark	Notes
22		$\frac{1}{3}\times \pi \times 15^2 \times 40$ $-\frac{1}{3}\times \pi \times 7.5^2 \times 20$	8250	4	B1 for 15cm as diameter or 7.5 cm as radius of smaller cone (may be marked on diagram or used in a formula) M1 for a numerical expression for the volume of one cone eg. $\frac{1}{3}\times \pi \times 15^2 \times 40$ (=9424...) **or** $\frac{1}{3}\times \pi \times 7.5^2 \times 20$ (=1178...) M1 for $\frac{1}{3}\times \pi \times 15^2 \times 40$ oe $-\frac{1}{3}\times \times \pi \times 7.5^2 \times 20$ oe A1 for answer in the range 8240 − 8250 **OR** B1 for 2^3 M1 for a numerical expression for the volume of the large cone eg. $\frac{1}{3}\times \pi \times 15^2 \times 40$ (=9424...) M1 volume of frustrum = $\frac{7}{8}\times\frac{1}{3}\times \pi \times 15^2 \times 40$ oe A1 for answer in the range 8240 − 8250

Question		Working	Answer	Mark	Notes
11		$8\times10+\frac{4+10}{2}\times6=122$ 80+42 = 122 122 × 30 OR $(8+6)\times10-2\times\frac{1}{2}\times\frac{10-4}{2}\times6=$ $140-18=122$ 122 × 30 OR 8 × 10 × 30 = 2400 $\frac{4+10}{2}\times6\times30=1260$ 2400 + 1260 OR (8 + 6) × 10 × 30 = 4200 $2\times\frac{1}{2}\times\frac{10-4}{2}\times6\times30=540$ 4200-540	3660	4	M1 for correct method to find one correct area eg 8 × 10 (= 80) or $\frac{4+10}{2}\times6\ (=42)$ or (8 + 6) × 10 (=140) or $\frac{1}{2}\times\frac{10-4}{2}\times6\ (=9)$ M1 for correct method to find one correct volume eg 8 × 10 × 30 (= 2400) or $\frac{4+10}{2}\times6\times30\ (=1260)$ or 9 ×30 M1 for correct and complete method to find the total volume A1 cao

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Original question 16

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Original question 21

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Original question 17

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Question		Working	Answer	Mark	Notes
22			1200 cm^3	4	M1 for $10 \times 2 \times 2$ and 15×2 M1 for "40" × "30" A1 for 1200 B1 (indep) for cm^3 OR M1 for 10×15 or 2^3 or 8 indicated as scale factor M1 for $10 \times 15 \times 2 \times 2 \times 2$ A1 for 1200 B1 (indep) for cm^3 SC B2 for 600 cm^3 (B1 for 600)

Question		Working	Answer	Mark	Notes
1			40.5	3	M1 for 1.5×6 or 1.5 ×1.5 M1 for adding area of 5 or 6 faces provided at least 3 are the correct area A1 cao NB: anything that leads to a volume calculation 0 marks.
*2			Not enough mincemeat since 600<700 OR Only able to make 38 mince pies since insufficient mincemeat	4	M1 for 45 ÷ 18 (= 2.5) M1 for 2.5 used as factor or divisor A1 for ingredients as 562.5 and 875 and 250 and 700 and 2.5 (accept 2 or 3) OR for availables as 400, 400, 200 240, 2.4 (accept 2 or 3) C1 ft (dep on at least M1) for identifying and stating which ingredient is insufficient for the recipe (with some supportive evidence) OR M1 for a correct method to determine the number of pies one ingredient could produce M1 for a correct method to determine the number of pies **all** ingredient could produce A1 for 80 and 51 and 90 and 38 and 108 C1 ft (dep on at least M1) for identifying and stating which ingredient is insufficient for the recipe. (with some supportive evidence)

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Question		Working	Answer	Mark	Notes
7			90	3	M1 for one division (eg 60 ÷ 10), may be implied by correct number of marks on the diagram or correct number on one edge of diagram or eg 6×10, or by two of 6, 5 and 3 seen M1 for $(60 \div 10) \times (50 \div 10) \times (30 \div 10)$ A1 cao OR M1 for $10 \times 10 \times 10$ or $60 \times 50 \times 30$ M1 for $(60 \times 50 \times 30) \div (10 \times 10 \times 10)$ A1 cao

9		$\frac{1}{2} \times 5 \times 12 \times 10 =$	300	2	M1 for $\frac{1}{2} \times 5 \times 12$ ($\times 10$) oe A1 cao

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3			120 cm^3	4	M1 for $\frac{1}{2} \times 3 \times 4$ M1 (dep) for '$\frac{1}{2} \times 3 \times 4$' $\times 20$ A1 for 120 B1 (indep) for cm^3

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16		$120 \div 20 = 6$ $6^2 = 36$ $36 \times 300 = 10\ 800$	10 800	3	M1 $120 \div 20$ (= 6) oe, can be implied by $120^2 \div 20^2$ M1 '6'$^2 \times 300$ A1 cao

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Question	Working	Answer	Mark	Notes
24		14.4	3	M1 for $\pi \times 6.5^2 \times 11.5$ (=1526.42...) M1 (dep) for $\frac{'1526.42...'}{\pi \times 5.8^2}$ A1 for 14.4 - 14.5 **OR** M1 for $\frac{5.8}{6.5}$ or $\frac{6.5}{5.8}$ or 0.89(23…) or 1.12(06896…) M1 for $11.5 \div \left(\frac{5.8}{6.5}\right)^2$ or $11.5 \div \left(\frac{6.5}{5.8}\right)^2$ A1 for 14.4 - 14.5
*25		Yes with explanation	3	M1 For **Line A**: writes equation as $y = 1.5x + 4$ or gives the gradient as 1.5 or constant term of 4 OR for **Line B**: shows a method which could lead to finding the gradient or gives the gradient as 2 or constant term of 4 or calculates a sequence of points including (0,4) or writes equation of line as $y = 2x + 4$ M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made eg gradients, equations or points. C1 for gradients 1.5 **and** 2 **and** Yes **with** explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations OR M1 for a diagram that shows both lines drawn and intersecting at (0,4) M1 for a diagram that shows both lines and their intersection point identified as (0,4) C1 for Yes and states the intersection point as (0,4)

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6	(a)		Correct diagram	2	B2 (B1 any isometric face correct)
	(b)		6	2	M1 for (1) × 2 × 3 or 2 × 4 × 6 ÷ (2 × 2 × 2) A1 cao

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11			66400	5	M1 for explicit area of a trapezium eg (3+4) ÷2 × 14 (=49) or (60+62) ÷2 ×14 (=854) OR M1 for implicit area of trapezium eg 3×14 (=42) and 0.5×14×1 (=7) or 3×14×4 (=168) and 0.5×14×1×4 (=28) M1 for area of a rectangle using correct dimensions eg 68 × 2 (=136), 30 × 68 (=2040) M1 for a complete and correct method to find the total area M1 (dep on at least one previous M1) for multiplying their total area by 200 (where total area is a calculation involving at least two areas) A1 cao

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Question		Working	Answer	Mark	Notes
16	(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60^o$ or $\sqrt{5^2 - 2.5^2} = 4.330.....$ $\frac{1}{2} \times 5 \times 4.33$	10.8	3	M1 for using a triangle of sides 5 cm and angle 60° or a right-angled triangle of sides 5 cm and 2.5 cm M1 for a complete correct method to find the area of the triangle A1 for answer in the range 10.8 to 10.9
	(b)		7	4	M1 for $\frac{4}{3} \times \pi \times 17.5^3$ (= 22449.29...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 35^3$ (= 89797.19...) M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 17.5^3$ (= 11224.6) M1 (dep on M1) for 80 × 1000 ÷ '11224.6' oe A1 for 7 or (dep on M2) ft rounded down.

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Question		Working	Answer	Mark	Notes
16	(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60^o$ or $\sqrt{5^2 - 2.5^2} = 4.330.....$ $\frac{1}{2} \times 5 \times 4.33$	10.8	3	M1 for using a triangle of sides 5 cm and angle 60° or a right-angled triangle of sides 5 cm and 2.5 cm M1 for a complete correct method to find the area of the triangle A1 for answer in the range 10.8 to 10.9
	(b)		7	4	M1 for $\frac{4}{3} \times \pi \times 17.5^3$ (= 22449.29...) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 35^3$ (= 89797.19...) M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 17.5^3$ (= 11224.6) M1 (dep on M1) for 80 × 1000 ÷ '11224.6' oe A1 for 7 or (dep on M2) ft rounded down.

25			302	3	M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3$ oe (= 133.9 – 134.2) M1 for $\frac{1}{3} \times \pi \times 4^2 \times 10$ oe (= 167.4 – 167.7) A1 for 301 – 302 (or 96π or $\frac{288}{3}\pi$)

Original question 4

The full source mark scheme begins on page 533. Use the original paper code, tier and question number shown above.

6			500	4	M1 for a correct method to convert cm to m or m to cm or cm^3 to m^3 or m^3 to cm^3 (can be implied eg 4 packets drawn in container height) M1 for correct method for one volume or correct method to get at least 2 multipliers from packet to container (can be implied on the diagram) M1 for complete correct method (ignore incorrect conversions) A1 cao

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*7			80	4	B1 for *EBF* = 50 or *ABE* = 50 M1 for angles given that can lead to $x = 80$ as the next step eg *EBF* = 50 and *ABE* = 50 eg *EBF* = 50 and *BFG* = 100 eg *EBF* = 50 and *BFE* = 80 eg *EBF* = 50 and *DEB* = 130 and *ABE* = 50 A1 cao C1 for stating correct reasons appropriate to their method shown eg Base angles of an isosceles triangle are equal. with Angles in a triangle add up to 180° with Alternate angles are equal eg Base angles of an isosceles triangle are equal. with Alternate angles are equal with Angles on a straight line add up to 180° eg Base angles of an isosceles triangle are equal. with The exterior angle of a triangle is equal to the sum of the opposite interior angles. with Allied angles / Co-interior angles add up to 180°

PAPER: 5MB2H_01

PAPER: 5MB2H_01

Question		Working	Answer	Mark	Notes
14		**Front or Back**: ½ × 3x(13x – 3 + 5x – 3) = 27x^2 – 9x or ½ (4x)(3x) + 3x(5x – 3) **Top**: (5x – 3)(x + 2) = 5x^2 + 7x – 6 **Bottom**: (13x–3)(x + 2) = 13x^2 + 23x – 6 **Each Side**: 5x(x + 2) = 5x^2 + 10x **Total SA** = 2(27x^2 – 9x) + 2(5x^2 + 10x) + (5x^2 + 7x – 6) + (13x^2 + 23x – 6) = (54 + 10 + 5 + 13) x^2 + (–18 + 20 + 7 + 23) x + (– 6 – 6)	82x^2 + 32x – 12	4	M1 finds the area of at least 2 faces (condone omission of brackets) M1 writes a correct algebraic expression for the area of at least 3 different faces M1 correct expressions for all 6 faces and adds C1 (dep on M3) for correct algebraic expression as a correct summary

PAPER: 5MB2H_01

7			77 to 77.2	4	M1 for $\pi \times 40^2 \times 90$ (= 452389. ..) M1 for "452389. .." – 65000 (= 387389. …) M1 (dep on at least M1) for "387389. .." ÷ ($\pi \times 40^2$) A1 for answer in the range 77 to 77.2 OR M1 for $\pi \times 40^2$ (= 5026. ...) M1 for 65000 ÷ "5026. ...." (= 12.93...) M1 (dep on at least M1) for 90 − "12.93..." A1 for answer in the range 77 to 77.2

Paper: 5MB3H_01

20			128π	5	M1 for $\frac{4\pi r^2}{2} = 32\pi$ oe A1 for $(r =) 4$ M1 for $2\times\pi\times$"4"$\times 10$ $(=80\pi)$ **or** $\pi\times$"4"^{2} $(=16\pi)$ or ft their r M1 for $32\pi +$ "80π" + "16π" oe or 402.1 −402.3 or ft their r A1 cao

Original question 6

The full source mark scheme begins on page 547. Use the original paper code, tier and question number shown above.

6			261 cm^3	4	M1 for complete method to find the area of cross section or to find the volume of a cuboid of depth 9 M1 for complete method to find the volume of the prism eg $(5 \times 7 - 2 \times 3) \times 9$ or $(35 - 6) \times 9$ A1 for 261 B1 (indep) for cm^3

20			82.5	4	B1 for 70.5 M1 for $\sqrt[3]{}(3 \times$ "70.5" $\div 4 \div \pi)$ (= 2.56…) M1 for $4 \times \pi \times$ "2.56…"^{2} A1 for 82.5 – 82.6

Question		Working	Answer	Mark	Notes
5			12	3	M1 for a method to find volume of a cuboid, eg. 2 × 10 × 15 (= 300) or 5 × 5 × x (= 25x) M1 (dep) for "300" ÷ "25" oe A1 cao OR M1 for 10 ÷5 (= 2) and 15 ÷ 5 (= 3) or 10 ÷5 (= 2) and 2 ÷ 5 (= 0.4) M1 (dep) for 2 × “2” × “3” or 15 × “2” × “0.4” A1 cao

5		150 cm^3	3	M1 for a complete method to find the volume A1 for 150 B1 (indep) for cm^3

6	3000 ÷ 20=150 150 ÷ (14+1) = 10 10 ÷ 0.5 = 20 20 × 3.99	79.80	4	M1 for amount of petrol or oil or mixture M1 for use of ratio M1(dep on M1, M1) for total cost of bottles A1 for 79.8(0)

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Question	Working	Answer	Mark	Notes
11		3.4	3	M1 for $\pi \times 3.5^2 \times 10$ (=384.85 or =122.5π) or $\pi \times 6^2$ (=113.1 or =36π) M1 (dep) for "384.85" ÷ "113.1" or 122.5(π) ÷ 36(π) A1 for 3.4 – 3.5 OR M1 for $\left(\frac{12}{7}\right)^2$ (=2.9) or $\left(\frac{7}{12}\right)^2$ (=0.34) M1 for 10 ÷ "$\left(\frac{12}{7}\right)^2$" or 10 × "$\left(\frac{7}{12}\right)^2$" A1 for 3.4 – 3.5

Original question 9

The full source mark scheme begins on page 560. Use the original paper code, tier and question number shown above.

19			756π	5	M1 for ⅓πr^2×10 (=270π) A1 for $r = 9$ M1 (dep on M1) for $\frac{1}{2}\times\frac{4}{3}\pi\times"9"^3$ (= 486π) M1 for 270π + "486π" oe A1 cao
*20			Proof	5	M1for finding one other vector expressed as **a** and/or **b** M1 for method to find one of $\overrightarrow{DM}$, $\overrightarrow{MA}$ or $\overrightarrow{DA}$ eg $\overrightarrow{DM}$ = −**b** + ½(3**b** +**a**) oe, $\overrightarrow{MA}$ = ½(3**b** + **a**) + **a** oe or $\overrightarrow{DA}$ = 2**b**+2**a** oe M1 for method to find two of $\overrightarrow{DM}$, $\overrightarrow{MA}$ or $\overrightarrow{DA}$ A1 for two of $\overrightarrow{DM}$ = ½ (**a** + **b**), $\overrightarrow{MA}$ = 1.5(**a** + **b**), $\overrightarrow{DA}$ =2(**a**+**b**) ie simplified but oe C1 (dep on working shown) for conclusion relating to correct working

1MA0 1H November 2015

Original question 3

The full source mark scheme begins on page 576. Use the original paper code, tier and question number shown above.

5MB3H_01 November 2015

Question		Working	Answer	Mark	Notes
8			180	3	M1 for area of cross section, eg 3×2 + 3×4 + 3×6 (=36) or 9×6 − 3×3×2 (=36) M1 for "36" ×5 A1 cao OR M1 for area of one cuboid eg 3 × 2 × 5 (=30) M1 for 6 × "30" A1 cao OR M1 for 4.5 × 8 (=36) M1 for "36" × 5 A1 cao

Question	Working	Answer	Mark	Notes
1		750 cm^3	3	M1 for 30×25 A1 for 750 B1 (indep) for cm^3

14			3	5	M1 for a complete method to find the area of the cross section, eg. 15 × 2 + "(12 – 4)" × 2 + 15 × 2 (= 76) or for finding the volume of a relevant prism, eg. 15 × 2 × 120 (= 3600) "(12 – 4)" maybe just seen on the diagram M1 for a method to find the volume of the bar, eg. "76" × 120 (= 9120) or ft "area of cross section"×120 provided "area of cross section" includes a method to find the area of at least **two** relevant rectangles M1 for "volume" × 8, eg. "9120" × 8 (= 72960) or 250 × 1000 ÷ 8 (= 31250) NB "volume" must be dimensionally correct M1 (dep on previous M1) for 250 ÷ ("volume" × 8) ÷ 1000, eg. 250 ÷ "72960 ÷ 1000" (= 3.4265….) or "31250" ÷ "9120" A1 for an answer of 3 with correct working

PAPER: 1MA0_2H

Question		Working	Answer	Mark	
4		or	Yes (supported)	4	M1 for attempt to divide corresponding sides eg 500 ÷ 50 (=10) or 250 ÷ 50 (=5) or 200 ÷ 50 (=4) M1 (dep) multiplying divisors eg "10" × "5" × "4" (=200) [consistent units] M1 for use of 3 containers eg "200" × 3 (=600) or use of 500 boxes eg 500 ÷ "200" (=2.5) C1 for yes and 600 (boxes) or 2.5 (containers) oe OR M1 for attempt to find the volume eg 500 × 250 × 200 (=25 000 000) or 50 × 50 × 50 (=125 000) M1 (dep) for dividing volumes [consistent units] eg "25 000 000" ÷ "125 000" (=200) or "125 000" × 500 (=62 500 000) M1 for use of 3 containers eg "25 000 000" × 3 (=75 000 000) or "200" × 3 (=600) or use of 500 boxes eg for "125 000" × 500 (= 62 500 000) and "25 000 000" × 3 (= 75 000 000) or 500 ÷ "200" (=2.5) C1 for yes and 600 (boxes) or 2.5 (containers) or 62 500 000 and 75 000 000 oe

Question		Working	Answer	Mark	
9			142	3	M1 for 3 × 7 (=21) or 3 × 5 (=15) or 5 × 7 (=35) M1 (dep on M1) for 2 × ('21' + '15' + '35') A1 cao

Original question 6

The full source mark scheme begins on page 589. Use the original paper code, tier and question number shown above.

Original question 9

The full source mark scheme begins on page 589. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
22		$9x^2 + 7x - 2$	4	M1 for finding an expression for a missing length eg $4x - 1 - x - x$ $(=2x - 1)$ or $x + 2 - 2x$ $(=2 - x)$ M1 for a correct expression for one area from the cross-section, eg. $x \times 2x$ or $(4x - 1)(x + 2 - 2x)$ or for one volume of cuboid(s), eg. $x \times 2x \times (x + 1)$ M1 for a complete method to find the volume A1 for $9x^2 + 7x - 2$ or $(9x - 2)(x + 1)$ oe

27		32 : 45	5	M1 for a correct expression for surface area of the cylinder ($=2\times\pi\times3^2+6\pi h$) or surface area of the sphere ($=4\times\pi\times6^2$) M1 (dep) for equating 'surface area of cylinder' and '2 × surface area of sphere', $2\times\pi\times3^2+6\pi h = 2\times4\times\pi\times6^2$ M1 (dep) for a method to isolate h M1 for $\pi\times3^2\times$'45' oe and $\frac{4}{3}\times\pi\times6^3$ oe A1 cao

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
1		The enlargement has been drawn on the grid. Grid has been enlarged. Wording has been changed to: 'On the grid there are two shapes, shape X and shape Y. A point A is marked on the grid. Describe fully the transformation that maps shape X onto shape Y.'	B3 for an enlargement of scale factor 3 with centre A (B2 for 2 aspects described) (B1 for 1 aspect described)
4		Diagram enlarged. Axes labels have been moved to the top of the vertical axis and to the left of the horizontal axis. Right axis has been labelled.	As standard mark scheme
5		Model provided for all candidates. Diagram enlarged and also provided for MLP. Wording has been changed to: 'They show a prism. An arrow points to the side elevation of the prism. Now look at the three shapes below the diagram of the prism, shape A, shape B and shape C. Which shape A, B or C shows the view from the direction of the arrow? [The three diagrams show: A the front elevation, B the plan and C the side elevation].	B2 for shape C only indicated (B1 for shape C and one other shown)

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
6	(a)	The letter 'a' has been changed to 't' for all candidates. Frequency numbers have been changed to 5, 15, 15, 20, 5.	Standard mark scheme with letter change
	(b)	Grid has been enlarged. Axes labels have been moved to the top of the vertical axis and to the left of the horizontal axis. Right axis has been labelled.	Standard mark scheme Tolerance to **within** half a square
7		Diagram enlarged. Shading changed to dotty shading.	Standard mark scheme
9		Diagram has been enlarged. Wording added 'Angle CEA is marked x.'	Standard mark scheme
10	(a)	Diagram enlarged.	Standard mark scheme
12	(b)	North lines have been extended to 9cm. A line has been added between Y and L and this line has been extended to 9cm. The distance from point Y to T is now 10.8 cm. [Leeway will be needed for answering the question]. '80 km' changed to '100 km'.	M1 for line drawn on a bearing of 320 ±5 drawn A1 for an answer in the range 20 to 30

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
14		Grid has been enlarged. Triangle B and Triangle C have been drawn on the grid. Question changed to: 'A cut out shape has been provided.' '(a) Describe fully the transformation that maps triangle A onto triangle B. (b) Describe fully the single transformation that maps triangle B onto triangle C. (c) Describe fully the single transformation that maps triangle A onto triangle C.	(a) B1 for one aspect of rotation 90°clockwise or centre (0,1) (b) B1 for translation or vector $\begin{pmatrix}-3\\-1\end{pmatrix}$ (c) B1 for rotation of 90°clockwise with centre (−2,2)
	(a) (b)	The table has been turned to vertical format and left aligned. Wording added 'There are four spaces to fill.' Grid has been enlarged.	(a) Standard Mark scheme (b) Standard mark scheme- Allow extra tolerance
18		Diagram enlarged. Lines on the box plot have changed to, '95, 105, 115, 120, 135.'	Boys :Range 40, IQR 15 Standard Mark scheme
21		Diagram enlarged.	Standard Mark scheme

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
22		Model provided for all candidates. Diagram enlarged and also provided for MLP. MLP only: x changed to y.	M1 for finding an expression for a missing length eg $4y - 1 - y - y$ (=$2y - 1$) or $y + 2 - 2y$ (=$2 - y$) M1 for a correct eypression for one area from the cross-section, eg. $y \times 2y$ or $(4y - 1)(y + 2 - 2y)$ or for one volume of cuboid(s), eg. $y \times 2y \times (y + 1)$ M1 for a complete method to find the volume A1 for $9y^2 + 7y - 2$ or $(9y - 2)(y + 1)$ oe
23	(i)	Diagram enlarged. Distances have been changed to '30, 40, 30, 20, 20'. Wording added 'There are two spaces to fill.	M1 for evidence of frequency density calculation, eg 6 on the frequency density axis for the height of the first column or 5 is 1 cm² can be implied by 30 as the second missing frequency A1 for 40 and 30
	(ii)	'	B1 for 30 – 50 bar of height 1 cm
24		Braille only: letter 'I' changed to 'S'.	Standard Mark scheme
25		Diagram enlarged.	Standard Mark scheme
26		Diagram enlarged.	Standard Mark scheme
27		Two models provided for all candidates. Diagrams enlarged and also provided for MLP.	Standard Mark scheme

Question	Working	Answer	Mark	Notes	Type
8	$4 \times 3 = 12$ $2 \times 10 = 20$ $(12 + 20 + 20) \times 1.5$ $8 \times 10 \times 1.5 = 120$ $\frac{1}{2} \times 4 \times 7 \times 1.5 = 21$ $120 - 21 - 21$	78	4	M1 for method to find area of parallelogram or 2 triangles M1 for method to find whole cross sectional area M1 for complete method to find volume A1 cao OR M1 for method to find volume of enclosing cuboid or volume of a single cuboid. M1 for method to find volume of triangular prism(s) or for method to find volume of parallelogram prism(s) M1 for complete method to find volume of prism. A1 cao	E

PAPER: 5MB3H_01

Question	Working	Answer	Mark	Notes
12 (a)		Equation	2	M1 for $2x \times x \times (x + 4)$ A1 for clear working leading to $x^3 + 4x^2 = 90$
(b)	3 63 4 128 3.1 68.231 3.2 73.728 3.3 79.497 3.4 85.544 3.5 91.875 3.45 88.67363 3.46 89.30814 3.47 89.94552 3.48 90.58579	3.5	4	B2 for trial evaluated using $3 < x < 4$ (B1 for trial evaluated using $3 \leq x \leq 4$) B1 for a different trial evaluated using $3.4 \leq x \leq 3.5$ B1 (dep on at least one previous B1) for 3.5 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but correct to 1dp (rounded or truncated) if the value of x is to 2 dp. NB: no working scores no marks even if the answer is correct.

23	(a)		199.75	1	B1 cao
	*(b)		Yes	3	B1 for ub = 24.5 or 175.5 M1 ft for “24.5” + “175.5” (= 200) C1 (dep M1) for 200 and statement based on their working as to whether the cup will overflow (ie comparison with (a)).

7		15 200	3	M1 for a method to obtain at least 2 different areas from 50×80 (= 4000), $\frac{1}{2} \times 40 \times 60$ (= 1200), 60×80 (= 4800) M1 (dep on M1) for adding at least 4 correct face areas A1 cao

12		270	3	M1 for correct use of formula for volume of a cylinder using exact or (some) approximate figures eg $\pi \times 31^2 \times 97.5$ or $\pi \times 31^2 \times 100$ or using an estimate of π eg $\pi = 3$ in the volume formula M1 for a complete method to find an estimate for the volume in cm^3 with at least 2 values rounded eg $\pi \times 30^2 \times 100$ (= 270 000) eg $3.1 \times 30^2 \times 100$ eg $3 \times 31^2 \times 100$ A1 accept answer in the range 270 − 300 from a method using estimates

Paper: 1MA0/1H

15	(a)		3.5 to 4.5	M1	substitution into formula $\frac{1}{3}\pi r^2 h$ of chosen values for r and V (accept $r = 5.13$ and $V = 98$) and starts rearrangement e.g. multiplies by 3, divides by π or divides by r^2 (both sides)
				M1	uses estimates in calculation e.g. $\frac{3\times100}{3\times25}$ (or in rearranged formula) or $\frac{12}{\pi}$
				A1	arrives at a single value from estimate in the range 3.5 to 4.5
	(b)		more	C1	ft e.g. more since number in numerator goes up; numbers in denominator go down.

3		Side elevation	C2 [C1	for the side elevation (4 cm by 2 cm rectangle with a solid line drawn 1 cm from the 2 cm edge, and correct orientation) for the side elevation as a rectangle]
		Front elevation	C2 [C1	for the front elevation as a trapezium in correct orientation with base 4 cm, parallel sides 1 cm and 4 cm for the front elevation as a trapezium with two right angles] [Ignore incorrect or no labelling]

Paper: 1MA1/2H

Question	Working	Answer	Mark	Notes
6		1.01	P1	fruit syrup 15 × 1.4 (= 21) or water 280 × 0.99 (= 277.2) or apple juice 25 × 1.05 (= 26.25)
			P1	(dep P1) for complete process to find the total mass e.g. “277.2” + “26.25” + “21” (= 324.45) or a weighted density eg 15 × 1.4 ÷ 320 (= 0.065625) or 280 × 0.99 ÷ 320 (= 0.86625) or 25 × 1.05 ÷ 320 (= 0.08203125)
			P1	(dep P2) for complete process to find the density eg “324.45” ÷ 320 (=1.01..) or “0.065625” + “0.86625” + “0.08203125” (= 1.0139..)
			A1	1.01 to 1.014

18		0.98	B1	cao

Paper: 1MA1/2H

3		648	M2 [M1 A1	a complete method, eg 12.5 × 1000 ÷ 19.3 for using volume = mass/density, eg 12500 ÷ 19.3 (condone inconsistent units or incorrect conversions) may be implied by digits 647... or 648...] for answer in range 647 to 648

Paper: 1MA1/3H

14		Shown	M1 M1 A1	for $\sqrt[3]{\frac{8}{27}}$ (= $\frac{2}{3}$) or $\sqrt[3]{\frac{27}{8}}$ (= $\frac{3}{2}$) or 2 : 3 or 3 : 2 for $\left(\sqrt[3]{\frac{8}{27}}\right)^2$ (= $\frac{4}{9}$) or $\left(\sqrt[3]{\frac{27}{8}}\right)^2$ (= $\frac{9}{4}$) or 4 : 9 or 9 : 4 132 from correct arithmetic

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
5 (a)	isosceles triangle, base 6 cm, height 4 cm	M1	for drawing an isosceles triangle **or** for drawing a triangle of base 6cm and height 4cm	Accept a freehand drawing Only a single triangle is acceptable; do **not** accept any attempted nets or 3-D diagrams
		A1	for a fully correct diagram	Condone a perpendicular drawn from base to vertex
(b)	96 cm^2	M1	for a method to find the area of a triangular face eg ½ × 6 × 5 (= 15)	
		M1	(dep) for finding the total surface area eg 4 × "15" + 6 × 6	
		A1	for a numerical answer of 96	Ignore incorrect or absent units for this mark
			SC B1 for an answer of 84 if M0 scored	[The SC is from: 4 × ½ × 6 × 4 + 6 × 6]
		B1	cm^2	Ignore incorrect or absent numerical answer for this mark

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
19	905	P1	for correct use of formula for the volume of a sphere eg $\frac{1}{4} \times \frac{4}{3} \times \pi \times r^3$ (= 576π or 1809…) **OR** $576\pi \times 4$ **or** 2304π **or** 7238…$(=\frac{4}{3} \times \pi \times r^3)$	We do not need to see what is in the brackets to award this mark. The contents of the bracket alone would score P0
		P1	for a complete correct process to find *r*, eg $r = \sqrt[3]{\frac{576 \times 4 \times 3}{4}}$ **or** $r = 12$	Could be shown in several stages $\sqrt[3]{\frac{576 \times 4 \times 3}{4}} = \sqrt[3]{1728}$
		P1	for a process to find the curved surface area eg $\frac{4 \times \pi \times [radius]^2}{4}$ (=144π or 452…) **OR** the surface area of both flat surfaces eg $(2 \times \frac{\pi \times [radius]^2}{2})$ **OR** complete expression for the total surface area eg $\frac{4\pi r^2}{4} + \frac{\pi r^2}{2} \times 2$ oe	Radius used must be clearly identified as their radius of the solid
		P1	for process to find the complete surface area eg $\frac{4 \times \pi \times [radius]^2}{4} + (2 \times \frac{\pi \times [radius]^2}{2})$	
		A1	answer in the range 904.7 – 905 or 288π (SCB2 for an answer in the range 358.1 – 359.2)	If an answer is given in the range but then incorrectly rounded, award full marks.

12	(a)	1.5	M1	for method to find the gradient of the line, eg $\frac{12}{8}$	Must see use of scales.
			A1	for 1.5 oe	
	(b)	Explanation	C1	Explanation relating to rate of change of volume with time, eg rate at which the container fills or change in number of litres per second or number of litres added per second	Ignore any quantities given. Award the mark for an explanation involving rate.
	(c)	Explanation	C1	Explanation relating to volume (amount) of liquid in the container at the start eg number of litres in the container when $t = 0$, amount of liquid in the container to start with	

13	6.50	M1 M1 A1	for method to find ratio or scale factor of lengths or volumes eg $\sqrt{3} : 2$ or $1 : 1.15(47....)$ or $0.86(60\ldots) : 1$ or $\sqrt{27} : 8$ oe for complete method to find ratio of volumes and use to find required volume eg $10 \div (\text{"}1.15...\text{"})^3$ or $10 \times (\text{“}0.86\ldots\text{”})^3$ for answer in the range 6.49 to 6.53	Scale factors may just be seen as 1.15..., 0.86...etc If an answer is given within the range then incorrectly rounded to 3 sig figs, award full marks. Accept 6.5

Paper: 1MA1/3H

15	3 : 10	P1 P1 P1 A1	process to find ratio of lengths **A**:**B** = $\sqrt{4}$:$\sqrt{25}$ (= 2:5 or $\frac{2}{5}$ or 2, 5) for process to find ratio of lengths **B**:**C** = $\sqrt[3]{27}$: $\sqrt[3]{64}$ (= 3:4 or $\frac{3}{4}$ or 3, 4) for process to write as one ratio eg. finding a common multiple of 3 and 5 **or** 6 : 15 : 20 oe cao	Accept working in fractions for the award of process marks but the final answer must be in correct simplified ratio notation

Paper: 1MA1/1H

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
20	3.75	P1	works to find vol of frustum eg $1/3\pi(3.6)^2\times6.4 - 1/3\pi(1.8)^2\times3.2$ or 86.858.. − 10.857… (=24.192π or 76.00..)	
		P1	works to find vol of hemisphere eg $\frac{1}{2}\times\frac{4}{3}\pi\times3.6^3$ (=31.104π or 97.7....)	781.7… by use of diameter does not get the mark
		P1	mass of frustum as [vol]×density eg "76.00" × 2.4 (=182.4..) **or** mass of hemisphere as [vol]×density eg "97.7...."×4.8 (=469.037...)	[vol] is their volume which could be ft using the radius, using the diameter, or could be another value as long as it is stated as being the volume, or clearly intended from working.
		P1	mean density as total mass ÷ total volume eg ("182.4.." + "469.037") ÷ ("76…" + "97.7..") or "651.4..". ÷ "173.7...."	All figures must come from correct method shown.
		A1	answer in the range 3.7 to 3.8	

8	8	P1 P1 P1 A1	process to start the problem eg $xy = 45$ **and** $xz = 15$ **and** $yz = 27$ **or** 5×9 (=45) **and** 3×9 (=27) **and** 3×5 (=15) **or** 3, 5 and 9 stated for $3 \times 5 \times 9$ (=135) **or** 2 of "9" ÷ 2.5 (=3.6) **or** "5" ÷ 2.5 (=2) **or** "3" ÷ 2.5 (=1.2) for 2.5^3 (=15.625) **or** all of "9" ÷ 2.5 (=3.6) **and** "5" ÷ 2.5 (=2) **and** "3" ÷ 2.5 (=1.2) for a complete process to find the number of cubes possible eg [volume] ÷ "15.625" (=8.64) **or** "3.6" × "2" × "1.2" (=8.64) cao	Maybe seen on diagram [Volume] must come from multiplying together what they clearly indicate as the 3 dimensions of the cuboid. The three dimensions cannot be 45, 27 and 15

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
12	$\frac{4}{9}$	P1	for process to find link between volume of Q and volume of P **or** between volume of R and volume of Q, eg ratio 1.5 : 1 **or** Q = 1.5P **or** P = $\frac{2}{3}$Q **or** two values in the ratio 1 : 1.5 such as 100 and 150	
		P1	for process to find link between volume of R and volume of P eg 1.5^2 : 1 **or** two values in the ratio 1 : 2.25 such as 100 and 225	$1.5^2 (=\frac{9}{4})$ is enough for this mark, award P1P1
		A1	for $\frac{4}{9}$ oe fraction eg $\frac{100}{225}$	Accept P = $\frac{4}{9}$R

15	48	M1	for method to use a volume formula with correct substitution for the cone, sphere or hemisphere eg $\frac{1}{3} \times \pi \times 3^2 \times 10$ **or** $\frac{4}{3} \times \pi \times 3^3$ **or** $\frac{2}{3} \times \pi \times 3^3$ oe	May work without π or with an approximation of π; must use the correct radius of 3 (and 10) in substitution
		M1	for complete method to find total volume eg $\frac{1}{3} \times \pi \times 3^2 \times 10 + \frac{2}{3} \times \pi \times 3^3$	
		M1	(dep first M1) for correct partial simplification, eg 30π **or** 18π	Must be cone or hemisphere
		A1	cao SC B2 for answer of 264 or 264π	Accept 48π

Paper: 1MA1/1H

4	8	P1 P1 P1 A1	for working with volume of the cuboid, eg 30 × 6 × 19 (= 3420) **OR** for using $\frac{2}{3}$ with one dimension, eg. 30 × 2 ÷ 3 (= 20) for "3420" × 2 ÷ 3 (= 2280) **or** "3420" ÷ 3 (= 1140) **OR** "20" × 6 × 19 (= 2280) **OR** "3420" ÷ 275 (= 12.4… = 12 cups) (dep on P2) for "2280" ÷ 275 (= 8(.29...)) **or** "1140" ÷ 275 (= 4(.14...)) **OR** "12" × 2 ÷ 3 **OR** for 275 × 8 (= 2200) **or** 275 × 9 (= 2475) cao	For P marks, ignore attempts at unit conversion

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
6	No Supported	P1	for finding the area of a circle eg $\pi \times 0.8^2$ (= 2.01...)	Must be area of circle and not part of a volume, eg $\pi r^2 h$ May be seen as $2\pi r^2$
		P1	for finding the curved surface area eg $2\pi \times 0.8 \times 1.8$ (= 9.047…)	May be seen from $2\pi rh$ or from πdh
		P1	for use of the coverage information with an area eg "2.01…" ÷ 5 (= 0.402…) or "4.02…" ÷ 5 (= 0.804…) or "9.047…" ÷ 5 (= 1.8095…) or "11.058" ÷ 5 (= 2.2116..) or "13.069…" ÷ 5 (= 2.6138…) **OR** for process to find total coverage for comparison eg 5 × 7 (= 35)	Accept numbers without working written to no less than 2dp Do not award if a volume has been used as part of the calculation. An independent mark for 5 ×7
		P1	(dep P1) for finding total surface area for 3 tanks eg [total surface area] × 3 (= 39.2…) **OR** for complete process to find the number of tins needed for total area of 3 tanks eg "13.069"....× 3 ÷ 5 (= 7.84.…) **OR** for complete process to find coverage needed from each tin eg "13.069"...× 3 ÷ 7 (= 5.6...)	[total surface area] must come from the addition of two attempts at area, but not from volume.
		C1	for conclusion "No" supported by accurate figures eg 8 tins **or** 7.84 (> 7) **or** 39.2 > 35 **or** 5.6 (>5)	Clear statement that there is **not** enough paint supported by correct figures for comparison. NB: 2.6 × 3 = 9 tins needed is inaccurate 8 or 7.84 tins is sufficient without restating the 7, 5.6 m^2 is sufficient without restating the 5 but 39.2 and 35 are needed for comparison. A statement of "No, 8 tins" alone gets 0 marks without supporting working.

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
17	4	P1	for process to find ratio of corresponding lengths, eg. $\sqrt{4}$: $\sqrt{9}$ (= 2 : 3)	
		P1	for process to find ratio of volumes, eg "2"^{3} : "3"^{3} (= 8 : 27)	
		P1	for "27" ÷ "8" (= 3.375)	This may be seen by checking their volume, eg. "8" × 4 (= 32) and "8" × 3 (= 24)
		A1	for rounding to give an answer of 4 from correct working	An answer of 4 with no supportive working gets no marks

Paper: 1MA1/1H

9	No (supported)	P1	for finding the area of 3 or more faces of the cuboid **and** adding eg (6 × 8) + (8 × 18) + (6 × 18) … or "48" + "144" + "108" … (= 300)		Could be an addition of *any* three faces eg 48 + 48 + 144 etc.
		P1	complete process to find surface area of cuboid, eg 6 × 8 × 2 + 6 × 18 × 2 + 8 × 18 × 2 (= 600)		
		P1	for process to find side length of cube, eg [surface area] ÷ 6 **and** square rooting (= 10)	for a process to find the volume of the cuboid 6 × 8 × 18 (= 864) **and** cube rooting (= 9.52…) to find a side length	[surface area] must come from the addition of at least three attempts at area, but not from volume.
		P1	(dep on previous P1) for processes to find volume of cube **and** volume of cuboid, eg [side length]^3 (= 1000) **and** 6 × 8 × 18 (= 864)	(dep on previous P1) for process to find surface area of cube, eg. ("9.52…")^2 × 6 (= 544.28…)	
		A1	No with 1000 **and** 864 **OR** No with 600 **and** 544(.28…)		

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
19	155	M1	for a complete method to find the volume of the hemisphere, eg $\frac{1}{2}\times\frac{4}{3}\times\pi\times4.2^3$ oe	
		A1	answer in range 155 to 155.2	If an answer in the range is seen in working and then incorrectly rounded award full marks

13	739	P1	process to find the volume of C, eg $\pi \times 3^2 \times 25$ (= 706.8583471 or 225π)	For use of 3.14 Volume of C is 706.5
		P1	process to find the volume of A **or** the volume of B, eg "706.8..." $\times \frac{2}{2+13}$ (= 94.24777961 or 30π) or "706.8…" $\times \frac{13}{2+13}$ (= 612.6105675 or 195π) **or** process to work with density and ratio, eg ($2 \times 1.21 + 13 \times 1.02$) (= 15.68)	Volume of A is 94.2 Volume of B is 612.3
		P1	process to find the mass of C, eg "30π" × 1.21 (= 114.0398133) + "195π" × 1.02 (= 624.8627788) **or** "225π" × "15.68" ÷ (2+13)	Mass of A is 113.982 Mass of B is 624.546
		A1	for an answer in the range 738.5 to 739	Do not award accuracy mark if the figure is from obvious incorrect working

Paper: 1MA1/3H

23	264	P1 P1 P1 P1 A1	correct substitution into the volume formula, eg $56.8 = \frac{1}{3} \times \pi \times r^2 \times 3.6$ completes process to find base radius **or** the value of r^2, eg $r = \sqrt{\frac{56.8 \times 3}{\pi \times 3.6}}$ (=3.88158…) or $r^2 = \frac{56.8}{1.2\pi}$ (=15.066) Uses Pythagoras to find the sloping length, eg $\sqrt{"3.88\ldots"^2 + 3.6^2}$ (=5.29...…) process to find an equation in *AOB*, eg $\pi \times$ "3.88" $\times$ "5.29" $= \frac{AOB}{360} \times \pi \times$ "5.29"^{2} **or** $\frac{AOB}{360} \times \pi \times 2 \times$ "5.29" $= 2 \times \pi \times$ "3.88" **or** $\frac{AOB}{360} \times$ "5.29" = "3.88" answer in the range 263.9 to 264.1	*AOB* does not need to be the subject of the equation

Paper: 1MA1/3H

8	450	M1 M1 A1	for 18 ÷ 3 (=6) for substitution eg. $75 = \frac{F}{"6"}$ or $75 \times$ "6" cao	Ignore units

13	196	P1 P1 A1	for vol A = 1400 ÷ 70 (=20) **or** for mass B = 280 × 30 (=8400) for density C = $\frac{1400+"8400"}{"20"+30}$ (= $\frac{9800}{50}$) or answer with digits 196 cao	 An answer of 350 from 70 + 280 gets no marks

12	(a)	–0.09	M1	for suitable method to find gradient, eg 27 ÷ 300	Any readings from the graph must be reasonable. Condone missing negative for M1
			A1	for answer in the range −0.1 to −0.08 oe	
	(b)		C1	for explanation **Acceptable examples** volume of petrol used each km litres/km Rate of fuel consumption For every 9 litres you can travel 100 km **Not acceptable examples** volume ÷ distance volume of petrol used per distance km/litre as distance increases volume decreases	Can ft explanation linked to incorrect gradient in part (a)

Paper: 1MA1/2H

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
9	2820	P1	for start to process to find height of triangle, eg $\tan(40) = \frac{h}{5}$ oe **or** equivalent process to find the height of the triangle **or** start to process to find slant height, eg $\frac{10}{\sin 100} = \frac{x}{\sin 40}$	
		P1	for complete process to find height of triangle, eg 5tan 40 (= 4.19...) **or** complete process to find the slant height, eg $\frac{10}{\sin 100} \times \sin 40$ (= 6.5...)	Accept 4.2
		P1	for start of process to find volume of prism, eg 10 × 20 × 12 (= 2400) or 0.5 × 10 × "4.19..."× 20 (= 419....) or $\frac{1}{2}$ × 10 ×"6.52..." ×sin 40 × 20 (419....) **or** process to find total area of cross section, eg 0.5 × 10 × "4.19..." + 10 × 12 (= 140.9...) or $\frac{1}{2}$ × "6.52..." ×"6.52..." × sin 100 + 10 × 12 (= 140.9...)	10 × 20 × 12 may be seen as part of a calculation to find the volume of the prism
		P1	for complete process to find total volume, eg (0.5 × 10 × "4.19..." + 10 × 12) × 20	
		A1	for an answer in the range 2810 to 2820	If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
6	12	P1	for a process to find the area of cross section, eg $750 \div 25$ (= 30) oe **or** $\frac{1}{2} \times 5 \times h$ oe	May use any letter for h or may use ?
		P1	for a correct equation in h, eg $750 \div 25 = \frac{1}{2} \times 5 \times h$ oe **or** $\frac{1}{2} \times 5 \times h \times 25 = 750$ oe **or** for a complete process to find h, eg $\frac{750}{25} \times \frac{2}{5}$ oe **or** "30" $\times 2 \div 5$	
		A1	cao SC B1 for answer of 6 if P0 scored	

7	Shown	M1 M1 M1 A1	for a correct expression for the area of one face of the cube, eg x^2 **or** a correct expression for the surface area of the cube, eg $6 \times x^2$ for a correct expression for the surface area of the sphere, eg $4 \times \pi \times 3^2 (= 36\pi)$ for forming a suitable equation, eg $6 \times x^2 = 4 \times \pi \times 3^2$ **or** $6x^2 =$ "36π" for completing the method to $x = \sqrt{6\pi}$ or $k = 6$	No marks for $x = \sqrt{6\pi}$ without any working. $6 \times x^2 = 4 \times \pi \times 3^2$ $x^2 = 36\pi \div 6$ $x = \sqrt{6\pi}$

Paper: 1MA1/1H

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
19	25 : 36	P1	for $\sqrt[3]{125}$ (= 5) **and** $\sqrt[3]{27}$ (= 3) oe **OR** for correct process to find the radius of A and radius of B (3.10… and 1.86…)	Accept scale factors expressed as fractions or decimals eg 1.66, 1.67, 0.6 or better Ignore units throughout
		P1	for method to find values in ratio of length between *A* and *C* eg 5 **and** 2×3 (= 6) oe **or** "3.10…" **and** "1.86…" × 2 (=3.72…) **OR** 25 **and** 36 **OR** for correct process to find SA of A **and** SA of C (120.(8…)) and (174.(0…))	For both P marks the lengths need not be written as a ratio
		A1	for 25 : 36 oe eg 1: 1.44	

Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	(100,18)	B1	cao	
(b)	12.8 to 14.8	M1	for a method to read off eg line of best fit **or** line up from 370 **or** for a point on the grid at (370, *y*) where *y* lies between 12.8 and 14.8	
		A1	for an answer in the range 12.8 to 14.8	
(c)	Decision and statement	C1	for decision and statement **Acceptable examples** No, as this point can be disregarded from the general trend No, ignore this point No, the correlation is positive No, because even with an outlier you can still have a negative or positive correlation. No, there is still a correlation. No, as you can use the rest of the data to determine a correlation. No, as outlier does not affect the majority No as a line of best fit can still be drawn No, it is an anomaly **Not acceptable examples** Yes, …. Outliers can be ignored [no decision] No, the outlier can be ignored so the correlation is negative No there are other things that can affect the test	

Paper: 1MA1/3H	

15	0.7 to 1.1	M1 M1 A1	for tangent to the curve drawn at $t = 12$ for method to find the gradient of their tangent, eg $28 \div 30$ for answer in the range 0.7 to 1.1 dependent upon tangent drawn	 Working may be seen on the diagram Ignore negative signs

Paper: 1MA1/3H	

7	3 : 2	P1 P1 A1	for a process to find either volume eg 3^3 (= 27) or 4^3 (= 64) for showing density **A** = 81 ÷ "27" (= 3) or density **B** = 128 ÷ "64" (= 2) for 3 : 2 oe	 Ignore units quoted

Paper: 1MA1/1H

9	278	P1	for working out at least 3 areas from 5 × 7 (= 35) 5 × 6 (= 30) 7 × 6 (= 42) 4 × 4 (= 16)	
		P1	for a complete process, eg "35"× 2 + "30"× 2 + "42" + ("42" – "16") + "16" × 5 oe or "35"× 2 + "30"× 2 + "42" × 2 + "16" × 4 **OR** for a process to find the total surface area of at least 5 faces for each solid, eg "35"× 2 + "30"× 2 + "42" **and** "16"× 6 or "35"× 2 + "30"× 2 + "42"× 2 **and** "16"× 5	Total surface area of cuboid = 214 Total surface area of cube = 96
		A1	cao	

Paper: 1MA1/1H

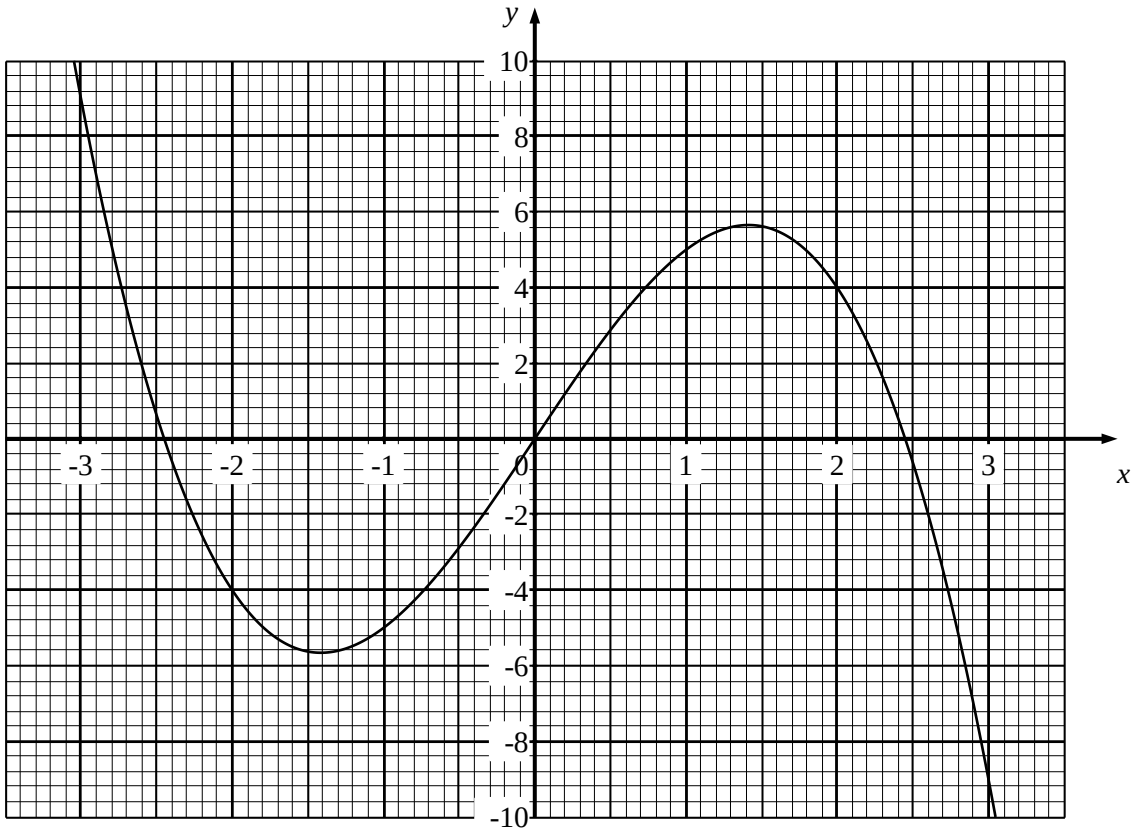
Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
17 (a)	25.9	P1	for process to find volume of hemisphere, eg $\frac{1}{2}\times\frac{4}{3}\times\pi\times3.5^3$ (=89.797…) $\left(\frac{343\pi}{12}\right)$ **or** for a correct expression for the volume of the cone, eg $\frac{1}{3}\times\pi\times3.5^2(y-3.5)$ or $\frac{1}{3}\times\pi\times3.5^2\times h$	'$y-3.5$' may be seen as a new variable, but cannot be just y Condone missing brackets Accept decimals rounded or truncated to 1dp
		P1	for setting up an equation linking all three aspects, eg $\frac{1}{2}\times\frac{4}{3}\times\pi\times3.5^3+\frac{1}{3}\times\pi\times3.5^2(y-3.5)=120\pi$ **or** "89.797…" + "12.828…"$(y-3.5)$ = "376.99 …" **or** "28.5833…" π + "4.0833..." $\pi(y-3.5)=120\pi$	120π - "89.797..." = 287.193... or $\frac{1097\pi}{12}$ π may be missing throughout Award of this mark implies award of the previous May be seen in multiple steps
		P1	for process to isolate y or $(y-3.5)$ or h in their equation, eg $\frac{120\pi-\frac{1}{2}\times\frac{4}{3}\pi3.5^3+\frac{1}{3}\pi3.5^3}{\frac{1}{3}\pi3.5^2}$ **or** $\frac{"376.99..."-"89.797..."+"44.898..."}{"12.828..."}$ **or** $\frac{120\pi-"28.583..."\pi+"14.291..."\pi}{"4.083..."\pi}$ oe	
		A1	for answer in range 25.8 to 26.3 SCB3 for an answer in the range 22.3 to 22.8 or $\frac{1097}{49}$	If an answer is given in the range in working and then rounded incorrectly award full marks.

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
(b)	explanation	C1	for explanation, eg **Acceptable examples** the height would decrease the height would be 0 at 14.227 *y* would be smaller it would decrease **Not acceptable examples** the height would increase	

24 (a)	1 : 4	P1 A1	for process to equate the two volumes, $\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$ cao	
(b)	$1 : \sqrt{8}$	P1 P1 P1 A1	for process to equate surface areas, eg $4\pi r^2 = \pi r^2 + \pi r l$ for process to substitute $l = \sqrt{h^2 + r^2}$, eg $4\pi r^2 = \pi r^2 + \pi r\sqrt{h^2 + r^2}$ for process to isolate term in r^2 after substituting for l, eg $8r^2 = h^2$ for $1 : \sqrt{8}$	Can be implied by $3r = l$

Question 9(b)



Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 1H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme. Notes apply to both MLP papers and Braille papers unless otherwise stated.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
5		Wording added 'Look at the table for Question 5 in the Diagram Booklet.' Wording added 'in the Diagram Booklet'. Table enlarged.	Standard mark scheme
6	(a)	Text left aligned. Values changed: *a* to *p*; *b* to *q*; *c* to *r*	Standard mark scheme but note change of letter
6	(b)	Text left aligned. Values changed: *m* to *w*; *n* to *x*; *p* to *y*	Standard mark scheme but note change of letter
7		Wording added 'Look at Diagram 1 and Diagram 2 for Question 7 in the Diagram Booklet. You may be provided with a model. It is not accurate.' Wording added 'Diagram 1 and the model show'. Wording added 'that'. Diagram enlarged. Base view added with measurements. Wording added 'Diagram 2 shows the base view.' Frame removed from formula and moved above the diagram to the left	Standard mark scheme
9	(a)	Wording added 'below'. Wording added 'There are four spaces to fill.' Table turned vertical and enlarged.	Standard mark scheme
9	(b)	Wording added 'Look at the diagram for Question 9(b) in the Diagram Booklet.' Wording added 'in the Diagram Booklet'. Diagram enlarged. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Black grid lines. Small squares removed.	Standard mark scheme
10		Wording added 'Look at the diagram and table for Question 10 in the Diagram Booklet.' The word 'a' removed and replaced with 'the'. Wording added 'in the Diagram Booklet'. Diagram enlarged. Spinner straightened and spike removed. Dot added to the centre. Table turned vertical and enlarged. The wording 'Here are her results' removed and replaced with 'Her results are shown in the table in the Diagram Booklet.'	Standard mark scheme
11		Wording added 'Look at the diagram for Question 11 in the Diagram Booklet. It shows Shape P and Shape Q.' Labels moved above the shapes. Shapes relabelled as 'Shape P' and 'Shape Q'. Wording added 'in the Diagram Booklet'. Diagram enlarged. Shading changed. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Black grid lines.	Standard mark scheme
13		Wording added 'Look at the table for Question 13 in the Diagram Booklet.' Wording added 'There are three spaces to fill.' Table turned vertical and enlarged.	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
14		Wording added ‘Look at the diagram for Question 14 in the Diagram Booklet. It shows a grid.’ Wording added ‘in the Diagram Booklet’. Diagram enlarged. Axes labels moved above the vertical axis and left on the horizontal axis.	Standard mark scheme
15		Wording added ‘Look at the diagram for Question 15 in the Diagram Booklet.’ Diagram enlarged. Angle moved outside the angle arc. Angle arc made smaller.	Standard mark scheme
18		Wording added ‘Look at the diagram for Question 18 in the Diagram Booklet. It shows a circle with centre O’ Diagram enlarged. Angle moved outside the angle arc. Angle arc made smaller. The wording ‘a circle, centre O.’ removed and replaced with ‘the circle.’ Wording added ‘The lines AB, OB and OA form the triangle AOB.’ The word ‘point’ added. Dot at O enlarged.	Standard mark scheme
21		Wording added ‘Look at the diagram for Question 21 in the Diagram Booklet. It shows’ The wording ‘The diagram’ removed. Diagram enlarged. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Change cross to solid dot.	Standard mark scheme
22		Wording added ‘Look at the diagram for Question 22 in the Diagram Booklet.’ The wording ‘Here is’ removed and replaced with ‘It shows’. Diagram enlarged. Angle moved outside the angle arc. Angle arc made smaller. Wording added: ‘AC = 6.5cm’; ‘BC = 10.7 cm’; ‘Angle BAC = 30º'	Standard mark scheme

PAPER: 1MA1_1H			
Question		**Modification**	**Mark scheme notes**
24	(a)	Wording added 'Look at Diagram 1, Diagram 2, Diagram 3, Diagram 4 and Diagram 5 for Question 24(a) in the Diagram Booklet. You may be provided with models. They are not accurate.' Diagrams enlarged and added for 2D representation of sphere, cone side and cone base. The wording 'Here is a solid sphere and a solid cone' removed and replaced with 'Diagram 1 and model 1 show a solid sphere. Diagram 2 shows a 2D representation of the sphere. Diagram 3 and Model 2 show a solid cone. Diagram 4 shows a 2D representation of the cone. Diagram 5 shows the base of the cone.' Wording added 'radius of the sphere = radius of the base of the cone = r'. Wording added 'vertical height of the cone = h'; Wording added 'Volume of sphere = $\frac{4}{3}\Pi r^3$' Wording added 'Volume of cone = $\frac{1}{3}\Pi r^2 h$' Dashed lines made longer and thicker. Diagram headings moved above the diagrams. Labels moved to the left side. Models provided.	Standard mark scheme
24	(b)	Wording added 'Look at Diagram 1, Diagram 2, Diagram 3, Diagram 4 and Diagram 5 for Question 24(b) in the Diagram Booklet. You may be provided with models. They are not accurate. They show a different solid sphere and solid cone.' The wording 'Here is a different solid sphere and a different solid cone.' Removed. Diagrams enlarged and added for 2D representation of sphere, cone side view and cone base' Wording added 'Diagram 1 and model 1 show a solid sphere. Diagram 2 shows a 2D representation of the sphere. Diagram 3 and Model 2 show a solid cone. Diagram 4 shows a 2D representation of the cone. Diagram 5 shows the base of the cone.' Wording added 'radius of the sphere = radius of the base of the cone = r'. Wording added 'slant height of the cone = l'; 'Surface area of sphere = $4\Pi r^2$' Wording added 'Curved area of cone = Πrl' Dashed lines made longer and thicker. Diagram headings moved above the diagrams. Labels moved to the left side. Models provided.	Standard mark scheme

Question	Answer	Mark	Mark scheme	Additional guidance
17	3.6	P1	process to find the volume scale factor, eg 1587.762 ÷ 58.806 (= 27) **or** 58.806 ÷ 1587.762 (= 0.037…)	
		P1	process to find the height of **B**, eg 2 × 43.74 ÷ 8.1 (= 10.8) **or** process to find the area of **A,** eg 43.74 ÷ $(\sqrt[3]{"27"})^2$ (= 4.86) **or** 43.74 × $(\sqrt[3]{"0.037..."})^2$ (= 4.86)	
		P1	complete process to find height of **A**, eg "10.8" ÷ $\sqrt[3]{"27"}$ **or** "4.86" × 2 ÷ (8.1 ÷ $\sqrt[3]{"27"}$)	
		A1	cao	

21	(a)	1.06	M1	for tangent drawn at t =17.5	No tangent drawn at t=17.5 scores zero marks
			M1	for a complete method to find the gradient, eg tangent drawn at t = 17.5, and 18.5 ÷ 17.5	Use of change in y over change in x Working may be seen on the diagram
			A1	answer in the range 0.9 to 1.2	Answer of $\frac{10.5}{17.5}$ oe scores no marks Accept answers in the form a/b where a and b are integers
	(b)	Explanation	C1	suitable explanation, eg the rate of change of volume	If units are given they must be correct.

Question	Answer	Mark	Mark scheme	Additional guidance
4	Yes (supported)	P1	for a process to find the volume of 1 tank eg $\pi \times 40^2 \times 160$ (= 804247.7… or 804.2...or 256000π)	Values can be truncated or rounded
		P1	for complete process to find the volume of 4 tanks, [volume of tank] × 4 eg $\pi \times 40^2 \times 160 \times 4$ (= 3216990.8… or 3216.9... or 1024000π) **or** for process to find volume of fertiliser available per tank eg $32 \times 1000 \div 4$ (= 8000)	For this mark, [volume of tank] must come from a calculation involving π, r^2, h
		P1	for a process to find the volume of fertiliser needed for 1 tank eg [volume of tank] ÷ 101 (= 7962.8...) or 4 tanks (= 31851.3…) **OR** for a process to find volume of mixture that 32 litres of fertiliser will make eg 32000 × 101 (= 3232000) or 32 × 101 (= 3232)	For this mark, [volume of tank] must come from a calculation involving π, r^2, h or be stated as their volume.
		C1	for Yes supported by correct figures shown eg a comparable figure in the range 31.8 to 31.9 (litres) **or** in the range 31800 to 31900 with 32000 (cm^3) **or** in the range 3216 to 3217 with 3232 (litres) **or** in the range 3216000 to 3217000 with 3232000 (cm^3) **or** in the range 7958 to 7963 with 8000 (cm^3)	There are other possible pairs of values which can be used in the comparison

25	14.1	P1	for a process to find the volume of the top eg $92.8 \div 2.9$ (= 32)	Values can be truncated or rounded
		P1	for finding total mass of P eg $92.8 + 972.8$ (= 1065.6)	
		P1	for finding total volume of P eg $\frac{"1065.6"}{4.7}$ (= 226.7234)	
		P1	(dep P2) for $\frac{"32"}{[\text{total volume}]} \times 100$	For this mark, [total volume] does not have to come from a correct process but is the value that the student believes is the total volume of the pyramid.
		A1	for answer in the range 14.1 to 14.2	

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
3	125	P1	for process to find area of one face, eg 150 ÷ 6 (= 25)	
			or $6x^2 = 150$	where x is the length of one side
		P1	for process to find side length, eg $\sqrt{"25"}$ (= 5)	
		P1	for a complete process to find volume, eg “5” × “5” × “5” or “25” × “5”	
		A1	cao	

8	3	P1 P1 A1	for process to find area of base, eg 1200 ÷ 40 (= 30) for process to find pressure, eg 90 ÷ "30" cao	

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
16	$10\sqrt{2}$	P1	for process to find total surface area of sphere, eg $75\pi \div 3 \times 8\ (= 200\pi)$ or $75 \div 3 \times 8\ (= 200)$ **or** for setting up an equation, eg $\frac{3}{8} \times 4\pi r^2 = 75\pi$ or $\frac{3}{8} \times 4r^2 = 75$	Could work without π for the three P marks
		P1	for process to find r^2, eg $(r^2 =) \frac{"200\pi"}{4\pi}$ oe or $(r^2 =) \frac{75\pi}{4\pi} \times \frac{8}{3}$ oe or $r^2 =$ "50"	
		P1	for process to find radius, eg $(r =) \sqrt{\frac{"200\pi"}{4\pi}}$ oe or $\sqrt{"50"}$ or $5\sqrt{2}$ **or** for $(2r =) = \sqrt{"200"}$	
		A1	cao	

8	648	M1 A1	for substitution into density formula eg 9×72 or $9 = \frac{m}{72}$ cao	

Paper: 1MA1/3H

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
18	98.8	P1	for process to find the radius of the top of the frustum eg $6 \div 10 \times 3$ (= 1.8)	Accept rounded or truncated values Accept multiples of π for process marks.
		P1	for process to find the curved surface area of the frustum eg $3 \times \pi \times 10 - \text{“1.8”} \times \pi \times 6$ (= 60.3...)	
		P1	for process to find the area of either circular face eg $\pi \times 3^2$ (= 28.27...) **or** $\pi \times \text{“1.8”}^2$ (= 10.1...)	
		P1	for a process to find the curved surface area + the area of at least one circular face eg $3 \times \pi \times 10 - \text{“1.8”} \times \pi \times 6 + \pi \times 3^2$ (= 88.5...) **or** $3 \times \pi \times 10 - \text{“1.8”} \times \pi \times 6 + \pi \times \text{“1.8”}^2$ (= 70.49....)	
		A1	for an answer in the range 98.7 to 98.8	If a correct answer within the range is shown in working but incorrectly rounded award full marks.

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
13	187.5	M1	for $\left(\frac{5}{2}\right)^3$ or $\left(\frac{2}{5}\right)^3$ or 2.5^3 or $\left(\frac{1}{2.5}\right)^3$ or $2^3 : 5^3$	
		M1	for a complete method, eg $12 \div 8 \times 125$ or 12×2.5^3	
		A1	oe	Accept $\frac{375}{2}$

8	Shown	M1	for substitution to find area of face, eg $3.5 = \frac{504}{\text{area}}$ or $3.5 \times \text{area} = 504$ or $\text{area} = 504 \div 3.5$ (= 144) **or** for working from surface area eg $900 \div 6$ (= 150)	Other equivalent methods should be credited accordingly
		M1	for method to find comparable figures, eg "144" × 6 (= 864) or "150" × 3.5 (= 525) or 504 ÷ "150" (=3.36…) **or** for 504 ÷ 3.5 (= 144) **and** 900 ÷ 6 (= 150) **or** for 900 ÷ 144 (= 6.25) **and** 6	
		C1	for correct comparable figures, eg 864 (and 900) **or** 144 and 150 **or** 525 (and 504) **or** 3.36… (and 3.5) **or** 6.25 and 6	Condone incorrect units given.

Paper: 1MA1/3H

19	2030	P1	for process to find diameter of base of small cone, eg 16 seen as diameter or 8 seen as radius **or** for scale factor (length) is $\frac{2}{3}$ oe or $\frac{3}{2}$ oe	
		P1	for process to find the volume of one cone, eg $\frac{1}{3} \times \pi \times 12^2 \times 15$ (= 720π or 2261.946…) or $\frac{1}{3} \times \pi \times$ "8"$^2 \times 10$ (= $\frac{640}{3}\pi$ or 670.206...) or for process to find the volume of the hemisphere, eg $\frac{2}{3} \times \pi \times 12^3$ (= 1152π or 3619.114…) **or** for scale factor (volume) is $\left(\frac{2}{3}\right)^3$ oe	
		P1	for full process to find volume of frustum **and** hemisphere, eg "2261.946…" – "670.206…" (= $\frac{1520}{3}\pi$ or 1591.740…) or "2261.946…" × $\left(1 - \left(\frac{2}{3}\right)^3\right)$ **and** ($\frac{4}{3} \times \pi \times 12^3$) ÷ 2 oe (= 1152π or 3619.114…)	
		A1	for answer in the range 2026 to 2030	If an answer is shown in the range in working and then incorrectly rounded award full marks.

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
21	2.5	P1	for forming an equation using the volume, eg $20wh = 300$ or $wh = 15$ oe **or** for $300 \div 20$ (= 15)	Can use any variables for height and width
		P1	for forming an equation using the surface area, eg $20w + 20w + 20h + 20h + hw + hw = 370$ oe or $20w + 20w + 20h + 20h + 30 = 370$ oe	Use of 30 in this equation implies 1st P1
		P1	for eliminating one variable, eg $40h + \frac{600}{h} + 30 = 370$ or $40h^2 - 340h + 600$ (= 0) or $2h^2 - 17h + 30$ (= 0)	
		P1	for process to solve quadratic equation, eg $(2h - 5)(h - 6)$ (= 0) or $\frac{17 \pm \sqrt{(-17)^2 - 4 \times 2 \times 30}}{2 \times 2}$	Award P4 for answer of 6 if 2.5 and 6 identified and supported by working that involves both volume and surface area
		A1	for 2.5 oe	Do not award A1 for 2.5 if it is not supported by working that involves both volume and surface area

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
17	12 : 15 : 5	P1	for process to find ratio of heights of **L** and **M** eg $\sqrt[3]{64} : \sqrt[3]{125}$ (= 4 : 5) oe or $\sqrt[3]{\frac{64}{64}} : \sqrt[3]{\frac{125}{64}}$ $(=1:1.25)$ oe or $\sqrt[3]{\frac{64}{125}} : \sqrt[3]{\frac{125}{125}}$ $(=0.8:1)$ oe	Condone not written as a ratio as long as clear $\frac{125}{64} = 1.953...$ $\frac{64}{125} = 0.512$
		P1	for process to find ratio of heights of **M** and **P** eg $\sqrt{144} : \sqrt{16}$ (= 12 : 4 = 3 : 1) oe or $\sqrt{\frac{144}{16}} : \sqrt{\frac{16}{16}}$ $(=3:1)$ oe or $\sqrt{\frac{144}{144}} : \sqrt{\frac{16}{144}}$ $\left(=1:0.\dot{3}\right)$ oe	Condone not written as a ratio as long as clear $\frac{144}{16} = 9$ $\frac{16}{144} = 0.\dot{1}$
		P1	(dep on P2) for process to find ratio of heights of all 3, eg "(4 : 5)" × 3 and "(3 : 1)" × 5 or $(1:1.25)\times 12$ and $(3:1)\times 5$ or $(0.8:1)$ and $\left(1:0.\dot{3}\right)$	
		A1	for 12 : 15 : 5 oe	Can ISW incorrect simplification of a correct ratio

Paper: 1MA1/2H

5	2	P1 P1 P1 A1	for process to find volume of tin eg 600 ÷ 0.6 (= 1000) for process to find volume of salt eg "1000" – 700 (= 300) for a process to find density of the salt eg 600 ÷ "300" **or** 0.6 × ("1000" ÷ "300") **or** 600 ÷ [volume] cao	Award P1 for 600 ÷ 0.6 (= 1000) even if not used [volume] can be 700 or from a seen calculation using "1000", "300", 700 or identified as volume by label or formula or units A correct answer with no supportive working gets 0 marks

Paper: 1MA1/3H

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
9	10.125	P1	for process to find volume of at least one of the cube or the pyramid, eg $6 \times 6 \times 6$ (= 216) oe or $k \times 8 \times 8 \times h$ ($= \frac{64}{3}h$) oe	Check diagram for working Throughout $0 < k \leq 1$
		P1	for process to form an equation, eg $6 \times 6 \times 6 = k \times 8 \times 8 \times h$ or "216" $= \frac{64}{3}h$ **or** for process to find h eg "216" $\div 8^2 \div k$	
		A1	for 10.125 oe mixed number	

Paper: 1MA1/3H

7	Rate of change of volume	C1	for a correct explanation **Acceptable examples** The rate of water poured Speed of pouring water out from the tank How fast the water is being used (in the tank over time) Amount of water decreasing in the tank each second **Not acceptable examples** Negative correlation / negative gradient Amount of water decreasing in the tank in seconds As time increases the volume of water in the tank decreases It is negative, the volume of litres is going down It represents the deceleration or changing speed	Allow amount of water increasing in the tank each second

Paper: 1MA1/1H

12	64 : 25	P1 P1 P1 A1	for start of process to find ratio of lengths of **A** to **B**, eg $\sqrt[3]{64}$ (= 4) **or** $\sqrt[3]{125}$ (= 5) **or** 4 : 5 for $\sqrt[3]{125} \div 2$ (= 2.5) oe **or** $\left("\sqrt[3]{64}"\right)^2$ (= 16) for process to find ratio of areas of **A** to **C**, eg "4"^{2} : "2.5"^{2} (= 16 : 6.25) for 64 : 25 oe in form a : b where a and b are integers	

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
13	7	P1	for setting up an equation using volumes, eg $(x + 2)(2x – 1)(x – 1) = 2x(x + 3)(x – 3) + 142$	May occur later in the process Must use expressions for volumes but these may have been incorrectly expanded and simplified
		P1	for process to find an expanded expression for the area of **one** face, eg $(x + 2)(2x – 1) = 2x^2 – x + 4x – 2$ or $2x^2 + 3x – 2$ or $(x + 2)(x – 1) = x^2 – x + 2x – 2$ or $x^2 + x – 2$ or $(2x – 1)(x – 1) = 2x^2 – 2x – x + 1$ or $2x^2 – 3x + 1$ or $2x(x + 3) = 2x^2 + 6x$ or $2x(x – 3) = 2x^2 – 6x$ or $(x + 3)(x – 3) = x^2 – 3x + 3x – 9$ or $x^2 – 9$	Condone one incorrect term in expansion of two brackets
		P1	for a complete process to find a fully expanded expression for the volume of **one** cuboid, eg $2x^3 + 3x^2 – 2x – 2x^2 – 3x + 2$ or $2x^3 + x^2 – 5x + 2$ **or** $2x^3 + 6x^2 – 6x^2 – 18x$ or $2x^3 – 18x$	Expression need not be fully simplified, but must be correct
		P1	(dep P3) for correct rearrangement of the expanded terms in their equation leading to a 3-term quadratic eg $x^2 + 13x – 140$ (= 0) or $x^2 + 13x = 140$	
		A1	cao	

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
19	6	P1	for starting process, by defining height, radius **and** using Pythagoras to form an equation for the slant height l eg height = h, radius = $\frac{3}{4}h$ **and** $l^2 = h^2 + \left(\frac{3h}{4}\right)^2 \left(= \frac{25}{16}h^2\right)$ or $(l =)\sqrt{h^2 + \left(\frac{3h}{4}\right)^2} \left(= \frac{5}{4}h\right)$ oe eg $r = 3x$ **and** $h = 4x$ **and** $l^2 = (3x)^2 + (4x)^2$	Can use any other letter than h provided it is defined eg height = x
		P1	(dep P1) for process to form a correct expression for the curved surface area in terms of a single variable, eg $\pi \times \frac{3}{4}h \times "\frac{5}{4}h" \left(= \frac{15}{16}\pi h^2\right)$ or $\pi \times 3x \times "5x"$ where $h = 4x$	May include area of circle eg $\pi \times \left(\frac{3}{4}h\right)^2 + \pi \times \frac{3}{4}h \times "\frac{5}{4}h" \left(= \frac{24}{16}\pi h^2\right)$
		P1	for forming and simplifying a correct equation to find height, eg $\frac{24\pi}{16}h^2 = 54\pi$	
		A1	cao	

Paper: 1MA1/3H

8	25	P1 P1 A1	for working with density eg 8 ×1500 (= 12 000) **or** [density] ×1500 for a conversion, eg "12 000" ÷ 1000 (= 12) **or** $\frac{8}{1000}$ $(=0.008)$ **or** 300 × 1000 (= 300 000) **or** [mass] ÷ 1000 cao	P marks can be awarded in either order [density] is 8×10^n Condone 8×1500×300 for this mark only P marks can be awarded in either order [mass] must be what they believe to be mass following a calculation that uses 8 and 1500 but not 300

Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	4.9	P1	for beginning to work with scale factors eg $\left(\frac{h}{12}\right)^3$ **or** $\left(\frac{12}{h}\right)^3$ **or** $\frac{90}{1350}\left(=\frac{1}{15}\right)$ **or** $\frac{1350}{90}\left(=15\right)$ **or** 90 : 1350 oe	
		P1	for equating scale factors eg $\left(\frac{h}{12}\right)^3=\frac{90}{1350}$ **or** $\left(\frac{12}{h}\right)^3="15"$ **or** for finding the linear scale factor, eg $\sqrt[3]{\frac{90}{1350}}$ **or** $\sqrt[3]{"15"}\left(=2.46(6...)\right)$	
		P1	for a complete method eg $\sqrt[3]{12^3\times\frac{90}{1350}}$ **or** $12\times\sqrt[3]{\frac{90}{1350}}$ **or** $\frac{12}{"\left(\sqrt[3]{"15"}\right)"}$	
		A1	for answers in the range 4.8 to 4.9	
(b)	$(15)^{\frac{2}{3}}$	B1	for $15^{\frac{2}{3}}$ **or** $\left(\sqrt[3]{15}\right)^2$ **or** $\sqrt[3]{15^2}$ **or** $225^{\frac{1}{3}}$	If given in an acceptable form, then given as a decimal, isw and award

Question	Answer	Mark	Mark scheme	Additional guidance
16	15	P1	for process to find volume of cylinder or volume of cone, eg $\pi\times8^2\times\frac{h}{3}$ oe **or** $\frac{1}{3}\times\pi\times8^2\times h$ oe **or** $\pi\times8^2\times H$ oe **or** $\frac{1}{3}\times\pi\times8^2\times3H$ oe **or** $\pi\times8^2\times\frac{x}{4}$ oe **or** $\frac{1}{3}\times\pi\times8^2\times\frac{3x}{4}$ oe	h = height of the cone H = height of the cylinder x = total height of the shape Allow any letter for h, H and x, does not have to be defined for the award of the marks The award of all marks requires the substitution of $r = 8$, allow this to be done at a later stage in the question
		P1	(dep P1) for setting up an equation in terms of one variable, eg $"\pi\times8^2\times\frac{h}{3}"+"\frac{1}{3}\times\pi\times8^2\times h"=640\pi$ oe or $"\pi\times8^2\times H"+"\frac{1}{3}\times\pi\times8^2\times3H"=640\pi$ oe or $"\pi\times8^2\times\frac{x}{4}"+"\frac{1}{3}\times\pi\times8^2\times\frac{3x}{4}"=640\pi$ oe or $"\pi\times8^2\times\frac{h}{3}"=320\pi$ oe or $"\frac{1}{3}\times\pi\times8^2\times h"=320\pi$ oe or $"\pi\times8^2\times H"=320\pi$ oe or $"\frac{1}{3}\times\pi\times8^2\times3H"=320\pi$ oe or $"\pi\times8^2\times\frac{x}{4}"=320\pi$ oe or $"\frac{1}{3}\times\pi\times8^2\times\frac{3x}{4}"=320\pi$ oe	A correct equation implies the first P1 Allow inconsistent use of π within their equation provided the correct volumes are seen previously

Paper: 1MA1/3H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
		P1	(dep P2) for process to solve for h or H or x eg $(h=)\dfrac{640\pi}{"\frac{1}{3}\times\pi\times8^2"+"\frac{1}{3}\times\pi\times8^2"}$ oe eg $(h=)\dfrac{3\times640\pi}{"64\pi"+"64\pi"}$ or $(H=)\dfrac{640\pi}{"\pi\times8^2"+"\frac{1}{3}\times\pi\times8^2\times3"}(=5)$ oe eg $(h=)\dfrac{640\pi}{"64\pi"+"64\pi"}(=5)$ or $(x=)\dfrac{640\pi}{"\pi\times8^2\times\frac{1}{4}"+"\frac{1}{3}\times\pi\times8^2\times\frac{3}{4}"}(=20)$ oe eg $(x=)\dfrac{640\pi}{"32\pi"}(=20)$	Can be an equation in the form $ah = p$ or $bH = q$ or $cx = r$ where a or b or c is an integer
		A1	cao	Award 0 marks for a correct answer with no (or incorrect) supportive working

GCSE

Mark Scheme

Mathematics A (1387)

June 2003

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

M marks - awarded for correct working seen or implied.
A marks - conditional accuracy marks which are awarded for accurate working following the award of M marks.
B marks - unconditional accuracy marks (independent of M).

2 Abbreviations

cao - correct answer only.
ft - follow through.
$\surd$ - Denotes a "follow through" answer.

SC - special case.
isw - ignore subsequent working.
oe - or equivalent (and appropriate).
NB: a candidate cannot benefit from both isw and ft.

3 If no working shown, then

correct answers normally score full marks
incorrect (even though nearly correct) answers score no marks.

4 Marking instructions

Misread loses A marks (and sometimes B marks) on that part but ft can be allowed on subsequent parts. M marks can still be earned. If in doubt contact your team leader.
If there is a wrong answer in the answer space DO CHECK the working in the body of the script.

- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.
- If there is a wrong answer in the answer space DO CHECK the working in the body of the script.
- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.

5 Style of marking

Answer correct: tick and write part mark in margin NEXT TO BRACKETED MARK.
Answer incorrect: cross, but show M, A or B marks if any earned in body of script and transfer the total of these to the margin next to the bracket mark.
Total for each double page at bottom right page (except for back if used), FINAL TOTAL IN RELEVANT BOX ON FRONT COVER.
Nought in margin for fully incorrect question or page AND FOR NO ATTEMPT.
Where no attempt has been made a line should be put in the answer space and zero in the margin next to the bracketed mark
CHOICE OF METHOD – No marks unless one answer is in answer space – then mark that.
CROSSED OUT WORK - if not replaced this should be marked (if legible).
There must always be a mark next to bracketed mark in the margin/

6 Follow Through Marks

Follow throughs are guided by two principles:

(a) Follow throughs which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous, do not award.
(b) Follow throughs which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 Probability

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least two decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

8 Linear Equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

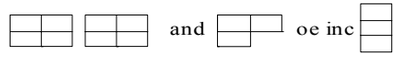
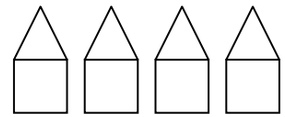
9 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

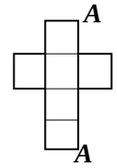
Paper 5501

No	Working	Answer	Mark	Notes
1 (a)		46	1	B1 cao
(b)		3.4	1	B1 oe
(c)		Arrow at 430	1	B1 allow ± half graduation
(d)		Arrow at 3.7	1	B1 allow ± half graduation Accept indications other than arrows as long as they are clear
2		1.60 2.05	2	B1) Condone B1) reversal
3 (a)	$\frac{18}{24}$ or $\frac{9}{12}$ or $\frac{6}{8}$	$\frac{3}{4}$	2	B2 for $\frac{3}{4}$ cao (B1 for $\frac{18}{24}$ or $\frac{9}{12}$ or $\frac{6}{8}$) SC B1 for $\frac{1}{4}$ only
(b)		16 squares shaded	1	B1 cao
4 (a)		line	1	B1 within overlay tolerance
(b)		midpoint	1	B1 within overlay tolerance ft from (a) ± 0.2cm
(c)		rectangle	1	B1 for rectangle 6 cm ± 0.2cm by 4 cm ± 0.2cm
5		kilograms, kg litre, *l* or cubic metres, m^3 inches, in	3	B1 B1 B1
6 (a)		parallel lines marked	1	B1
(b)		right angle marked	1	B1
(c)(i)		acute	1	B1
(ii)		reflex	1	B1

Paper 5501

No	Working	Answer	Mark	Notes
7 (i)		sphere	1	B1
(ii)		cylinder	1	B1 Accept circular prism
(iii)		pyramid	1	B1 Condone omission of "triangular" Accept tetrahedron
8 (a)(i)		40	2	B1 cao
(ii)		50		B1 cao
(b)		5 complete symbols	1	B1 cao
(c)		 and oe inc	1	B1
9 (i)		9, 37, 56, 59, 75	5	B1 cao
(ii)		0.067, 0.56, 0.6, 0.605, 0.65		B1 cao Ignore trailing zeros
(iii)		–10, –6, –4, 2, 5		B1 cao
(iv)		$\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$		B2 for all 4 correct (B1 for any 3 in correct order) SC B1 for all 4 in reverse order (applies to(iv) only)
10 (a)			1	B1
(b)		Plotting (4, 24)	1	B1 ft from their matchsticks
(c)		60	1	B1 cao
(d)		$m = 6n$	2	B2 for $m = 6n$ oe (B1 for $6n$ oe or m = multiple of n except $m = n$)
11 (i)		6, 12	4	B1 cao
(ii)		4, 16		B1 cao
(iii)		3, 4, 6 or 3, 4, 6, 12		B1 Condone omission of 12
(iv)		8, 27		B1 cao

Paper 5501

No	Working	Answer	Mark	Notes
12		2.43	4	B1 for 36 or 0.36 B1 for 96 or 0.96 B1 for 125 or 1.25 If none of first 3 B1s awarded then SC B1 for four 24s and five 25s seen OR 4 × 24 and 5 × 25 seen B1 for 2.43 cao
13 (a)(i)		Edinburgh and Plymouth	3	B1 for Edinburgh or −7 B1 for Plymouth or 5
(ii)		12		B1ft from (i) if one positive and one negative
(b)		Cardiff and Belfast London and Plymouth	2	B1 for Cardiff and Belfast OR −6 and −4 B1 for London and Plymouth OR 3 and 5
14		5 9 8	3	B1 cao B1 cao B1 cao
15 (a)			2	✓ / × / 2 / 0 / B2 1 / 0 / B1 1 / 1 / B1 2 / 1 / B1
(b)	$2\times2\times2$	8	2	M1 for $2\times2\times2$ A1 for 8 cao
16 (a)		30	1	B1 cao
(b)		3	1	B1 cao
(c)	$2 \times 29 = 58$ $5 \times 30 = 150$ $2 \times 31 = 62$ $1\times32 = 32$ $\frac{302}{10} = 30.2$	30.2	3	M1 for freq × no pins M1 (dep on 1st M1) for totalling and ÷ 10 A1 for 30.2 cao

Paper 5501

No	Working	Answer	Mark	Notes
17		7 5 5 13 33 52 23	3	B3 all correct (B2 for 4, 5 or 6 correct B1 for 2 or 3 correct)
18 (a)(i) (ii) (iii) (iv) (b)		$4c$ p^4 $8g$ $10pr$ OR $10rp$ $10y - 15$	4 1	B1 oe B1 cao B1 oe B1 B1 cao Accept $10y + -15$
19		$\frac{2}{3}$	3	M1 for 3 rows (9 squares) shaded M1 for 2 columns (10 squares) shaded A1 for $\frac{2}{3}$
	$\frac{3}{5} = \frac{9}{15}$ $\frac{2}{3} = \frac{10}{15}$	$\frac{2}{3}$	3	M1 for $\frac{3}{5} = \frac{9}{15}$ M1 for $\frac{2}{3} = \frac{10}{15}$ A1 for $\frac{2}{3}$
	$\frac{3}{5} = 0.6$ $\frac{2}{3} = 0.66$ or 0.67 or better	$\frac{2}{3}$	3	M1 for $\frac{3}{5} = 0.6$) Accept M1 for $\frac{2}{3} = 0.66$ or 0.67 or better) percentages A1 for $\frac{2}{3}$

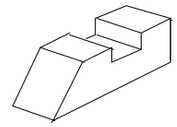
Paper 5501

No	Working	Answer	Mark	Notes
20 (a)	955 × 48 7640 38200 45840 OR 48 × 955 240 2400 43200 45840	458.40	3	M1 for complete correct method (condone one computational error) A2 for 458.40 cao (A1 for digits 4584 OR ft if M1 awarded)
(b)	14. 5 48 | 696. 0 48 216 192 24 0 24 0	14.50	3	M1 for 1 as first digit in answer and remainder 21 M1 (dep) 4 as second digit in answer A1 for 14.50 (Accept 14.5)
21 (a)		$12x$	1	B1 oe
(b)		$12x + 10y$	2	B2 oe ft from (a) (B1 $12x$ + multiple of y or $10y$ seen) SC B1 for $x = 12x + 10y$ OR $y = 12x + 10y$

Paper 5501

No	Working	Answer	Mark	Notes
22	$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$ $1-\frac{7}{12}=\frac{5}{12}$	$\frac{5}{12}$	3	M1 for $\frac{4}{12}$ **and** $\frac{3}{12}$ oe A2 for $\frac{5}{12}$ oe (A1 for $\frac{7}{12}$) B1 for 1–"$\left(\frac{1}{3}+\frac{1}{4}\right)$" correctly evaluated
	$1-\frac{1}{3}=\frac{2}{3}$, $1-\frac{1}{4}=\frac{3}{4}$ $\frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ or $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$	$\frac{5}{12}$	3	B1 for $\frac{2}{3}$ or $\frac{3}{4}$ seen M1 for $\frac{8}{12}-\frac{3}{12}=\frac{5}{12}$ or $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$ A1 for $\frac{5}{12}$ oe
		$\frac{5}{12}$	3	M1 for 0.25 and 0.33 or better A1 for 0.58 or better A1 for $0.41\dot{6}$ or recurring
23 (a) (b)(i) (ii)	 180 – (54 + 54)	54 72 Reason	1 3	B1 cao M1 for 180 – (54 + 54) A1 ft from (a) if $x < 90$ B1 for mentioning isosceles and equal or base angles or equal sides and equal or base angles

Paper 5501

No	Working	Answer	Mark	Notes
24 (a)		Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or $4 \times x \times x$ or square x first or square 3 first A1 SC 4×3^2 with Bryani scores B2
(b)		64	1	B1 cao
25 (a)		 dotted line may be solid	3	B2 for rectangle base 3 squares and height 4 squares (B1 for rectangle with one correct dimension) B1 for horizontal line 1 cm from top) SC B2 for completely correct elevation on its side
(b)			2	B2 for perspective drawing showing slant face and cutout B1 for perspective drawing with either slant face cutout omitted
26 (a)	20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$	40	2	M1 for 20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$ A1 cao
(b)	$\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes	line from (45, 20) to (65, 0)	2	M1 for $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen A1 for correct line SC If M0, B1 for line from (45, 20) to (t, 0) where $t > 45$ or B1 for a line of the correct gradient.

Paper 5502

No		Working	Answer	Mark	Notes
1	(a)		$\frac{7}{100}$	1	B1 cao accept 0.07
	(b)		0.18	1	B1 cao
	(c)	20 in 100 oe	40	2	M1 for sight of 20 in 100 or 20 × 2 A1 cao
2	(a)		6cm	2	B1 for 6 ± 0.2 or 60 ± 2 B1 indep for cm or mm consistent with 1st B1
	(b)		At centre	1	B1 within overlay
	(c)		Circle drawn	1	B1 all within overlay
3			See diagram	3	B3 all correct – see separate sheet (B2 for 3 correct B1 for 2 correct)
4	(a)		$\frac{1}{4}$ oe	1	B1 cao
	(b)		0.75	1	B1 cao
	(c)		75%	1	B1 cao
	(d)(i)		9	2	B1 accept answer in range 9 - 9.2
	(ii)		15 - 16		B1 accept answers in range15 - 16
5	(a)		9:30	1	B1 cao
	(b)		2hrs 45 min	2	B2 for 2hr 45 min or 2 $\frac{3}{4}$ hr or 165 minutes B1 2:45 or 2.45 or 165 or 45min + 1hr + 1hr oe
	(c)		17	1	B1 cao
6	(a)	96 × 4	3.84	2	M1 for 96 × 4 or digits 384 A1 cao
	(b)	3 × 96 + 40 = 328	(0).56	2	M1 for 3 × 96 + 40 or digits 328 or digits 56 A1 cao accept 56p

Paper 5502

No	Working	Answer	Mark	Notes
7 (a)		54 000	1	B1 cao accept 54 thousand
(b)		50 000	1	B1 (accept ten thousand or 10 000) oe
8 (a)		14	1	B1 cao
(b)		6	1	B1 cao
(c)		Correct reflection	2	B2 fully correct (B1 correct reflection in a line parallel to the mirror line or condoning 1 block error in shape or position of shape)
9 (a)		Missing horiz label 1 (and 6) missing on vertical scale	2	B1 B1
(b)		Correct graph	2	B1 for bar up to 4 for yellow B1 for bar up to 2 for green
(c)		Blue	1	B1 cao
(d)	3 + 5 + 4 + 2	14	1	B1 ft from (b)
(e)		$\frac{3}{14}$	1	B1 ft on '14'
10	Barry (8) because you double Kath (7) because you add, 1,2,3		2	B1 oe B1 oe SC: B1 for correct rules only
11 (a)		$2n$	1	B1 for $2n$ or $n + n$ OR $2 \times n$ OR $n \times 2$ OR $n2$
(b)		$2n + 15$	1	B1 for "$2n$" + 15 oe
(c)		20q	1	B1 cao
12 (a)	1 + 3 + 5 + 8 + 5	22	2	M1 add frequencies A1 cao
(b)		No, is>no of cups of coffee in the table	1	B1 'average cannot be bigger than 6' oe OR 'Average must be less than 6 oe'
13 (a)		Trapezium	1	B1 cao ignore spelling
(b)		(2, 3)	1	B1 cao
(c)		Isosceles	1	B1 cao ignore spelling
(d)		Q correct	1	B1 cao

Paper 5502

No	Working	Answer	Mark	Notes
14 (a)		250 000	1	B1 cao
(b)	$\frac{28}{4}$	7	2	M1 for $\frac{28}{4}$ oe or "250000" × 28 A1 cao **SC** B1 for 7 000 000
15 (a)		10	1	B1 cao
(b)		5.5	1	B1 ±0.3 pounds
(c)	$\frac{110}{22}$	50	3	M1 for use of graph at 11 or $\frac{110}{22}$ A1 for 5 A1 cao **SC** B2 for 49.5 – 50.6

Paper 5502

No	Working	Answer	Mark	Notes
16 (a)	$269.30 - 56.80 = 212.50$ $\frac{212.50}{42.50}$	6	2	M1 for $\frac{269.30 - 56.80}{42.50}$ or 5 seen A1 cao
(b)	5% of £269.30 £269.30 – "£13.465" OR $\frac{95}{100} \times 269.30$	255.83 or 255.84	3	M1 for $(5 \div 100) \times 269.30$ M1 for $269.30 - $ "13.465" A1 cao OR M2 for $\frac{95}{100} \times 269.30$ A1 cao **Alternative Method:** M1 for $\frac{5}{100} \times 56.80$ $(= 2.84)$ and $\frac{5}{100} \times 42.50$ (=2.12(5)) (OR 53.96 AND 40.38 (40.375) seen M1 for $56.80 -$ "2.84" (= 53.96) $42.50 -$ "2.12(5)" (= 40.375 or 40.38) "5" × "40.375" + "53.96" A1 cao
17	$4.1^2 \times 1.07 = 16.81 \times 1.07$	17.9867	2	M1 for ("4.1") followed by squaring, or sight of 16.81 A1 cao SC: *B1 for 18 or better with no working*
18 (a)		60	1	B1 cao
(b)	$360 - 60 - 90 - 90$	120	2	M1 for $360 -$ " 60 " $- 90 - 90$ or $180 -$ "60" A1 cao
(c)	6×2	12	2	M1 for 6×2 A1 cao for 12

Paper 5502

No	Working	Answer	Mark	Notes
19 (a)(i)	$240 \times 5 = 1200$	1250	3	B1 cao 1250
(ii)	$\frac{50}{'1250'}$	$\frac{1}{25}$		M1 cao $\frac{50}{'1250'}$ A1 for $\frac{1}{25}$ in its simplest form
(b)	$\frac{60}{100} \times 1000 = 600$	12:5	3	M1 for $\frac{60}{100} \times 1000$ oe A1 for 600 A1 cao
20 (a)		$x + 2$	1	B1 accept $2 + x$ but not $x = x + 2$
(b)	$x + 5 + x + 5 + x + 2 + x + 2$	$4x + 14$	2	M1 adding 4 sides, two of which are '$x + 2$' (all sides to be linear expressions in x) **SC** $x + 5 + x + 2 \times 2$ gets M1 A1 for correct simplified answer or $(20 - 14) \div 4$ oe gets M1
(c)	'$4x + 14$' = 20	1.5 oe	2	M1 for equation A1 cao
21	$\sum f = 90$	Angles drawn, labelled	3	M1 for 1 person = 4°or one angle correct in table or pie chart A1 any 2 correctly drawn angles in pie chart A1 fully correct chart labelled
22 (a)		$2p - q$	2	B1 cao for $2p$ B1 cao for $-q$ accept $(-q + 2p)$, $2p - 1q$ and $2p + -q$
(b)	$5x = 3 + 4$	1.4	2	M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6) A1 cao accept $\frac{7}{5}$ or $1\frac{2}{5}$

Paper 5502

No	Working	Answer	Mark	Notes
23 (a)		$\frac{4\times5}{2}$	1	B1 cao
(b)	$1+2+3+4+5+6+7+8$	$\frac{8\times9}{2}$	1	B1 cao
(c)	$\frac{100\times101}{2}$	5050	1	B1 cao
24	0 | 5 7 8 8 1 | 0 0 0 0 2 5 5 5 6 2 | 0 0 0 4 5 3 | 3 5 Key 1 | 2 = 12 (min)	See working	3	B1 for stem 0, 1, 2, 3 or 0, 10, 20, 30 B1 for accurate unordered leaves condone 1 error or omission B1 for key and ordered leaves all correct
25	$3.2\times2.8=8.96$ $2\times4.5\times2.8=25.2$ $2\times4.5\times28.8=28.8$ $\frac{62.96}{2.5}\times2.99$	£75.30	5	M1 for area of any face found correctly M1 for 2 areas found correctly A1 for 62.96 or 54 M1 for $\frac{'62.96'}{2.5}\times2.99$ Al cao Alternate method for candidates who round up $\frac{"62.92"}{2.5}$ M1 for "26" × 2.99 A1 for £77.74 cao **SC**: *for top included B2 for 71.92 m^2 seen or* B3 for £86.02 seen **SC** B4 for £64.58 or £65.78 seen
26	$2.5\times10\,000$	25 000	2	M1 for $2.5\times100\times100$ A1 cao

Paper 5503

No	Working	Answer	Mark	Notes
1 (a)(i)		$8g$	2	B1 oe
(ii)		$10rp$		B1 for $10pr$ or $10\ rp$
(b)		$10y - 15$	1	B1 cao accept $10y$ - + 15
(c)	$6x + 8 - 12x + 15$	$-6x + 23$	2	M1 for 3 correct terms out of 4 A1 cao
2		$m = 6n$	2	B2 for $m = 6n$ oe accept $6 \times n$, n 6 (B1 for $6n$ alone, or $6n$ +1 oe OR m = multiple of n except $m = n$)
3 (i)		0.067, 0.56, 0.6, 0.605, 0.65	1	B1 cao Ignore trailing zeros
(ii)		$-10, -6, -4, 2, 5$	1	B1 cao
(iii)		$\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$	2	B2 all four correct (B1 any three in correct order) SC: B1 all 4 in reverse order
4		7 5 5 13 33 52 23	3	B3 all correct (B2 for 4, 5 or 6 correct entries) (B1 for 2, 3 correct entries)

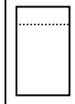
Paper 5503

No	Working	Answer	Mark	Notes
5		$\frac{2}{3}$	3	M1 for 3 rows (9 squares) shaded M1 for 2 columns (10 squares) shaded A1
	OR $\frac{3}{5}=\frac{9}{15}$ $\frac{2}{3}=\frac{10}{15}$ Therefore $\frac{2}{3}>\frac{3}{5}$	$\frac{2}{3}$		M1 for $\frac{3}{5}=\frac{9}{15}$ M1 for $\frac{2}{3}=\frac{10}{15}$ A1
	OR $\frac{3}{5}=0.6$ or percent $\frac{2}{3}=0.66$ or 0.67 or better Therefore $\frac{2}{3}>\frac{3}{5}$	$\frac{2}{3}$		M1 for $\frac{3}{5}=0.6$ or percent M1 for $\frac{2}{3}=0.66$ or 0.67 or better A1
6	$2\times 29=58$ $5\times 30=150$ $2\times 31=62$ $1\times 32=32$ $\frac{302}{10}=30.2$	30.2	3	M1 for freq × no. pins (at least 3) M1 for totalling and for ÷ 10 (dep on 1st M1) A1 cao
7 (a)			2	B1 for 180° rotation (wrong centre) B1 cao
(b)			3	B1 for any enlargement sf other than 1 B1 for all sides halved B1 for position

Paper 5503

No	Working	Answer	Mark	Notes
8 (a)		$12x$	1	B1 oe
(b)		$12x + 10y$	2	B2 oe or ft from (a) (B1 for $12x$ + a multiple of y or $10y$ seen) **SC** B1 for $x = 12x + 10y$ or $y = 12x + 10y$
9	$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$ $1-\frac{7}{12}=\frac{5}{12}$ OR $1-\frac{1}{3}=\frac{2}{3}, 1-\frac{1}{4}=\frac{3}{4}$ $\frac{9}{12}-\frac{4}{12}=\frac{5}{12}, \frac{8}{12}-\frac{3}{12}=\frac{5}{12}$	$\frac{5}{12}$	3	M1 for $\frac{4}{12}$ and $\frac{3}{12}$ oe A2 for $\frac{5}{12}$ oe (A1 for getting $\frac{7}{12}$) (B1 for $1 - \frac{"1}{3} + \frac{1"}{4}$ correctly evaluated) OR B1 for $\frac{2}{3}$ or $\frac{3}{4}$ seen M1 for $\frac{3}{4}-\frac{1}{3}=\frac{9}{12}-\frac{4}{12}$ or $\frac{2}{3}-\frac{1}{4}=\frac{8}{12}-\frac{3}{12}$ A1 for $\frac{5}{12}$ oe OR M1 0.25 and 0.33 or better A1 for 0.58 or better A1 for 0.416 *recurring*
10 (a)		54	1	B1 cao
(b)(i)	180 – (54 +54)	72	3	M1 for 180 – (“54” + “54”) A1 for 72° ft from (a) if $x < 90°$
(ii)				B1 for mentioning isosceles and equal or base angles or equal sides and equal or base angles

Paper 5503

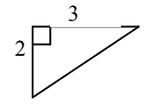
No	Working	Answer	Mark	Notes
11 (a)	Bryani was correct $4 \times 3^2 = 4 \times 9 = 36$	Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or "square the three/x then multiply by four" A1 Bryani **SC** 4×3^2 with Bryani gets B2
(b)			1	B1 cao
12 (a)			3	B2 for rectangle height 4 squares, base 3 squares (B1 for rectangle with one correct dimension) B1for line 1 square from the top **SC** B2 for completely correct elevation on its side
(b)			2	B2 for perspective drawing showing slant face and cut out (B1 for perspective drawing with either slant face or cut out omitted or one aspect incorrect)
13 (a)	20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$	40	2	M1 for 20×2 or $\frac{20}{30} \times 60$ or $20 \div \frac{1}{2}$ A1 cao
(b)	$\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen	Line from (45, 20) to (65, 0)	2	M1 for $\frac{20}{60}$ or $\frac{1}{3}$ or 20 minutes seen A1 for correct line **SC** If M0, B1 for line from (45, 20) to (t, 0) where $t > 45$ or a line of the correct gradient
14 (i)		119.31	3	B1 cao
(ii)		119 310		B1 cao
(iii)		1.23		B1 cao

Paper 5503

No	Working	Answer	Mark	Notes
15	$\frac{10}{100}\times 12000$ 12 000 – 1200 = 10 800 $\frac{10800}{10}=1080$ 10 800 – 1080 = £9720	£9720	3	M1 for $\frac{10}{100}\times 12000$ or sight of 1200 or 2400 or 10 800 or 9600 M1 (dep) for $\frac{10}{100}\times(12\,000-\frac{10}{100}\times 12000)$ or sight of 1080 A1 cao Alternative mark scheme M2 for $12000\times(1-\frac{10}{100})^2$ (M1 for $12000\times(1-\frac{10}{100})$ A1 cao
16 (a)	$2p = 6$	$p = 3$	2	M1 for $7p - 5p = 8 - 2$ or $2p$ or 6 A1 cao
(b)	$7r - 5r = -20 - 2$	–11	2	M1 for $7r + 2 = 5r - 20$ or $\frac{7r}{5}+\frac{2}{5}=r-4$ or $7r-5r=20-2$ or $\frac{7r}{5}-r=-4-\frac{2}{5}$ A1 cao
17		$5n + 1$	2	B2 oe (B1 for $5n$ seen) NB: n = gets B1 max

Paper 5503

No	Working	Answer	Mark	Notes
18 (a)	–1, 0, 1		2	B2 for –1, 0, 1 (B1 for –1, 0 or 0,1 or –1,1 or –2, -1, 0, 1 only)
(b)	(–1, –1), (0, –1), (1, –1), (0, 0), (1, 0), (1, 1)		3	B3 for 6 points correct B2 for 3 points correct B1 for 1 point correct **NB** –B1 each additional point over six
19 (a)	Triangle with vertices at (0,0) (0,–2) and (3,0)		2	M1 for correct orientation A1 cao
(b)	Rotation, 180°, centre (0,1) Enlargement sf - 1 centre (0,1)		2	B2 for 180° 'rotation' centre (0, 1) B2 for Enlargement sf - 1 centre (0,1) (B1 for any two of the three parts) NB: B0 if additional transformation is included
20	Bisector of $\angle BAC$ Arc around A Region		3	B3 cao (B2 for either two correct boundaries, no shading/ wrong shading or one correct boundary, one incorrect boundary with valid shading) (B1 for either two incorrect boundaries but one drawn from A and one intersection, with valid shading or one correct boundary) Ignore shading outside the triangle
21		Length Volume Area	3	B1 for Length B1 for Volume B1 for Area
22 (a)	Unbiased question with choices		2	B1 for unbiased question B1 for at least 2 choices
(b)			2	Classification 1: A biased question Classification 2: A restricted sample of people Classification 3: Not specifying a range of foods Classification 4: Nothing to do with eating habits B2 reasons which satisfy 2 different classifications (B1 a reason which satisfies one classification)



Paper 5503

No	Working	Answer	Mark	Notes
23 (a)	$6 \times 10^2 \times 8 \times 10^4$ 48×10^6	4.8×10^7	3	M1 for $6 \times 10^a \times 8 \times 10^b$ oe, a and b integers including 0 A1 for 48×10^6 oe A1 cao
(b)	200 000 + 30 000	230000	2	B2 cao (B1 for sight of 200 000 or 30 000 or 2.3×10^5 or 23×10^4)
24 (i)		64	4	B1 cao
(ii)		3		B1 cao
(iii)	$\sqrt{16 \times 9} = \sqrt{144}$	12		B2 cao (B1 for sight of $\sqrt{2^4} \times \sqrt{9}$ or better, or 144 seen)
25 (i)	Tangent 90° to diameter /radius/ line from (through) centre	27°	4	B1 for 27° cao B1 for reason
(ii)	180 –(90+ "27") angle in semicircle (is 90°)/Alternate segments /angle at centre twice at circumference	63°		B1 ft for 90–"27" if not 63° B1 for reason
26 (a)(i)		152	2	B1 cao
(ii)		177		B1 cao
(b)			3	B1 for median marked at 167 B1 ft for postion of box with its ends at "152" and "177" B1 for position of whiskers with ends at 132 and 182 NB: For any points plotted between 141 and 149 give a tolerance of an extra ± 1 square
27	$x^2 + xy + xy + y^2$	$x^2 + 2xy + y^2$	2	M1 for at least 3 of the 4 terms correct A1 cao
		25	2	M1 for recognising 3.47 + 1.53 (= 5) A1 cao

Paper 5504

No	Working	Answer	Mark	Notes
1 (a)	$4.1^2 \times 1.07 = 16.81 \times 1.07$	17.9867	2	M1 for (4.1) followed by squaring, or sight of 16.81 A1 cao SC: B1 for 18 or better with no working
(b)		$(1.6 + 3.8 \times 2.4) \times 4.2$	1	B1 cao Allow additional brackets if they give an expression with value 45.024
2 (a)	269.30 – 56.80 = 212.50	6	2	M1 for $\frac{269.30 - 56.80}{42.50}$ or 5 seen A1 cao
(b)	5% of £269.30 £269.30 – "£13.465" OR $\frac{95}{100} \times 269.30$	255.83 or 255.84	3	M1 for (5 ÷ 100) × 269.30 M1 (dep) for 269.30 – "13.465" A1 cao OR M2 for $\frac{95}{100} \times 269.30$ A1 cao **Alternative Method:** M1 for $\frac{5}{100} \times 56.80$ (= 2.84) and $\frac{5}{100} \times 42.50$ (=2.12(5)) (OR 53.96 AND 40.38 (40.375) seen M1 for 56.80 – "2.84" (= 53.96) 42.50 – "2.12(5)" (= 40.375 or 40.38) "5" × "40.375" + "53.96" A1 cao

Paper 5504

No	Working	Answer	Mark	Notes
3 (a)		60	1	B1 cao
(b)	360 – 60 – 90 – 90	120	2	M1 for 360 – "60" – 90 – 90 or 180 – "60" A1 cao
(c)	6×2	12	2	M1 for 6×2 A1 cao 12
(d)		Correct drawing	2	B2 for triangle and construction lines (see overlay) (B1 for 1 line of length 4cm and correct arcs crossing OR for correct triangle with either no arcs or incorrect arcs) SC: B1 similar triangle drawn with construction lines
4 a(i)	$240 \times 5 = 1200$	1250	3	B1 cao 1250
(ii)	$\frac{50}{1250}$	$\frac{1}{25}$		M1 $\frac{50}{"1250"}$ A1 oe in its simplest form
(b)	$\frac{60}{100} \times 1000 = 600$ 600: 250	12:5	3	M1 for $\frac{60}{100} \times 1000$ oe A1 for 600 A1 cao
5 (a)		$x + 2$	1	B1
(b)	$x + 5 + x + 5 + x + 2 + x + 2$	$4x + 14$	2	M1 adding 4 sides, two of which must be '$x + 2$' (all sides to be linear expressions in x) A1 for correct simplified answer
(c)	"$4x + 14$" = 20	1.5	2	M1 for equation "$4x + 14$" = 20 OR $\frac{20-14}{4}$ oe A1 cao

Paper 5504

No	Working	Answer	Mark	Notes
6 (a)		$2p - q$	2	B1 cao for $2p$ B1 cao for $-q$ accept $-q + 2p$ and $2p - 1q$
(b)	$5x = 3 + 4$	1.4	2	M1 for either (+3 or sight of 7) or (÷ 5 or sight of 0.8 and 0.6) A1 cao accept $\frac{7}{5}$ or $1\frac{2}{5}$
7 (a)		$\frac{4\times5}{2}$	1	B1 cao
(b)	$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$	$\frac{8\times9}{2}$	1	B1 cao
(c)	$\frac{100\times101}{2}$	5050	1	B1 cao
(d)		$\frac{n(n+1)}{2}$	2	B2 cao (B1 for any quadratic in n)
8	$3.2 \times 2.8 = 8.96$ $2 \times 4.5 \times 2.8 = 25.2$ $2 \times 4.5 \times 3.2 = 28.8$ $\frac{62.96}{2.5} \times 2.99$	75.30	5	M1 for area of any face found correctly M1 for 2 areas seen A1 for 62.96 or 54 M1 for $\frac{'62.96'}{2.5} \times 2.99$ A1 cao Alternate method for candidates who round up $\frac{"62.96"}{2.5}$ M1 for "26" x 2.99 A1 for £77.74 cao SC: for top included B2 for 71.92 m^2 seen or B3 for £86.02 or £86.71 SC: B4 for £64.58 or £65.78 seen

Paper 5504

No	Working	Answer	Mark	Notes
9	2.5 × 10000	25000	2	M1 for 2.5 × 10000 or 2.5.× 100 ×100 A1 cao
10 (a)	∑f = 90 (88), 144, 32, 96	Angles drawn, labelled	3	M1 for 1 person = 4°or one angle correct in table or pie chart A1 any 2 angles correctly drawn in pie chart A1 fully correct chart labelled
(b)	0.38 + 0.27 + 0.15	0.20	2	M1 1 – sum A1 cao
11	0 | 5 7 8 8 1 | 0 0 0 0 2 5 5 5 6 2 | 0 0 0 4 5 3 | 3 5 Key 1 | 3 = 13 (min)	See working column	3	B1 for stem 0, 1, 2, 3 or 0, 10, 20, 30 B1 for accurate unordered leaves condone 1 error or omission B1 for key and ordered leaves all correct
12 (a)	$V = \pi \times 4^2 \times 10$	502 – 503	2	M1 for $\pi \times 4^2 \times 10$ A1 502 – 503
(b)	$P^2 = 10^2 + 8^2$ $P = \sqrt{164}$	$\sqrt{164} < 13$	3	M1 for sight of a correct right-angled triangle M1 for $10^2 + 8^2$ A1 for conclusion based on a correct calculation or 12.8 seen
13 (a)	2 × 30	2 × 2 × 3 × 5	4	M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
	2 × 48	$2^5 \times 3$		M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
(b)		12	1	B1 cao
(c)	$2^5 \times 3 \times 5$	480	2	B2 cao B1 for $2^5 \times 3 \times 5$ or any correct common multiple

Paper 5504

No	Working	Answer	Mark	Notes
14 (a)		$150 < C \leq 200$	2	M1 use of cum freq to find the cost of the 20th or 20.5^{th} car OR $\frac{1}{2}\Sigma f$ or $\frac{1}{2}(\Sigma f + 1)$ A1 eg 150 to 200
(b)		No, because the 21st value is in the same interval	1	B1 20.5^{th} or 21st in same interval or an alternative correct explanation
(c)	80% = 5200 $\frac{5200}{80} \times 100$	6500	3	M1 for (100 – 20) % = 5200 M1 for $\frac{5200}{"80"} \times 100$ A1 cao
15 (a)	$x^2(x + 1) = 230$	AG	2	M1 for $x \times x \times (x+1)$ or $x \times x \times x + 1$ oe A1 cao from $x \times x \times (x+1)$
(b)	'5 – 150 5.1 – 158.7 5.2 – 167.6 5.3 – 177.0 5.4 – 186.6 5.5 – 196.6 5.6 – 207.0 5.7 – 217.7 5.8 – 228.8 5.9 –240.2 5.85 – 234.4	5.8	4	B 2 for trial between 5.8 and 5.9 inclusive (B1 for different trial between 5 and 6 inclusive) B1 for different trial between 5.8 and 5.85 (not including 5.8) B1 (dep on at least one previous B1) cao for 5.8, 5.81, 5.811

Paper 5504

No	Working	Answer	Mark	Notes
16	$\pi \times \left(\frac{15}{2}\right)^2 = 176.715$	88.4cm^2	3	M1 for $\pi \times \left(\frac{15}{2}\right)^2$ A1 88.3 – 88.4 B1(ind) for cm²
17 (a)	$5 = 0.5x + 1$	8	2	M1 for $5 = 0.5x + 1$ A1 cao
(b)		$y = \frac{1}{2}x + c$	1	B1 $y = \frac{1}{2}x + c$, c ≠ 1, oe
(c)		$x = 2y - 2$ OR $x = 2(y - 1)$	2	M1 for correctly multiplying both sides by 2 or correctly isolating $\frac{x}{2}$ A1 for $x = 2(y - 1)$, $x = \frac{y-1}{0.5}$, $x = \frac{y-1}{\frac{1}{2}}$ oe SC: B1 for $x = 2y - 1$
18	$4x - 6y = 22$ $15x + 6y = 54$ $19x = 76$	$x = 4,\ y = -1$	4	M1 for coefficients of x or y the same followed by correct operation , one arithmetical error A1 cao M1(dep on previous M mark) for sub for other variable A1 cao Trial and improvement –0 unless both x and y correct values found

Paper 5504

No	Working	Answer	Mark	Notes
19 (a)	$SF = \frac{10}{6}$ $\frac{10}{6} \times 4.8 = 8$	8	2	M1 for sight of $\frac{10}{6}$ or $\frac{6}{10}$ or 1.67 or better or $\frac{CD}{10} = \frac{4.8}{6}$ A1 cao
(b)	$\frac{10}{6} \times 4.5 - 4.5 = 3$	19.8	2	M1 for use of SF from (a) to find *BC* or *AC* and adding 4 sides A1 cao
20	$\frac{6 \times 10^{15}}{3.2 \times 10^{8}}$ 1.875×10^{7}	4.3×10^{3}	3	B3 for 4.3×10^{3} to 4.34×10^{3} (B2 for 1.875×10^{7} oe or 4300 to 4340 or final answer of 1.9×10^{7}) (B1 for sight of 6×10^{15} oe or 3.2×10^{8} oe)
21	$8.5 \times \tan 38 = 8.5 \times 0.7813$	6.64	3	M1 for correct use of trig, eg $\tan 38 = \frac{opp}{8.5}$ M1 for 8.5 × tan38 A1 6.64 – 6.641

Paper 5504

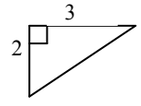
No	Working	Answer	Mark	Notes
22 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all branches labelled B1 for $\frac{1}{6}$, $\frac{5}{6}$ on all remaining branches as appropriate

Paper 5505

No	Working	Answer	Mark	Notes
1 (i) (ii) (iii)		119.31 119310 1.23	3	B1 cao B1 cao B1 cao
2	$\frac{10}{100}\times 12000 = 1200$ 12 000 – 1200 = 10 800 10 800 ÷ 10 =1080 10 800 – 1080 = £9720	9720	3	M1 for $\frac{10}{100}\times 12\,000$ or sight of 1200 or 2400 or 10 800 or 9600 M1 (dep) for $\frac{10}{100}\times(12\,000 - \frac{10}{100}\times 12\,000)$ or sight of 1080 A1 cao Alternative markscheme M2 for $12000\times\left(1-\frac{10}{100}\right)^2$ (M1 for $12000\times\left(1-\frac{10}{100}\right)$) A1 cao
3	$7r - 5r = -20 - 2$	–11	2	M1 for $7r + 2 = 5r - 20$ or $\frac{7r}{5} + \frac{2}{5} = r - 4$ or $7r - 5r = -20 - 2$ or $\frac{7r}{5} - r = -4 - \frac{2}{5}$ A1 cao

Paper 5505

No	Working	Answer	Mark	Notes
4 (a)		–1, 0, 1	2	B2 for –1, 0, 1 only (B1 for –1, 0 or 0,1 or –1, 1 or –2, -1, 0, 1 only)
(b)		(–1,–1)(0,–1) (1,–1) (0, 0) (1, 0) (1, 1)	3	B3 for 6 points correct (B2 for 3 points correct) (B1 for 1 point correct) *NB: –B1 for each additional point over six*
5		$5n + 1$	2	B2 oe (B1 for $5n$ seen) NB: n = gets B1 max
6 (a)	Triangle with vertices at (0,0) (0,–2) and (3,0)		2	M1 for correct orientation A1 cao
(b)	Rotation, 180°, centre (0,1) Enlargement sf –1 centre (0,1)		2	B2 for 180° 'rotation' centre (0, 1) or for Enlargement sf - 1 centre (0,1) (B1 for any two of the three parts) NB: B0 if additional transformation is included
7	Bisector of $\angle BAC$ Arc around A Region	See overlay	3	B3 cao (B2 for either two correct boundaries, no shading/ wrong shading or one correct boundary, one incorrect boundary with valid shading) (B1 for either two incorrect boundaries but one drawn from A and one intersection, with valid shading or one correct boundary) Ignore shading outside the triangle
8		Length Volume Area	3	B1 for Length B1 for Volume B1 for Area



Paper 5505

No	Working	Answer	Mark	Notes
9 (a)	Unbiased question with choices		2	B1 for unbiased question B1 for at least 2 choices
(b)	Leading question and a restricted sample		2	Classification 1: A biased question Classification 2: A restricted sample of people Classification 3: Not specifying a range of foods Classification 4: Nothing to do with eating habits B2 reasons which satisfy 2 different classifications (B1 a reason which satisfies one classification)
10 (a)	$6 \times 10^2 \times 8 \times 10^4$ $48 \times 10^6 = 4.8 \times 10^7$	4.8×10^7	3	M1 for $6 \times 10^a \times 8 \times 10^b$ oe, a and b integers including 0 A1 for 48×10^6 oe A1 cao
(b)	200 000 + 30 000 = 230 000	230 000	2	B2 cao (B1 for sight of 200 000 or 30 000 or 2.3×10^5 or 23×10^4)
11 (a)	$x^2 + xy + xy + y^2$	$x^2 + 2xy + y^2$	2	M1 for at least 3 of the 4 terms correct A1 cao
(b)		25	2	M1 for recognising 3.47 + 1.53 (= 5) A1 cao
12 (i)	Tangent 90° to diameter /radius/ line from (through) centre	27°	4	B1 for 27° cao B1 for reason
(ii)	180 –(90+ "27") angle in semicircle (is 90°)/Alternate segments /angle at centre twice at circumference	63°		B1 ft for 90–"27" if not 63° B1 for reason
13 (i)		p^9	1	B1 cao
(ii)		$6q^6$	2	B2 for $6q^6$ (B1 for sight of $\frac{6q^9}{q^3}$ or $3q \times 2q^5$ or $3q^4 \times 2q^2$ or $6 \times q \times q \times q \times q \times q \times q$ or final answer of the form kq^6, $k > 0$)

Paper 5505

No	Working	Answer	Mark	Notes
14 (a)(i)		152	2	B1 cao
(ii)		177		B1 cao
(b)			3	B1 for median marked at 167 B1 ft for postion of box with its ends at "152" and "177" B1 for position of whiskers with ends at 132 and 182 NB: For any points plotted between 141 and 149 give a tolerance of an extra ± 1 square
15	(arc =) $\frac{40}{360} \times 2\pi \times 9$ $= 2\pi$	$2\pi + 18$	4	M1 for $\frac{40}{360} \times$ M1 for $2\pi \times 9$ M1 (dep) for $\frac{40}{360} \times 2\pi \times 9$ oe A1 for $\frac{18 \times \pi}{9} + 18$ oe exact form
16 (i)		1	1	B1 cao
(ii)		$\frac{1}{16}$	1	B1 cao accept 0.0625
(iii)		64	1	B1 cao condone ± 64

Paper 5505

No	Working	Answer	Mark	Notes
17 (a)	$F \propto 1/x^2$ $F = k/x^2$ $4 = k / 3^2$ $F = 36/x^2$	$F = \frac{36}{x^2}$	3	M1 for $F = k/x^2$ seen or implied. ($k \neq 1$) M1 (dep) for subst. or sight of $k = 36$ A1 for $F = 36/x^2$
(b)		9	1	B1 ft for 9 (ft on $F = kx^n$, $n \neq 0$)
(c)	$64 = \frac{36}{x^2}$ $x^2 = \frac{36}{64}$ $x = \pm\frac{3}{4}$	$\frac{6}{8}$	2	M1 for $x^2 = \frac{"36"}{64}$ A1 for $\frac{6}{8}$ oe (condone $\pm$) *SC: Use of $F = kx^2$ max M1 M1 A0 B1 ft M0 A0* *SC: Use of* $F = \frac{k}{\sqrt{x}}$ *max M1 M1 A0 B0 M1* ($\sqrt{x} = \frac{4\sqrt{3}}{64}$) *A0*
18	$(5+\sqrt{3})(5-\sqrt{3}) = 5\times5 - 5\sqrt{3} + 5\sqrt{3} - \sqrt{3}\sqrt{3}$ $= 5\times5 - 3$ $\frac{22}{\sqrt{22}} = \frac{22\sqrt{22}}{22}$	$\sqrt{22}$	3	B1 for correct expansion 25 - $5\sqrt{3}$ + $5\sqrt{3}$ - $\sqrt{3}$ $\sqrt{3}$ with 1st three terms reducing to 25 **without** any errors seen B1 (indep) for $\sqrt{3}$ $\sqrt{3}$ = 3 B1 for $\sqrt{22}$ coming from $\frac{22}{\sqrt{22}}$ (S.C $\frac{(5+\sqrt{3})(5-\sqrt{3})\sqrt{22}}{22}$ gets B1)

Paper 5505

No	Working	Answer	Mark	Notes
19 (a)		60 40	2	B1 cao B1 cao
(b)		correct bars	2	B1 for $30 < x \leq 40$ with an area of 2½ squares B1 for $40 < x \leq 70$ with an area of 3 squares *SC:* $\frac{0}{4}$ *give M1 if clearly using area or frequency density*
20 (a)	$6x + 8 - 12x + 15$	$-6x + 23$	2	M1 for 3 of the 4 terms $6x$, $+8$, $-12x$, $+15$ correct A1 cao
(b)		$32x^5y^{15}$	2	B2 cao (B1 for two of 32, x^5, y^{15})
(c)	$\frac{(n+1)(n-1)}{n+1} \times \frac{2}{n-2}$ $\frac{2(n-1)}{n-2}$	$\frac{2(n-1)}{n-2}$	3	M1 for $k(n + 1)(n - 1)$ M1 dep for $\frac{(n+1)(n-1)}{(n+1)} = n - 1$ A1 for $\frac{2(n-1)}{n-2}$
21	Vertices at $(-3, -1\frac{1}{2}), (-4\frac{1}{2}, -1\frac{1}{2}), (-3, -4\frac{1}{2})$		3	B1 for all sides ×1½ B1 for correct orientation with 2 vertices almost correct B1 cao

Paper 5505

No	Working	Answer	Mark	Notes
22	Total = 3 + 5 + 2 (=10) $\frac{3}{10}\times\frac{3}{10}\times\frac{5}{10}\left(=\frac{45}{1000}\right), \frac{3}{10}\times\frac{3}{10}\times\frac{2}{10}\left(=\frac{18}{1000}\right)$ $\frac{5}{10}\times\frac{5}{10}\times\frac{3}{10}\left(=\frac{75}{1000}\right), \frac{5}{10}\times\frac{5}{10}\times\frac{2}{10}\left(=\frac{50}{1000}\right)$ $\frac{2}{10}\times\frac{2}{10}\times\frac{3}{10}\left(=\frac{12}{1000}\right), \frac{2}{10}\times\frac{2}{10}\times\frac{5}{10}\left(=\frac{20}{1000}\right)$ $3\times\left(\frac{"45"}{1000}+\frac{"18"}{1000}+\frac{"75"}{1000}+\frac{"50"}{1000}+\frac{"12"}{1000}+\frac{"20"}{1000}\right)$ $\frac{660}{1000}$	$\frac{660}{1000}$ oe	5	M3 for all six expressions seen OR their combined equivalents (M2 for four expressions seen OR their combined equivalents) (M1 for two expressions seen OR their combined equivalents) M1 sum of 18 relevant products condone 1 slip A1 for $\frac{660}{1000}$ oe *SC: without replacement maximum M4 A0* SC: Just 2 beads: Answer either $\frac{38}{100}$ oe OR $\frac{28}{90}$ oe B1

Paper 5505

No	Working	Answer	Mark	Notes
23 (a)(i)		$6\mathbf{b} - 6\mathbf{a}$	2	B1 for $6\mathbf{b} - 6\mathbf{a}$ oe
(ii)		$6\mathbf{a}$		B1 for $6\mathbf{a}$ oe
(b)	$\overrightarrow{EX} = \overrightarrow{EB} + \overrightarrow{BX}$ $= 12\mathbf{b} + \frac{1}{2}\overrightarrow{BC}$	$12\mathbf{b} - 3\mathbf{a}$	2	M1 for $\overrightarrow{EX} = \overrightarrow{EB} + \overrightarrow{BX}$ oe vector journey in a form ready for straightforward substitution A1 for $12\mathbf{b} - 3\mathbf{a}$ oe
(c)	$\vec{AY} = \frac{5}{3}\vec{AB}$ or $\vec{BY} = \frac{2}{3}\vec{AB}$ $\vec{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\vec{XY} = 4\mathbf{b} - \mathbf{a}$ $\vec{EY} = 4\vec{XY}$ or $\vec{EX} = 3\vec{XY}$ or $\vec{EY} = \frac{4}{3}\vec{EX}$	Printer Answer	3	B1 for either $\vec{AY} = \frac{5}{3}\vec{AB}$ or $\vec{BY} = \frac{2}{3}\vec{AB}$ oe B1 ft for either $\vec{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\vec{XY} = 4\mathbf{b} - \mathbf{a}$ ft only on parts (*a*) and (*b*) B1 for either $\vec{EY} = 4\vec{XY}$ or $\vec{EX} = 3\vec{XY}$ or $\vec{EY} = \frac{4}{3}\vec{EX}$ oe **plus** conclusion of *E*, *X*, *Y* on the same straight line
24 (a)(i)		$(5, -4)$	4	B1 cao
(ii)		$(2, -9)$		B1 cao
(iii)		$(2, 4)$		B1 cao
(iv)		$(1, -4)$		B1 cao
(b)		$(x-2)^2 - 4$	4	B4 for $(x-2)^2 - 4$ oe eg. $x^2 - 4x$ (B3 for $(x+2)^2 - 4$ or $(x-2)^2 + 4$) (B2 for $x^2 - 4$ or $(x-2)^2$ OR $x^2 + bx$, $b \neq 0$ OR $(x+2)^2 + 4$ OR $f(x-2) - 4$) (B1 for $x^2 + 4$ or $(x+2)^2$ or $ax^2 + bx$ or $x^2 + bx + c$ OR $x - 2 - 4$ or $x^2 - 2 - 4$, $a, b, c \neq 0$)

Paper 5506

No	Working	Answer	Mark	Notes
1 (a)	$V = \pi \times 4^2 \times 10$	502 – 503 cm^3	2	M1 for $\pi \times 4^2 \times 10$ A1 502 – 503
(b)	$P^2 = 10^2 + 8^2$ $P = \sqrt{164}$	$\sqrt{164} < 13$	3	M1 for sight of correct right angled triangle M1 for $10^2 + 8^2$ A1 for conclusion based on a correct calculation Or 12.8 seen
2 (a)(i)	2×30	$2 \times 2 \times 3 \times 5$	4	M1 for systematic method, eg division, factor trees (at least one prime) A1 cao
(ii)	2×48	$2^5 \times 3$		M1 for systematic method, division, factor trees (at least one prime) A1 cao
(b)		12	1	B1 cao
(c)	$2^5 \times 3 \times 5$	480	2	B2 cao B1 for $2^5 \times 3 \times 5$ or any correct common multiple

Paper 5506

No	Working	Answer	Mark	Notes
3 (a)		$150 < C \leq 200$	2	M1 use of cum freq to find the cost of the 20th or 20.5^{th} car OR $\frac{1}{2}\Sigma f$ th or $\frac{1}{2}(\Sigma f + 1)$ th car. A1 eg 150 to 200, 150 – 200
(b)		No, because the 21st value is in the same interval	1	B1 for 20.5^{th} or 21st value in the same internal consistent with 'a' OR Refers to the median value being low in the interval (statement to be mathematically correct) See additional sheet
(c)	80% = 5200 $\frac{5200}{80} \times 100$	6500	3	M1 for (100 – 20)% = 5200 M1 for $\frac{5200}{"80"} \times 100$ A1 cao

Paper 5506

No	Working	Answer	Mark	Notes
4 (a)	$x^2(x+1) = 230$	AG	2	M1 for $x \times x \times (x+1)$ or $x \times x \times x + 1$ oe, $x^2(x+1)$, $x^2 \times x + 1$ A1 cao from $x \times x \times (x+1)$, no need to see 230
(b)	5 – 150 6 – 252 5.1 – 158.7 5.2 – 167.6 5.3 – 177.0 5.4 – 186.6 5.5 – 196.6 5.6 – 207.0 5.7 – 217.7 5.8 – 228.8 5.9 –240.2 5.85 – 234.4	5.8	4	B2 for trial between 5.8 and 5.9 inclusive evaluated (B1 for trial between 5 and 6 inclusive evaluated) B1 for different trial between 5.8 and 5.85 (not including 5.8) B1 dep on at least are previous B1 5.8, 5.81, 5.811
5	$\pi \times \left(\frac{15}{2}\right)^2 = 176.715$	88.4 cm^2	3	M1 for $\pi \times \left(\frac{15}{2}\right)^2$ seen A1 88.3 – 88.4 B1 for cm² (independent)

Paper 5506

No	Working	Answer	Mark	Notes
6 (a)	$5 = 0.5x + 1$	8	2	M1 for $5 = 0.5x + 1$ A1 cao
(b)		$y = \frac{1}{2}x + c$	1	B1for $y = \frac{1}{2}x + c$, $c \neq 1$, oe
(c)		$x = 2y - 2$ OR $x = 2(y - 1)$	2	M1for correctly multiplying both sides by 2 or correctly isolating $\frac{x}{2}$ A1 for $x = 2(y - 1)$, $x = \frac{y-1}{0.5}$, $\frac{y-1}{\frac{1}{2}}$ oe SC B1 for x= 2y -1
7	$4x - 6y = 22$ $15x + 6y = 54$ $19x = 76$	$x = 4$, $y = -1$	4	M1 for coefficients of x or y the same followed by correct operation, allow one arithmetical error A1 cao M1 (dep) for correct sub for other variable A1 cao Trial and improvement 0 marks unless both correct values of x and y found
8 (a)	SF = $\frac{10}{6}$ $\frac{10}{6} \times 4.8 = 8$	8	2	M1 for sight of $\frac{10}{6}$ or $\frac{6}{10}$ or 1.67 or better or $\frac{CD}{10} = \frac{4.8}{6}$ A1 cao
(b)	$\frac{10}{6} \times 4.5 - 4.5 = 3$	19.8	2	M1 for use of SF from "a" to find AC or BC or $\frac{BC}{4.5} = \frac{4}{6}$ and adding 4 sides A1 cao

Paper 5506

No	Working	Answer	Mark	Notes
9	$\frac{6\times10^{15}}{3.2\times10^{8}}$ 1.875×10^{7}	4.3×10^{3}	3	B3 for 4.3×10^{3} to 4.34×10^{3} (B2 for 1.875×10^{7} oe or 4300 to 4340, final answer of 1.9×10^{7} B1 for sight of 6×10^{15} oe or 3.2×10^{8} oe)
10	$8.5\times\tan38$ $=8.5\times0.7813$ $\frac{8.5}{\sin(90-38)}=\frac{AB}{\sin38}$ $AB=\frac{8.5\times\sin38}{\sin(90-38)}$ $=\frac{5.2331}{0.788}=6.64$	6.64	3	M1 for correct use of trig, eg $\tan 38=\frac{opp}{8.5}$ M1 for $8.5\times\tan38$ A1 6.64 – 6.641 OR M1 for correct substitution into the sine rule M1 (dep) for correct rearrangement for AB= A1 6.64 – 6.641
11 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer See additional sheet

Paper 5506

No	Working	Answer	Mark	Notes
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all branches labelled B1 for $\frac{1}{6}$ and $\frac{5}{6}$ on all remaining branches as appropriate
(c)(i)	$\left(\frac{1}{6}\right)^2$	$\frac{1}{36}$	2	M1 $\left(\frac{1}{6}\right)^2$ or $\frac{1}{6}\times\frac{1}{6}$ only or 0.28 A1 $\frac{1}{36}$ or 0.03 or better
(ii)	$1-\left(\frac{5}{6}\right)^2$ OR $\frac{1}{6}\times\frac{5}{6}+\frac{5}{6}\times\frac{1}{6}+\frac{1}{6}\times\frac{1}{6}$	$\frac{11}{36}$	3	M2 for $1-\left(\frac{5}{6}\right)^2$ or $1-\frac{5}{6}\times\frac{5}{6}$ A1 cao OR M1 for $\frac{1}{6}\times\frac{5}{6}$ oe M1 for 2 or 3 only of $\frac{1}{6}\times\frac{5}{6}, \frac{5}{6}\times\frac{1}{6}$, "a" A1 for $\frac{11}{36}$ or 0.31 or better

Paper 5506

No	Working	Answer	Mark	Notes
12 (a)	$\pi \times 30 \times \frac{7.5^2}{3} - \pi \times 10 \times \frac{2.5^2}{3} = 1767 - 65$	1700	3	M1 for either $\pi \times 30 \times \frac{7.5^2}{3}$ or $\pi \times 10 \times \frac{2.5^2}{3}$ M1 (dep) for difference A1 1700 – 1702 **SC** B1 Using d instead of r, 6800 – 6808
(b)	$\frac{S}{2\pi d} = \sqrt{h^2 + d^2}$ $\left(\frac{S}{2\pi d}\right)^2 = h^2 + d^2$	$h = \sqrt{\frac{S^2 - 4\pi^2 d}{4\pi^2 d^2}}$	3	M1 for correctly isolating $\sqrt{h^2 + d^2}$ or $h^2 + d^2$ or $h + d$ or kh^2 or kh M1(indep) squaring both sides A1 $h = \sqrt{\frac{S^2 - 4\pi^2 d^4}{4\pi^2 d^2}}$, $h = \frac{\sqrt{S^2 - 4\pi^2 d^4}}{2\pi d}$ $h = \sqrt{\left(\frac{S}{2\pi d}\right)^2 - d^2}$
(c)	$\left(\frac{30}{20}\right)^2 \times 450$ or $450 \div \left(\frac{20}{30}\right)^2$	1012.5	2	M1 for sight of correct SF^2 including 4:9 A1 1010 to 1013

Paper 5506

No	Working	Answer	Mark	Notes
13 (a)	$\frac{2x(x+20)}{2} = 400$	As given	2	M1 $\frac{2x(x+20)}{2}$ or $\frac{2x \times x + 20}{2}$ or $2x(x + 20) = 800$ A1 cao following correct working, no need for = 400 *SC B1* $2x \times x + \frac{1}{2} \times 2x(10 - \frac{x}{2}) \times 2$
(b)	$\frac{-20 \pm \sqrt{20^2 - 4 \times 1 \times (-400)}}{2}$ $= \frac{-20 \pm 44.721}{2}$	12.361	3	M1 for correct sub, up to signs, in the quad formula A1 for 44.7 or $\sqrt{2000}$ A1 for 12.3606 – 12.361, ignore negative solution T.I B3 for 12.361 OR Completing the square M1 for $(x+10)^2$ seen A1 for $-10 \pm \sqrt{500}$ A1 for 12.3606 – 12.361 ignore negative solution

Paper 5506

No	Working	Answer	Mark	Notes
14 (a)	$0.5\times 8\times 15\times \sin 70^0$	56.4	2	M1 for correct sub into area formula A1 56.38 – 56.4
(b)	$AB^2 = 8^2 + 15^2 - 2\times 8\times 15\times \cos 70^0 = 206.9$ EITHER $0.5\times AB\times CX = '56.38'$ OR $\frac{\sin B}{8} = \frac{\sin 70}{\sqrt{'206.9'}}$ $B = 31.5$ 15 sin '31.5'	7.84	4	M1 for correct sub into cos rule A1 for 206.9 - 207 or 14.38 – 14.4 EITHER M1 for use of area rule to find CX A1 7.83 – 7.84 OR M1 for correct use of sine rule to find sin B or sin A and then sight of 15sin B *or* 8 sin A A1 7.83 – 7.84

Paper 5506

No	Working	Answer	Mark	Notes
15 (a)	$4a^2 - 4a + 1 - (4b^2 - 4b + 1) =$ $4(a^2 - b^2) - 4(a - b)$ $4(a - b)(a + b - 1)$ OR $((2a - 1) - (2b - 1))((2a - 1) + (2b - 1))$ $(2a - 2b)(2a + 2b - 2)$	AG	3	Expansion Method M1 for a correct expansion of any one of the three terms M1(dep) on an attempt to expand all 3 terms and show LHS = RHS A1 fully correct algebra RHS exp is $4(a^2 + ab - a - ba - b^2 + b)$ OR Factorisation Method M1 for attempt to use difference of 2 squares on LHS M1 for one bracket correctly simplified A1 fully correct
(b)	Any 2 odd square numbers have the above form If a and b are both even or odd then $a - b$ is even, so $4(a - b)$ is a multiple of 8 If one of a,b is odd, then $a + b - 1$ is even, so $4(a + b - 1)$ is a multiple of 8		3	B1 'any 2 square nos have the above form' (may be implied by sight of $(2a - 1)^2 - (2b - 1)^2$ in part (b)) B1 first reason B1 second reason SC B1 for $(2r + 1)^2 - (2r - 1)^2$ B1 for 8r
16 (a)	$g_L = \frac{2 \times 4.495}{1.35^2 \times \sin 30.5}$ $g_u = \frac{2 \times 4.505}{1.25^2 \times \sin 29.5}$	9.719 11.710	4	B2 for any 4 of 4.505, 1.25, 29.5, 4.495, 1.35, 30.5 seen (B1 for any two or three seen) B1 for 11.710 – 11.7103 B1 cao 9.719 – 9.71904
(b)	Round, until lower and upper bounds agree	10	1	B1 for 10 + reason " they agree to this level of accuracy"

Paper 5506

No	Working	Answer	Mark	Notes
17 (a)(i)		xy	3	B1 cao
(ii)		y^2		B1 for y^2 or $y \times y$
(iii)		$\frac{x}{2}$		B1 for $\frac{x}{2}$ or $0.5x$ or $2^{-1}x$
(b)	Divide to get $2y = 1$	$q = -1$	2	M1 for $2y = 1$ or $\frac{x}{2} = 32$ or $p + q = 5$ or $1 + p + 2q = 5$
		$p = 6$		A1 cao
18 (a)	$x^2 - 2mx + m^2 - k$	$k = m^2$	2	M1 for correct exp of $(x - m)^2$ or correct completion of the square eg $\left(x - \frac{2m}{2}\right)^2 - \left(\frac{2m}{2}\right)^2$
				A1 cao
				SC B1 for $k = -m^2$
(b)(i)	Min value is $-m^2$	$-m^2$	3	M1 for recognition that min value occurs when $(x - m)^2 = 0$ (either (b)(i) or (b)(ii) correct implies this M1)
(ii)	$x = m$	m		A1 ft on 'k', " $-k$" gets M1 A0
				A1 cao
19	$0.06 \times 0.05 = 0.003$	No	2	M1 for 0.06×0.05
				A1 correct conclusion based on 0.003 or 0.06 x 0.05 stated as $\neq 0.0011$
				OR M1 for statement that for the two events to be independent P (BL and CL) = P(BL) × P(CL)

Paper 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
20		50 50 4	3	B1 50 or $\frac{100}{2}$ B1 for 50 or "a" B1 4 or $\frac{360}{90}$ oe

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

M marks - awarded for correct working seen or implied.
A marks - conditional accuracy marks which are awarded for accurate working following the award of M marks.
B marks - unconditional accuracy marks (independent of M).

2 Abbreviations

cao - correct answer only.
ft - follow through.
$\surd$ - Denotes a "follow through" answer.

SC - special case.
isw - ignore subsequent working.
oe - or equivalent (and appropriate).
NB: a candidate cannot benefit from both isw and ft.

3 If no working shown, then

correct answers normally score full marks
incorrect (even though nearly correct) answers score no marks.

4 Marking instructions

Misread loses A marks (and sometimes B marks) on that part but ft can be allowed on subsequent parts. M marks can still be earned. If in doubt contact your team leader.
If there is a wrong answer in the answer space DO CHECK the working in the body of the script.

- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.
- If there is a wrong answer in the answer space DO CHECK the working in the body of the script.
- If it is clear from working that the "correct" answer has been obtained from incorrect working, award no marks. If in doubt contact your team leader.

5 Style of marking

Answer correct: tick and write part mark in margin NEXT TO BRACKETED MARK.
Answer incorrect: cross, but show M, A or B marks if any earned in body of script and transfer the total of these to the margin next to the bracket mark.
Total for each double page at bottom right page (except for back if used), FINAL TOTAL IN RELEVANT BOX ON FRONT COVER.
Nought in margin for fully incorrect question or page AND FOR NO ATTEMPT.
Where no attempt has been made a line should be put in the answer space and zero in the margin next to the bracketed mark
CHOICE OF METHOD – No marks unless one answer is in answer space – then mark that.
CROSSED OUT WORK - if not replaced this should be marked (if legible).
There must always be a mark next to bracketed mark in the margin/

6 Follow Through Marks

Follow throughs are guided by two principles:

(a) Follow throughs which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous, do not award.
(b) Follow throughs which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 Probability

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least two decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

6 Linear Equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

8 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

PAPER 5501					
No		**Working**	**Answer**	**Mark**	**Notes**
1			K: 1020 L: 8.06	2	B1 for 1020 or 1,020 B1 for 8.06 Accept £8.06p and £8,06
2	(a)		28, 33	2	B1, B1 (B1 ft for "28" + 5 if both numbers >25)
	(b)			1	B1 for add 5, +5, for going up in 5's the difference is 5 oe
	(c)			1	B1 for they end in 3 and 8, it ends in 7; or refers to 383 and 388 are in sequence
3	(a)(i)		$\frac{1}{2}$	2	B2 for ½ accept half (B1 for an equivalent unsimplified fraction eg 4/8 or 50% or 0.5)
	(ii)		2 rectangles shaded	1	B1 for correct shading (any 2 rectangles)
	(b)(i)		40	4	B1 for 40 cao
	(ii)		150 000		B1 for 150 000 cao (accept 150,000 not 150.000)
	(iii)		6.55		B1 for 6.55 cao not $6.5^{½}$
	(iv)		$\frac{3}{8}$		B1 for $\frac{3}{8}$ oe accept 0.375
	(c)		Cross 3cm from *A*	1	B1 mark a cross 3 cm (±2 mm) from *A*
4	(a)(i)		metres	2	B1 for metres (m)
	(ii)		grams		B1 for grams (g)
	(b)		miles	1	B1 for miles
5	(a)		(3, 2)	1	B1 for (3, 2)
	(b)(i)		*Q* at (0, 3)	1	B1 for *Q* plotted correctly on *y*-axis at (0, 3) ±2mm
	(ii)		*R* at (−2, −3)	1	B1 for *R* plotted correctly at (−2, −3) ±2mm
6	(a)(i)		30	2	B1 for 30
	(ii)		25		B1 for 25
	(b)(i)		4 shapes	2	B1 for drawing 4 shapes
	(ii)		1½ shapes		B1 for drawing 1½ shapes

PAPER 5501					
	No	Working	Answer	Mark	Notes
7	(a)		30	1	B1 for 30
	(b)	$20 \times 3 + 5$	65	2	M1 for $20 \times 3 + 5$ oe A1 for 65
8	(a)		Draws perp.	1	B1 for correctly drawing perp must touch line or cut line *AB* ± 2mm
	(b)		Sketches a cylinder	1	B1 for sketching cylinder
9	(a)	1974 6580 8554	855.4	3	M1 for complete method with relative place value correct, condone 1 error in multiplication A2 cao (A1 for digits 8554 seen or A1 for "855.4" dependent on 1 arithmetic error)
	(b)	990 ÷ 69 = 14.3…. or 14 rem 24	14	4	Method 1 - Everything excluding long division M2 for a valid method with no errors …need to see 966 or 1035 (M1 for a valid method, including estimation, that reaches an answer between 901 and 1099 inclusive. Ignore errors.) A2 for 14 with a fully correct method (A1 (dep on 1st M1) for an answer between 14 and 15 inclusive. Ignore errors. Cannot have used estimation.) Note: Estimation can only score a maximum of M1 unless accompanied by another method or 966 or 1035 see (award M2) Method 2 – long division method M2 for 990 ÷ 69 = integer answer between 12 and 19 inclusive and rem 30 seen (M1 for 990 ÷ 69 with 1 in tens column.) A2 for 14 with fully correct method (A1 (dep on 1st M1) for an answer between 14 and 15 inclusive.)

PAPER 5501					
	No	**Working**	**Answer**	**Mark**	**Notes**
10	(a)(i)		7	2	B1 for 7
	(ii)		−10		B1 for −10
	(b)(i)		6	2	B1 for 6 (accept −6)
	(ii)		8		B1 for 8 (accept −8)
	(c)		−7	1	B1 for −7 cao
11	(a)		B and D	2	B1, B1 (–1 each extra)
	(b)(i)		A	2	B1 for A
	(ii)		3		B1 for 3
12	(a)	800 − 144	656	2	M1 for at least 1 digit correct and in correct position needs to be 3 digit number A1 for 656
	(b)	144 is less than 200 so Trudy is wrong		2	B1 for 200 B1ft for 'correct' explanation based on cand's "200"
	(c)	$\frac{45\times800}{100}$	360	2	M1 for 45 × 800 ÷ 100 oe A1 for 360
	(d)	$\frac{176}{800}\times100$	22	2	M1 for $\frac{176}{800}\times100$ oe A1 for 22
13	(a)(i)		25	4	B1 for 25
	(ii)		28		B1 for 28
	(iii)		5 and 20		B1 for 5 and 20
	(iv)		26 and 33		B1 for 26 and 33
	(b)	$2^3 = 8$ or $2^3 = 2 \times 2 \times 2$ (which is not 6)		1	B1 for valid 'explanation'
14			10 m^2	2	B1 for 10 B1 indep for m^2.

PAPER 5501					
No		**Working**	**Answer**	**Mark**	**Notes**
15	(a)	$\frac{11}{12}-\frac{10}{12}$	$\frac{1}{12}$	2	M1 for correctly writing both fractions to a common denominator A1 for $\frac{1}{12}$ oe
	(b)	$\frac{70\times400}{200}$	140	2	B2 for 140 (accept 136) (B1 for sight of any two of 70, 400 or 200)
16	(a)		$2y$	1	B1 for $2y$ or $2\times y$, $y2$, $y\times2$
	(b)		$3p^2$.	1	B1 for $3p^2$ or $3\times p^2$ or $p^2\times3$ or $p^2 3$
	(c)		$x(x-3)$	2	B2 for $x(x-3)$ (B1 for x (x…….)) $\frac{25}{60}$ wrongly cancelled gets B1 ISW
17	(a)		2 23 9 34 15 2 9 26 17 25 18 60	3	B3 for all correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
	(b)		$\frac{25}{60}$	1	B1 for $\frac{25}{60}$ or $\frac{5}{12}$ oe $\frac{25}{60}$ wrongly cancelled gets B1 ISW

PAPER 5501					
	No	**Working**	**Answer**	**Mark**	**Notes**
18	(a)(i)		60	2	B1 for 60
	(ii)				B1 for all **angles equal** so equilateral triangle oe
	(b)(i)		130	3	B1 for 130
	(ii)				B1 for isosceles triangle oe or 2 angles equal accept $\angle Q = \angle R$ B1 for angles on a straight **line** add up to **180°**oe (180° could be in working)
	(c)		64	1	B1 for 64
19	(a)		1	1	B1 for 1
	(b)		3	1	B1 for 3
	(c)	$9\times1+3\times2+5\times3+3\times4$ (= 42) "42" ÷ 20	2.1	3	M1 for 9×1, 3×2, 5×3, 3×4 or for 42 seen M1 (dep) for "42" ÷ 20 A1 for 2.1 or $2\frac{1}{10}$ or $2\frac{2}{20}$
20	(a)		09 05	1	B1 for 09 05 oe
	(b)		7	1	B1 for 7
	(c)		10	1	B1 for 10
	(d)	7km in 20 mins	21	3	B1 for 20 (minutes) oe or $\times3$ seen M1 for $\frac{"7"}{"20"}$ A1 cao [SC: "7" × 3 seen gets B1 M1]

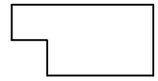
PAPER 5501				
No	**Working**	**Answer**	**Mark**	**Notes**
21	Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 a right angled triangle with horizontal length 4 or vertical length 8 in the same orientation as the shaded triangle) SC B2 for s + 3 totally correct
22 (a) (b) (c)	 8560 ÷ (10 × 10)	8 Pentagon 85.6	1 1 2	B1 for 8 B1 for pentagon M1 for 8560 ÷ (10 × 10) oe A1 for 85.6
23	$2x + x + 100 + 47 = 360$ $2x + x = 360 - 100 - 47$ $x = 71$ Largest angle = $2x$ =	142	4	M1 for $2x + x + 100 + 47 = 360$ or 360 – 147 or 213 seen M1 dep for correctly separating x-terms and non x terms or "360 – 147" ÷ 3 A1 for $x = 71$provided M2 awarded A1 ft for 142

PAPER 5502					
	No	**Working**	**Answer**	**Mark**	**Notes**
1	(a)		Diagram	1	B1 cao
	(b)		22, 26	1	B1 cao
	(c)		46	1	B1 cao
2	(a)	£5.95 + £1.62 + 25p + 2 × 48p = £8.78	1.22	3	M1 for 3 of £5.95, £1.62, 25p, 48p seen with intention to add or 170 seen A1 for £8.78 A1 ft from " 8.78"
	(b)	160 ÷ 12 = 13.(333…)	14	2	M1 for 160 ÷ 12, or 13 or better or 12 × 13 or 12 × 14 A1 14 cao
	(c)	"14" × £12.20 = £170.8**0**	170.80	2	M1 for "14" × 12.20 A1 for 170.8**0** or 158.6**0** if 13 in (b) NB: 170.8 or 158.6 gets M1 A0
3	(a)(i)		1459	1	B1 cao
	(ii)		9541	1	B1 cao
	(b)		9 + 5 = 14	1	B1 cao
	(c)		0	1	B1 cao
4	(a)		1123	1	B1 cao
	(b)		1125	1	B1 cao
	(c)		43	1	B1 cao
	(d)	67 – "43"	24	2	M1 for 67 – "43" A1 ft from "43"
	(e)(i)		80	2	B1 cao
	(ii)		56 – 58		B1 answer in range 56 to 58 inc
	(f)		Completes graph	2	B2 for (Apr , 70) and (May , 60 < p < 65) plotted and joined (B1 for one point plotted)

PAPER 5502					
	No	Working	Answer	Mark	Notes
5	(a)(i)		4	1	B1 cao
	(ii)		10	1	B1 cao
	(b)		28	2	B2 for 28 (B1 for 29 or 14×2)
6	(a)		$\frac{3}{4}$	1	B1 accept 0.75, 75%
	(b)	$\frac{3}{4} \times 28 = 21$	15.54	3	M1 for $\frac{3}{4} \times 28$ or 21 seen M1 for "21" $\times$ 74 or 28×74 or 7×74 A1 cao
	(c)(i)		44 – 46	2	B1 44 – 46 inc
	(ii)		5.2 – 5.4		B1 5.2 – 5.4 inc
7	(a)		Correct shape	1	B1
	(b)		Correct shape	1	B1
8	(a)		Hexagon	1	B1
	(b)		Right	1	B1 cao
	(c)		Drawing	2	B2 for 7 additional hexagons with at least 2 points at which 3 hexagons meet (B1 for one point at which 3 hexagons meet)
9	(a)		$\frac{3}{4}$	2	M1 $\frac{80-20}{80}$ or $\frac{60}{80}$ or 0.75 (oe) A1 cao Do not accept equivalents
	(b)		15	1	B1 cao
	(c)		Iron and Cook set	1	B1 for both Accept mixer and fryer
	(d)		Microwave	1	B1 cao
	(e)		Bar chart	2	B1 one column (mixer): 70, 90 B1 second column (fryer): 70, 85 [SC: B1 columns correct but reversed]

PAPER 5502					
No		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		Acute	1	B1
	(b)		Reflex	1	B1
	(c)		reason	1	B1 reason eg 120 + 230 = 350 ≠ 360
11	(a)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ oe
	(b)		reason	1	B1 for reason e.g could get 30 heads
12	(a)	7.5×4	30	2	M1 for 7.5×4 or $7\frac{1}{2} \times 4$ A1 cao
	(b)	$\sqrt{(42.25)}$	6.5	2	B2 for 6.5 (B1 for 42.25)
13	(a)		$6x$	1	B1 accept $6 \times x$, $x6$ oe
	(b)		$x - 4$	1	B1 cao
	(c)		$12(x - 4)$	1	B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe
	(d)		$18x - 48$	2	M1 for "$6x$" + "$12(x-4)$" or "$6x$" + "$12x - 48$" oe A1 ft $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$
14	(a)		90	2	B2 for 90 ± 2 (B1 for 9 ± 0.2)
	(b)		317	1	B1 for 317 ± 4
15	(a)	Accurate drawing of triangle		2	B1 cao for 38° (±2°) B1 cao (indep) for BC drawn 7.3 cm (±2mm) and completing the triangle.
	(b)	Measure angle A	63°	1	B1 for 63° (±2°) or ft their diagram (±2°)

PAPER 5502					
	No	Working	Answer	Mark	Notes
16	(a)	0 × 1 = 0 1 × 1 = 1 2 × 4 = 8 3 × 8 = 24 4 × 8 = 32 5 × 7 = 35	100	3	M1 col 1 × col 2 (at least 3 shown) M1 (dep) sum of totals A1 cao SC: M1 M1 A0 for 101
	(b)	Either 35.50 ÷ 1.42 = 25; 26.99 – 25 = 1.99 Cheaper in the USA Or 26.99 × 1.42 = 38.33; 38.33 – 35.50 = 2.83 Cheaper in the USA		3	M1 35.50 ÷ 1.42 A1 25 seen B1 ft (dep on M1) £1.99 with conclusion (must have units) **OR** M1 26.99 × 1.42 A1 38.32 or 38.33… seen B1 ft (dep on M1) \$2.83 or \$2.82 with conclusion (must have units) must be to 2dp
17	(a)		-1, (1), (3), 5, 7, 9	2	B2 cao (B1 for 2 values)
	(b)		Graph	2	B1 ft for plotting points ±1/2 square B1 cao for line between $x = -2$ and $x = 3$
	(c)(i)		0.4	2	B1 for 0.4 or ft from single straight line with positive gradient
	(ii)		1.2		B1 for 1.2 or ft from single straight line with positive gradient

PAPER 5502					
	No	Working	Answer	Mark	Notes
18	(a)		Plots	1	B1 cao
	(b)		description	1	B1 dynamic relationship or "positive" (correlation)
	(c)		line of best fit	1	Line within overlay region, and to the extent of.
	(d)(i)	280 g →	reading	2	B1 ft from single straight line of positive gradient (±1/2 square)
	(ii)	120 pages →	reading		B1 ft from single straight line of positive gradient (±1/2 square)
19			200 150 225 150 10	3	B3 cao (B2 for three correct, or B1 for one correct)
20	(a)			2	B1 B1 for correct sketch – ignore additional internal lines B1 B0 for rectangle or right-angled triangle or correct shape without line NB 3-D sketch gets B0 B0
	(b)			2	B1 B1 for correct plan – ignore internal lines – accept a rotated plan, not reflected B1 B0 for a single rectangle drawn NB 3-D sketch gets B0 B0
21	(a)	163.25 – 35.50 = 127.75 127.75 ÷ 18.25 = 7	8	3	M1 163.25 – 35.50 (or sight of 127.75) M1 (dep) "127.75" ÷ 18.25 A1 cao SC: M2 for 7 days
	(b)	1.175 × £64 or $\frac{17.5}{100}$ × 64 or £11.20 seen	75.20	2	M1 1.175 × 64, 0.175 × 64 oe or 11.20 or 75.2 seen or 6.40, 3.20 and 1.60 seen A1 cao

PAPER 5502					
	No	Working	Answer	Mark	Notes
22	(a)		6	1	B1 cao
	(b)		$t^2 - 2t$	1	B1 oe
	(c)		$3(y - 4)$	1	B1 Accept $3 \times (y - 4)$ or $3(y - 4$
23	(a)		Reason	1	B1 Makes some mention of bias either directly or making reference to an insufficient or biased range of responses
	(b)		Reason	1	B1 (a) an insufficient range of responses (b) No mention of money (c) No time frame in the question (d) Misunderstanding of "A lot" and "Not much"

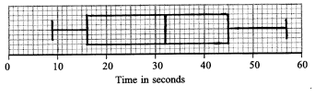
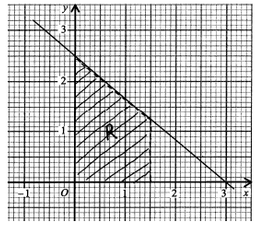
PAPER 5503				
No	**Working**	**Answer**	**Mark**	**Notes**
1		10.	1	B1 for 10
2 (a)(i)		$3e + 2f$	2	B1 for $3e + 2f$
(ii)		$3p^2$		B1 for $3p^2$
(b)	$5 \times -3 + 1$	-14	2	M1 for $5 \times -3 + 1$ A1 for -14
3	1974 6580 8554	855.4	3	M1 for complete correct method with relative place value correct, condone 1 error in multiplication. A2 cao (A1 for digits 8554 seen or A1 ft for "855.4" dependent on one arithmetic error only)
4 (a)		2 23 9 34 15 2 9 26 17 25 18 60	3	B3 all correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
(b)		$\frac{25}{60}$	1	B1 for $\frac{25}{60}$ or $\frac{5}{12}$ oe
5 (a)	$\frac{45}{100} \times 800$	360	2	M1 for $\frac{45}{100} \times 800$ oe A1 for 360
(b)	$\frac{176}{800} \times 100$	22	2	M1 for $\frac{176}{800} \times 100$ oe A1 for 22

PAPER 5503					
	No	Working	Answer	Mark	Notes
6	(a)	$\frac{11}{12}-\frac{10}{12}$	$\frac{1}{12}$	2	M1 for correctly writing both fractions to a common denominator A1 for $\frac{1}{12}$ oe
	(b)	$\frac{70\times400}{200}$	140	2	B2 for 140 (accept 136) (B1 for sight of any two of 70, 400 or 200)
7	(a)(i)		60	2	B1 for 60
	(ii)				B1 for all angles equal so equilateral triangle oe
	(b)(i)		130	3	B1 for 130
	(ii)				B1 for isosceles triangle oe B1 for angles on a straight line add up to 180°oe
	(c)		64	1	B1 for 64
8		$9\times1+3\times2+5\times3+3\times4$ (=42) "42" ÷ 20	2.1	3	M1 for 9×1, 3×2, 5×3, 3×4 or for 42 seen M1 (dep) "42" ÷20 A1 for 2.1 or $2\frac{1}{10}$ or $2\frac{2}{20}$
9	(a)		09 05	1	B1 for 09 05 oe
	(b)		7	1	B1 for 7
	(c)		10	1	B1 for 10
	(d)	7 km in 20 minutes	21	3	B1 for 20 (minutes) oe or $\times3$ seen M1 for $\frac{"7"}{"20"}$ A1 cao SC: "7" $\times3$ gets B1 M1

PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
10		Vertices of new triangle at (2, −2) (2, 6) and (6, −2)	Correct triangle drawn	3	B3 cao (B2 for either correct triangle in wrong translated position or for 2 vertices correct) (B1 for a right-angled triangle with horizontal length 4 or vertical length 8 in the same orientation as shaded triangle) SC B2 for scale factor 3, totally correct
11		$2^2 + 3 =$	7 which is not even	2	B2 (B1 for correctly evaluating $n^2 + 3$ with a prime number value for n.)
12	(a)	360 ÷ 5	72	2	M1 for 360 ÷ 5 oe A1 for 72
	(b)	8560 ÷ (10 × 10)	85.6	2	M1 for 8560 ÷ (10 × 10) oe A1 for 85.6
	(c)(i)	Least length = 100.5	100.5	2	B1 for 100.5
	(ii)	Greatest length = 101.5	101.5		B1 for 101.5 or 101.499 or better
13		$2x + x + 100 + 47 = 360$ $2x + x = 360 - 100 - 47$ $x = 71$ Largest angle = $2x$ =	142	4	M1 for $2x + x + 100 + 47 = 360$ or 360 – 147 or 213 seen M1 (dep) for correctly separating x-terms and non x terms or $\frac{"360-147"}{3}$ A1 for $x = 71$ A1 ft (provided M2 awarded) for "142"
14	(a)(i)		2.21	2	B1 for 2.21
	(ii)		0.013		B1 for 0.013
	(b)	LCM = 3 × 13 × 17 = 3 × 221	663	2	M1 for 3 × 13 × 17 oe A1 for 663

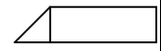
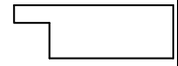
PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
15			Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2\left(c^2+d^2\right)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
16		200×0.2	40	2	M1 for 200×0.2 or $\frac{40}{200}$ seen A1 for 40
17	(a)	eg 2 | 108 2 | 54 3 | 27 3 | 9 3	$2^2 \times 3^3$	3	M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error (M1 for 108 written as a correct product(s) with only one non-prime or equivalent division or a full process with 2 calculation errors.) A1 for $2^2 \times 3^3$ (accept $2 \times 2 \times 3 \times 3 \times 3$)
	(b)		12	1	B1 for 12
18		Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2cm long		2	M1 relevant pair of arcs crossing within tramlines A1 SC M1 AO for a full construction of a perpendicular to AB not passing through P.
19		15×10	150 cm^3.	3	M1 for 15×10 A1 for 150 B1 for cm^3.

PAPER 5503					
No		**Working**	**Answer**	**Mark**	**Notes**
20			$y = 2x + 6$	2	B2 for $y = 2x + 6$ (B1 for $y = 2x + k$, $k \neq 1$ or for $y = mx + 6$, m $\neq 0$ or for $2x + 6$)
21		$6\frac{2}{5} = \frac{32}{5}$ Area of triangle = $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ (=2) Length of a side of sq. = $\sqrt{18 \times "2"}$ (=6) Perimeter of square = 4 × 6	24	5	B1 for $6\frac{2}{5} = \frac{32}{5}$ oe or $3\frac{1}{5} = \frac{16}{5}$ or $\frac{30}{8} + \frac{2}{8}$ oe (or implied by area of triangle=2) M1 for $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ oe M1 for area of square = 18 × product of two lengths A1 for $\sqrt{18 \times "2"}$ A1 for 24
22	(a)		$x(x-3)$	2	B2 for $x(x-3)$ (B1 for x (…….))
	(b)		k^3.	1	B1 for k^3.
	(c)(i)	$4x + 20 + 3x - 21$	$7x - 1$	4	M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better) A1 for $7x - 1$
	(ii)	$x^2 + 3yx + 2xy + 6y^2$	$x^2 + 5xy + 6y^2$		M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$ A1 for $x^2 + 5xy + 6y^2$
	(d)		$(p+q)(p+q+5)$	1	B1 for $(p+q)(p+q+5)$

PAPER 5503					
	No	Working	Answer	Mark	Notes
23	(a)		32	1	B1 for 32 (accept 31.5 to 33.5 inclusive)
	(b)			3	B1 for ends of whiskers at 9 and 57, (with a box) B1 for ends of box at 16 and 45 (± 0.5) B1 for median marked at 32 or a complete box and whisker diagram drawn with a median inside the box
	(c)	Median(B)>Median(G); on average boys take longer IQR(B)>IQR(G); times for boys have a greater spread		2	B1 eg for comparison of medians B1 eg for comparison of (interquartile) ranges
24	(a)	$6y = 15 - 5x$	$y = \frac{15-5x}{6}$	2	M1 for either $6y = 15 - 5x$ or -6 $y = 5x - 15$ or for $\frac{5x}{6} + y = \frac{15}{6}$ or a correct ft on sign error to $y=$ A1 for $y = \frac{15-5x}{6}$ oe
	(b)	$6k + 5(-21) = 15$	20	2	M1 for substitution of $x = -21$ (or $x = 21$) into given equation or candidate's answer to (a) A1 for $k = 20$
	(c)(i)		Region R indicated	3	B2 correct region shaded (accept unshaded if R clear) (B1 shaded or R region satisfies 3 of the 4 given inequalities with same boundaries)
	(ii)		(1,1)		B1 for (1,1)

PAPER 5503					
	No	Working	Answer	Mark	Notes
25	(a)		60	1	B1 for 60 B1 for *BDC* = 25
	(b)	eg Angle *BDC* = 25 *ADB* = 60 − 25	35	2	[Award the mark for equivalent approaches] B1 ft for (a) − 25
	(c)	Ben is correct; angle *DAB* = 65 + 25 = 90 and since angle in a semi-circle is 90°, *BD* must be a diameter		1	B1 for full valid justification

PAPER 5504					
	No	Working	Answer	Mark	Notes
1	(a)	Accurate drawing of triangle		2	B1 cao for 38º (±2º) B1 cao (indep) for BC drawn 7.3 cm (±2mm) and completing the triangle.
	(b)	Measure angle A	63º	1	B1 for 63º (±2º) or ft their diagram (±2º)
2	(a)	0 × 1 = 0 1 × 1 = 1 2 × 4 = 8 3 × 8 = 24 4 × 8 = 32 5 × 7 = 35	100	3	M1 col 1 × col 2 (at least 3 shown) could be implied by answers. M1 (dep) sum of totals A1 cao SC: M1 M1 A0 for 101
	(b)	Either $35.50 ÷ 1.42 = £25; £26.99 - £25 = £1.99 Cheaper in the USA Or £26.99 × 1.42= $38.33; $38.33 - $35.50 = $2.83 Cheaper in the USA		3	M1 35.50 ÷ 1.42 A1 25 seen B1 ft (dep on M1) £1.99 with conclusion; units needed OR: M1 26.99 × 1.42 A1 38.33 or 38.32…seen B1 ft (dep on M1) $2.83 or $2.82 with conclusion; units needed
3	(a)		-1, (1), (3), 5, 7, 9	2	B2 cao (B1 for 2 values)
	(b)		Graph	2	B1 ft for plotting points ±1/2 square B1 cao for line between $x = -2$ and $x = 3$
	(c)(i)		0.4	2	B1 0.4 or ft single straight line with positive gradient
	(ii)		1.2		B1 1.2 or ft single straight line with positive gradient

PAPER 5504					
	No	Working	Answer	Mark	Notes
4	(a)			2	B1 Rectangle drawn B1 Triangle attached Ignore additional internal lines; 3D sketch gets B0
	(b)			2	B1 single Rectangle drawn B1 Attached smaller rectangle drawn Accept rotated plan, Ignore internal lines down; Nets get B0
5	(a)	£163.25 - £35.50 = £127.75 £127.75 ÷ £18.25 = 7	8	3	M1 163.25 – £35.50 (or sight of £127.75) M1 (dep) "127.75" ÷ 18.25 A1 cao SC: M2 for 7 days
	(b)	1.175 × £64 or $\frac{17.5}{100}$ × 64 or £11.20 seen	75.20	2	M1 1.175 × 64.00 0.175 × 64 oe or 11.20 or 75.2 seen OR 6.40, 3.20, and 1.60 seen A1 cao
	(c)	54 × £2.38 =	128.52	2	M1 54 × £2.38 A1 cao
6		Tessellation	Drawing	2	B2 seven additional hexagons, with at least 2 points at which 3 hexagons meet (B1 one point at which 3 hexagons meet).
7			200 150 225 150 10	3	B3 cao (B2 for three correct, or B1 for one correct)
8	(a)(i)	Bearing measured	70	2	B1 70 ± 4
	(ii)	Bearing measured	317		B1 317 ± 4
	(b)	Locus (circle) drawn & shaded		2	B1 circle ±2 mm centre Manchester B1 shading with accurate or approximate circle within tolerance

PAPER 5504					
	No	Working	Answer	Mark	Notes
9	(a)		Plots	1	B1 cao
	(b)		Description	1	B1 dynamic relationship or "positive" (correlation)
	(c)		Line of best fit	1	Line within overlay region, and to the extent of.
	(d)(i)	280 g →	Reading	2	B1 ft from single straight line of positive gradient (±1/2 square) B1 ft from single straight line of positive gradient (±1/2 square)
	(ii)	120 pages →	Reading		
10	(a)	$\frac{1}{6}, \frac{3}{8}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$		2	B2 for all correct (B1 for 1 error or all correct but wrong order, or use of a common denominator decimals).
	(b)	3/5, 65%, 2/3, 0.72, 3/4		2	B2 for all correct (B1 for 1 error or all correct but wrong order or conversions to decimals oe)
11	(a)		182, 178, 180, 184	2	M1 mean of any three consecutive months, eg (147 + 161 + 238) ÷ 3 oe A1 cao
	(b)	Sale price = 80% Fun Friday price = 70% of 80% = 56% (oe)		2	B1 B1 for a fully correct explanation involving a worked example (oe) B1 a partially complete explanation

PAPER 5504					
	No	Working	Answer	Mark	Notes
12	(a)		Reason	1	B1 makes a mention of bias, either directly, or making reference to an insufficient or biased range of responses.
	(b)(i)		Reason	1	B1 make some mention of any one of (a) an insufficient range of responses (b) no mention of money (c) no time frame in the question (d) misunderstanding of "a lot" or "not much"
	(ii)		Question	2	B2 B1 for each of the following upto B2 (a) an improved question eg time frame made clear (b) response boxes (imperfect) (c) response boxes no errors OR For suggesting a generally improved question (a) a question clearly in the context of changes to the canteen (b) at least 3 boxes showing a full range of responses
13	(a)	$20y - 18y = 16 - 9$ oe $2y = 7$	$3\frac{1}{2}$ oe	3	M1 $20y - 18y = 16 - 9$ oe M1 $2y = 7$ A1 cao
	(b)	$40 - x = 3(4 + x)$ $40 - x = 12 + 3x$ $40 - 12 = x + 3x$ $4x = 28$	7	3	M1 multiplying through by 3: $3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$ A1 $40 - 12 = x + 3x$ A1 cao
14	(a)		$12(x\text{-}4)$	1	B1 for $12(x - 4)$ or $12x - 48$ or $12 \times x - 48$ oe $x = 12\ (x - 4)$ gets B0
	(b)		$18x\text{-}48$	2	M1 $6x +$ "$12(x - 4)$" or $6x +$ "$12x - 48$" A1 ft a linear expression $18x - 48$, $2(9x - 24)$, $3(6x - 16)$, $6(3x - 8)$

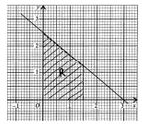
PAPER 5504					
No		**Working**	**Answer**	**Mark**	**Notes**
15		x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) Accept answer to 1 dp 4.22 66.7(114) or more 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for different trial $4.225 \leq x \leq 4.25$ evaluated B1 (dep on at least one previous B1) for 4.2 cao
16	(a)		1.0×10^{-9}	1	B1 accept 1×10^{-9} or just 10^{-9}
	(b)	$1 \div 5 \times 10^{-9}$	2×10^{8}	2	M1 for $1 \div$ ("5×10^{-9}") or digit 2 with zeros only seen Condone omission of bracket for M1. A1 cao
17	(a)	$\frac{6.27 \times 4.52}{4.81 + 9.63} = \frac{28.3404}{14.44} = 1.962631579$	1.9626…	2	B2 for 1.9626… (B1 for 28.34 or 14.44)
	(b)		1.96	1	B1 ft from (a) as rounded to 1dp or 2dp. Do not accept 2, 2.00, but accept 2.0
18			$d = 4n + 6$	2	B2 $d = 4n + 6$ oe (B1 $d = 4n + k$, k an integer or 0, $4n + 6$, $n = 4n + 6$)
19		Vol = $\pi \times 3.8^2 \times 2.5 = \pi \times 14.44 \times 2.5$ = 45.36… × 2.5 = 113.411 Mass = "113" × 1.5 = 170.1165	170	4	M1 for $\pi \times r^2 \times 2.5$ where r = is 3.8 or 7.6 A1 if $r = 3.8$ M1 for "113" × 1.5 A1 for 169.5 – 170.3 cao

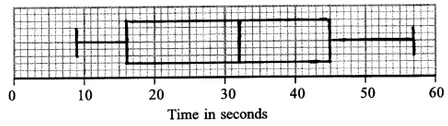
PAPER 5504					
	No	Working	Answer	Mark	Notes
20	(a)	$10^2 + 6^2$ or 136 $\sqrt{(100+36)}$ or $\sqrt{136} = 11.66\ldots$	11.7	3	M1 $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	$\cos x = \frac{8}{10}$ or 0.8 $x = \cos^{-1} 0.8 = 36.869^\circ$	36.9	3	M1 for $\cos = \frac{8}{10}$, cos = 0.8 (oe) M1 (dep) for $\cos^{-1}$ (oe) A1 for 36.86 – 36.9
21		$18x - 6y = 99$ $\quad 12x - 4y = 66$ $8x + 6y = 18$ $\quad 12x + 9y = 27$ $26x = 117$ $\quad -13y = 39$	$x = 4\frac{1}{2}$ $y = -3$	4	M1 correct process to eliminate either x or y (condone one error) A1 cao for non – eliminated one. M1 (dep on 1st M1) for correct substitution of their found value. A1 cao (need both)
22		$\frac{133}{72} = 1.8472, \frac{160}{82} = 1.9512$ OR $\frac{72}{133} = 0.54135, \frac{82}{160} = 0.5125$ OR $\frac{160}{133} = 1.203...., \frac{82}{72} = 1.1388....$ OR $\frac{133}{160} = 0.83125...., \frac{72}{82} = 0.878$	1.84..≠ 1.95.. 1.20..≠ 1.13..	3	M1 for $\frac{133}{72}$ (= 1.8472…) oe Accept 1.8, 1.85 M1 for $\frac{160}{82}$ (=1.9512…) oe consistent pairing Accept 2.0, 1.9 **OR** M1 for $\frac{160}{133}$ (= 1.203…) oe M1 for $\frac{82}{72}$ (=1.1388) oe A1 for enough decimal places to show that the ratios are not equal; since the scale factors are different the shapes cannot be similar. NB Do Not need conclusion

PAPER 5504					
	No	Working	Answer	Mark	Notes
23	(a)		0.4, 0.6 0.4, 0.6, 0.4	2	B1 for LHS: (0.6), 0.4 B1 for RHS: 0.6, 0.4, 0.6, 0.4
	(b)	(30 × 42) – (25 × 42.8) = 1260 – 1070 = 190 190 ÷ 5 =	38	3	M1 for (30 × 42) – (25 × 42.8) or 1260 – 1070 or 190 seen M1 (dep) for "190" ÷ 5 A1 cao
24	(a)	£12000 × 0.25 = £3000; £12000 – £3000 = £9000 £9000 × 0.25 = £2250; £9000 – £2250 = £6750 £6750 × 0.25 = £1687.50; £6750 – £1687.50 =	£5062.50	3	M1 for 12000 × 0.75 (=9000) oe or £3000 or £23437.50 seen M1 (dep) for at least two further depreciation calculations (complete steps) A1 cao **OR** M2 for $12000 \times (0.75)^3$ or 5062.50 seen (M1 for $12000 \times (0.75)^n$, $n = 2$ or 4)
	(b)	0.8 × 0.8 × 0.8 × 0.8 (oe)	0.4096	2	M1 0.8^4 (oe) A1 cao

PAPER 5505					
	No	Working	Answer	Mark	Notes
1	(a)(i) (ii) (b)	 LCM = 3 × 13 × 17 = 3 × 221	2.21 0.013 663	2 2	B1 for 2.21 B1 for 0.013 M1 for 3 × 13 × 17 oe A1 for 663
2			Tick boxes 1,3 & 6	3	B1 for $\frac{\pi abc}{2d}$; B1 for $2a^2$; B1 for $2(c^2 + d^2)$ (−B1 for each additional expression ticked (>3) to a minimum of 0)
3	(a) (b)	200 × 0.2 0.2 + 0.4	40 0.6	2 2	M1 for 200 × 0.2 or $\frac{40}{200}$ seen A1 for 40 M1 for 0.2 + 0.4 A1 for 0.6
4	(a) (b)	eg 2 | 108 2 | 54 3 | 27 3 | 9 3 12	$2^2 \times 3^3$ 12	3 1	M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error (M1 for 108 written as a correct product with only one non-prime or equivalent division or a full process with 2 calculation errors.) A1 for $2^2 \times 3^3$ (accept 2 × 2 × 3 × 3 × 3) B1 for 12
5		Perpendicular from P to intersecting arcs (within tramlines); perpendicular at least 2 cm long		2	M1 relevant pair of arcs crossing within tramlines A1 SC M1A0 for full construction of a line perpendicular to AB not through P
6		15 × 10	150 cm^3.	3	M1 for 15 × 10 A1 for 150 B1 for cm^3

PAPER 5505					
	No	Working	Answer	Mark	Notes
7	(a)		k^3.	1	B1 for k^3.
	(b)(i)	$4x + 20 + 3x - 21$	$7x - 1$	4	M1 for **three** of 4 terms $4x + 20 + 3x - 21$ (or better) A1 for $7x - 1$
	(ii)	$x^2 + 3yx + 2xy + 6y^2$	$x^2 + 5xy + 6y^2$		M1 for **three** of 4 terms $x^2 + 3yx + 2xy + 6y^2$ A1 for $x^2 + 5xy + 6y^2$
	(c)		$(p+q)(p+q+5)$	1	B1 for $(p+q)(p+q+5)$
	(d)		m^8	1	B1 for m^8.
	(e)		$6r^3t^6$	2	B2 for $6r^3t^6$ (B1 for $.....r^3t^6$ or for $6....t^6$)
8	(i)	Least length = 100.5	100.5	2	B1 for 100.5
	(ii)	Greatest length = 101.5	101.5		B1 for 101.5; ACCEPT 101.499 or better
9		$6\frac{2}{5} = \frac{32}{5}$ Area of triangle = $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ (= 2) Length of a side of sq. = $\sqrt{18 \times "2"}$ (=6) Perimeter of square = 4 × 6	24	5	B1 for $6\frac{2}{5} = \frac{32}{5}$ oe or $3\frac{1}{5} = \frac{16}{5}$ oe or $\frac{30}{8} + \frac{2}{8}$ oe (or implied by area of triangle=2) M1 for $\frac{1}{2} \times \frac{5}{8} \times 6\frac{2}{5}$ oe M1 for (area of square) = 18 × product of two lengths A1 = $\sqrt{18 \times "2"}$ A1 for 24

PAPER 5505					
	No	Working	Answer	Mark	Notes
10	(a)	$6y = 15 - 5x$	$y = \frac{15-5x}{6}$	2	M1 for either $6y = 15 - 5x$ or for $\frac{5x}{6} + y = \frac{15}{6}$ or $-6y = 5x - 15$ or a correct ft on sign error to $y =$ A1 for $y = \frac{15-5x}{6}$ oe
	(b)	$6k + 5(-21) = 15$	20	2	M1 for subst. of $x = -21$ (or $x = 21$) into given eq^n or answer to (a) A1 for $k = 20$
	(c)(i)		Region R indicated	3	B2 correct region shaded (accept unshaded if R clear) (B1 shaded (R) region satisfies 3 of the 4 given inequalities with same boundaries)
	(ii)		(1,1)		B1 for (1,1)
11	(a)		$y = 2x + 6$	2	B2 for $y = 2x + 6$ (B1 for $y = 2x + k$, $k \neq 1$ or for $y = mx + 6$, $m \neq 0$ or for $2x+6$)
	(b)	Grad of $AB = 2$; Grad of $BC = \frac{-1}{"2"}$	$y = -\frac{1}{2}x + 6$	2	M1 for Grad of $BC = \frac{-1}{"2"}, -\frac{1}{2}$ or grad of $BC = -\frac{1}{\text{grad of AB}}$ A1 ft for $y = -\frac{1}{2}x + 6$ oe ft on wrong coeff. of x in (a)
	(c)	Eg A rectangle is always a cyclic quadrilateral because the opposite angles of a rectangle always add up to 180° (90+90)		1	B1 for valid explanation. (eg lines from the pt of int. of diagonals of rect to all 4 vertices are equal(radii))
12		Vertices of new triangle at $(-1, -4)$ $(-4, 2)$ and $(2, 2)$	Correct triangle drawn	3	B3 cao (B2 for 3 correct vertices no triangle or triangle with 2 correct vertices (B1 for triangle with two of six co-ordinates correct from using P as centre or any isosceles triangle with base 6 and height 6)

PAPER 5505					
	No	Working	Answer	Mark	Notes
13	(a)		32	1	B1 for 32 (accept 31.5 to 33.5 inclusive)
	(b)			3	B1 for ends of whiskers at 9 and 57 (with a box) B1 for ends of box at 16 and 45/46 ($\pm$ 0.5) B1for median marked at "32"or complete box and whisker diagram drawn with a median inside the box
	(c)	Median(B)>Median(G); on average boys take longer IQR(B)>IQR(G); times for boys have a greater spread		2	B1 eg for comparison of medians (ft on diagrams) B1 eg for comparison of (interquartile) ranges (ft on diagram)
14		Reading top to bottom frequencies are 20; 18; 45; 52		2	B2 all correct (B1 for one frequency correct)
15	(a)	$1600 = p\,q^0$.; $400 = pq^2$ $q^2 = 0.25$	$p = 1600$ $q = 0.5$	3	M1 for either $400 = pq^2$ or $1600 = pq^0$ B1 for $p = 1600$ A1 for $q = 0.5$
	(b)	$V = pq^{-2}$	6400	2	M1 for recognition that t = –2 A1 for 6 400

PAPER 5505					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	(I) $AB = AC$ (triangle ABC is isosceles) (II) PB = PC tangents (from a point to a circle are) equal (III) AP = AP (common side) so the 2 triangles are congruent ,SSS.		3	B3 for I, II, III with congruency reason (B2 for any two of I, II or III) (B1 for any one of the I, II or III)
	(b)	$BPC = 20°$ PBC (or PCB) = 90-1/2 "20" (= 80°) $BAC = PBC$ = "80"	50°	4	B4 for 50° (B3 for $BAC = 80°$) (B2 for $PBC = 80°$ or $PCB = 80°$) (B1 for $APC = 10°$ or $BPC = 20°$ or a middle angle = 90°) SC if clear numerical slip seen eg "PBC = 180 – 90 – 10 = 70" then goes on to get correct ft angle $ABC = 55$ deduct 1 from total so this cand would get B4–1 = B3
17	(a)	$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $= \overrightarrow{OA} + \frac{2}{3}(6\mathbf{c} - 6\mathbf{a})$ $= 6\mathbf{a} + 4\mathbf{c} - 4\mathbf{a}$	$2\mathbf{a} + 4\mathbf{c}$	3	M1 for $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ or any correct vector journey involving $\overrightarrow{OP}$ M1 for $\overrightarrow{AP} = \frac{2}{3}(6\mathbf{c} - 6\mathbf{a})$ oe or $\overrightarrow{CP} = \frac{1}{3}(-6\mathbf{c} + 6\mathbf{a})$ oe or reverse vectors A1 for $2\mathbf{a} + 4\mathbf{c}$ oe (accept unsimplified)
	(b)	Eg $\overrightarrow{OM} = \overrightarrow{OC} + \overrightarrow{CM} = 6\mathbf{c} + 3\mathbf{a}$ $\overrightarrow{OM} = 1.5\overrightarrow{OP}$	$\overrightarrow{OM} = 1.5\overrightarrow{OP}$ so OPM is a straight line	2	B1 for $\overrightarrow{OM} = 6\mathbf{c} + \frac{1}{2}(6\mathbf{a})$ or $\overrightarrow{PM} = 2\mathbf{c} + \mathbf{a}$ unsimplified or reverse vectors B1 for a fully correct proof.

PAPER 5505					
	No	Working	Answer	Mark	Notes
18	(a)		4	1	B1 for 4 condone $\pm$ 4
	(b)		2	1	B1 for 2 condone ± 2
	(c)	$\sqrt{160} = 4\sqrt{10}$; $\left[\frac{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)-\sqrt{2}\times\sqrt{5}}{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)}\right]\times 100$ $\left[\frac{6\sqrt{10}-\sqrt{10}}{6\sqrt{10}}\right]\times 100$	$\frac{500}{6}$	4	B1 for **either** $\sqrt{160} = 4\sqrt{10}$ or $\sqrt{8} = 2\sqrt{2}$ **or** $\sqrt{20} = 2\sqrt{5}$ M1 for $\left[\frac{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)-\sqrt{2}\times\sqrt{5}}{\sqrt{8}\left(\sqrt{5}+\sqrt{20}\right)}\right]$ oe $(\times 100)$ B1 for either $6\sqrt{10} - \sqrt{10}$ or $6\sqrt{10}$ A1 for $\frac{500}{6}$ (accept 83.3 if no obvious earlier error)

PAPER 5505					
	No	Working	Answer	Mark	Notes
19	(a)(i)		$(2x-7)(x-14)$	3	M1 x^2 term and constant term (± 98) obtained or $2x(x-14) - 7(x-14)$ or $x(2x-7) - 14(2x-7)$ A1 for $(2x-7)(x-14)$
	(ii)		$x = \frac{7}{2}$; $x = 14$		B1ft ft (i) provided of form $(2x\pm a)(x\pm b)$
	(b)(i)		$\frac{7}{n+7}$	3	B1 for $\frac{7}{n+7}$ oe
	(ii)	$\frac{7}{n+7} = \frac{2}{5} \Rightarrow 2(n+7) = 5 \times 7$ $2n = 21$	n=10.5 is not possible since n has to be an integer		M1 for $2(n+7) = 5\times 7$ or $n+7=5\times 3.5$ (can be implied) ft (b)(i) fractional in terms of n and < 1 A1 ft for n=10.5 not possible (since n not integer) oe
	(c)	$2\times\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right) = \frac{4}{9}$ $14n\times 9 = 4(n+7)^2$ $14n\times 9 = 4(n^2+14n+49)$ $4n^2+56n+196-126n = 0$	$2n^2 - 35n + 98 = 0$	5	M1 for $\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right)$ seen M1 for $2\times\left(\frac{n}{n+7}\right)\times\left(\frac{7}{n+7}\right)$ oe $(=\frac{4}{9})$ M1(dep on 1st M) elimination of fractions within an equation B1 3 terms correct in expansion of $(n+7)^2 = n^2 + 7n + 7n + 49$ A1 full valid completion to printed answer

PAPER 5505					
	No	Working	Answer	Mark	Notes
	(d)	$\frac{7}{n+7}\times\frac{7}{n+7}=\frac{7}{21}\times\frac{7}{21}=$	$\frac{1}{9}$	2	M1 for $\frac{7}{n+7}\times\frac{7}{n+7}$ or better or ft [answer (b)(i)]^2 or $1-\frac{4}{9}-(\frac{n}{n+7})^2$ A1 for $\frac{1}{9}$ oe cao
20	(a)(i)		$y=1+\sin x$	2	B1 for $y=1+\sin x$
	(ii)		$y=2\sin x$		B1 for $y=2\sin x$ SC both (i) f(x) + 1, (ii) 2f(x) B1
	(b)	Stretch parallel to y-axis scale factor 3 Stretch parallel to x-axis scale factor $\frac{1}{2}$		3	M1 for 'stretch' A1 for Stretch parallel to y-axis scale factor 3 oe A1 for Stretch parallel to x-axis scale factor $\frac{1}{2}$ oe SC if M0 award BI for "sf 3 vertically" **and** "sf $\frac{1}{2}$ horizon."

PAPER 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
1		Question	2	B1 for each of the following upto B2 (a) an improved question eg time frame made clear (b) response boxes (imperfect) (c) response boxes no errors OR For suggesting a generally improved question (a) a question clearly in the context of changes to the canteen (b) at least 3 boxes showing a full range of responses
2	Locus (circle) drawn & shaded		2	B1 circle centre Manchester ±2mm B1 shading with accurate or approximate circle within tolerance
3 (a)		182, 178, 180, 184	2	M1 mean of any three consecutive months, eg (147 + 161 + 238) ÷ 3 oe A1 cao
(b)	Sale price = 80% Fun Friday price = 70% of 80% = 56% (oe)		2	B1 B1 for a fully correct explanation involving a worked example (oe) B1 a partially complete explanation
4	x $x^3 - 2x$ 4.1 60.7(21) 4.2 65.6(88) 4.3 70.9(07) 4.22 66.7(114) 4.23 67.2(269) 4.24 67.7(45) 4.25 68.2(656)	4.2	4	B2 for trial $4.1 \leq x \leq 4.3$ evaluated (B1 for trial $4 < x < 5$ evaluated) B1 for different trial $4.225 \leq x \leq 4.25$ evaluated B1 (dep on at least one previous B1) for 4.2 cao

PAPER 5506					
	No	Working	Answer	Mark	Notes
5	(a)		1.0×10^{-9}	1	B1 accept 1×10^{-9} or just 10^{-9}
	(b)	$1 \div (5 \times 10^{-9})$	2×10^{8}	2	M1 for $1 \div$ ("5×10^{-9}") or digit 2 with zeros only seen Condone omission of bracket for M1. A1 cao
6	(a)	$\frac{6.27 \times 4.52}{4.81 + 9.63} = \frac{28.3404}{14.44} = 1.962631579$	1.9626…	2	B2 for 1.9626… (B1 for 28.34… or 14.44)
	(b)		1.96	1	B1 ft from (a) as rounded to 1dp or 2dp. Do not accept 2, 2.00, but accept 2.0
7			$d = 4n + 6$	2	B2 $d = 4n + 6$ oe (B1 $d = 4n + k$, k an integer $\neq 6$, $4n + 6$, $n = 4n + 6$)
8		Vol = $\pi \times 3.8^2 \times 2.5 = \pi \times 14.44 \times 2.5$ $= 45.36\ldots \times 2.5 = 113.411$ Mass = "113" × 1.5 = 170.1165	170	4	M1 for $\pi \times r^2 \times 2.5$ where r = is 3.8 or 7.6 A1 if $r = 3.8$ M1 for "113" × 1.5 A1 for 169.5 – 170.3 cao

PAPER 5506					
	No	Working	Answer	Mark	Notes
9	(a)	$10^2 + 6^2$ or 136 $\sqrt{(100 + 36)}$ or $\sqrt{136} = 11.66\ldots$	11.7	3	M1 for $10^2 + 6^2$ or 136 seen M1 (dep) $\sqrt{100+36}$ or $\sqrt{136}$ A1 11.66 – 11.7
	(b)	Cos x = 8/10 or 0.8 $x = \cos^{-1} 0.8 = 36.869^o$	36.9	3	M1 for cos = $\frac{8}{10}$, cos = 0.8(oe) M1 (dep) for $\cos^{-1}$ (oe) A1 for 36.86 – 36.9 M1 Use of sine rule and x found M1 for $x = 90 - \sin^{-1}$("0.8") A1 for 36.86 – 36.9
10		$18x - 6y = 99$ $\quad 12x - 4y = 66$ $8x + 6y = 18$ $\quad 12x + 9y = 27$ $26x = 117$ $\quad -13y = 39$	$x = 4\ ½$ $y = –3$	4	M1 correct process to eliminate either x or y (condone one error) A1 cao for non – eliminated one. M1 (dep on 1st M1) for correct substitution of their found value. A1 cao (need both)

PAPER 5506					
	No	Working	Answer	Mark	Notes
11		$\frac{133}{72} = 1.8472\,,\ \frac{160}{82} = 1.9512$ OR $\frac{72}{133} = 0.54135, \frac{82}{160} = 0.5125$ OR $\frac{160}{133} = 1.203...., \frac{82}{72} = 1.1388....$ OR $\frac{133}{160} = 0.83125...., \frac{72}{82} = 0.878$	1.84..≠ 1.95.. 1.20..≠ 1.13..	3	M1 for $\frac{133}{72}$ (= 1.8472…) oe Accept 1.8, 1.85 M1 for $\frac{160}{82}$ (=1.9512…) oe consistent pairing Accept 2.0, 1.9 **OR** M1 for $\frac{160}{133}$ (= 1.203…) oe M1 for $\frac{82}{72}$ (=1.1388) oe A1 for enough decimal places to show that the ratios are not equal; since the scale factors are different the shapes cannot be similar. NB Do Not need conclusion
12	(a)	£12000 × 0.25 = £3000; £12000 – £3000 = £9000 £9000 × 0.25 = £2250; £9000 – £2250 = £6750 £6750 × 0.25 = £1687.50; £6750 – £1687.50 =	£5062.50	3	M1 for 12000 × 0.75 (=9000) oe or £3000 or £23437.50 seen M1 (dep) for at least two further depreciation calculations (complete steps) A1 cao **OR** M2 for 12000 × $(0.75)^3$ or 5062.50 seen (M1 for 12000 × $(0.75)^n$, $n = 2$ or 4)
	(b)	0.8 × 0.8 × 0.8 × 0.8 (oe)	0.4096	2	M1 0.8^4 (oe) A1 cao

PAPER 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
13	$r^2 = \frac{3\times10}{\pi h} = \frac{3\times10}{\pi 1.5} = \frac{3\times10}{4.712..} = 6.36, 6.37$ $r = \sqrt{6.366\ldots}$	2.52-2.54	3	M1 for correct rearrangement to give $r^2 = \frac{3V}{\pi h}$ or $30 \div 4.712..$ or $6.36 - 6.37$ *Allow 0.3, 0.33 for* $\frac{1}{3}$ M1 (dep) for $\sqrt{}$ A1 cao 2.52 – 2.54
14 (a)		0.4 0.6,0.4, 0.6,0.4	2	B1 for LHS: (0.6), 0.4 B1 for RHS: 0.6, 0.4, 0.6, 0.4
(b)	0.6×0.6	0.36	2	M1 $0.6 \times$ "0.6" [0 < "0.6" < 1] A1 cao
(c)	$(30 \times 42) - (25 \times 42.8) = (1260 - 1070 = 190$ $190 \div 5 =$	38	3	M1 for $(30 \times 42) - (25 \times 42.8)$ or $1260 - 1070$ or 190 seen M1(dep) for "190" ÷ 5 A1 cao 38

PAPER 5506					
	No	Working	Answer	Mark	Notes
15	(a)	$S = \frac{k}{f^2};\ 125 = \frac{k}{8^2};\ k = 8000$	$S = \frac{8000}{f^2}$	3	M1 for $S = \frac{k}{f^2}$ M1 for $125 = \frac{k}{8^2}$ A1 cao These marks can be awarded if the full formula appears in part (b), rather than in part (a). [SC: $S = \frac{125}{64} f^2$ M1 M0 A0, $S = 1.95(3125) f^2$ M1 M0 A0 $S = \frac{1000}{f}$ M1 M0 A0]
	(b)		500	1	B1 cao

PAPER 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
16	$0.5 \times 3.2 \times 8.4 \times \text{Sin } B = 10$ $\sin B = 0.74404\ldots$ 48.077 $AC^2 = 3.2^2 + 8.4^2 - 2 \times 3.2 \times 8.4 \times \cos B$ $AC^2 = 44.8815\ldots..$ $AC = 6.69\ (936\ldots)$ Perimeter = 18.3 Use the altitude AD, $\frac{h \times 8.4}{2} = 10 \Rightarrow h = (2.381)$ $BD = \sqrt{3.2^2 - h^2} = 2.139$ $DC = 6.261$ $AC = \sqrt{2.38^2 + '6.261'^2} = 6.69(936)$ Perimeter = 18.3	18.3	6	M1 for $0.5 \times 3.2 \times 8.4 \times \sin B\ (= 10)$ A1 for $\sin B = 0.74(404\ldots)$ or $B = 47.7 - 48.1$ M1 for $3.2^2 + 8.4^2 - 2 \times 3.2 \times 8.4 \times \cos$ "48.077" M1(dep) for AC^2 = "44.8(815)"….. with correct order of evaluation A1 $AC = 6.69 - 6.7$ A1 18.29 – 18.3 **for** $\frac{h \times 8.4}{2} = 10 \Rightarrow h = (2.381)$ M1 for $BD^2 = 3.2^2 - "2.381"^2$ A1 $BD = 2.1 - 2.2$ M1 (dep) $AC^2 = "2.381"^2 + "6.261"^2$ A1 $AC = 6.69 - 6.7$ A1 18.29 – 18.3

PAPER 5506					
	No	Working	Answer	Mark	Notes
17	(a)	$(x + 8)^2 = x^2 + (x + 5)^2$ $x^2 + 16x + 64 = 2x^2 + 10x + 25$		4	B1 for angle $OTA = 90°$ (implied by use of Pythagoras with OA as hypotenuse) M1 $(x + 8)^2 = x^2 + (x + 5)^2$ oe M1 for correct squaring of x+8 or x+5 A1 for completion following correct working
	(b)	$(+6 + \sqrt{(6^2 - - 4\times39)})/2$ $= (6 \pm \sqrt{(36 + 156)})/2$ $= (6 \pm \sqrt{192})/2 = (6 + 13.856)/2$	9.93	3	M1 for substitution into quadratic formula, allow sign errors in b and c M1 for $x = (6 \pm \sqrt{192})/2$ [+ alone will do] A1 for 9.92 – 9.93
					M1 for $(x-3)^2-9-39$ M1 for $x = 3 \pm \sqrt{48}$ [+ alone will do it] A1 for 9.92 – 9.93 T&I= 9.93 gets M1,M0,A0
18		$EB = 60 \times \tan 30°$ $BD = \sqrt{(60^2 + 60^2)}$ $\tan BDE = 34.64 \div 84.85$	22.2°	4	M1 for $EB = 60\times\tan30$ M1 for $BD = \sqrt{(60^2 + 60^2)}$ M1 for $\tan BDE =$ "34.64" ÷ "84.85" A1 22.17 – 22.21
		$EB = 60 \times \tan 30°$ (= 34.64) $ED^2 = 60^2 + \left(\frac{60}{\cos 30}\right)^2$ $ED = \sqrt{8400} = (91.65)$ $\text{Angle} = \sin^{-1}\left(\frac{EB}{\sqrt{8400}}\right) = 22.2$			M1 for $EB = 60 \times \tan 30°$ oe M1 for fully correct method for ED M1 for $\sin BDE = \left(\frac{'34.84'}{'\sqrt{8400}'}\right)$ (oe) A1 22.17 – 22.21

PAPER 5506					
	No	Working	Answer	Mark	Notes
19	(a)	$x^2 + 6^2 = 25$ $x^2 = -11$		2	M1 substitutes y=6 to get x^2+36 = 25 A1 deduces x^2=25-36<0; impossible, (so line does not intersect curve)
	(b)	$y^2 = (2x - 2)^2$ $x^2 + (2x - 2)^2 = 25$ $x^2 + 4x^2 - 8x + 4 = 25$ $5x^2 - 8x + 4 - 25 = 0$ $5x^2 - 8x - 21 = 0$ $(5x + 7)(x - 3) = 0$ or $x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 5 \times (-21)}}{10} = \frac{8 \pm \sqrt{484}}{10}$ So $x = 3$, or $x = -1.4$ Subs into either equation gives: $y = 4$, or $y = -4.8$	$x = 3$ $y = 4$ $x = -1.4$ $y = -4.8$	6	M1 $y^2=(2x-2)^2$ seen or implied A1 $x^2 + 4x^2 - 8x + 4 = 25$ (oe expanded form) M1 correct attempt to solve 3 term quadratic equation A1 $x = 3$, $x = -1.4$ M1 (dep on previous Ms) Sub one value of x into either equation gives: A1 $y = 4$, $y = -4.8$ NB: incorrectly matched pairs loses the final A1.

PAPER 5506					
	No	Working	Answer	Mark	Notes
20	(a)	400.005 ÷ 59.95 = 6.672310 6.672310 ÷ 1000 × 3600 = 24.02032 399.995 ÷ 60.05 = 6.661032 6.661032 ÷ 1000 × 3600 = 23.97972	24.020 23.980	5	B1 for 400.005 or 59.95 seen oe M1 for "400.005" ÷ "59.95" where "400.005" ∈ [400.005,400.5] and "59.95" ∈ [59.5,59.95] oe B1 for 399.995 or 60.05 seen oe M1 for "399.995" ÷ "60.05" where "399.995" ∈ [399.5,399.95] and "60.05" ∈ [60.05,60.5] oe A1 23.979-23.980 and 24.020-24.0204
	(b)	24.0 because to 1dp the answers are the same		1	B1cao for 24.0 with reason
	(c)	177 × 50/477 = 18.553 → 19 → 18 111 × 50/477 = 11.635 → 12 86 × 50/477 = 9.0147 → 9 82 × 50/477 = 8.595 → 9 21 × 50/477 = 2.201 → 2	18 12 9 9 2	3	M1 for $\frac{50}{"477"} \times 177$ or 111 or 86 or 82 or 21 A1 for all integers or better answers, at least 3 correct A1 cao
21	(a)	$40 - x = 3(4 + x)$ $40 - x = 12 + 3x$ $40 - 12 = x + 3x$ $4x = 28$	7	3	M1 multiplying through by 3: $3 \times \frac{40 - x}{3} = 3 \times 4 + 3 \times x$ A1 $40 - 12 = x + 3x$ A1 cao
	(b)	$\frac{2x(2x - 3)}{(2x - 3)(2x + 3)} = \frac{2x}{2x + 3}$	$\frac{2x}{2x + 3}$	3	B1 for $(2x-3)(2x+3)$ B1 for $2x(2x-3)$ or $(2x + 0)(2x + 3)$ B1 cao

PAPER 5506				
No	**Working**	**Answer**	**Mark**	**Notes**
22	Distance from x axis is y. Distance from (0, 2) is $\sqrt{(x^2+(y-2)^2)}$ $y^2 = x^2 + (y-2)^2$ $y^2 = x^2 + y^2 - 4y + 4$ $0 = x^2 - 4y + 4$ $4y = x^2 + 4$ and finish		4	B1 for $(x-0)^2 + (y-2)^2$ or $\sqrt{((x-0)^2+(y-2)^2)}$ oe seen B1 for $y = \sqrt{(x-0)^2+(y-2)^2}$ or $y^2 = (x-0)^2 + (y-2)^2$ oe B1 $(y-2)^2 = y^2 - 4y + 4$ seen B1 for $4y = x^2 + 4$ and finish

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NOTES ON MARKING PRINCIPLES

1 Types of mark

- M marks: method marks
- A marks: accuracy marks
- B marks: unconditional accuracy marks (independent of M marks)

2 Abbreviations

cao – correct answer only
ft – follow through
isw – ignore subsequent working
SC: special case
oe – or equivalent (and appropriate)
dep – dependent
indep - independent

3 No working

If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

4 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
If there is no answer on the answer line then check the working for an obvious answer.

5 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

6 **Ignoring subsequent work**
It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7 **Probability**
Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

8 **Linear equations**
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

9 **Parts of questions**
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		17252	1	B1 cao
	(b)		5400	1	B1 cao
	(c)		thousands, 1000, 4000	1	B1
2	(a)		grams, g	3	B1 oe spelling
			centimetres, cm		B1 oe spelling
			millilitres, m*l*, cm^3		B1 oe spelling
	(b)		5	1	B1 cao
3	(a)		106, 102	1	B1 cao ignore extras
	(b)		eg take away 4	1	B1 could be indicated on the diagram
	(c)		46	1	B1 cao

Paper 5521/01

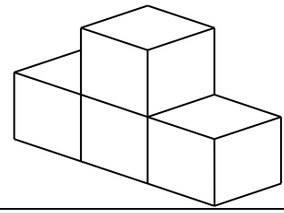
No	Working	Answer	Mark	Notes
4	286 × 43 = 858, 11440, 12298 43 × 286 = 258, 3440, 8600, 12298 286×40 = 1140 286×3 = 858 1140+858=12298 x | 40 | 3 | 200 | 8000 | 600 | 8600 80 | 3200 | 240 | 3440 6 | 240 | 18 | 258 | | | 12298 2 8 6 1 | 0 8 | 3 2 | 2 4 | 4 2 | 0 6 | 2 4 | 1 8 | 3 2 9 8	12298	3	M2 for complete correct method (condone one computational error) (M1 for complete correct method with two computational errors) A1 cao OR B2 inside of grid completed (condone missing zeros and one error) (B1 2 or 3 errors) B1 cao
5 (a)		18, 69	1	B1
(b)(i)		18 or 36	1	B1
(ii)		16 or 36	1	B1
(c)		factor	1	B1
(d)(i)		18	3	B1 cao
(ii)		11 or 88		B1
(iii)		69		B1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		April & May	1	B1 for both
	(b)		Daffodil	1	B1
	(c)		Feb	1	B1
	(d)		Crocus	1	B1
	(e)(i)		$\frac{1}{5}$	2	B1 for $\frac{1}{5}$ oe
	(ii)		× from 56 mm to 64 mm from 0		B1 A single mark on the line, between 56 mm and 64 mm measured from end 0
7	(a)	$\frac{40}{100}$	$\frac{2}{5}$	2	B2 for $\frac{2}{5}$ B1 for $\frac{40}{100}$ or $\frac{4}{10}$ or $\frac{20}{50}$ or $\frac{8}{20}$
	(b)		0.98	1	B1 cao
	(c)		7 500 000	1	B1 cao
	(d)		25	1	B1 cao
	(e)		60	1	B1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
8	(a)(i)		(0, 2)	2	B1 cao
	(ii)		(4, 1)		B1 cao
	(b)		$(2, 1\frac{1}{2})$ marked	1	B1 Allow 2mm tolerance from $(2, 1\frac{1}{2})$
9	(a)		2.40	1	B1 cao could be indicated on the diagram
	(b)	1.60 + 0.40	2.00	2	M1 for appropriate sum or product in £ or p or 200 seen eg 1.60 + 0.40, 160 + 40, 0.80 + 0.80 + 0.40, 80 + 80 + 40, 0.08×25, 0.80×2.5, 200 A1 cao
	(c)	$1\div0.8$ or $2.50\div2$	1.25	2	M1 for $1.00\div0.8$ or $2.50\div2$ or 125 or appropriate combination eg $1+\frac{1}{2}\times0.50$ A1 cao
10	(a)		hexagon	1	B1 Condone spelling error
	(b)		Sum of angles at a point is 360°	2	B1 for 360 seen B1 for "point", "complete turn" or "a circle" or similar unless accompanied by an incorrect angle SC If neither B1 scored, award B1 for a clear indication that the size of an angle, other than *x*, is 90° or a right angle (may be on diagram)
	(c)	$30\times4+8\times2$	136	2	M1 $30\times4+8\times2$ or attempt to sum 5 or 6 lengths A1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		13, 67, 76, 103, 130	5	B1 cao
	(b)		$-7, -3, -1, 0, 5$		B1 cao
	(c)		0.07, 0.072,0.7, 0.702, 0.72		B1 cao
	(d)		0.6, $\frac{2}{3}$, 70%, $\frac{3}{4}$		B2 (B1 for any 3 in correct order)
12	(a)		16 30	1	B1 Accept 4 30 pm Do not accept 4 30
	(b)(i)	$33.56 \div 4$ oe	8.39	3	M1 for $33.56 \div 4$ oe eg $3356 \div 4$, division by 2 twice A1 cao
	(ii)		9		B1 ft from "8.39" unless whole number of pounds
13	(a)		6 cm^2	3	B2 for 6 cao for numerical answer (B1 for $5.5 < \text{Area} \leq 7$) then B1 (indep) for cm^2 with or without numerical answer
	(b)	See diagram	Correct shape	2	B2 (B1 for any 2 sides correct or a correct enlargement scale factor $\neq 1$ or 2)

Paper 5521/01				
No	**Working**	**Answer**	**Mark**	**Notes**
14 (a)	$(4+3)\times10$	70	2	M1 for (4 + 3) × 10 A1 cao
(b)	$120\div10-3$	9	2	M1 for $\frac{120}{10}$ or 12 seen eg $12\times10=120$ A1 cao
(c)		$C=10(n+3)$	3	B3 for $C=10(n+3)$ oe such as $C=(n+3)\times10$ (B2 for correct RHS or $C=n+3\times10$, $C=10n+3$ oe B1 for C = some other linear expression in n or for $n+3\times10$, $10n+3$ etc) Note: $C = n$ scores no marks
15		11 13 16 8 21	2	B2 all correct (B1 for 2 correct)

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		$2p + 4q$	2	B2 for $2p + 4q$ (accept $2 \times p$ etc) (B1 for $2p$ or $4q$)
	(b)		$2y^2$	1	B1 accept $2 \times y^2$ oe inc $2 \times y \times y$
	(c)		$3c + 4d$	2	B2 for $3c + 4d$ (accept $3 \times c$ etc) (B1 for $3c$ or $4d$)
	(d)		$8pq$	1	B1 accept in any order but must not include $\times$ sign
17	(a)(i)		60	2	B1 cao
	(ii)		eg top triangle is equilateral		B1 for reason
	(b)		150	2	M1 for $\frac{180-"60"}{2} + 90$ A1 ft from (a)(i) if $x < 90$ SC B1 for "60" + 90 if $x < 90$
18			40	2	M1 for 60×2 or 120 or $60 \div 3$ or 20 or $\frac{120}{180}$ A1 cao
19			correct drawing	2	B2 Condone hidden detail shown with solid lines and missing lines on front face (B1 for a correct sketch with other incorrect sketch(es) or for prism with correct cross section >1 cube wide or for attempt to draw prism with correct cross section or prism with correct plan and side elevation)

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
20		$\frac{600}{3\times10}$ or $\frac{640}{3.2\times10}$	20- $21\frac{1}{3}$	2	M1 for rounding at least two of the numbers to 1 sf or for sight of 640, 3.2 or 640, 32 or 600, 32 or 30 seen A1 for 20- $21\frac{1}{3}$ Note: 20.3125 scores M0 A0
21	(a)		Points plotted	1	B1 $\pm$ 1 full (2 mm) square
	(b)		positive	1	B1 cao
	(c)		Line of best fit	1	B1 Must pass through (42.5, 1.45), (42.5, 1.55) AND (67.5, 1.75), (67.5, 1.85)
	(d)		~ 1.65	1	B1 ft from single line segment with positive gradient $\pm$ 1 full (2 mm) square
22	(a)	eg $50\times\frac{2000}{500}$	200	2	M1 for $\frac{2000}{500}$ or 4 seen A1 cao
	(b)	eg $400\times\frac{750}{500}$	600	2	M1 for $\frac{750}{500}$ or 1.5 seen or 400 + 200 A1 cao

Paper 5521/01					
No		**Working**	**Answer**	**Mark**	**Notes**
23	(a)	$4\times3-2\times1$ $12-2$	10	3	M1 for 3×4 (=12) or 1×2 or attempt to divide diagram up into rectangles M1 "12"– "2" or sum of areas of rectangles A1 cao
	(b)(i)	$\frac{10}{100}\times680$ or $680\div10$ 680 + 68	748	5	M1 $\frac{10}{100}\times680$ or 680÷10 or 68 seen M1 (dep) 680 + "68" or M2 for 680×1.10 A1 cao
	(ii)	"748"÷50 or 14.96	15		M1 For "748"÷50 or 14.96 Accept "748" rounded up or down to next 50 followed by $\div50$ A1 ft from (b)(i) rounded up SC B1 for 680 (seen) leading to 14

Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	Plain llll lll 8 Chicken lll 3 Bovril llll 5 S & Vin llll 4		3	M1 for attempt to tally A1 for 1 frequency correct or all tallies correct A1 for all frequencies correct (accept for /20)
	(b)		4	1	B1 ft
	(c)		Plain or 8	1	B1 ft
2	(a)(i)		11	2	B1 cao
	(ii)		16		B1 cao
	(b)	See diagram	Correct lines	2	B2 cao for both lines correct (B1 for one line correct)
	(c)		12	2	B2 cao (B1 for 11 or 13)
3	(a)		580	1	B1 for 580 (± 2) could be written on line
	(b)		7.2	1	B1 for 7.2 ± 0.02 could be written on line
	(c)		Arrow at 48	1	B1 allow ± half graduation
	(d)		Arrow at 6.7	1	B1 allow ± half graduation
4	(i)		Cylinder	2	B1 ignore spelling
	(ii)		Cuboid		B1 ignore spelling
5	(a)	£10 – (£2.15 + £2.30)	5.55	4	M1 £2.15 + £2.30 A1 for 4.45 M1 £10 – "4.45" A1 cao
	(b)	£60 ÷ £2.80 = 21.42857	21	2	M1 for £60 ÷ 2.80 or sight of digits 214… A1 for 21
	(c)	$120 \times 25 \div 100$	30	2	M1 ¼ of £120 (oe) A1 cao SC B2 for £90

Paper 5521/02					
No		Working	Answer	Mark	Notes
6	(a)(i)		143^0	2	B1 for 143 ($\pm 2^0$)
	(ii)		Obtuse		B1 for obtuse (ignore spelling)
	(b)	See diagram	Accurate drawing	1	B1 for accurate drawing ± 2mm
7	(a)(i)		5	2	B1 cao
	(ii)		23		B1 cao
	(b)	$\times 2 - 1$		1	B1 for explaining a suitable method
	(c)	See their diagram		1	B1 for a correct diagram
	(d)		14, 17	2	B2 cao for both (B1 for one only ft from their 14)
8	(a)		90	1	B1 accept –90
	(b)		540	1	B1 accept –540
	(c)		Jupiter	1	B1 accept –150
	(d)		- 230	1	B1 cao

Paper 5521/02					
No		Working	Answer	Mark	Notes
9	(a)	2658 – 2430 = 228 "228" × 32	72.96	4	M1 2658 – 2430 A1 228 M1 "228" × 32 or "228" × 0.32 or digits 7296 seen A1 cao **Or** M1 for 2430 × 32 (or digits 77760 seen) or 2658 × 32 (or digits 85056 seen) A1 if 1 correct M1 for "85056" – "77760" or 7296 seen A1 cao
	(b)	$\frac{2}{5} \times 145 = 58$ 145 – "58"	87	3	M1 $\frac{2}{5} \times 145$ (or M1 $\frac{3}{5}$ seen) A1 58 (or M1 $\frac{3}{5} \times 145$) A1 for 87 ft
	(c)(i) (ii)		80 125	2	B1 for 80 (± 1) B1 125 (± 3)

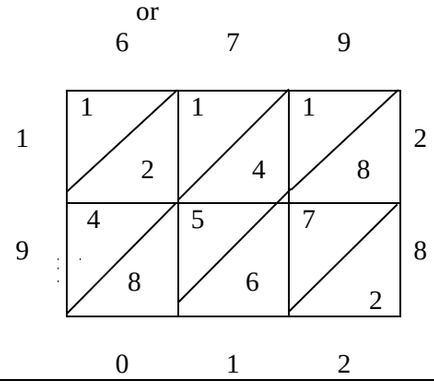
Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		1.5 – 2.0	1	B1 for height between 1.5m – 2.0m inclusive
	(b)	Height of man × "2.5"	3 – 6	3	B3 for height between 3m – 6m inclusive (B2 for multiplying (a) by a number between 2 and 3 inclusive) (B1 for multiplying (a) by a number)
11		61 – 19 = 42 42 ÷ 3 = 14	14	2	M1 for – 19 or 42 seen A1 cao
12	(a)		5	1	B1
	(b)	4+5+5+5+4+3+2+1+4+5 = 38 mean = 38 ÷ 10 = 3.8	3.8	2	M1 for attempt to add and ÷ 10 or 3.7 or 3.9 seen A1 for 3.8 SC B1 for 33.5 seen
13	(a)		$3x$	1	B1 cao Accept $3 \times x$, $x3$, $x \times 3$, $x + x + x$
	(b)		x - 9	1	B1 for x – 9 cao
14	(a)	14.44 – 8.660254038	5.77974(…)	2	M1 for 14.44 seen or 8.66(…) or 5.7 or 5.8 or better rounded or truncated
	(b)		6	1	A1 cao B1 ft
15		15 ÷ 24	62.5	2	M1 for 15 ÷ 24 or 1500 ÷ 24 or sight of digits 625 A1 cao
16		2.10 × 450	945	2	M1 for digits 210 × 450 or sight of digits 945 A1 cao
17		See diagram	$2(y + y)$ $2y + 2y$	2	B1 for $2(y + y)$ B1 for $2y + 2y$ (Deduct B1 for each additional tick (>2) to min 0)
18		360° ÷ 18 (=20) Sector angles: G= 60; S= 80; B=220; Correct sectors labelled correctly Use angle measurer	Angles drawn, labelled	4	B4 for fully correct and labelled pie chart (B3 for all angles correct or for a labelled pie chart with 2 correct angles) (B2 for labelled pie chart with 1 correct angle drawn) (B1 for 360° ÷ 18 or 20 seen or implied)

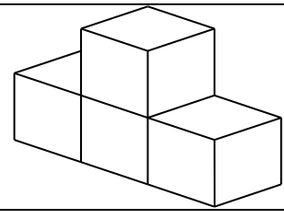
Paper 5521/02					
No		Working	Answer	Mark	Notes
19	(a)		Correct plane	2	B2 for a correct plane defined by showing at least 2 lines. (B1 for a line of symmetry on one face)
	(b)		Correct net	2	B2 cao (B1 for 2 equilateral triangles joined appropriately to at least one rectangle or for 1 equilateral triangle joined appropriately to one of 3 rectangles)
	(c)		Correct drawing	2	B1 for two extra sides of length 6cm (± 2mm) B1 for construction arcs 6cm from each of the ends of the given line.
20	(a)		15	1	B1 for 15 (± 1)
	(b)		15	1	B1 for 15 (± 0.4)
	(c)			2	B1 horiz. line from (2, 20) to (3, 20) B1 line from (3, 20) to (5,0) or horizontal translation of it SC B1 for any journey ending at (5,0)
21	(a)	$x+4+x+x+4+x$	$4x+8$	2	M1 for attempting to add x, $x + 4$, x, $x + 4$ may be implied by $4x + a$ ($a > 0$) A1 for $4x + 8$ or $4(x + 2)$
	(b)	$4x + 8 = 54$ $4x = 46$ $x = 11.5$ Length = "11.5" + 4	15.5	3	M1 for "$4x + 8$" = 54 A1 cao for 11.5 seen B1 ft for "11.5" + 4
22		0.4 + 0.15 1 – "0.55"	0.45	2	M1 for 1 – sum A1 for 0.45 o.e. SC B1 for 0.81
23	(a)		3:1	1	B1 cao
	(b)	$\pi \times 2.45$	7.7	2	M1 for $\pi \times 2.45$ (accept π as 3.1 or better) A1 for 7.59 to 7.70

Paper 5521/02					
No		**Working**	**Answer**	**Mark**	**Notes**
24		7×10000	70 000	2	M1 for 7 X 10 000 or 7 X 100 X 100 A1 cao
25		5.40 ÷ 3 × 7	12.60	3	M1 for 5.40 ÷ 3 or sight of 1.8 M1 dep for "1.80" × 7 A1 for 12.6 or equivalent
26		7.60 x $\frac{17.5}{100}$ = 1.33 7.60 + 1.33 = 8.93 1650 x "8.93"	£14 734.50	4	M1 for 7.60 x $\frac{17.5}{100}$ or 1.33 seen or 7.60 x 1.175 (oe) (Award M1 for 10%, 5% and 2½% correctly calculated) A1 for 8.93 or 893 M1 for 1650 x "8.93" or digits 147345 seen A1 cao Accept 14734.5 **Alternative** M1 for 1650 × 7.6(0) or 12540 seen M1 for "12540" × $\frac{17.5}{100}$ or 2194.5 seen or "12540"× 1.175 (oe) (Award M1 for 10%, 5% and 2½% correctly calculated) M1 for "12540" + "2194.5" (dep on both previous method marks) or digits 147345 seen A1 cao accept 14 734.5

Paper 5523/03				
No	**Working**	**Answer**	**Mark**	**Notes**
1		Correct shape	2	B2 B1 for any 2 sides correct, or a correct enlargement scale factor ≠1 or 2.
2 (a)		11 13 16 8 21	2	B2 all correct (B1 for 2 correct) sign
(b)		$\frac{31}{80}$	1	B1 oe
3 (a)		$2p+3q$	2	B2 for $2p+3q$ (accept $2\times p$ etc) (B1 for $2p$ or $3q$ or $2p3q$)
(b)		$2y^2$	1	B1 accept $2\times y^2$ or $2\times y\times y$
(c)		$3c+4d$	2	B2 for $3c+4d$ (accept $3\times c$ etc) (B1 for $3c$ or $4d$ or $3c4d$)
(d)		$8pq$	1	B1 accept in any order but must not include ×
4 (a)(i)		60	2	B1 cao
(ii)		eg top triangle is equilateral		B1 for reason
(b)		150	2	M1 $\frac{(180-"60")}{2}+90$ A1 ft from (a)(i) if $x < 90°$ SC:B1 for answer from "60" + 90 if $x < 90°$

Paper 5523/03					
No		Working	Answer	Mark	Notes
5	(a)	$4\times3-2\times1$ $12-2$	10	3	M1 for 3×4 (=12) or 1×2 or attempt to divide diagram up into rectangles M1 "12" – "2" A1 cao
	(b)(i)	$\frac{10}{100}\times680$ or $680\div10$ 680 + 68	748	5	M1 $\frac{10}{100}\times680$ or $680\div10$ or 68 seen M1 (dep) 680 +"68" (or M2 for 680×1.10) A1 cao
	(ii)	"748" ÷ 50 or 14.96	15		M1 for "748" $\div50$ or 14.96; accept "748" rounded up or down to next 50 followed by $\div50$ A1 ft from (b)(i) rounded up SC B1 for 680 (seen) leading to 14
6	(a)	$2\times5+5\times-3=10-15=$	-5	2	M1 substitute e.g 2×5 and 5×-3 or 10 and -15 A1 cao
	(b)	$5\times4^2-7$ $5\times16-7$	73	3	M1 substitution e.g $5\times4^2-7$; do not accept 54^2-7 M1 $5\times16-7$ or $5\times4\times4-7$ or $80-7$ (NB 4^2 as 4×4) A1 cao

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
7		679 × 28 = 5432 + 13580 = 19012 or 28 × 679 = 252 + 1960 + 16800 = 19012 or  	190.12	3	M1 for an attempt to multiply the units and tens, or correct partitioning M1 complete correct method (condone one arithmetic error) A1 for 190.12 cao OR M1 for putting the numbers in a grid M1 for multiplying out and addition (condone one error) A1 answer shown with point OR M1 for correct partitioning M1 679×20 and 679×8 calculated oe (condone one error) A1 cao
8	(a)		Points plotted	1	B1 ±1 full (2mm) square
	(b)		positive	1	B1 cao
	(c)		Line of best fit	1	B1 must pass through (42.5, 1.45), (42.5, 1.55) AND (67.5, 1.75), (67.5, 1.85)
	(d)		approx 1.65	1	B1 ft from single line segment with positive gradient ± 1 full (2mm) square

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
9	(a)	eg $50 \times \frac{2000}{500}$	200	2	M1 $2000 \div 500$ or 4 seen A1 cao
	(b)	eg $400 \times \frac{750}{500}$	600	2	M1 $750 \div 500$ or 1.5 seen or 400 + 200 A1 cao
10			$C = 10(n+3)$	3	B3 for $C = 10(n+3)$ oe such as $C = (n+3) \times 10$ (B2 for correct RHS or $C = n + 3 \times 10$, $C = 10n + 3$ etc B1 for C = some other linear expression in n or $n + 3 \times 10$, $10n + 3$ etc) NB: C=n scores no marks
11	(a)		$p(p+6)$	2	B2 for $p(p+6)$ or $p \times (p+6)$ (B1 for $p(ap+b)$ where a,b are numbers or $p+6$ seen on it's own, or part of an expression)
	(b)	$x^2 - 4x + 7x - 28$	$x^2 + 3x - 28$	2	M1 for 4 terms correct ignoring signs (e.g $x^2, 4x, 7x, 28$) or 3 terms with correct signs (e.g $x^2, -4x, 7x, -28$) A1 cao
12			correct drawing	2	B2. Condone hidden detail shown with solid lines, or missing lines on front face. (B1 for : one sketch correct with other sketches incorrect cross-section correct with depth > 1 cube, correct plan and side elevation)

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
13		$\frac{600}{3\times10}$ or $\frac{640}{3.2\times10}$	20 to 21 $\frac{1}{3}$	2	M1 For rounding at least two of the numbers to 1 sf, or for sight of 640, 3.2 or 640, 32 or 600, 32 or 30 seen A1 for 20 to 21 $\frac{1}{3}$ NB: 20.3125 scores M0 A0
14	(a)		correct reflection	2	B2 (B1 reflection in line other than x=3)
	(b)		reflection in $y = x$	2	B2 cao Accept the word "reflected" (B1 any statement including the word "reflection")
15	(a)(i)		5^6	1	B1 accept 15125, 5^{4+2}
	(ii)		5^3	1	B1 accept 125, 5^{9-6}
	(b)	$x + y = 10$ and $x - y = 4$	$x = 7$ $y = 3$	3	M1 for either $x + y = 10$ or $x - y = 4$ A2 for both values correct [(A1 for one value correct) If M0, award B3 for both values correct or B2 for one value correct, otherwise B0] SC B2 for $x = 3$ and $y = 7$

Paper 5523/03				
No	**Working**	**Answer**	**Mark**	**Notes**
16 (a)	$5-3x=2x+2$ $5-2=2x+3x$	$\frac{3}{5}$	3	B1 for $2x+2$ seen OR $2.5-1.5x=x+1$ M1 for correct rearrangement of 4 terms A1 for $\frac{3}{5}$ oe
(b)		$-3,-2,-1,0,1,2$	2	B2 (B1 for 5 correct and not more than one incorrect integers)
17		question + response boxes oe	2	1st aspect: One question with time period (eg each night); ignore other questions. 2nd aspect: Response list (at least two), not overlapping.* 3rd aspect: Some mention of units (eg hours) in either question or responses Award B2 for all three aspects, or B1 for just two aspects. * 0-1, 2-3, 4-5 is OK, but 0-1, 1-2, 2-3 is not OK.

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
18	(a)	$\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}$	$\frac{1}{2}$	2	M1 for $\frac{6}{12}$ or $\frac{3}{6}$ or $\frac{2\times3}{3\times4}$ A1 accept 0.5
	(b)	$1+2+\frac{8}{12}+\frac{9}{12}$	$4\frac{5}{12}$	3	M1 for attempt to convert to fractions with common denominator e.g two fractions, denominator of 12 A1 correct conversion : $\frac{8}{12}$ and $\frac{9}{12}$, or $\frac{20}{12}$ and $\frac{33}{12}$ seen (oe) A1 cao for $4\frac{5}{12}$ OR attempts to convert to decimals: must use at least 2dp M1 0.66+0.75 (or 1.66+2.75) or 0.67+0.75 etc A1 4.41, 4.417, 4.416 A1 4.416 (*recurring*)
19		$2\times\frac{1}{2}\times6\times8$ or 48 $8\times9+6\times9+10\times9$ or 72 +54 + 90	264 cm^2	4	M1 attempt to find the area of one face; $\frac{1}{2}\times6\times8$ or (8×9) or (6×9) or (10×9) or 72 or 54 or 90 or 24 M1 all five faces with an intention to add A1 cao numerical answer of 264 B1 (indep) cm^2 with or without numerical answer

Paper 5523/03					
No		**Working**	**Answer**	**Mark**	**Notes**
20			$\frac{\pi ab^3}{3d}$ $3(c+d)^3$ $3\pi bc^2$	3	B3 (B1 for each one correct) Nb –B1 for each of the 4th,5th,6th tick
21	(a)	$x+0.3+0.2+x=1$	0.25	2	M1 for $x+0.3+0.2+x=1$ oe, or $0.5\div 2$ A1 oe
	(b)	0.3×200	60	2	M1 0.3×200 A1 cao Accept 60 out of 200 (in words) SC B1 for $\frac{60}{200}$
22	(a)		$(-12)-4\quad -2\quad (0)8$	3	B3 for all correct [(B1 for each one correct)
	(b)		points plotted accurately points joined with smooth curve	2	B1 ± 1 full (2mm) square ft table if at least B1 awarded (all 5 points plotted) B1 ft for any smooth curve if previous B1 gained NB: curve must pass within 1 full square of the points
23			$\frac{1}{4}$ on LH branch $\frac{2}{3}$ & $\frac{1}{3}$ & $\frac{2}{3}$ on RH branches	2	B1 B1
24			m=3 n=5	2	B1 for 3 B1 for 5 (B2 for $2^3\times 5$ or $2\times 2\times 2\times 5$) SC: award B1 only if m=5, n=3 or for 8×5 seen

Paper 5523/03					
No		Working	Answer	Mark	Notes
25		$\frac{5--1}{-1-2} = -2$	$y = -2x + 5$	4	M1 for clear attempt to find gradient eg fraction with -1,5 in numerator, 2,-1 in denominator A1 for -2 B2 ft for $y =$"-2"$x + 5$ oe (eg $y = \frac{-6}{3}x + 5$) (B1 for $y = mx + 5$ or , $-2x+5$ or $y =$"-2"$x + c$)
26	(a)(i)		150	2	B1 accept 150 or 210
	(ii)				B1 for angle at the centre is twice the angle at the circumference
	(b)	$360 - 90 - 90 -$"150"	30	3	B1 identifies angle between radius and tangent as $90°$ (may be in working or on diagram) M1 $360° - 90 - 90 -$"150" A1 ft from (a)(i) excluding a negative answer OR B1 for 90 M1 for $2 \times (180 - 90 -$"$\frac{150}{2}$"$)$ A1 ft from (a)(i) excluding a negative answer OR B3 for $180 -$(a)

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	14.44 – 8.660254038	5.77974(….)	2	M1 for 14.44 seen or 8.66(……) seen or 5.7 or 5.8 or better, rounded or truncated A1 cao
	(b)		6	1	B1 ft
2		15 ÷ 24	62.5	2	M1 for 15 ÷ 24 or 1500 ÷ 24 or sight of digits 625 A1 cao
3	(a)	2.10 × 450	945	2	M1 for digits 210 × 450 or sight of digits 945 A1 cao
	(b)	63÷2.10	30	2	M1 for 63 ÷ digits 210 A1 cao
4		See diagram	$2(y + y)$ $2y + 2y$	2	B1 for $2(y + y)$ B1 for $2y + 2y$ (Deduct B1 for each additional tick (>2) to min 0)
5		$360^o \div 18$ (=20) Sector angles: G= 60; S= 80; B=220; Correct sectors labelled correctly Use angle measurer	Angles drawn, labelled	4	B4 for fully correct and labelled pie chart (B3 for all angles correct or for a labelled pie chart with two angles correct) (B2 for labelled pie chart with one correct angle drawn) (B1 for $360 \div 18$ or 20 seen or implied)
6	(a)		Correct plane	2	B2 for a correct plane defined by showing at least 2 lines. (B1 for a line of symmetry on one face)
	(b)		Correct net	2	B2 cao (B1 for 2 equilateral triangles joined appropriately to at least one rectangle or for 1 equilateral triangle joined appropriately to one of the three rectangles)
	(c)		Correct drawing	2	B1 for two extra sides of length 6 cm (± 2mm) B1 for construction arcs 6cm from each of the ends of the given line
7		61 – 19 = 42 42 ÷ 3 = 14	14	2	M1 for –19 or 42 seen or $3x + 19$ A1 cao

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
8	(a) (b) (c)		15 15	1 1 2	B1 cao for $15(\pm 1)$ B1 cao for $15(\pm 0.4)$ B1 horiz. line from (2,20) to (3,20) B1 line from (3,20) to (5,0) or horiz. translation of it SC: B1 for any journey ending at (5,0)
9	(a)	$x+4+x+x+4+x$	$4x+8$	2	M1 for attempting to add $x+4, x, x+4, x$ may be implied by $4x+a$, $a>0$ A1 for $4x+8$ or $4(x+2)$
	(b)	$4x + 8 = 54$ $4x = 46$ $x = 11.5$ Length = "11.5" + 4	15.5	3	M1 for "$4x + 8$" = 54 A1 cao for 11.5 seen B1 ft for "11.5"+ 4
10		0.4 + 0.15 1 – 0.55	0.45	2	M1 for 1 – sum A1 for 0.45 oe SC: B1 for 0.81
11	(a) (b)	 $\pi \times 2.45$	3:1 7.7	1 2	B1 cao M1 for $\pi \times 2.45$ (accept π as 3.1 or better) A1 for 7.59 to 7.70
12		7×10000	70000	2	M1 for 7×10000 or $7 \times 100 \times 100$ A1 cao
13		5.40 ÷ 3 × 7	12.60	3	M1 for 5.40 ÷ 3 or sight of 1.8 M1 (dep) for "1.80" × 7 A1 for 12.6 or equivalent

Paper 5523/04				
No	**Working**	**Answer**	**Mark**	**Notes**
14	$7.60 \times \frac{17.5}{100} = 1.33$ 7.60 + 1.33 = 8.93 1650 × "8.93"	£14734.50	4	M1 for $7.60 \times \frac{17.5}{100}$ or 1.33 seen or 7.60 ×1.175 (oe) (Award M1 for 10%, 5% and 2½% correctly calculated) A1 for 8.93 or 893 M1 for 1650 × "8.93" or digits 147345 seen A1 cao Accept 14734.5 OR M1 for 1650×7.6 or 12540 seen M1 for "12540" $\times \frac{17.5}{100}$ or 2194.5 seen or "12540"×1.175 (oe) (Award M1 for 10%, 5%, and 2½% correctly calculated) M1 for "12540" + "2194.5" (dep on both previous M marks) or digits 147345 seen A1 cao accept 14734.5

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
15		$285 \times 1000/(60 \times 60) = 79.1\dot{6}$		3	M2 for $285 \times 1000 \div 60 \div 60$ or $80 \times 60 \times 60 \div 1000$ or for a correct method to obtain two comparable values e.g $80 \times 60 \times 60$ and 285×1000 (M1 for $285 \div 60 \div 60$ or 0.079(….) seen or $80 \times 60 \times 60$ or 288000 seen or for 285×1000 or 285000 seen or $80 \div 1000$ or 0.08 seen) A1 for 288 or 79.(….) or for two correctly calculated comparable values e.g 288000 and 285000
16	(a)	$4x + 12 = 6$ $4x = -6$	-1.5	3	B1 for $4x + 12$ or $x + 3 = \frac{6}{4}$ M1 for a correct re-arrangement of their 3 terms to isolate $4x$ or x A1 for -1.5 oe
	(b)	$v - u = 5t$	$\frac{v-u}{5}$	2	M1 for isolating $\pm 5t$ or $\pm t$ or for dividing through by 5 A1 oe

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
17		3→15 4→48 3.1→17.3(91) 3.2→19.9(68) 3.3→22.7(37) 3.4→25.7(04) 3.5→28.8(75) 3.4→25.7(04) 3.3→22.7(37) 3.35→24.1(95375)	3.3	4	B2 for trial between 3.3 and 3.4 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.3 and 3.4 exclusive B1 (dep on at least one previous B1) for 3.3 NB trials should be evaluated to at least 1 dp truncated or rounded
18	(a)	36 ÷ (7+3+2) "3" × 7	21	3	M1 for 36 ÷ (7+3+2) M1 (dep) for "3" × 7 or 3 or 2 A1 cao
	(b)	$51.5 \times \frac{8.5}{100} = 4.3775$ 51.5 – 4.3775 = 47.1225	47 or 47.1 or 47.12	4	M1 for $51.5 \times \frac{8.5}{100}$ or 4.37(75) seen M1 (dep) for 51.5 – "4.37(75)" A1 for 47 or better B1 (indep) for rounding their answer correctly to the nearest whole number or 1 or 2 d.p OR M1 for $51.5 \times \frac{100-8.5}{100}$ M1 for $51.5 \times$"0.915" or 0.515 × "91.5" A1 for 47 or better B1 (indep) for rounding their answer correct to the nearest whole number or 1 or 2 d.p

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		Angle in a semicircle	1	B1 oe
	(b)	$12^2 + 16^2 = 400$ $\sqrt{400} = 20$	20	3	M1 for $12^2 + 16^2$ M1 for $\sqrt{144+256}$ A1 cao
	(c)	$\pi \times 10^2$	314	3	M1 for $\pi \times \left(\frac{"20"}{2}\right)^2$ M1 (indep) for correct order of evaluation of $\pi \times r^2$ for any r A1 for 314 – 315 inclusive

Paper 5523/04					
No		Working	Answer	Mark	Notes
20	(a)	$(1 \times 10)+(3 \times 15)+(5 \times 30)+(7 \times 35)+$ $(9 \times 25)+(11 \times 5) = 730$ "730" $\div$ 120 = 6.08333	6.08	4	M1 for use of *fx* with *x* consistent within intervals (including end points) M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\frac{\sum fx}{\sum f}$ A1 6.08 to 6.085
	(b)		(10),25,55,90,115, 120	1	B1 for all correct
	(c)		graph	2	B1 ft for 5 or 6 points plotted correctly $\pm$ 1 full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) B1(dep) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points. (SC: B1 if 5 or 6 points plotted not at end but consistent within each interval and joined)

Paper 5523/04				
No	**Working**	**Answer**	**Mark**	**Notes**
(d)		72–74	2	M1 (ft dep on graph being cf) for reading from graph at 7 A1 ft ±1 full (2 mm) square Or B2 for $72-74$
21 (a) (b) (c) (d)		a^7 $15x^3y^4$ $x-1$ $(x+3)(x-3)$	1 2 1 1	B1 accept a^{4+3} B2 cao (B1 for two of 15, x^3, y^4 in a product) B1 cao B1 cao
22	80% = 220 $220 \div 80 \times 100$	275	3	M1 for recognising that 80% is equivalent to 220 M1 for $220 \div 80 \times 100$ oe A1 cao

Paper 5523/04					
No		**Working**	**Answer**	**Mark**	**Notes**
23			$x = 3$ $y = 0.5$	3	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error M1 (dep) for substituting found value in one equation A1 cao SC: B1 for one correct answer only if M's not awarded
24			1.4×10^{10}	2	B2 for 1.4×10^{10} or 1.44×10^{10} (B1 for 14.4×10^{9} or 14400,000,000 or 14000,000,000 or 14×10^{9})
25	(a)	$\tan x = \frac{1.9}{3.2}$ $x = \tan^{-1}\left(\frac{1.9}{3.2}\right) = 30.7$	30.7	3	M1 for $\tan x = \frac{1.9}{3.2}$ or $\tan \frac{1.9}{3.2}$ M1 for $\tan^{-1}\left(\frac{1.9}{3.2}\right)$ A1 for 30.6 – 30.7
	(b)	90 + "30.7"	121	1	B1 (indep) ft for 90 + "30.7" rounded to 3 or 4 s.f

Paper 5523/04				
No	**Working**	**Answer**	**Mark**	**Notes**
26	SF$=\frac{12}{9}$ $\frac{12}{9}\times 6=8$	2	2	M1 for $\frac{12}{9}$ or $\frac{9}{12}$ or 1.33… seen or 0.75 seen or 8 seen or $\frac{6}{9}$ or $\frac{9}{6}$ or 0.66… or 1.5 or $\frac{1}{3}$ or 3 oe seen A1 cao

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$x^2-4x+7x-28$	$x^2+3x-28$	2	M1 for 4 terms correct ignoring signs (e.g $x^2,4x,7x,28$) or 3 terms with correct signs (e.g $x^2,-4x,7x,-28$) A1 cao
	(b)		y^4+2y^2	2	B2 cao B1 for y^4 or $2y^2$
	(c)		$p(p+6)$	2	B2 for $p(p+6)$ or $p\times(p+6)$ (B1 for $p(ap+b)$ where a,b are numbers or $p+6$ seen on it's own, or part of an expression)
	(d)		$3x(2x-3y)$	2	B2 (B1 for $3(2x^2-3xy)$ or $x(6x-9y)$ or $3x(...)$)
2			question + response boxes oe	2	1st aspect: One question with time period (eg each night); ignore other questions. 2nd aspect: Response list (at least two), not overlapping.* 3rd aspect: Some mention of units (eg hours) in either question or responses Award B2 for all three aspects, or B1 for just two aspects. * 0-1, 2-3, 4-5 is OK, but 0-1, 1-2, 2-3 is not OK.
3	(b)		reflection in $y=x$	2	B2 cao accept the word "reflected" (B1 any statement including the word "reflection")
4	(a)	$5-3x=2x+2$ $5-2=2x+3x$	$\frac{3}{5}$	3	B1 for $2x+2$ seen OR $2.5-1.5x=x+1$ M1 for correct rearrangement of 4 terms A1 for $\frac{3}{5}$ oe
	(b)		$-3,-2,-1,0,1,2$	2	B2 (B1 for 5 correct and not more than one incorrect integers)

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
5	(a)	$\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}$	$\frac{1}{2}$	2	M1 for $\frac{6}{12}$ or $\frac{3}{6}$ or $\frac{2\times3}{3\times4}$ A1 accept 0.5
	(b)	$1+2+\frac{8}{12}+\frac{9}{12}$	$4\frac{5}{12}$	2	M1 for attempt to convert to fractions with common denominator e.g two fractions, denominator of 12 A1 correct conversion : $\frac{8}{12}$ and $\frac{9}{12}$, or $\frac{20}{12}$ and $\frac{33}{12}$ seen (oe) A1 cao for $4\frac{5}{12}$ OR attempts to convert to decimals: must use at least 2dp M1 0.66+0.75 (or 1.66+2.75) or 0.67+0.75 etc A1 4.41, 4.417, 4.416 or 0.41, 0.417, 0.416 or 0.42, 4.42 A1 4.416 (*recurring*)
6	(a)(i)		5^6	1	B1 accept 15625, 5^{4+2}
	(ii)		5^3	1	B1 accept 125, 5^{9-6}
	(b)	$x+y=10$ and $x-y=4$	$x = 7$ $y = 3$	3	M1 for either $x + y = 10$ or $x-y=4$ A2 for both values correct [(A1 for one value correct) If M0, award B3 for both values correct or B2 for one value correct, otherwise B0] SC B2 for $x = 3$ or $y = 7$

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
7		$2\times\frac{1}{2}\times6\times8$ or 48 $8\times9+6\times9+10\times9$ or 72 +54 + 90	264 cm^2	4	M1 attempt to find the area of one face; $\frac{1}{2}\times6\times8$ or (8×9) or (6×9) or (10×9) or 72 or 54 or 90 or 24 or 48 M1 all five faces with an intention to add A1 cao numerical answer of 264 B1 (indep) cm^2 with or without numerical answer
8			$\frac{\pi ab^3}{3d}$ $3(c+d)^3$ $3\pi bc^2$	3	B3 (B1 for each one correct) Nb –B1 for each of the 4th,5th,6th tick
9	(a)	$x+0.3+0.2+x=1$	0.25	2	M1 for $x+0.3+0.2+x=1$ oe, or 0.5 ÷ 2 A1 oe
	(b)	0.3×200	60	2	M1 0.3×200 A1 cao Accept 60 out of 200 (in words) SC B1 for $\frac{60}{200}$
10	(a)		$(-12)-4\quad-2\quad(0)8$	3	B3 for all correct [(B1 for each one correct)
	(b)		5 points plotted accurately points joined with smooth curve	2	B1 ±1 full (2mm) square ft table if at least B1 awarded (all 5 points plotted) B1 ft for any smooth curve if previous B1 gained NB: curve must pass within 1 full square of the points
11			m=3 n=5	2	B1 for 3 B1 for 5 (B2 for $2^3\times5$ or $2\times2\times2\times5$) SC: award B1 only if m=3, n=3, for 8×5 seen

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
12		$\frac{5--1}{-1-2} = -2$	$y = -2x + 5$	4	M1 for clear attempt to find gradient eg fraction with -1,5 in numerator, 2,-1 in denominator A1 for -2 cao B2 ft for $y =$"-2"$x + 5$ oe (eg $y = \frac{-6}{3}x + 5$) (B1 for $y = mx + 5$ or , $-2x+5$ or $y =$"-2"$x + c$)
13	(a)		$\frac{1}{4}$ on LH branch $\frac{2}{3}$ & $\frac{1}{3}$ & $\frac{2}{3}$ on RH branches	2	B1 cao B1
	(b)	$\frac{3}{4} \times \frac{2}{3} + \frac{1}{4} \times \frac{1}{3} = \frac{6}{12} + \frac{1}{12}$	$\frac{7}{12}$	3	M1 for $\frac{3}{4} \times \frac{2}{3}$ or $\frac{1}{4} \times \frac{1}{3}$ from their tree diagram M1 for sum of two products A1 for $\frac{7}{12}$ oe
	(c)	$n = 21 \times 4$ or $\frac{1}{6} : \frac{1}{4}$ oe $\frac{1}{6} \times 84$ or $21 \times \frac{2}{3}$	14	3	M1 for either $\frac{1}{3} \times \frac{3}{4} \left(= \frac{1}{4}\right)$ or $\frac{2}{3} \times \frac{1}{4} \left(= \frac{1}{6}\right)$ from their tree diagram M1 for 21×4 (=84) or $\frac{21}{3} \times 2$ A1 for 14 cao SC: B2 for 63 seen in fraction or ratio

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
14	(a)(i)		150	2	B1 accept 150 or 210
	(ii)				B1 for angle at the centre is twice the angle at the circumference
	(b)		30	3	B1 identifies angle between radius and tangent as $90°$ (may be in working or on diagram) M1 $360° - 90 - 90 - "150"$ A1 ft from (a)(i) excluding a negative answer Or B1 for 90 M1 for $2 \times (180 - 90 - "\frac{150}{2}")$ A1 ft from (a)(i) excluding a negative answer Or B3 for $180 - (a)$ SC: 180 – "210" can get B1 for $90°$ and/or B1 for "cyclic quadrilateral"
		$360 - 90 - 90 - "150"$ or $180 - "150"$			
15	(a)		0.2727…	1	B1 for 2.27 recurring or 0.2727…. oe or 0.273
	(b)	eg $x = 0.3939…$ so $100x = 39.3939…$ $99x = 39$ so $x = \frac{39}{99} = \frac{13}{33}$		3	M1 for $100x = 39.39…$ M1 dep for subtraction of both sides A1 for $\frac{13}{33}$ from correct proof **Alternative method** M1 for $13.000 \div 33$ M1 for remainders 31 and 13 A1 for 0.39 recurring SC:B1 for $\frac{39}{99}$

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$d = kt^2$ $80 = k \times 4^2$	$d = 5t^2$	3	M1 for $d = kt^2$ or $d \propto t^2$ M1 sub d=80 and t=4 into their equation A1 for $d = 5t^2$ oe (cao)
	(b)		245	1	B1 ft from (a) using "k"
	(c)	$45 = 5t^2$	3	2	M1 ft from (a) for substituting d=45 into their equation A1 for 3 cao (condone inclusion of -3)
17	(a)(i) (ii)		(0, 9) (8, 25)	3	B1 cao B1 for $x = 8$ cao B1 for $y = 25$ cao SC: B1 for (25, 8)
	(b)	LHS = $\left(\frac{100-(x^2-16x+64)}{4}\right)$ = $\left(\frac{36+16x-x^2}{4}\right)$ RHS = $\left(\frac{36-2x+18x-x^2}{4}\right)$ = LHS		3	M1 for expansion of either set of brackets with at least 3 of 4 terms correct M1 for common denominator of 4 or multiplying through by 4 or reducing each numerator to a single term A1 for fully correct solution **Alternative method** M1 for $(5-\frac{(x-8)}{2})(5+\frac{(x-8)}{2})$ M1 for $(\frac{2\times5-(x-8)}{2})(\frac{2\times5+(x-8)}{2})$ A1 for $\frac{(18-x)(x+2)}{4}$

Paper 5525/05					
No		Working	Answer	Mark	Notes
18	(a)	$\frac{810\pi}{90\pi}$ or 9 $\sqrt{9}$ or 3	12	3	M1 for $\frac{810\pi}{90\pi}$ or 9 or $\frac{1}{9}$ or 1:9 oe M1 for $\sqrt{\frac{810\pi}{90\pi}}$ or $\sqrt{9}$ or 3 or $\frac{1}{3}$ or $\sqrt{9}:\sqrt{1}$ oe A1 cao
	(b)	3^3 or 27 or 2700	2700π	2	SC:B1 for answer of 36 M1 for "3"^{3} or 27 or $\left(\sqrt{9}\right)^3 : (\sqrt{81})^3$ oe or 9^3 or 2700– A1 cao
19	(a)(i)		1	1	B1 cao
	(ii)		8	1	B1 cao
	(iii)	$64^{-\frac{2}{3}} = \frac{1}{64^{\frac{2}{3}}}$ or $64^{-\frac{2}{3}} = (4^2)^{-1}$	$\frac{1}{16}$	2	M1 for knowing negative power is a reciprocal or power of $\frac{1}{3}$ root is a cube root A1 cao for $\frac{1}{16}$
	(b)	$\sqrt{27} = \sqrt{9\times3}$ or $\sqrt{27} = 3\sqrt{3}$ or $\sqrt{27} = 3^{3/2}$	$\frac{5}{2}$ oe	2	M1 for $\sqrt{27} = \sqrt{9\times3}$ or $\sqrt{27} = 3^{3/2}$ A1 for $\frac{5}{2}$ oe (cao) **Alternative method** M1 for $9\times27 = 3^{2n}$ A1 for $\frac{5}{2}$ oe (cao)

Paper 5525/05					
No		**Working**	**Answer**	**Mark**	**Notes**
20	(a)(i) (ii) (b)(i) (ii)		(90, 1) (180, 0) (45, 0) (90, -3)	2 2 	B1 cao could be indicated on diagram B1 cao could be indicated on diagram B1 cao could be indicated on diagram B1 cao could be indicated on diagram
21		$\frac{1}{3}\pi x^2 h = \frac{4}{3}\pi(2x)^3$ $x^2 h = 4\times 8x^3$	$32x$	3	M1 for substitution in correct formulae M1 (dep.) for correct unsimplified expression eg $h = \frac{\frac{4}{3}\pi(2x)^3}{\frac{1}{3}\pi x^2}$ oe or $h = 8x$ oe A1 for $32x$ cao
22	(a) (b)	$\left(\overline{OM} =\right)\ \boldsymbol{a} + 2\boldsymbol{b}$ $\left(\overline{ON} =\right) 3\boldsymbol{a}$ or $\frac{6}{2}\boldsymbol{a}$ $\left(\overline{MN} =\right)\ -\boldsymbol{a} - 2\boldsymbol{b} + 3\boldsymbol{a}$ $\left(\overline{OX} =\right)\ 2\boldsymbol{a} + \boldsymbol{b}$ $\left(\overline{OY} =\right) \boldsymbol{b} + 4\boldsymbol{a}$ (½ $\overline{QR}$ =) $2\mathbf{a} - \boldsymbol{b}$ or (½ $\overline{RQ}$ =) $\boldsymbol{b} - 2\boldsymbol{a}$	$2\boldsymbol{a} - 2\boldsymbol{b}$ $\overline{XY} = 2\boldsymbol{a}$ (hence parallel)	2 2	B2 (B1 for either $\overline{OM}$ or $\overline{ON}$ or $-\boldsymbol{a} - 2\boldsymbol{b} + 3\boldsymbol{a}$ SC: B1 for $2\boldsymbol{b} - 2\boldsymbol{a}$ B1 for either $\overline{OX}$ or $\overline{OY}$ or (½ $\overline{QR}$) B1 for $\overline{XY} = 2\boldsymbol{a}$ or $\overline{YX} = -2\boldsymbol{a}$

Paper 5525/06					
No		Working	Answer	Mark	Notes
1	(a)	$v - u = 5t$	$\frac{v-u}{5}$	2	M1 for isolating $\pm 5t$ or $\pm t$ or for dividing through by 5 A1 oe
	(b)	$x - 3 = 5x - 25$ $22 = 4x$	$5\frac{1}{2}$	3	M1 for $x - 3 = 5(x-5)$ or $\frac{x}{5} - \frac{3}{5} = x - 5$ M1 for isolating terms in x correctly from $ax + b = cx + d$ A1 cao accept $5\frac{1}{2}$, $\frac{11}{2}$, 5.5
2	(a)	$36 \div (7+3+2)$ "3" $\times 7$	21	3	M1 for $36 \div (7+3+2)$ M1 (dep) for "3" $\times 7$ or 3 or 2 A1 cao
	(b)	$51.5 \times \frac{8.5}{100} = 4.3775$ $51.5 - 4.3775 = 47.1225$	47 or 47.1 or 47.12	4	M1 for $51.5 \times \frac{8.5}{100}$ or 4.37(75) seen M1 (dep) for 51.5 – "4.37(75)" A1 for 47 or better B1 (indep) for rounding their answer correctly to the nearest whole number or 1 or 2 d.p OR M1 for $51.5 \times \frac{100 - 8.5}{100}$ M1 for $51.5 \times$"0.915" or 0.515 ×"91.5" A1 for 47 or better B1 (indep) for rounding their answer correct to the nearest whole number or 1 or 2 d.p

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
3		3→15 4→48 3.1→17.3(91) 3.2→19.9(68) 3.3→22.7(37) 3.4→25.7(04) 3.5→28.8(75) 3.4→25.7(04) 3.3→22.7(37) 3.35→24.1(95375)	3.3	4	B2 for trial between 3.3 and 3.4 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.3 and 3.4 exclusive B1 (dep on at least one previous B1) for 3.3 NB trials should be evaluated to at least 1 dp truncated or rounded
4	(a)		Angle in a semicircle	1	B1 oe
	(b)	$12^2 + 16^2 = 400$ $\sqrt{400} = 20$	20	3	M1 for $12^2 + 16^2$ M1 for $\sqrt{144+256}$ A1 cao
	(c)	$\pi \times 10^2$	314	3	M1 for $\pi \times \left(\frac{"20"}{2}\right)^2$ M1 (indep) for correct order of evaluation of $\pi \times r^2$ for any r A1 for 314 – 315 inclusive

Paper 5525/06					
No		Working	Answer	Mark	Notes
5	(a)	$(1 \times 10)+(3 \times 15)+(5 \times 30)+(7 \times 35)+$ $(9 \times 25)+(11 \times 5) = 730$ "730" ÷ 120 = 6.08333	6.08	4	M1 for use of *fx* with *x* consistent within intervals (including end points) M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\frac{\sum fx}{\sum f}$ A1 6.08 to 6.085
	(b)		(10),25,55,90, 115,120	1	B1 for all correct
	(c)		graph	2	B1 ft for 5 or 6 points plotted correctly ± 1 full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) B1(dep) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points. (SC: B1 if 5 or 6 points plotted not at end but consistent within each interval and joined)
	(d)		72 – 74	2	M1 (ft dep on graph being cf) for reading from graph at 7 A1 ft ±1 full (2 mm) square Or B2 for 72 – 74

Paper 5525/06					
No		Working	Answer	Mark	Notes
6	(a)		a^7	1	B1 accept a^{4+3}
	(b)		$15x^3y^4$	2	B2 cao (B1 for two of 15, x^3, y^4 in a product)
	(c)		$x-1$	1	B1 cao
	(d)		$(a + 3b)(a - 3b)$	2	B2 for $(a + 3b)(a - 3b)$ (B1 for $(a \pm 3b)(a \pm 3b)$
7		80% = 220 $220 \div 80 \times 100$	275	3	M1 for recognising that 80% is equivalent to 220 M1 for $220 \div 80 \times 100$ oe A1 cao
8			$x = 3$ $y = 0.5$	3	M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error M1 (dep) for substituting found value in one equation A1 cao SC: B1 for one correct answer only if Ms not awarded
9			1.4×10^{10}	2	B2 for 1.4×10^{10} or 1.44×10^{10} (B1 for 14.4×10^9 or 14400,000,000 or 14000,000,000 or 14×10^9)

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
10	(a)	$\tan x = \frac{1.9}{3.2}$ $x = \tan^{-1}\left(\frac{1.9}{3.2}\right) = 30.7$	30.7	3	M1 for $\tan x = \frac{1.9}{3.2}$ or $\tan \frac{1.9}{3.2}$ M1 for $\tan^{-1}\left(\frac{1.9}{3.2}\right)$ A1 for 30.6 – 30.7
	(b)	90 + "30.7"	121	1	B1 (indep) ft for 90 + "30.7" rounded to 3 or 4 s.f
11	(a)	$SF = \frac{12}{9}$ $\frac{12}{9} \times 6 = 8$	2	2	M1 for $\frac{12}{9}$ or $\frac{9}{12}$ or 1.33… seen or 0.75 seen or 8 seen or $\frac{6}{9}$ or $\frac{9}{6}$ or 0.66… or 1.5 or $\frac{1}{3}$ or 3 oe seen A1 cao
	(b)	$SF = \frac{9}{12}, \frac{9}{12} \times 7 = 5.25$	5.25	2	M1 for $\frac{BE}{7} = \frac{9}{12}$ oe A1 cao

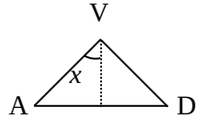
Paper 5525/06					
No		Working	Answer	Mark	Notes
12	(a)	$84 = 6.7\pi + 2 \times 6.7 + 2a$ $2a + 13.4 = 62.95\ldots$ or $2a + 34.44 = 84$	24.8	3	M1 for substituting correctly, π may be left M1 for correct rearrangement as far as $\pm 2a$ A1 for $24.7 - 24.8$
	(b)	$P = \pi r + 2r + 2a$ $P - 2a = \pi r + 2r$ $P - 2a = (\pi + 2)r$	$\frac{P-2a}{\pi+2}$	3	M1 subtracting $2a$ from each side M1 for factorising to get $(\pi+2)r$ A1 for $\frac{P-2a}{\pi+2}$ oe S.C $\frac{p-2a}{5.14}$ oe is M1 M1 A0
13		Area $\Delta ABC = \frac{1}{2} \times 14 \times 8 \times \sin 106$ (= 53.8)	53.8	3	M1 for $\frac{1}{2} \times 14 \times 8 \times \sin 106$ M1 (dep) for $56 \times 0.961(26..)$ or $107.6\ldots$ A1 $53.8 - 53.9$ SC 107.6 is B2
14	(a)		4.5	1	B1 cao
	(b)	$500 \times 1.045^{20} = 1205.857\ldots\ldots$	1205.86	2	M1 for 500×1.045^{20} A1 for $1205.85 - 1206$ (SC:B1 for $705.85 - 706$ no working)

Paper 5525/06				
No	**Working**	**Answer**	**Mark**	**Notes**
15 (a)	$6x^2 + 11x - 10 + 6x - 4 = 25$ $6x^2 + 17x - 39 = 0$		3	M1 for an expression for the area involving either $(3x-2)(2x+5)+2(3x-2)$ or $3x(3x-2)+(3x-2)(7-x)$ or $3x(2x+5)-2(7-x)$ or $(3x-2)^2 + 2(3x-2) + (3x-2)(7-x)$ where in each case at least one of 2 or 3 product terms must be correct M1 (indep) for one correct expansion involving x^2 A1 for simplification to final answer

Paper 5525/06				
No	**Working**	**Answer**	**Mark**	**Notes**
15 (b)(i)	$x = \frac{-17 \pm \sqrt{17^2 - 4\times 6\times(-39)}}{2\times 6}$ $= \frac{-17 \pm \sqrt{289+936}}{12}$ $x = +\frac{18}{12}$ or -4.33	$1.5, -\frac{13}{3}$	4	M1 for $x = \frac{-17 \pm \sqrt{17^2 - 4\times 6\times(-39)}}{2\times 6}$ up to signs in b & c M1 for $x = \frac{-17 \pm \sqrt{1225}}{12}$ A1 $x = 1.5$ or -4.33, or better OR M2 for $(3x+13)(2x-3)$ (M1 for $(3x \pm a)(2x \pm b)$ with ab = ±39 A1 x = 1.5 or – 4.33, or better
	$x^2 + \frac{17}{6}x - \frac{39}{6} = 0$ $\left(x+\frac{17}{12}\right)^2 - \left(\frac{17}{12}\right)^2 - \frac{39}{6} = 0$ $\left(x+\frac{17}{12}\right)^2 = \left(\frac{17}{12}\right)^2 + \frac{39}{6}$			OR M1 for $\left(x+\frac{17}{12}\right)^2$ *seen* M1 $\left(x+\frac{17}{12}\right)^2 = \left(\frac{17}{12}\right)^2 + \frac{39}{6}$ A1 x = 1.5 or – 4.33, or better SC:M1 for answer "1.5" with no working or T & I
(ii)		8		B1 cao length = 8

Paper 5525/06					
No		Working	Answer	Mark	Notes
16	(a)	P(win) = $\frac{2}{5}\times\frac{3}{5}+\frac{2}{5}\times\frac{1}{5}(=\frac{8}{25})$	$\frac{8}{25}$	3	M1 for $\frac{2}{5}\times\frac{3}{5}$ or $\frac{2}{5}\times\frac{1}{5}$ or for clearly identifying in P(R) $\times$P(R) + P(B) $\times$ P(B) M1 for P(win) = " $\frac{2}{5}$ " $\times$ " $\frac{3}{5}$ " + " $\frac{2}{5}$ " $\times$ " $\frac{1}{5}$ " A1 for $\frac{8}{25}$, oe
	(b)	$\frac{8}{25}$ $\times$ 100 (=32) 100 $\times$ 20 – "32" $\times$ 50	£4	2	M1 for (" $\frac{8}{25}$ " $\times$100)$\times$50 or $\times$ 0.5 A1 cao

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
17		Lower bound of 1200 is 1150 Upper bound of 60 is 65 $1150 \div 65$	17	4	B1 for 1150 or 1250 seen B1 for 65 or 55 seen M1 (Lower bound of load) ÷ (Upper bound of weight) Where 1150 ≤ LB load < 1200 and 60 < UB Weight ≤ 65 A1 for 17 requires fully correct working OR B1 for 1150 or 1250 seen B1 for 65 or 55 seen M1 (upper bound of load) ÷(lower bound of weight) Where 1200 ‹ UB load ≤ 1250 and 55 ≤ LB weight < 60 A1 for 22 requires fully correct working OR M2 $1200 \div 55$ A1 21.8 A1 21 requires fully correct working OR M2 $1200 \div 65$ A1 18.4(6) A1 18 requires fully correct working
18	(a)	$3^4 x^4 y^8$	$81x^4y^8$	2	B2 for $81x^4y^8$ (B1 for 2 of 81, x^4, y^8)
	(b)	$\frac{x(x-3)}{(x-5)(x-3)}$	$\frac{x}{x-5}$	3	B1 for $x(x-3)$ B1 for $(x-5)(x-3)$ B1 cao

Paper 5525/06					
No		Working	Answer	Mark	Notes
19	(a)	$6^2 - 2^2 = 32$	5.66	2	M1 for $6^2 - 2^2$ (= 32) A1 5.65 – 5.66
	(b)	V  $DVA = 2 \times \sin^{-1}(\frac{2}{6})$ OR $\cos DVA = \frac{6^2 + 6^2 - 16}{2 \times 6 \times 6}$ $= \frac{56}{72}$ $DVA = \cos^{-1}\left(\frac{56}{72}\right) = 38.94$	38.9	3	M1 $\sin x = \frac{2}{6}$ oe M1 for $DVA = 2 \times \sin^{-1}(\frac{2}{6})$ A1 38.9 – 38.95 OR M1 for $(\cos DVA =) \frac{6^2 + 6^2 - 4^2}{2 \times 6 \times 6}$ M1 for $DVA = \cos^{-1}\left(\frac{56}{72}\right)$ A1 38.9 – 38.95

Paper 5525/06				
No	**Working**	**Answer**	**Mark**	**Notes**
19 (c)	$AC^2 = 2^2 + 2^2 - 2 \times 2 \times 2 \times \cos 120^o$ $AC = \sqrt{12}$ **OR** $AN = 2 \times \sin 60 = \sqrt{3}$ **OR** VN = $\sqrt{"32"+1} = \sqrt{33}$ $\cos AVC = \frac{6^2 + 6^2 - 12}{2 \times 6 \times 6}$ $\cos AVC = \frac{60}{72}$ **OR** $AVC = 2 \times \sin^{-1}\frac{\sqrt{3}}{6}$, using AN **OR** $AVC = 2 \times \cos^{-1}\frac{\sqrt{33}}{6}$, using VN	33.6	4	M1 for any valid method for AC or AN or VN where N is the midpoint of AC A1 for $AC^2 = 12$ or $AC = \sqrt{12}$ (= 3.46…) or $AN = \sqrt{3}$ (=1.73…)or $VN = \sqrt{33}$ (=5.74…) M1 (indep) for correct method to find angle AVC A1 33.55 – 33.6

Paper 5525/06					
No		**Working**	**Answer**	**Mark**	**Notes**
20	(a)	Graph translated 1 unit to the right passing through the points (-1,0), (1,2) and (2,0)		2	M1 for translation of $\begin{pmatrix}1\\0\end{pmatrix}$ or $\begin{pmatrix}-1\\0\end{pmatrix}$ A1 for right through the 3 points, $\pm\frac{1}{4}$ sq
	(b)	Graph stretched 2 units parallel to y-axis; passing through the points (-2,0), (0,4) and (1,0)		2	M1 for graph stretched parallel to the y-axis by scale factor 2 A1 through all 3 points; $\pm\frac{1}{4}$ sq not on grid at $x = 2$

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Mark Scheme

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NOTES ON MARKING PRINCIPLES

1 **Types of mark**
M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

2 Abbreviations
cao – correct answer only
ft – follow through
isw – ignore subsequent working
SC: special case
oe – or equivalent (and appropriate)
dep – dependent
indep - independent

3 No working
If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

4 With working
If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
If there is no answer on the answer line then check the working for an obvious answer.

5 Follow through marks
Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

6 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

8 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

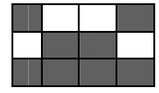
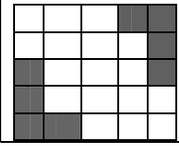
9 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

Remember: if you are having difficulty making a decision on how you should mark a candidate response contact your Team Leader for advice, or send the item to review.

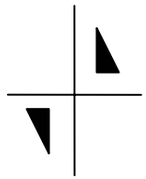
Paper 5521_01					
No		Working	Answer	Mark	Notes
1		Cat |||| /||| 8 Dog |||| | 6 Fish || 2 Hamster |||| 4	8, 6, 2, 4	3	M1 for attempt to tally or one frequency correct in either column A1 for 1 frequency correct or all tallies correct in correct column A1 for all frequencies correct (accept if /20)
2			27, 35, 42, 67, 118	1	B1 cao
3	(a)		Diameter drawn	1	B1 for a diameter
	(b)		Right angle marked	1	B1 *R* marked correctly
	(c)		Rectangle drawn	1	B1 for a rectangle
4	(a)		40	1	B1 cao
	(b)		50	1	B1 cao
	(c)		3 full loaves 4 full loaves + 1 half loaf	2	B1 for 3 full loaves B1 for 4 full loaves + 1 half loaf
5	(a)		7252	1	B1 cao
	(b)		Three thousand and eighty six	1	B1 accept 3 thousand and eighty six (condone 0 hundred)
	(c)		4600	1	B1 accept 4600
	(d)		200	1	B1 for 200 or 2 hundred or 100 or hundred
6	(i)		Cube	2	B1 for 'cube' (accept 'cuboid') ignore spelling
	(ii)		Cylinder		B1 for 'cylinder' ignore spelling
7		5×100	500	2	B2 for 490 or 500 or 510 (B1 for either 5 or 5.0 or 100 seen)

Paper 5521_01					
No		Working	Answer	Mark	Notes
8	(a)		8.4 cm or 84 mm	2	B2 allow ±2mm (B1 for 8.4 or 84, B1 for appropriate unit)
	(b)		37°	1	B1 allow ±2°
9	(a)		Carbon black	1	B1 accept 'black carbon' accept 26%
	(b)		0.1(0)	1	B1 cao
	(c)		0.04	1	B1 cao
	(d)	$\frac{26}{100}$	$\frac{13}{50}$	2	M1 for $\frac{26}{100}$ A1 cao
10	(a)		97	1	B1 cao
	(b)		London Reading	1	B1 cao
	(c)	41 + 57 + 58	156	3	M1 for two of 41, 57, 58 M1(dep) for '41' + '57' + '58' A1 cao
11	(a)		3	1	B1 cao allow ± 0.2
	(b)		–5	1	B1 cao allow ±0.2

Paper 5521_01					
No		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		Centimetres (cm) miles litres (*l*)	3	B3 (B1 for each correct answer) accept abbreviations
	(b)		300	1	B1 cao
	(c)	'1500>1400' or '1.5>1.4'	Reason	1	B1 for No and '1500>1400' or '1.5>1.4'
13	(a)	Height of bars 12, 8, 6 lines drawn between points	Bars drawn	2	B2 for 3 bars correctly drawn (B1 for 2 bars correct)
	(b)		July and August	1	B1 oe
	(c)	24 – 4	20	1	B1 (Accept '4 to 24' oe)
	(d)	The temperatures are rising	Temp's rising oe	1	B1 for reason
14	(a) (i)		$(-4, 3)$	2	B1 cao
	(ii)		$(2, -1)$		B1 cao
	(b) (i)	*D* marked at $(-4, -1)$	Point marked on grid	2	B1 for point marked at $(-4, -1)$ cao
	(ii)		$(-4, -1)$		B1 ft
15	(a)			1	B1 cao
	(b)			1	B1 cao

Paper 5521_01					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		(Pat +) reason	1	B1 correct comment (Pat may be implied)
	(b)	$21 \div 3$	7	1	B1 cao
17	(i)		S marked at 1	3	B1 for S within ½ cm of 1
	(ii)		P marked at 0		B1 for P marked at 0 cao
	(iii)		Q marked at "1/3"		B1 for Q marked at 1/3 ± 1 cm use overlay
18		$6 + 6 + 3$ or $2\frac{1}{2} \times 6$	15	3	M1 for realizing 6 glasses in one bottle M1 for realizing 3 glasses in ½ a bottle A1 cao (M2 for attempt to find $2\frac{1}{2} \times 6$) oe
19		15 and 16 parts shaded Alternative 1 $\frac{3}{4} = 0.75$, $\frac{4}{5} = 0.8$ Alternative 2 $\frac{3}{4} = \frac{15}{20}$, $\frac{4}{5} = \frac{16}{20}$	$\frac{4}{5}$ + reason	3	M1 for correctly shading 15 parts for 3/4 M1 for correctly shading 16 parts for 4/5 A1 (dependent on M2) for selection of 4/5 Alternative 1 M1 for $\frac{3}{4} = 0.75$ M1 for $\frac{4}{5} = 0.8$ A1 (dep on M2) for selection of 0.8 or $\frac{4}{5}$ or $\frac{16}{20}$ Alternative 2 M1 for $\frac{3}{4} = \frac{15}{20}$ M1 for $\frac{4}{5} = \frac{16}{20}$ A1(dep on M2) for selection of $\frac{4}{5}$ or $\frac{16}{20}$

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
20 (a)		−5 (−3) (−1) 1 3 5	2	B2 cao (B1 for any 2 or 3 correct)
(b)	Points plotted	Line	2	B2 for line from (−1, −5) to (4, 5) (B1 ft for plotting at least 5 "points")
21	Shapes shaded on grid	6 tessellating shapes	2	B2 for fully correct with 5 or more additional shapes, no gaps (B1 for 4 shapes tessellating with at least one shape inverted, with or without the given shape ignore extras)
22 (a)		$\frac{7}{20}$	1	B1 for $\frac{7}{20}$ oe
(b)	7 + 2 (or 20 – 11) are not lime flavour	$\frac{9}{20}$	1	B1 for $\frac{9}{20}$
(c)		0	1	B1 for 0, zero or nought ($\frac{0}{20}$ gets B0)
23 (a)		$4a$	1	B1 accept $4\times a$, $a \times 4$, $a4$
(b)		$12b$	1	B1 accept $12\times b$, $b \times 12$, $b12$
(c)		$2a + 6b$	2	B2 cao (B1 for $2a$ or $6b$ seen)
(d)		$x(x-6)$	2	B2 cao (B1 for $x(ax+b)$ where a, b are numbers not equal to 0 or $x - 6$ seen on its own, or as part of an expression)
24 (a)		40	1	B1 cao
(b)		45	1	B1 for 42 – 48 accept ¾ hour
(c)	40×2 or $\frac{40}{30}\times 60$ or $40\div\frac{1}{2}$	80	2	M1 for 40×2 or $\frac{40}{30}$ or $40\div\frac{1}{2}$ A1 cao NB $\frac{40}{45}\times 60$ gets M0 A0

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
25 (a)		4560	1	B1 cao
(b)		45.6	1	B1 cao
(c)		2.4	1	B1 cao
26	$-7 - 3 = -10$ $2 \times -10 = -20$ $-20 \div 4$	-5	3	M1 for substitution of 2 and -7 into $p(q - 3)$ or sight of -20 or $-14 - 6$ M1dep for '-20' $\div 4$ A1 cao B1 SC for sight of -10 if M0 awarded
27 (a)		Reflection in y-axis	1	B1 cao
(b)		Rotation by half turn about (0,0)	2	B2 cao (B1 for half turn not about (0,0).)
(c)		Enlargement Scale factor 3 Centre (0,0)	3	B1 for 'enlargement' B1 for "scale factor 3" or 3 seen B1 for 'centre (0,0)
28 (a)		Reason	1	B1 for 'The frequencies are nearly equal' oe
(b)	$1\times26+2\times26+3\times23+4\times25 = 247$ 247/100	2.47	3	M1 for fx (attempting at least 2 relevant products) M1 for $\sum fx \div 100$ A1 2.47 cao

Paper 5521_01				
No	**Working**	**Answer**	**Mark**	**Notes**
29	5 × 5 × 6	150	4	M1 for attempt at 1 division (e.g. 40 ÷ 8), may be implied by marks or number on one edge of diagram or by 5 or 6 seen M1 for attempt at 3 divisions (40÷8, 40÷8, 60÷10), may be implied by marks or numbers on diagram or by 5,5 and 6 seen. M1 (dep on 1st M1) for "5" × "5" × "6" A1 cao Alternatively M1 for 40 × 40 × 60 **or** 8 × 8 × 10 **or** 96000 or 640 seen M1 for 40 × 40 × 60 **and** 8 × 8 × 10 or 96000 **and** 640 seen M1 (dep on 1st M1) for "(40 × 40 × 60)" ÷ "(8 × 8 × 10)" A1 cao SC:B1 for dividing area of one carton face by area of corresponding box face if M0

Paper 5521_02					
No		Working	Answer	Mark	Notes
1	(a)	Draw diagram.	Diagram	1	B1 cao
	(b)		13,16	1	B1 cao
	(c)		31	1	B1 cao
2	(a)		8	1	B1 cao
	(b)		14	2	B2 for 14 (B1 for 13 or 15)
	(c)		16	2	B2 for 16 (B1 for 15, 17 or 8)
3	(a)		4,7 drawn	2	B2 for car height 4 and bus height 7, (B1 for one correct)
	(b)		6	1	B1 cao
	(c)		Walk	1	B1
	(d)		27	1	B1 cao
4	(a)		40	1	B1 for 40–41 inclusive
	(b)		12	1	B1 for 11.5 – 12.5 inclusive
5	(a)		Row complete	2	B2 for 1+..+11; 36 (B1 for one of the 2 cells complete)
	(b)		Square	1	B1 "square"
6		One line of symmetry		1	B1 within 2mm of centre of base / 2mm of vertex

Paper 5521_02				
No	**Working**	**Answer**	**Mark**	**Notes**
7 (a) (i)		09 06	2	B1 (accept 9 06 oe)
(ii)		39		B1 cao
(b)		06 55	1	B1 (accept 6 55 oe)
(c)		2h 6min	1	B1 cao
(d)		15 min	2	M1 for 0906 – 0645 – "(c)" or 0906 – 0645 − 2hr 6min or 2hr 21min − "(c)" or 2hr 21min − 2hr 6 min or 141 − 126 or 20 − 5 A1 cao SC: B1 for 55 or 75 or 93 seen
8 (i)		8,10,12,20 or 30	3	B1 at least one of 8, 10, 12, 20, 30 (no extras)
(ii)		8,12 or 20		B1 at least one of 8,12, 20 (no extras)
(iii)		3 or 5		B1 3 or 5 or both (no extras)
9 (a)		C or G	1	B1 at least one of C or G (no extras)
(b)		A and F	1	B1 cao
(c)		2	1	B1 (accept –2)
10 (a)		$\frac{7}{10}$	1	B1 7/10 oe
(b)(i)		4 squares	2	B1 4 squares shaded
(ii)		80%		B1 80% or ft from unshaded part (no ft from 0% or 100%)
(c)(i)		2.5	2	B1 2.4–2.6 inclusive
(ii)		1.7		B1 1.6–1.8 inclusive
11 (a)		2	1	B1 for 2 or –2
(b)		14	1	B1 for 14 or –14

Paper 5521_02					
No		**Working**	**Answer**	**Mark**	**Notes**
12		2 × 8.50 = 17.00 3 × 4.50 = 13.50 Total = 30.50 50.00 – 30.50	19.5(0)(*p*)	3	M1 for adding 5 correct values or 2 × 8.50 + 3 × 4.50 (ignore units) or 30.5(0) or 3050 seen M1 dep for 50 − "30.50" (ignore units) (OR M1for adding at least 1 adult ticket and at least 1 child ticket **and** subtracting from 50) A1 cao SC: B1 for 24 or 37 or 2400 or 3700 seen
13	(a)		Hexagon	1	B1
	(b)(i)		120	2	B1 cao
	(ii)		Str line		B1 reference to a (straight) line and 180°
	(c)		Obtuse	1	B1 Accept "interior"
14	(a)	2, 2, 3, 3, 3, 4, 4, 4, 5, 6	3.5	2	M1 ordering the numbers (condone 1 error or omission) A1 cao
	(b)	36 ÷ 10	3.6	2	M1 sum of numbers ÷ 10 A1 cao SC B1 for 3r 6
	(c)	6 – 2	4	1	B1 cao
15	(a)		Paul	1	B1 cao
	(b)	36 ÷ 2 oe	18	1	B1 cao
	(c)	60/360 =	1/6	2	M1 60/360 oe A1 cao

Paper 5521_02					
No		**Working**	**Answer**	**Mark**	**Notes**
16		4.7 ÷ 5.9 = 0.796610169	0.7966..	2	B2 for 0.7966 or better (B1 for 0.8, 0.80, 0.79, 0.796, 0.797 or digits 59 seen
17		$6x - 7 + 7 = 38 + 7$ $6x = 45$	7.5	2	M1 $6x = 45$ or +7 both sides A1 7.5 oe; accept 45/6 oe
18		**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	3	B3 all six entries correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
19	(a)	900 × 1.70 =	1530	2	M1 900 × 1.7(0) or digits 153(0) seen A1 cao
	(b)	160 ÷ 1.70 =	£94.12 or £94.11	2	M1 160 ÷ 1.7(0) or digits 941(....) seen A1 cao
20	(a)(i)	180 – 54 (=126) "126" ÷ 2	63	3	M1 for (180–54) ÷ 2 A1 cao
	(ii)		Reason		B1 (indep) angles in triangle add to 180 OR equal angles in isosceles triangle OR equal angles and 2 sides the same (B0 if any incorrect reasoning given eg parallel, equilateral triangle)
	(b)	180 – "x"	117	1	B1 117 or ft 180 – "x" if $x < 90$
21	(a)	3 × 35 + 50	155	2	M1 for 3 × 35 + 50 or digits 155 seen A1 cao
	(b)	260 – 50 = 210 210 ÷ 35 =	6	3	M1 for 260–50 or 210 seen. M1 for "260-50" ÷ 35 or 210÷35 A1 cao SC B1 for starting at a number between 100 and 170 and adding at least two 35's and showing a total between 230 and 290 OR For adding at least three 35's, perhaps with other numbers, and showing a total between 180 and 240 (or between 230 and 290 if 50 is included in the sum)

Paper 5521_02				
No	**Working**	**Answer**	**Mark**	**Notes**
(c)		P=35h + 50	3	B3 for P=35h+50 or P=35×h+50 oe (B2 for correct RHS or P=h + 50 ×35 or P=35h+k where k is numerical oe) (B1 for P = some other linear expression in h, OR h + 50 ×35 OR 35h seen) NB: P=h scores no marks; ignore £ signs. SC B2 for $h = \frac{P-50}{35}$
22 (a)		Elevation	2	B2 for 4 vertical squares. Accept 4 by 1 rectangle. (B1 for 4 vertical squares with one square added or one parallelogram added at the top, or 3 vertical squares, or 4 horizontal squares)
(b)		Plan	2	B2 for 2 adjacent squares, vertical or horizontal. Accept 2 by 1 rectangle. (B1 for 3 adjacent horizontal or vertical squares or a rectangle with sides in the ratio 2:1)
23 (i) (ii) (iii)		5 9 6	3	B1 cao B1 cao B1 cao
24	$45.00 + 45.00 \times \frac{15}{100} =$ $45.00 + 6.75 =$	51.75	3	M2 for $45.00 + 45.00 \times \frac{15}{100}$ oe or 45.00×1.15 oe OR $45.00 + 6.75$ OR complete method or 5175 seen. (M1 for $45.00 \times \frac{15}{100}$ oe OR 6.75 seen OR 675 seen OR correct method for calculating 15% of 45) A1 cao SC Award B2 for an answer of 38.25

Paper 5521_02				
No	**Working**	**Answer**	**Mark**	**Notes**
25 (a)		Points	1	B1 all three points ±1 full square
(b)		Negative	1	B1 Negative (ignore additional descriptors unless contradictory)
(c)		lobf	1	B1 A single straight line drawn to cross between (5,30), (5,40) and (40,0), (40,15); accept freehand if considered to be straight.
(d)(i)		18–25	2	B1 18g–25g inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient.
(ii)		30–40		B1 30–40 min inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient
26		300 3 75 150	3	B3 for 4 correct answers (B2 for 2 or 3 correct answers) (B1 for 1 correct answer)
27	π × 0.65	2.04–2.05	2	M1 for π × 0.65 or 3.14 x 0.65 or 3.142 x 0.65 A1 for 2.04–2.05 SC Award B1 for 2.0 seen (not 2)
28	5 miles = 8 km 70mph÷5×8 = 112 km/h OR 120km/h ÷ 8 × 5 = 75 mph Faster than 70 mph	70mph (Great Britain) (112 km)	3	M1 5 miles = 8 km; OR 70 mph is about 100 km/h OR 1km=0.6(25) miles OR 1mile=1.6km oe M1 70 ÷ 5 × 8 (=112) or 120 ÷ 8 × 5 (=75) A1 (dep on at least M1) GB or 70 mph Refer to both answer line and working. NB GB or 70 mph without working scores 0 marks

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
1		Cuboid drawn	2	B2 for correct isometric drawing in any orientation (ignore points 'behind', mark 7 vertices only); accept lines drawn near to dots as long as there is no ambiguity. (B1 for one of the three faces drawn correctly **or** for an isometric drawing of any cuboid)
2	Different makes of car Tally Frequency	Make of car Tally Frequency	3	B1 for make of car or list of at least 3 different makes B1 for tally or tally marks B1 for frequency or totals
3		6 tessellating shapes	2	B2 for fully correct with 5 or more additional shapes, no gaps (B1 for 4 or more shapes tessellating, with at least one shape inverted, with or without the given shape, ignore extras)
4	24.90 ÷ 3 or 8.30 24.90 – '8.30' or 2 × 8.30	16.6(0)	3	M1 for 24.90 ÷ 3 or 8.30 M1 (dep) for 24.90 – “8.30” or 2 × “8.30” A1 for 16.60 or 16.6

Paper 5523_03

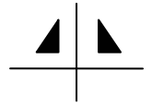
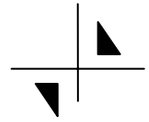
No	Working	Answer	Mark	Notes
5	315 × 24 24 × 315 1260 6300 7560 7200 7560 **3 1 5** 0 6 | 0 2 | 1 0 **2** 1 2 | 0 4 | 2 0 **4** 7 5 6 0 **300 10 5** 6000 200 100 **20** 1200 40 20 **4** 6000+200+100+1200+40+20 = 7560 **3 0.1 0.05** 60 2 1 **20** 12 0.4 0.2 **4** 60 + 2 + 1 + 12 + 0.4 + 0.2 = 75.6	75.6(0)	3	M1 for a complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. **OR** M1 for a complete grid with not more than 1 multiplication error, addition not necessary. **OR** M1 for sight of a complete partitioning method, condone 1 multiplication error, final addition not necessary. A1 for 7560 or digits 756(0) A1 (dep on M1, but not previous A1) for correct placement of decimal point.

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
6	15 and 16 parts shaded Alternative 1 $\frac{3}{4} = 0.75$ or 75%, $\frac{4}{5} = 0.8$ or 80% Alternative 2 $\frac{3}{4} = \frac{15}{20}$, $\frac{4}{5} = \frac{16}{20}$	$\frac{4}{5}$ + reason	3	M1 for shading 15 parts for $\frac{3}{4}$ M1 for shading 16 parts for $\frac{4}{5}$ A1 (dep on M2) for selection of $\frac{4}{5}$ with correct shading Alternative 1 M1 for $\frac{3}{4} = 0.75$ or 75% M1 for $\frac{4}{5} = 0.8$ or 80% A1 (dep on M2) for selection of 0.8 or 80% or $\frac{4}{5}$ with correct decimals or percentages Alternative 2 M1 for $\frac{3}{4} = \frac{15}{20}$ oe M1 for $\frac{4}{5} = \frac{16}{20}$ oe A1 (dep on M2) for selection of $\frac{4}{5}$ or $\frac{16}{20}$ with equivalent fractions

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
7		$5 \times 5 \times 6$	150	4	M1 for attempt at 1 division (e.g. $40 \div 8$), may be implied by marks or number on one edge of diagram or by 5 or 6 seen M1 for attempt at 3 divisions ($40 \div 8$, $40 \div 8$, $60 \div 10$), may be implied by marks or numbers on diagram or by 5,5 and 6 seen. M1 (dep on 1st M1) for "5" × "5" × "6" A1 cao Alternatively M1 for $40 \times 40 \times 60$ **or** $8 \times 8 \times 10$ **or** 96000 or 640 seen M1 for $40 \times 40 \times 60$ **and** $8 \times 8 \times 10$ or 96000 **and** 640 seen M1 (dep on 1st M1) for "$(40 \times 40 \times 60)$" ÷ "$(8 \times 8 \times 10)$" A1 cao SC:B1 for dividing area of one carton face by area of corresponding box face if M0
8	(a)		$\frac{7}{20}$	1	B1 for $\frac{7}{20}$ oe
	(b)	7 + 2 (or 20 – 11) are not lime flavour	$\frac{9}{20}$	1	B1 for $\frac{9}{20}$ oe
	(c)		0	1	B1 for 0, zero or nought ($\frac{0}{20}$ gets B0)
9	(a)		$80x$	1	B1 for $80x$ (accept $80 \times x$, $x80$, $x \times 80$) seen
	(b)		$95y$	1	B1 for $95y$ (accept $95 \times y$, $y95$, $y \times 95$) seen
	(c)		$80x + 95y$	2	M1ft for adding "$80x$" and "$95y$" (algebraic expressions only) A1 for $80x + 95y$

Paper 5523_03

No	Working	Answer	Mark	Notes
10 (a)		40	1	B1 cao
(b)		45	1	B1 for 42 to 48 (accept 3/4 hour)
(c)	40×2 or $\frac{40}{30}\times60$ or $40\div\frac{1}{2}$	80	2	M1 for 40×2 or $\frac{40}{30}$ or $40\div\frac{1}{2}$ A1 cao NB $\frac{40}{45}\times 60$ gets M0 A0
11 (a)	$3\times3-4\times2$ or $9-8$	1	2	M1 for substitution of 3 and 2 into expression or 9 and 8 seen A1 cao
(b)	$-7-3=-10$ $2\times-10=-20$ $-20\div4$	-5	3	M1 for substitution of 2 and -7 into $p(q-3)$ or sight of -20 or $-14-6$ M1 (dep) for "-20" $\div 4$ A1 cao SC: B1 for -10 seen if M0
12 (a)	6 | 8 9 7 7 | 8 5 9 6 3 8 | 1 3 1 7 1 9 | 0 1	6 | 7 8 9 7 | 3 5 6 8 9 8 | 1 1 1 3 7 9 | 0 1	3	M1 for unordered diagram (condone one error) A1 cao B1 for key (eg 6 | 7 = 67)
(b)(i)		Explanation	2	B1 for '(order numbers and) select middle value' oe
(ii)		79		B1 cao

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		Reflection in y-axis	1	B1 for triangle with vertices at (-1, 1) (-3, 1) and (-1,4)
	(b)		Rotation by half turn about (0, 0)	2	B2 for triangle with vertices (-1, -1) (-3, -1) and (-1, -4) (B1 for half turn not about (0,0))
	(c)		Enlargement Scale factor 3 Centre (0, 0)	3	B1 for 'enlargement' B1 for 'scale factor 3' or 3 seen B1 for 'centre (0,0)' B0 for any combination of transformations
14	(a)		4560	1	B1 cao
	(b)		45.6	1	B1 cao
	(c)		2.4	1	B1 cao
15	(a)	$4a-2a+5b+b$	$2a+6b$	2	B2 cao (B1 for $2a$ or $6b$ seen)
	(b)		$x(x-6)$	2	B2 cao (B1 for $x(ax+b)$ where a, b are numbers not equal to zero or $x-6$ seen on its own, or part of an expression)
	(c)		$3x-2x^3$	2	B2 cao (B1 for $3x$ or $2x^3$)
	(d)		$4x(3y+x)$	2	B2 cao (B1 for $2(6xy+2x^2)$ or $4(3xy+x^2)$ or $x(12y+4x)$ or $2x(6y+2x)$ or $4x(\quad)$)

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$1 - (0.2 + 0.3 + 0.1)$	0.4	2	M1 for $1 - (0.2 + 0.3 + 0.1)$ A1 for 0.4 oe, accept $\frac{0.4}{1}$
	(b)	0.2×200	40	2	M1 for 0.2×200 A1 cao NB $\frac{40}{200}$ is M1 A0, 40 out of 200 is M1 A1
17	(a) (i)	$180 - 2 \times 25$	130	3	M1 for $180 - 2 \times 25$ A1 cao
	(ii)		Reason		B1 for mentioning isosceles and equal (or base) angles or equal sides and equal (or base) angles
	(b)	$180 - 95$	85	1	B1 cao
18	(a) (i)		7^5	3	B1 cao
	(ii)		7^4		B2 cao (B1 for sight of 7^5 or 7^{2+3} or 7×7^3 or $7^1 \times 7^3$ or $7^2 \times 7^2$ or 7^{2+3-1})
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ or 0.5 or 2^{-1}
19	(a)		3×10^7	1	B1 cao
	(b)		0.002	1	B1 cao

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
20			Box plot	2	3 aspects: 1st aspect – vertical line for median 2nd aspect – box using correct quartiles 3rd aspect – whiskers (could be single line) drawn with correct end points B2 for fully correct box plot (B1 for 1 aspect)
21	(a)	e.g. 2 | 126 3 | 63 3 | 21 7	$2\times3\times3\times7$	2	M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line. A1 for $2\times3^2\times7$ or $2\times3\times3\times7$
	(b)	$2\times3\times7$	42	2	B2 cao (B1 for 6, 14, 21 or $2\times3\times7$)
22		$\frac{8}{3}\times\frac{5}{4}=\frac{8\times5}{3\times4}=\frac{40}{12}$	$3\frac{1}{3}$	3	B1 for $\frac{8}{3}$ oe improper fraction or $\frac{5}{4}$ oe improper fraction M1 (dep on B1) for multiplying numerator and denominator of "$\frac{8}{3}$" and "$\frac{5}{4}$" A1 for $3\frac{1}{3}$ oe mixed number or $\frac{10}{3}$ OR B1 for 1.25 and 2.67 or 2.66(…) M1 (dep on B1) for correct method of multiplication A1 for $3.\dot{3}$

Paper 5523_03				
No	**Working**	**Answer**	**Mark**	**Notes**
23			2	M1 for a relevant pair of intersecting arcs A1 for line drawn within guidelines, at least 3cm in length, accept broken line [SC: B1 for line drawn within guidelines if M0]
24 (a)		$-1, 0, 1, 2, 3$	2	B2 cao (-1 each error or omission)
(b)(i)		$x \geq \frac{7}{2}$	3	M1 for $2x \geq 7$, condone use of = sign or wrong equality A1 for $x \geq \frac{7}{2}$ oe as final answer
(ii)		4		SC:B1 for 3.5 or $\frac{7}{2}$ seen if M0 B1 ft from $x \geq$ "$\frac{7}{2}$"
25	$4x + 2y = 8$ $4x - 10y = 20$ $12y = -12$ $y = -1$ $4x + 2(-1) = 8$ $x = 2.5$	$x = 2.5$ $y = -1$	3	M1 for correct process to eliminate either x or y (condone one arithmetical error) M1 (dep) for substituting found value into either equation A1 for $x = 2.5$, $y = -1$ [SC: B1 for $x = 2.5$ or $y = -1$ if M0]

Paper 5523_03					
No		**Working**	**Answer**	**Mark**	**Notes**
26		Interior angle of hexagon = 180 – (360 ÷ 6) = 120 360 – (90 + 120)	150	4	Alternative 1 M1 for 360 ÷ 6 A1 for 60 M1 (dep on M1) for "60" + 90 A1 cao Alternative 2 M1 for 360 ÷ 6 A1 for 60 M1 (dep on M1) for 360 – (2 × "60" + 90) A1 cao Alternative 3 M1 for (6 – 2) × 180 ÷ 6 A1 for 120 M1 (dep on M1) for 360 – (90 + "120") A1 cao
27	(a)		(16), 50, 82, 96, 100	1	B1 cao
	(b)	Cumulative freq. diag. curve/ segments	Cum. freq graph	2	B1 for 4 or 5 points plotted correctly ± 1 full (2mm) square depending on sensible table (condone 1 addition error) B1 (dep) for points joined by curve or line segments provided no gradient is negative - ignore any part of graph outside range of their points. (SC:B1 if 4 or 5 points plotted not at end but consistent within each interval and joined)
	(c)	100 – 42	58	2	M1 (ft dep on graph being cf) for reading from graph at 18 or 19, can be implied by answer in range 40 to 46 A1 for answer in range 56 to 60 or ft for 100 – '42' ±1 full (2mm) square

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	900 × 1.70 =	1530	2	M1 900 × 1.7(0) or digits 153(0) seen A1 cao
	(b)	160 ÷ 1.70 =	£94.12 or £94.11	2	M1 160 ÷ 1.7(0) or digits 941(....) seen A1 cao
2	(a)	4.7 ÷ 5.9 = 0.796610169	0.7966..	2	B2 for 0.7966 or better (B1 for 0.8, 0.80, 0.79, 0.796, 0.797 or digits 59 seen)
	(b)	0.82, 0.8, 0.85, 0.66, 0.875 0.66, 0.8, 0.82, 0.85, 0.875 2/3, 4/5, 0.82, 85%, 7/8	2/3, 4/5, 0.82, 85%, 7/8	2	B2 correct order (oe decimals in order) (B1 correct order reversed, or one error in ordered listing) with or without decimal equivalents. NB Accept 0.67 or 0.66
3		**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	**55** 61 74 **190** 33 **17** **10** 60 **88** **78** 84 250	3	B3 all 6 correct (B2 for 4 or 5 entries correct) (B1 for 2 or 3 entries correct)
4	(a)	–3 (–1) (1) 3 5 7	**–3**, 3, **5**, **7**	2	B2 all correct (B1 2,3 correct)
	(b)	(-2,-3),(-1,-1),(0,1),(1,3),(2,5),(3,7)	line	2	B2 cao for line from $x = -2$ to $x = 3$ (B1 plotting at least 5 points correctly or single line passing through (0, 1) or single line of gradient 2) The six possible points are: (-2,-3), (-1,-1), (0,1), (1,3), (2,5), (3,7)
	(c)(i)		–2	2	B1 $y = -2$ or ft from line segment
	(ii)		2.5		B1 $x = 2.5$ or ft from line segment

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
5	(a) (i)	180 – 54 (=126) "126" ÷ 2	63	3	M1 for (180–54) ÷ 2 A1 cao
	(ii)		Reason		B1 (indep) angles in triangle add to 180 OR equal angles in isosceles triangle OR equal angles and 2 sides the same (B0 if any incorrect reasoning given eg parallel, equilateral triangle)
	(b)	180 – "x"	117	1	B1 117 or ft 180 – "x" if $x < 90$
6		15/120×360 = 45 Plain 40/120×360 = 120 Cheese & Onion 55/120×360 = 165 Salt & Vinegar 10/120 × 360 = 30 Beef	45°, 120°, 165°, 30°	4	M1 evidence of method for at least one angle (could be implied by one correct angle of four on pie chart or in the table) A2 All four angles drawn ±2° tolerance, any order (A1 at least 2 angles correctly drawn ±2°, or all 4 angles in the table) B1 (dep on at least 1 angle drawn correctly, and exactly 4 sectors) for labels (flavour or frequency; initials will do) NB: Ignore the table if the pie chart provides the marks.
7	(a)	260 – 50 = 210 210 ÷ 35 =	6	3	M1 for 260–50 or 210 seen. M1 for "260-50" ÷ 35 or 210÷35 A1 cao
	(b)		P=35h + 50	3	B3 for P=35h+50 or P=35×h+50 oe (B2 for correct RHS or P=h + 50 ×35 or P=35h+k where k is numerical oe) (B1 for P = some other linear expression in h, OR h + 50 ×35 OR 35h seen) NB: P=h scores no marks; ignore £ signs. SC B2 for $h = \frac{P-50}{35}$
8	(a)		Elevation	2	B2 for 4 vertical squares. Accept 4 by 1 rectangle. (B1 for 4 vertical squares with one square added or one parallelogram added at the top, or 3 vertical squares, or 4 horizontal squares)

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
(b)		Plan	2	B2 for 2 adjacent squares, vertical or horizontal. Accept 2 by 1 rectangle. (B1 for 3 adjacent horizontal or vertical squares or a rectangle with sides in the ratio 2:1)
9 (a)		Points	1	B1 all three points ±1 full square.
(b)		Negative	1	B1 Negative. Ignore other descriptors unless contradictory.
(c)		lobf	1	B1 A single straight line drawn to cross between (5,30), (5,40) and (40,0), (40,15); accept freehand if considered to be straight.
(d)(i) (ii)		18–25 30–40	2	B1 18g–25g inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient. B1 30–40 min inclusive OR if not in this range ft ±1 square dep on single straight line with negative gradient.
10		300, 3, 75, 150	3	B3 for 4 correct (B2 for 2 or 3 correct) (B1 for 1 correct)
11 (a)	$6x - 7 + 7 = 38 + 7$ $6x = 45$	7.5	2	M1 $6x = 45$ or +7 both sides A1 7.5 oe; accept 45/6
(b)	$5y - 2 = 10$ or $20y - 8 = 40$ $5y = 12$ $20y = 48$	$2\frac{2}{5}$	3	M1 $20y–8(=40)$ or $\frac{4(5y-2)}{4} = \frac{40}{4}$ or $5y–2=10$ M1 (indep) for correct rearrangement into the form $ay=b+c$ or better (eg $20y=40+8$ or $5y=10+2$, using own terms) A1 for $2\frac{2}{5}$, 2.4 oe
12	5 miles = 8 km 70mph÷5×8 = 122 km/h OR 120km/h ÷ 8 × 8 = 75 mph Faster than 70 mph	70mph (Great Britain) (112 km)	3	M1 5 miles = 8 km; OR 70 mph is about 100 km/h OR 1km=0.6(25) miles OR 1mile=1.6km oe M1 70 ÷ 5 × 8 (=112) or 120 ÷ 8 × 5 (=75) oe A1 (dep on at least M1) GB or 70 mph Refer to both answer line and working. NB GB or 70 mph without working scores 0 marks.

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
13 (a)	$\pi \times 0.65$	2.04–2.05	2	M1 for $\pi \times 0.65$ or 3.14×0.65 or 3.142×0.65 oe A1 2.04–2.05 SC Award B1 for 2.0 seen (not 2)
(b)	1000 ÷ "(a)"	487–491	2	M1 for 1000 (or 100) ÷ "(a)" A1 for 487–491
14	$45.00 + 45.00 \times \frac{15}{100} =$ $45.00 + 6.75 =$	51.75	3	M2 for $45.00 + 45.00 \times \frac{15}{100}$ oe or 45.00×1.15 oe OR $45.00 + 6.75$ OR complete method or 5175 seen. (M1 for $45.00 \times \frac{15}{100}$ oe OR 6.75 seen OR 675 seen OR correct method for calculating 15% of 45) A1 cao SC Award B2 for an answer of 38.25
15		273	2	M1 for 728 ÷ 8 or 728 ÷ "3+5" or 91 A1 cao SC B1 for 455, or for 273:455
16	3 24 3.7 46.9(53) 4 60 3.8 51.0(72) 3.1 26.6(91) 3.9 55.4(19) 3.2 29.5(68) 3.21 29.8(66…) 3.3 32.6(37) 3.22 30.1(66…) 3.4 35.9(04) 3.23 30.4(68..) 3.5 39.3(75) 3.24 30.7(72...) 3.6 43.0(56) 3.25 31.0(78...) or 31	3.2	4	B2 for trial between 3.2 and 3.3 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.21 and 3.25 inclusive B1 (dep on at least one previous B1) cao for 3.2 as final answer. NB: embedded answers: –B1; award Bs for evaluations rounded or truncated to at least 1 dp or for 31

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
17	$45^2 + 34^2 =$ $2025 + 1156 = 3181$ $\sqrt{3181} = 56.4$	56	4	M1 for $45^2 + 34^2$ M1 (dep) for $\sqrt{(2025 + 1156)}$ A1 for 56.4 … B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal) NB 56 as the final answer gets full marks. NB Scale drawings result in 0 marks.
18	$2000 \times (1.055)^3$ Interest = 2348.48 – 2000 =	348.48	3	M1 for 5.5/100 × 2000 (oe) or 330 or 2330 or 110 or 2110 M1 (dep) for 5.5/100 × (2000 + "110" + "116.05") or 122.4… seen A1 cao (accept only 348.48 or 348.49) **OR** M2 for $2000 \times (1.055)^3$ or 2348.48(…) or 2348.49 seen (M1 for $2000 \times (1.055)^n$, $n \neq 3$) A1 for 348.48 or 348.49 [SC: B2 for 2348.48 - 2348.49]
19		Line	2	B2 line fully within tramlines, crossing AB and CD (B1 a straight line which crosses AB within the tramline, and also crosses CD) NB: Accept dotted or dashed lines, but not curves; accept freehand if considered to be straight. SC B1 for a perpendicular bisector of AB that is at least half way from AB to CD within the tramlines
20 (a)		$90<t\leq100$	1	B1 for $90<t\leq100$; accept 90-100.
(b)	65×12=780 75×22=1650 85×23=1955 95×24=2280 105×19=1995 8660/100=	86.6	4	M1 for use of fx with x consistent within intervals (including end points). Allow one slip. M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\sum fx/100$ or $\sum fx/\sum f$ A1 86.6

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
21	(a)	$8 \times \frac{10}{4}$	20	2	M1 $\frac{10}{4}$ or $\frac{4}{10}$ or 0.4 or 2.5 oe seen A1 cao NB ratios get M0 unless of the form 1:*n* OR M1 $\frac{8}{4}, \frac{4}{8}$ oe seen A1 cao
	(b)	$15 \times \frac{4}{10}$	6	2	M1 $15 \times \frac{4}{10}$ oe A1 cao
22	(a)	$x^2 - 4x + 3x - 12 = x^2 - x - 12$	$x^2 - x - 12$	2	M1 for exactly 4 terms correct ignoring signs (eg x^2, $4x$, $3x$, 12) or 3 correct terms out of 4 terms with correct signs (eg 3 out of 4 of x^2, $-4x$, $+3x$, -12) A1 cao
	(b)	$(x+2)(x+5)$	$(x+2)(x+5)$	2	B2 cao (B1 for exactly one of $(x+2)$, $(x+5)$)
	(c)	$6=15+4q-20$ $6-15=4(q-5)$ $p-3t=4q-4t$ $6-3\times5=4(q-5)$	2 ¾	3	M1 for correct substitution of *p* and *t*. M1 for correct expansion of $4(q-t)$ oe (eg $4q-20$, $4q-4t$) A1 11/4 or 2 ¾ or 2.75 OR M1 for correct substitution of *p* and *t*. M1 for $\frac{p-3t}{4} = q - t$ oe A1 11/4 or 2 ¾ or 2.75

Paper 5523_04					
No		**Working**	**Answer**	**Mark**	**Notes**
23	(a)	$9.9\times10^8 - 6.0\times10^7$	9.3×10^8	2	M1 for $99\times10^7 - 6\times10^7$ or $9.9\times10^8 - 0.6\times10^8$ or conversion of either to an ordinary number, or 930000000 or 93×10^7 or 9.3×10^n where n is any positive integer A1 cao
	(b)	$\frac{6.0-4.5}{4.5}\times100 = \frac{1.5}{4.5}\times100 =$ or $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}\times100$	33.3%	3	M2 $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}\times100$ oe (M1 for $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}$ or $\frac{6.0\times10^7 - 4.5\times10^7}{6.0\times10^7}\times100$ oe A1 cao OR M2 $\frac{6.0\times10^7}{4.5\times10^7}\times100$ -100 = (M1 $\frac{6.0\times10^7}{4.5\times10^7}\times100$ or 133.33(%)) A1 cao NB Accept any of the above expressions without any reference to 10^7.
24		LCM (40,24) = 120 Bread buns 120÷40 Burgers 120÷24 OR Bread buns: 40 is $2\times2\times2$ (×5) Burgers: 24 is $2\times2\times2$ (×3)	Bread buns 3 Burgers 5	3	M1 attempt to find LCM by eg lists of multiples, or summing of 40 and 24. A1 identify 120 (as LCM) A1 cao (both) OR M1 expansion of either number into its prime factors in a factor tree or 8×5 or 8×3 A1 both expansions correct A1 cao (both) SC B2 if answers given the wrong way around

Paper 5523_04				
No	**Working**	**Answer**	**Mark**	**Notes**
25	8 × 41 = 328 2 × 29 = 58 328 – 58 = 270 270 ÷ 6 = 45	45	3	M1 for either 8 × 41 (=328) or 2 × 29 (=58) M1 (dep) "328" – "58" (=270) A1 cao NB 328 and/or 58 on the answer line gets M1 (implied); 270 on the answer line gets M2 (implied)

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
1 (a)	1 – (0.2 + 0.3 + 0.1)	0.4	2	M1 for 1 – (0.2 + 0.3 + 0.1) A1 for 0.4 oe, accept $\frac{0.4}{1}$
(b)	0.2 × 200	40	2	M1 for 0.2 × 200 A1 cao NB $\frac{40}{200}$ is M1 A0, 40 out of 200 is M1 A1
2	650 – 430 = 220 1 choc ice costs 110p 650 – 5 × 110 = 100p	50	3	M1 for 650 – 430 or 220 or 110 oe seen M1 for $650 - 5 \times \frac{'220'}{2}$ or $430 - 3 \times \frac{'220'}{2}$ oe A1 for 50p or £0.50 or £0.5 *Alternative scheme* $2x + 5y = 650$ $2x + 3y = 430$ oe M1 for subtracting two simultaneous equations to eliminate x (lollies)(2 or 3 terms correct) M1 for 650 – 5 × 'y' or 430 – 3 × 'y' oe A1 for 50p or £0.50 or £0.5 *Alternative scheme* M1 for 3× ($2x + 5y = 650$) evaluated and 5 × ($2x + 3y = 430$) evaluated oe (5 or 6 terms correct) M1 for subtraction of equations to eliminate y (choc ices)(2 or 3 terms correct ft) A1 for 50p or £0.50 or £0.5

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
3		question + response boxes oe	2	1st aspect: One question (eg 'how long does it take you to travel to school?' or 'What time did you leave home to get to school?'); ignore other questions. 2nd aspect: Response list (at least two), not overlapping. 3rd aspect: Some mention of units (eg minutes) in either question or responses B2 for all three aspects, or B1 for just one aspects.
4	2 [(3×1) + (4×1)] + (3×6) + (1×6) + (2×6) + (4×6) + (1×6) + (5×6)	110 cm^2	4	M1 for attempt to find the area of one face M1 for at least 6 faces with intention to add A1 cao B1 (indep) for cm^2 (with or without numerical answer)
5	$\left(\frac{-6+4}{2}\right), \left(\frac{5+3}{2}\right)$	(–1, 4)	2	B2 cao [B1 for (–1,*a*) or (b,4) or (4,-1)]
6		Box plot	2	3 aspects: 1st aspect – vertical line for median 2nd aspect – box using correct quartiles 3rd aspect – whiskers (could be single line) drawn with correct end points B2 for fully correct box plot (B1 for 1 aspect)
7			2	M1 for a relevant pair of intersecting arcs A1 for line drawn within guidelines, at least 3cm in length, accept broken line [SC: B1 for line drawn within guidelines if M0]

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
8	(a)	e.g. 2 | 126 3 | 63 3 | 21 7	$2\times3\times3\times7$	2	M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line. A1 for $2\times3^2\times7$ or $2\times3\times3\times7$
	(b)	$2\times3\times7$	42	2	B2 cao (B1 for 6, 14, 21 or $2\times3\times7$)
9	(a)		$-1,0,1,2,3$	2	B2 cao (-1 each error or omission)
	(b)(i)		$x\geq\frac{7}{2}$	3	M1 for $2x\geq7$, condone use of = sign or wrong equality A1 for $x\geq\frac{7}{2}$ oe as final answer
	(ii)		4		SC:B1 for 3.5 or $\frac{7}{2}$ seen if M0 B1 ft from $x\geq$ "$\frac{7}{2}$" or $x>$"$\frac{7}{2}$"
10	(a)(i)		7^5	3	B1 cao
	(ii)		7^4		B2 cao (B1 for sight of 7^5 or 7^{2+3} or 7×7^3 or $7^1\times7^3$ or $7^2\times7^2$ or 7^{2+3-1})
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ or 0.5 or 2^{-1}
11	(a)	$5n=m+21$	$n=\frac{m+21}{5}$	2	M1 for $5n=m+21$ or for attempt to divide three terms by 5 A1 $n=\frac{m+21}{5}$ oe

Paper 5525_05				
No	**Working**	**Answer**	**Mark**	**Notes**
(b)	$4p-8q=3p+2$ $p-8q=2$ $p=8q+2$	$p=8q+2$	3	M1 for $4p-aq$ or $\frac{3}{4}p+b$ where a is an integer and b is a number M1 (dep) for taking one term correctly to LHS or RHS of expression A1 $p=8q+2$ oe
12		$y=\frac{1}{2}x+3$	2	B2 for $y = ½x + 3$ oe (B1 for $y = ½x + c$, $c \neq 7$ or $y = mx + 3$ oe or $½x + 3$ or $M = ½x + 3$)
13	$\frac{8}{3}\times\frac{5}{4}=\frac{8\times5}{3\times4}=\frac{40}{12}$	$3\frac{1}{3}$	3	B1 for $\frac{8}{3}$ oe or $\frac{5}{4}$ oe M1 (dep on B1) for multiplying numerator and denominator of "$\frac{8}{3}$" and "$\frac{5}{4}$" A1 for $3\frac{1}{3}$ oe mixed number or $\frac{10}{3}$ *OR* B1 for 1.25 and 2.67 or 2.66(…) M1(dep on B1) for correct method of multiplication A1 for $3.\dot{3}$
14	$4x+2y=8$ $4x-10y=20$ $12y=-12$ $y=-1$ $4x+2(-1)=8$ $x=2.5$	$x=2.5$ $y=-1$	3	M1 for correct process to eliminate either x or y (condone one arithmetical error) M1 (dep) for substituting found value into either equation A1 for $x = 2.5$, $y = -1$ [SC: B1 for $x = 2.5$ or $y = -1$ if M0]

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
15		Interior angle of hexagon = 180 – (360 ÷ 6) = 120 360 – (90 + 120)	150	4	Alternative 1 M1 for 360 ÷ 6 A1 for 60 M1 (dep on M1) for "60" + 90 A1 cao Alternative 2 M1 for 360 ÷ 6 A1 for 60 M1(dep on M1) for 360 – (2 × "60" + 90) A1 cao Alternative 3 M1 for (6 – 2) × 180 ÷ 6 A1 for 120 M1(dep on M1) for 360 – (90 + "120") A1 cao
16	(a)		(16), 50, 82, 96, 100	1	B1 cao
	(b)	Cumulative freq. diag. curve/ segments	Cum. freq graph	2	B1 ft for 4 or 5 points plotted correctly ± 1 full (2mm) square depending on sensible table (condone 1 addition error) B1 (dep) for points joined by curve or line segments provided no gradient is negative - ignore any part of graph outside range of their points. (SC:B1 if 4 or 5 points plotted not at end but consistent within each interval and joined)

Paper 5525_05					
No		Working	Answer	Mark	Notes
	(c)	$100 - 42$	58	2	M1 (ft dep on graph being cf) for reading from graph at 18 or 19, can be implied by answer in range 40 to 46 A1 for answer in range 56 to 60 or ft for 100 –'42' ±1 full (2mm) square
17	(a)		0.6 and 0.7,0.3,0.7	2	B1 for 0.6 on LH branch B1 for 0.7, 0.3 and 0.7 on RH branches
	(b)	0.4×0.3	0.12	2	M1 for 0.4×0.3 A1 0.12 oe
	(c)	$0.4\times0.7+0.6\times0.3$	0.46	3	M1 for '0.4×0.7' or '0.6×0.3' M1 for addition of two products from correct branches A1 0.46 oe Alternative M2 for an attempt to evaluate 1-(0.3×0.4 +'0.6×0.7') A1 cao
18		$x = 0.4545...$ so $100x = 45.4545...$ $99x = 45$ $x = \frac{45}{99} = \frac{15}{33}$	proof	3	M1 for $100x = 45.45\ldots$ or $10000x = 4545.45\ldots$ M1 (dep) for subtraction of both sides A1 for $\frac{15}{33}$ from correct proof
19		$\left(\sqrt{3}\right)^2 + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{2} - \left(\sqrt{2}\right)^2$ $= 3 - 2$	1	2	B2 cao (B1 for $\sqrt{3}\sqrt{3} + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{2} - \sqrt{2}\sqrt{2}$ oe, $\sqrt{3}\sqrt{3} - \sqrt{2}\sqrt{2}$ oe, or for 2,3, $\sqrt{4}$ $\sqrt{6}$ $\sqrt{9}$ seen)
20	(a)	$\frac{96}{24}$ or 4 $\sqrt{4}$ or 2	8	3	M1 for $\frac{96}{24}$ or $\frac{24}{96}$ or 4 or $\frac{1}{4}$ oe M1 for $\sqrt{\frac{96}{24}}$ or $\sqrt{\frac{24}{96}}$ or $\sqrt{'4'}$ or $\frac{1}{\sqrt{'4'}}$ or 2 or $\frac{1}{2}$ oe A1 cao

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
	(b)	12×2^3	96	2	M1 for '2'^{3} or 8 A1 cao
21	(a)	$x\times3-x\times2x^2$	$3x-2x^3$	2	B2 cao (B1 for a two term expression with either $3x$ or $2x^3$)
	(b)		$4x(3y+x)$	2	M1 for taking out a factor of x, $2x$, 2, 4 or $4x$ A1 cao
	(c)	$\frac{5a}{b^2}$	$\frac{5a}{b^2}$	2	B2 for $\frac{5a}{b^2}$ or $5ab^{-2}$ (accept $\frac{5a}{1b^2}$) (B1 for either dealing with the numbers or dealing with the powers of a)
	(d)	$\frac{\cancel{x-3}}{\cancel{(x-3)}(x+3)}$	$\frac{1}{x+3}$	2	M1 for $(x-3)(x+3)$ A1 cao
22	(a)		**a** + **b**	1	B1 **a** + **b** oe
	(b)	ED = **a** DX = –2**b** + 2 AC = 2**a** (So, DX = 2ED)	2**a**	3	M1 for (DX=) DA + AX A1 for (DX=) –2***b*** + 2 ("***a*** + ***b***") A1 2***a*** from fully correct proof
23		$\pi(2x)^2h=\frac{4}{3}\pi(3x)^3$ $h=\frac{\frac{4}{3}\pi(3x)^3}{\pi(2x)^2}$	$9x$	3	M1 for $\pi(2x)^2h=\frac{4}{3}\pi(3x)^3$ (condone absence of brackets) M1 (dep) for valid algebra that gets to $h=ax$ (condone one error in powers of numerical constants) A1 cao

Paper 5525_05					
No		**Working**	**Answer**	**Mark**	**Notes**
24	(i)	$n^2+(n+1)^2=2(n^2+n)+1$	$2n^2+2n+1$	4	M1 for at least 3 terms correct from $n^2+n+n+1$ A1 for $2n^2+2n+1$ oe
	(ii)		$2(n^2+n)$ is always even so $2(n^2+n)+1$ is always odd		M1 for recognizing $2n^2$ is always even A1ft complete proof for their quadratic *Alternative method* M1 for recognizing that if n^2 is odd then $(n+1)^2$ is even or vice versa A1 for complete proof
25			42 318	2	B1 for answer in range 36 – 48 B1 for answer in range 312 – 324
26	(a)	$(x-3)^2-3^2+15$	$p=3, q=6$	2	B2 for $p=3$ and $q=6$ (B1 for $p=3$ OR $q=6$) SC: award B2 for $(x-3)^2+6$ if p and q are not identified
	(b)		Sketch	2	B1 for U shaped curve B1 ft for TP in first quadrant (ft if TP not in first quadrant)
27	(a)	Graph translated 2 units upwards through points (–4, 2), (–2, 4), (0,2) and (3,5)	Sketch	2	M1 for a vertical translation A1 curve through points (–4, 2), (–2, 4), (0,2) and (3,5) ± ½ square
	(b)	Graph reflected in x-axis through points (–4,0), (–2, –2), (0, 0) and (3, -3)	Sketch	2	M1 for reflection in x-axis or y-axis A1 curve through points (–4,0), (–2, –2), (0, 0) and (3, -3) ± ½ square

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
1		273	2	M1 for 728 ÷ 8 or 728 ÷ "3+5" or 91 A1 cao SC B1 for 455 or 273:455
2		$3n - 1$	2	B2 for $3n - 1$ oe (B1 for $3n + k$ where $k \neq -1$ but k could be 0)
3	3 24 3.7 46.9(53) 4 60 3.8 51.0(72) 3.1 26.6(91) 3.9 55.4(19) 3.2 29.5(68) 3.21 29.8(66…) 3.3 32.6(37) 3.22 30.1(66…) 3.4 35.9(04) 3.23 30.4(68..) 3.5 39.3(75) 3.24 30.7(72...) 3.6 43.0(56) 3.25 31.0(78...) or 31	3.2	4	B2 for trial between 3.2 and 3.3 inclusive (B1 for trial between 3 and 4 inclusive) B1 for different trial between 3.21 and 3.25 inclusive B1 (dep on at least one previous B1) cao for 3.2 NB: embedded answers: –B1; award Bs for evaluations rounded or truncated to at least 1 dp or for 31
4	2 is the only even prime number and the product of 2 odd numbers is odd	Yes	2	B2 for 'yes' and '2 is the only even prime number and the product of two odd numbers is odd' oe (B1 for 'yes' and either '2 is the only even prime number' oe **or** 'the product of two odd numbers is odd' oe)
5	$45^2 + 34^2 =$ $2025 + 1156 = 3181$ $\sqrt{3181} = 56.4$	56	4	M1 for $45^2 + 34^2$ M1 for $\sqrt{(2025 + 1156)}$ A1 for 56.4 … B1 for rounding their diagonal to the nearest integer (dep on evidence from decimal) NB 56 with no incorrect working as the final answer gets full marks. NB Scale drawings result in 0 marks.

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
6	2000 × $(1.055)^3$ Interest = 2348.48 – 2000 =	£348.48	3	M1 for 5.5/100 × 2000 (oe) or 330 or 16.5/100×2000 or 2330 or 110 or 2110 M1 (dep) for 5.5/100 × (2000 + "110" + "116.05") or 122.4… seen A1 cao (accept only 348.48 or 348.49) **OR** M2 for 2000 × $(1.055)^3$ or 2348.48(…) or 2348.49 seen (M1 for 2000 × $(1.055)^n$, $n \neq 3$) A1 for 348.48 or 348.49 [SC: B2 for 2348.48 - 2348.49]
7 (a)		Line	2	B2 line fully within tramlines, crossing AB and CD (B1 a straight line which crosses AB within the tramline, and also crosses CD) NB: Accept dotted or dashed lines, but not curves; accept freehand if considered to be straight. SC B1 for the perpendicular bisector of *AB* reaching halfway or more from *AB*
(b)		Region		B2 correct arc ±2mm and shaded within. Allow dotty or continous arc. (B1 inaccurate arc and shaded or accurate arc unshaded)
8	65×12=780 75×22=1650 85×23=1955 95×24=2280 105×19=1995 8660/100=	86.6	4	M1 for use of fx with x consistent within intervals (including end points). Allow one slip even if outside interval M1 (dep) for use of midpoints M1 (dep on 1st M1) for use of $\sum fx/100$ or $\sum fx/\sum f$ A1 86.6

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
9		Distance ÷ time: 1400 ÷ 2 h 20 min 20 mins is $\frac{1}{3}$ hour 1400 × 3 ÷ 7 =	600 kph	3	B1 20 mins as $\frac{1}{3}$ hour or as 0.33……hour M1 for distance ÷ time eg 1400 ÷ "2h 20 min" A1 cao OR B1 2 hour 20min = 140 (min) M1 Speed = $\frac{1400}{140}$ = (10 km per minute) A1 cao
10	(a)	$(x+18)+2x+(2x+7)=180$	Equation	2	B2 for $(x+18)+2x+(2x+7)=180$ oe (B1 for $(x+18)+2x+(2x+7)$)
	(b)	$5x+25 = 180$ $5x = 155$	31	2	M1 for simplifying to at least $5x+25=180$ or 360 (may be earned in (a)) A1 for $x=31$
11	(a)	(–14) –4 (0) 4 14	–4, 4, 14	2	B2 for all 3 values correct (B1 for 1 or 2 values correct)
	(b)		curve	2	B1 for all 5 points plotted correctly ± ½ square (ft from table if at least B1 awarded in (a)) B1 (indep) ft for any smooth curve through their points

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
12	(a)	$8 \times \frac{10}{4}$	20	2	M1 $\frac{10}{4}$ or $\frac{4}{10}$ or 0.4 or 2.5 oe seen A1 cao NB ratios get M0 unless of the form 1:*n* OR M1 $\frac{8}{4}, \frac{4}{8}$ oe seen A1 cao
	(b)	$15 \times \frac{4}{10}$	6	2	M1 $15 \times \frac{4}{10}$ oe A1 cao
13	(a)	$9.9\times10^8 - 6.0\times10^7$	$\pm 9.3\times10^8$	2	M1 for $99\times10^7 - 6.0\times10^7$ or $9.9\times10^8 - 0.60\times10^8$ or correct conversion of either to an ordinary number or 930000000 or 9.3×10^n where *n* is any positive integer A1 cao
	(b)	$\frac{6.0-4.5}{4.5} \times 100 = \frac{1.5}{4.5} \times 100 =$ or $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7} \times 100$	33.3%	3	M2 $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7} \times 100$ oe (M1 for $\frac{6.0\times10^7 - 4.5\times10^7}{4.5\times10^7}$ or $\frac{6.0\times10^7 - 4.5\times10^7}{6.0\times10^7} \times 100$ oe A1 33.3 – 33.4 OR M2 $\frac{6.0\times10^7}{4.5\times10^7} \times 100$ -100 or 33.3% (M1 $\frac{6.0\times10^7}{4.5\times10^7} \times 100$ or 133.3%) A1 33.3-33.4 NB Accept any of the above expressions without any reference to 10^7.

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
14	LCM (40,24) = 120 Bread buns 120÷40 Burgers 120÷24 OR Bread buns: 40 is 2 × 2 × 2 (×5) Burgers: 24 is 2 × 2 × 2 (×3)	Bread Buns 3 Burgers 5	3	M1 attempt to find LCM by eg lists of multiples, or summing of 40s and summing of 24s, with at least 3 numbers in each list A1 identify 120 as LCM A1 cao (both) **OR** M1 expansion of either number into its prime factors in a factor tree or 8×5 or 8×3 A1 both expansions correct A1 cao (both) SC B2 if answers given the wrong way around
15	$\sin 32 = \frac{AB}{12}$ $AB = 12 \times \sin 32$ $AB = 6.35903\ldots$	6.36	3	M1 $\sin 32 = \frac{AB}{12}$ (accept $\text{Sin}\ \frac{AB}{12}$) M1 $12 \times \sin 32$ or $12 \times 0.5299..$ A1 accept 6.359 – 6.360 SC Gradians 5.78(1…) Radians 6.62 Get M1M1A0 **OR** Use of Sine Rule $\frac{\sin 32}{AB} = \frac{\sin 90}{12}$ or $\frac{AB}{\sin 32} = \frac{12}{\sin 90}$ M1 $AB = \frac{12 \times \sin 32}{\sin 90}$ M1 AB = 6.359 – 6.36 A1 SC Gradians 5.85(…) Radians 7. 40(…) M1M1A0

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
16		$8 \times 41 = 328$ $2 \times 29 = 58$ $328 - 58 = 270$ $270 \div 6 = 45$	45	3	M1 for either 8×41 (=328) or 2×29 (=58) M1 (dep) "328" – "58" (=270) A1 cao NB 328 and /or 58 on the answer line gets M1 (implied); 270 on the answer line gets M2 (implied)
17	(a)	$x^2 - 4x + 3x - 12 = x^2 - x - 12$	$x^2 - x - 12$	2	M1 for exactly 4 terms correct ignoring signs (x^2, $4x$, $3x$, 12) or 3 out of 4 terms with correct signs (x^2, $-4x$, $+3x$, -12) A1 cao
	(b)	$6x^2 - 8x + 15x - 20 = 6x^2 + 7x - 20$	$6x^2 + 7x - 20$	2	M1 for exactly 4 terms correct ignoring signs ($6x^2$, $8x$, $15x$, 20) or 3 out of 4 terms with correct signs ($6x^2$, $-8x$, $+15x$, -20) A1 cao
	(c)	$(x+2)(x+5)$	$(x+2)(x+5)$	2	B2 cao (B1 for exactly one of $(x + 2)$, $(x + 5)$)
	(d)		$12p^8q^3$	2	B2 cao (B1 for any 2 out of 3 terms correct in a product or 3 terms correct in a sum or part product)
	(e)	$6 = 15 + 4(q - 5)$ $6 = 15 + 4q - 20$ $11 = 4q$	$2\frac{3}{4}$	3	M1 for correct substitution of p and t. M1 for correct expansion of $4(q\text{-}t)$ oe (eg $4q$-20, $4q$-$4t$) A1 11/4 or 2 ¾ or 2.75 OR M1 for correct substitution of p and t. M1 for $\frac{p-3t}{4} = q - t$ oe A1 11/4 or 2 ¾ or 2.75
18	(a)	$T=kx$; $150=6k$; $k=25$	$T=25x$	3	M1 for $T=kx$, k algebraic M1 subs $T=150$ and $x=6$ into $T = kx^n$ $(n \neq 0)$ A1 for $T=25x$ oe SC B1 $T \propto 25x$ oe

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
	(b)	$T = 25 \times 15 =$	375	1	B1 ft on k , $k \neq 1$
	(c)	$600 = 25x$; $x = 600 \div 25 =$	24	1	B1 ft on k , $k \neq 1$
19		$\frac{120}{570} \times 50 = 10.5263$ $\frac{250}{570} \times 50 = 21.9298$ $\frac{200}{570} \times 50 = 17.5438$	10 22 18	3	M1 method shown eg $\frac{120}{120+250+200} \times 50$ or one of 10.5(263) 21.9(298), 17.5(438) **OR** 570 ÷ 50 = 11.4 and one of 120 ÷ 11.4 =10.526…) , 270 ÷ 11.4 (=21.9298…) , 200 ÷ 11.4 (=17.5438…) A1 for 10.5(263), 21.9(298), 17.5(438) or 11, 22, 18 B1 correction to add to 50: 10, 22, 18 or 11, 22, 17
20		$x(x+1) + 4(2x–3) = (2x–3)(x+1)$ $x^2 + x + 8x – 12 = 2x^2 + 2x – 3x – 3$ $x^2 – 10x + 9 = 0$ $(x – 9)(x – 1) = 0$	$x = 1,9$	5	M1 for multiplying through by common denominator $(2x–3)(x+1)$ M1 (dep)for either $x^2 + x + 8x – 12$ or $2x^2 + 2x – 3x – 3$ oe A1 for correct quadratic (= 0) M1 for a correct method to solve 3 term quadratic A1 cao for both solutions
21		$AB^2 = 8^2 + 9^2 – 2×8×9×\cos40$ $AB^2 = 64 + 81 – 144×\cos40$ $AB^2 = 145 – 144 × 0.766$ $AB^2 = 145 – 110.31… = 34.6896$ $AB = \sqrt{34.6796} = 5.8897877$	5.89	3	M1 Subs in Cos Rule: $8^2 + 9^2 – 2×8×9×\cos40$ M1 correct order of evaluation of $8^2 + 9^2 – 2×8×9×\cos40$ A1 cao 5.88 – 5.89 SC: Award B2 for one of $AB^2 = 241.03…$ or $AB = 15.525…$ (radians) $AB^2 = 28.50…$ or $AB = 5.33…$ (gradians)
22	(a)		24 30	2	B1 24 cao B1 30 cao
	(b)	Column $60 \leq w < 75$ at 10 Column $75 \leq w < 95$ at 4	10 4	2	B1 10 and correct width (tol $\pm\frac{1}{2}$ small square) B1 4 and correct width (tol $\pm\frac{1}{2}$ small square)

Paper 5525_06				
No	**Working**	**Answer**	**Mark**	**Notes**
23 (a)		100.5	1	B1 cao
(b)		10.515	1	B1 cao
(c)	$\frac{100.5}{10.515}$	9.5577746	2	M1 for greatest distance divided by least time Where 100 < greatest distance ≤ 100.5, 10.51 ≤ least time < 10.52 A1 for 9.555 – 9.56
(d)	$\frac{99.5}{10.525}$	9.45368..	2	M1 for least distance divided by greatest time Where 99.5 ≤ least distance < 100, 10.52 < greatest time ≤10.53 A1 for 9.45 – 9.455
24	$\frac{4}{7}\times\frac{4}{7}\times\frac{3}{7} + \frac{3}{7}\times\frac{3}{7}\times\frac{4}{7} =$ $\frac{48+36}{343} = \frac{84}{343}$ But there are three ways this can be achieved: BBG, BGB, GBB So the probability is $\frac{84}{343}\times 3$ OR $1-\frac{64}{343}-\frac{27}{343}$ NB: 84/343 = 0.244897; 252/343 = 0.73469 $\frac{4}{7} = 0.57(142...)$, $\frac{3}{7} = 0.42(857...)$	$\frac{252}{343}$	3	M1 for $\frac{4}{7}\times\frac{4}{7}\times\frac{3}{7}$ or $\frac{3}{7}\times\frac{3}{7}\times\frac{4}{7}$ oe or $\left(\frac{4}{7}\right)^3$ oe or $\left(\frac{3}{7}\right)^3$ oe or $\frac{91}{343}$ or 0.10(49…) or 0.13(99….) M1 (indep) for identification of all 6 outcomes (M2 for $1-\left[\left(\frac{4}{7}\right)^3+\left(\frac{3}{7}\right)^3\right]$) oe A1 $\frac{252}{343}$, $\frac{36}{49}$, 0.73(469…) oe

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
25	(a)	$\frac{1}{3} \times \pi \times 5^2 \times 8 = \pi \times 25 \times 8 \div 3 =$ 209.4395	209–210	2	M1 for $\frac{1}{3} \times \pi \times 5^2 \times 8$ A1 for 209–210
	(b)	Base radius = $\frac{216}{360} \times 15 = 9$ Height = $\sqrt{(15^2 - 9^2)} =$	12	4	M1 for 216 ÷ 360 A1 for 9 M1 for $\sqrt{(15^2 - \text{“9”}^2)}$, where “9” < 15 A1 cao

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Mark Scheme (Results)

March 2012

GCSE Mathematics (2MB01) Higher
5MB2H (Non-Calculator) Paper 01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		30 ÷ 12 = 2.5 220 × 2.5 40 × 2.5 150 × 2.5 2 × 2.5	550 100 375 5	3	M2 for any one of 220 + 220 + 110 or 40 + 40 + 20 or 150 + 150 + 75 or 2 + 2 + 1 or 550 or 100 or 375 or 5 A1 for all 4 correct values OR M1 for 30 ÷ 12 oe or sight of 2.5 M1(dep) for 220 × '2.5' or 40 × '2.5' or 150 × '2.5' or 2 × '2.5' oe or 550 or 100 or 375 or 5 A1 for all 4 correct values OR M1 for 220 ÷ 12 or 40 ÷ 12 or 150 ÷ 12 or 2 ÷ 12 or $18\frac{1}{3}$ or $3\frac{1}{3}$ or 12.5 or $\frac{1}{6}$ seen M1(dep) for '$18\frac{1}{3}$' × 30 or '$3\frac{1}{3}$' × 30 or '12.5' × 30 or '$\frac{1}{6}$' × 30 or 550 or 100 or 375 or 5 A1 for all 4 correct values **Continued on next page**

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
					OR M1 for M1 for 220 ÷ 2 or 40 ÷ 2 or 150 ÷ 2 or 2 ÷ 2 or 110 or 20 or 75 or 1 seen M1(dep) for '110' × 5 or '20' × 5 or '75' × 5 or '1' × 5 or 550 or 100 or 375 or 5 seen A1 for all 4 correct values (SC: B2 for 275, 50, 187.5 and 2.5 or B1 for 275 or 50 or 187.5 or 2.5, if M0 scored)
2	(a)		Terms must end in 2 or 7	1	B1 for any correct reason; eg terms must end in 2 or 7
	(b)		$5n - 3$	2	B2 for $5n - 3$ (oe, including unsimplified) (B1 for $5n + k$, $k \neq -3$ or k is absent, or $n = 5n - 3$)
3		$\left(\frac{1+4}{2}, \frac{2+0}{2}\right)$	(2.5, 1)	2	M1 for $\frac{1+4}{2}$ and $\frac{2+0}{2}$ or for either the x coordinate correct or the y coordinate correct A1 for (2.5, 1) oe SC: B1for an answer of (1, 2.5) if M0 scored

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4*		500 × 1000 × 400 = 200 000 000 20 × 50 × 40 = 40 000 200 000 000 ÷ 40 000 = 5000 OR (500 ÷ 20) × (1000 ÷ 50) × (400 ÷ 40) = 25 × 20 × 10 = 5000	Proof	4	B1 for a correct unit conversion, could be seen on the diagram or in working M1 for 500 × 1000 × 400 or 200 000 000 or 20 × 50 × 40 or 40 000 or 5 × 10 × 4 or 200 or 0.2 × 0.5 × 0.4 or 0.04 M1(dep) for '200 000 000' ÷ '40 000' C1 for fully correct working leading to final answer of 5000 OR B1 for a correct unit conversion, could be seen on the diagram or in working M1 for (500 ÷ 20) or (1000 ÷ 50) or (400 ÷ 40) or at least two of 25, 20, 10 seen M1(dep) for '25' × '20' × '10' C1 for fully correct working leading to final answer of 5000

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		$8e - 5f$	2	B2 for $8e - 5f$ oe (B1 for $8e$ or $-5f$)
	(b)		$2(2t + 5)$	1	B1 cao
	(c)	$3 + 2p - 2$	$1 + 2p$	2	M1 for $2 \times p$ and 2×-1 oe within at most 3 terms seen A1 cao
	(d)	$x(a + b) + y(a + b)$	$(a + b)(x + y)$	2	M1 for $x(a + b)$ or $y(a + b)$ or $a(x + y)$ or $b(x + y)$ seen A1 for $(a + b)(x + y)$ oe 2-bracketed expression

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		30000 × 20 ÷ 100 = 6000 30000 – 6000 = 24000 24000 ÷ 12 OR 30000 ÷ 12 = 2500 2500 × 20 ÷ 100 = 500 2500 – 500 OR 100 – 20 = 80 30000 × 80 ÷ 100 = 24000 24000 ÷ 12 OR 30000 ÷ 12 = 2500 2500 × 80 ÷ 100	2000	3	M1 for 30000 × 20 ÷ 100 oe (= 6000) M1 for (30000 – '6000') ÷ 12 A1 cao OR M1 for 30000 ÷ 12 (= 2500) M1 for '2500' – '2500' × 20 ÷ 100 oe A1 cao OR M1 for 100 – 20 (= 80) M1 for 30000 × 80 ÷ 100 oe and dividing by 12 A1 cao OR M1 for 30000 ÷ 12 (= 2500) M1 for '2500' × 80 ÷ 100 oe A1 cao

<table>
<tr><th colspan="5">5MB2H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>7</td><td></td><td>10 × 8/5 = 16
60 – 16

OR
60 × 5/8 = 37.5
37.5 – 10</td><td>44 km or
27.5 miles</td><td>3</td><td>B1 for 5 miles = 8 km or equivalent statement or use of conversion factor 8/5 or 5/8
M1 for 10 × ‘8/5’ (= 16) or 60 × ‘5/8’ (= 37.5)
A1 for 44 km or 27.5 miles, accept76 km or 47.5 miles (units must be quoted)</td></tr>
<tr><td>8</td><td></td><td><table><tr><td>x</td><td>–2</td><td>–1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>–10</td><td>–6</td><td>–2</td><td>2</td><td>6</td><td>10</td></tr></table>
OR

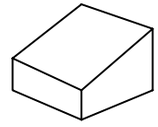
Using $y = mx + c$

gradient = 4
y intercept = –2</td><td>Straight line from (–2, –10) to (3, 10)</td><td>3</td><td>(Table of values)
M1 for at least 2 correct attempts to find points by substituting values of x
M1 (dep) ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted)
A1 for correct line between $x = -2$ and $x = 3$

(No table of values)
M2 for at least 2 correct points and no incorrect points plotted OR line segment of $y = 4x - 2$ drawn (ignore any additional incorrect segments)
(M1 for at least 3 correct points with no more than 2 incorrect points)
A1 for correct line between $x = -2$ and $x = 3$

(Use of $y = mx + c$)
M2 line segment of $y = 4x - 2$ drawn (ignore any additional incorrect segments)
(M1 for line drawn with gradient of 4 OR line drawn with y intercept of –2 and a positive gradient)
A1 for correct line between $x = -2$ and $x = 3$</td></tr>
</table>

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		6 by 4 rectangle drawn	2	B2 for a 6 by 4 rectangle drawn (B1 for a rectangle drawn with one correct dimension)
	(b)		3-D sketch 	2	M1 for an attempt at a 3-D sketch with a trapezoidal face A1 for a correct 3-D sketch

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10*		Angle *ABE* = 40 (vertically opposite angles are equal) Angle *BAE* = angle *BEA* = (180 – 40)/2 = 70 (base angles of an isos triangle are equal) *x* = 70 (alternate angles on parallel lines are equal) OR Angle *ABE* = 40 (vertically opposite angles are equal) Angle *BAE* = angle *BEA* = (180 – 40)/2 = 70 (base angles of an isosceles triangle are equal) Angle *BEF* = 40 (corresponding angles are equal) *x* = 180 – 70 – 40 = 70 (angles as a straight line add up to 180°)	70	5	B1 for angle *ABE* = 40, could be marked on the diagram M1 for (180 – '40')/2 (= 70) A1 for 70° identified as the angle x^o C2 for fully correct reasons: 'vertically opposite angles are equal' or 'vertically opposite angles are equal' 'base angles of an isosceles triangle are equal' 'alternate angles on parallel lines are equal' (C1 for just one correct reason quoted) OR B1 for angle *ABE* = 40 or angle *BEF* = 40, could be marked on the diagram M1 for (180 – '40')/2 (= 70) A1 for 70° identified as the angle x^o C2 for fully correct reasons: 'vertically opposite angles are equal' or 'vertically opposite angles are equal' 'base angles of an isosceles triangle are equal' 'corresponding angles on parallel lines are equal' 'angles on a straight line add up to 180' (C1 for just one correct reason quoted)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		1	1	B1 cao
	(b)		3	1	B1 cao
	(c)		$\frac{1}{8}$	1	B1 for $\frac{1}{8}$ oe
12		Angle *PTO* = angle *PSO* = 90 Angle *TPS* = 24 × 2 = 48 360 – 90 – 90 – 48 OR Angle *PTO* = 90 Angle *TOP* = 180 – 90 – 24 = 66 66 × 2	132	3	M1 for angle *PTO* = 90 or angle *PSO* = 90, could be marked on the diagram M1 for 360 – 90 – 90 – (24 × 2) A1 cao OR M1 for angle *PTO* = 90 or angle *PSO* = 90, could be marked on the diagram M1 for 2 × (180 – 90 – 24) A1 cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13*		Rectangle – unshaded triangle $(x + 6)(3x – 5) – ½×2x(3x – 5)$ $=3x^2 + 18x – 5x – 30 – (3x^2 – 5x)$ $=3x^2 + 18x – 5x – 30 – 3x^2 + 5x$ QED OR $(x + 6)(3x – 5) – ½×2x(3x – 5)$ $= (x + 6)(3x – 5) – x(3x – 5)$ $= (3x – 5)(x + 6 – x)$ $= 6(3x – 5) = 18x – 30$ QED OR Shaded trapezium + shaded triangle $½(x + 6 – 2x + x + 6)(3x – 5)$ $=6(3x – 5) = 18x – 30$ QED	Proof	4	M1 for using two lengths to find an area M1(dep) for '$(x + 6)(3x – 5)$' – '$½ × 2x(3x – 5)$' M1 for $3x^2 + 18x – 5x – 30$ or $½×(6x^2 – 10x)$ or $3x^2 – 5x$ C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working OR M1 for using two lengths to find an area M1(dep) for '$(x + 6)(3x – 5)$' – '$½ × 2x(3x – 5)$' M1 for factorising process with $(3x – 5)$ as the common factor C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working OR M1 for $x + 6 – 2x$ $(= 6 – x)$ M2 for $½(x + 6 – 2x + x + 6)(3x – 5)$ C1 for a correct completion of the proof resulting in $18x – 30$ from fully correct working

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		. 0.25 = 0.2555… 0.25555…×10 = 2.5555… 0.25555…×100 = 25.5555… 25.5555…– 2.5555… = 23 **Alternative Method** x = 0.25555 … 10x = 2.5555 … 100x = 25.5555… 90x = 23	$\frac{23}{90}$	3	M1 for 0.25555... or 0.2 + 0.05555… M1 for two correct recurring decimals that, when subtracted, would result a terminating decimal, and attempting the subtraction or $\frac{2.3}{9}$ or $\frac{253}{990}$ A1 cao **Alternative Method** M1 for x = 0.25555… M1 for two correct recurring decimals that, when subtracted, would result a terminating decimal, e.g. 10x = 2.5555..., 100x = 25.5555… and attempting the subtraction or 9x = 2.3 or 90x = 23 or 900x = 230 or $\frac{2.3}{9}$ or $\frac{253}{990}$ A1 cao SC: B1 for fraction with denominator 90 if M0
15		Grad = $\frac{1}{3}$ $3 = 6 \times \frac{1}{3} + c$ $c = 1$	$y = \frac{1}{3}x + 1$	3	M1 for $-3 \times m = -1$ oe or $\frac{1}{3}$ seen M1 for $3 = 6 \times$ '$\frac{1}{3}$' $+ c$ or $y - 3 =$ '$\frac{1}{3}$'$(x - 6)$ A1 for $y = \frac{1}{3}x + 1$ oe

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$	$3\sqrt{5}$	2	M1 for $\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ A1 for $\frac{15\sqrt{5}}{5}$ or better
	(b)	$(1 + \sqrt{3})(1 + \sqrt{3})$ $= 1 + \sqrt{3} + \sqrt{3} + 3$ $= 4 + 2\sqrt{3}$	4, 2	2	M1 for $1\times1 + 1\times\sqrt{3} + 1\times\sqrt{3} + \sqrt{3}\times\sqrt{3}$ oe A1 cao
17		$\frac{3(a-b)+2b}{b(a-b)}$ $\frac{3a-3b+2b}{b(a-b)}$	$\frac{3a-b}{b(a-b)}$	3	M1 for a common denominator of $b(a-b)$ oe M1 for $\frac{3(a-b)+2b}{'b(a-b)'}$ or $\frac{3(a-b)}{'b(a-b)'} + \frac{2b}{'b(a-b)'}$ A1 for $\frac{3a-b}{b(a-b)}$ or $\frac{3a-b}{ba-b^2}$

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		380	1	B1 cao
	(b)		6.2	1	B1 cao
	(c)		Arrow at 34	1	B1 cao
2	(a)		8	1	B1 for 8 ± 0.2
	(b)		35	1	B1 for 35 ± 2°
	(c)		Circle drawn	1	B1 for all parts within ± 2mm, (use overlay)
3	(a)		4, 7, 4, 3, 2	2	M1 for at least 3 correct tallies **or** at least 3 correct frequencies A1 for all frequencies correct
	(b)		7	1	B1 for 7 **or** ft from frequencies in (a) or tallies if no frequencies
	(c)		Diagram drawn	3	M1 for bar chart or other suitable chart with at least 3 correct heights for their scale (can f.t.) A1 for all 5 bars correctly labelled and vertical axis correctly scaled A1 for fully correct **or** ft frequencies in (a) **OR** M1 for pictogram with at least 3 correct rows (can f.t.) A1 for correct labels on all 5 rows and correctly key A1 for fully correct **or** ft frequencies in (a) **OR** M1 for pie chart with at least 3 correct sectors ± 2° (can f.t.) A1 for all 5 sectors correctly labelled A1 for fully correct **or** ft frequencies in (a)

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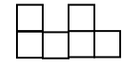
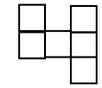
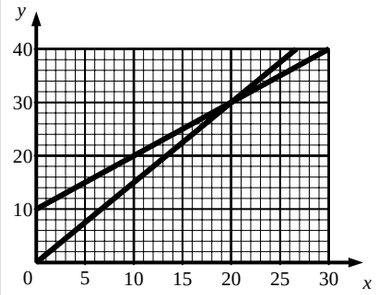
1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		£1.18 + 94p = £2.12 £5 – £2.12 – 30p = £2.58 £2.58 ÷ 2 =	1.29	3	M2 for (5 – 1.18 – 0.94 – 0.30) ÷ 2 oe **or** digits 129 (M1 for 1.18 + 0.94 **or** 2.12 seen **or** 1.18 + 0.94 + 0.30 oe **or** 2.42 seen **or** 5 – 1.18 – 0.94 oe **or** 2.88 seen **or** (5 – 1.18 – 0.94) ÷ 2 **or** 1.44 seen **or** 5 – 1.18 – 0.94 – 0.30 oe **or** 2.58 seen) A1 cao **NOTE**: Accept working in £ or pence
5	(a)(i)		(2, 3)	2	B1 cao
	(ii)		(–3, 1)		B1 cao
	(b)		Point plotted at (3, –4)	1	B1 cao
6	(a)		– 5	1	B1 cao
	(b)		6	1	B1 for 6 or – 6
	(c)		3	1	B1 cao
7			(P, B), (P, S), (P, L) (M, B), (M, S), (M, L) (H, B), (H, S), (H, L)	2	M1 for any 3 combinations with no incorrect combinations A1 for all 9 combinations with no duplicates or extras
8	(a)		Walk	1	B1 cao
	(b)	24 ÷ 4 =	6	2	M1 for 24 ÷ 4 oe or ¼ oe seen A1 cao

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		Isosceles triangle	1	B1 for isosceles triangle
	(b)		Rectangle with area 12 cm^2	2	M1 for rectangle drawn A1 cao
10	(a)		A marked at 0	1	B1 for A marked at 0 (within overlay)
	(b)		B marked at 1/4	1	B1 for B marked at 1/4 (within overlay)
11	(a)		9	1	B1 cao
	(b)		33	2	M1 for 5 × 5 **or** 25 seen in the working **or** 2 × 2 × 2 **or** 8 seen in the working A1 cao
12	(a)		20	2	M1 3 × 3 × 3 oe seen or drawn or 27 seen or use of 3 layers A1 cao
	(b)			2	B2 for correct view (B1 for  or )
13	(a)(i)		07 29	2	B1 for 07 29
	(ii)		36		B1 for 36 or ft difference between (i) and 06 53
	(b)		07 51	1	B1 cao
	(c)		09 55	1	B1 for 09 55 or 9 55 or five to ten

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		2 + 8 + 2 + 8 = 20 20 ÷ 4 =	5	4	M2 for 2 + 8 + 2 + 8 oe **or** 20 seen **or** (2 + 8) ÷ 2 oe (M1 for the sum of 3 sides of the rectangle) M1 (dep) for the sum of 3 or 4 sides of the rectangle ÷ 4 **or** an attempt to evaluate (2 + 8) ÷ 2 oe to get the length of one side A1 cao **SC**: B1 for an answer of 4 coming from $\sqrt{2\times 8}$ oe
15	(a)		4	1	B1 cao
	(b)	9.5 – 4.75 = **OR** 9.5 ÷ 2 =	4.75	2	M1 for 9.5 – 4.75 **or** 9.5 ÷ 2 **or** 4.75 – 9.5 A1 cao
	(c)		6	1	B1 cao
	(d)	12 × 4 =	48	2	M1 for × 4 seen **or** identifying + 0.5 for every 2 inches **or** 12 + 12 + 12 + 12 oe **or** build up method eg 12, 24, 36, 48 allow one error A1 cao
16	(a)		trapezium	1	B1 for trapezium or isosceles trapezium
	(b)			2	B2 for correct tessellation (at least 5 more shapes) (B1 for at least 4 shapes (including initial shape) correctly tessellating)

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
17*		S: 35 ÷ 100 × 40 = 14 W: 40 ÷ 8 × 3 = 15 **OR** D: 16 ÷ 40 (× 100) = 0.4 (40%) W: 3 ÷ 8 (× 100) = 0.375 (37.5%) **OR** D: $\frac{16}{40} = \frac{80}{200}$ S: $\frac{35}{100} = \frac{70}{200}$ W: $\frac{3}{8} = \frac{75}{200}$	Debbie and correct calculations	4	**Compares Marks out of 40 or fractions with denominator of 40** M1 for 35 ÷ 100 × 40 oe **or** 14 seen (or 14/40 seen) M1 for 40 ÷ 8 × 3 **or** 15 seen (or 15/40 seen) A1 for 14 and 15 **or** $\frac{14}{40}$ and $\frac{15}{40}$ C1 (dep on M1) for correct conclusion for their working QWC with 3 comparable marks: Decision and justification should be clear with working clearly presented and attributable. **OR Decimals (or Percentages)** M1 for 16 ÷ 40 (× 100) oe **or** 0.4 (or 40) seen M1 for 3 ÷ 8 (× 100) oe **or** 0.375 (or 37.5) seen A1 for 0.4 and 0.375 (**or** 40 and 37.5) C1 (dep on M1) for correct conclusion for their working QWC: with 3 comparable decimals (or percentages: Decision and justification should be clear with working clearly presented and attributable. **OR Compares Fractions with denominator other than 40** M1 for attempt to convert all to fractions with a common denominator other than 40 M1 for at least 1 correct A1 for $\frac{80}{200}$ and $\frac{70}{200}$ and $\frac{75}{200}$ oe C1 (dep on M1) for correct conclusion for their working QWC with 3 comparable fractions: Decision and justification should be clear with working clearly presented and attributable.

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
18*	(a)		10	1	B1 cao
	(b)	 **Miles** 0 10 20 30 40 50 **Ed** 0 15 30 45 60 75 **Bill** 10 20 30 40 50 60	Ed is cheaper up to 20 miles, Bill is cheaper for more than 20 miles	3	M1 for correct line for Ed intersecting at (20,30) ±1 sq tolerance **or** $10 + x = 1.5x$ oe C2 (dep on M1) for a correct full statement ft from graph eg. Ed cheaper up to 20 miles **and** Bill cheaper for more than 20 miles (C1 (dep on M1) for a correct conclusion ft from graph eg. cheaper at 10 miles with Ed ; eg. cheaper at 50 miles with Bill eg. same cost at 20 miles; eg for £5 go further with Bill **or** A general statement covering short **and** long distances eg. Ed is cheaper for shorter distances **and** Bill is cheaper for long distances) **OR** (continued on next page)

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
18 (contd)					**OR** M1 for correct method to work out Ed's delivery cost for at least 2 values of n miles where $0 < n \leq 50$ **or** for correct method to work out Ed and Bill's delivery cost for n miles where $0 < n \leq 50$ C2 (dep on M1) for 20 miles linked with £30 for Ed and Bill with correct full statement eg. Ed cheaper up to 20 miles **and** Bill cheaper for more than 20 miles (C1 (dep on M1) for a correct conclusion eg. cheaper at 10 miles with Ed; eg. cheaper at 50 miles with Bill eg. same cost at 20 miles; eg for £5 go further with Bill **or** A general statement covering short **and** long distances eg. Ed is cheaper for shorter distances **and** Bill is cheaper for long distances) SC: B1 for correct full statement seen with no working eg. Ed cheaper up to 20 miles **and** Bill cheaper for more than 20 miles QWC Decision and justification should be clear with working clearly presented and attributable

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		1,96 × 2.25 = 4.41 **OR** 4.23 ÷ 9 = 0.47 1.96 ÷ 4 = 0.49 **OR** 4.23 × 4 = 16.92 1.96 × 9 = 17.64 **OR** 4.23 ÷ 9 = 0.47 0.47 × 4 = 1.88 **OR** 1.96 ÷ 4 = 0.49 0.49 × 9 = 4.41 **OR** 9 ÷ 4.23 = 2.12 4 ÷ 1.96 = 2.04	Pack of 9	3	M2 for a fully correct method to enable a conclusion eg 1.96 × 2¼ **OR** M1 for 4.23 ÷ 9 or 423 ÷ 9 **or** 0.47 seen **or** 47 seen M1 for 1.96 ÷ 4 or 196 ÷ 4 or 0.49 seen or 49 seen **OR** M1 for 4.23 × 4 **or** 423 × 4 **or** 16.92 seen **or** 1692 seen M1 for 1.96 × 9 **or** 196 × 9 **or** 17.64 seen **or** 1764 seen **OR** M1 for 4.23 ÷ 9 **or** 423 ÷ 9 **or** 0.47 seen **or** 47 seen M1 for 0.47 × 4 **or** 47 × 4 **or** 1.88 seen **or** 188 seen **OR** M1 for 1.96 ÷ 4 **or** 196 ÷ 4 **or** 0.49 seen **or** 49 seen M1 for 0.49 × 9 **or** 49 × 9 **or** 4.41 seen **or** 441 seen **OR** M1 for 9 ÷ 4.23 **or** 2.12(...) seen **or** 2.13 seen M1 for 4 ÷ 1.96 **or** 2.04(...) seen A1 for Pack of 9 and fully correct calculations **NOTE:** B0 for an answer of 9 not supported by working.
20	(a)		6	1	B1 cao
	(b)		44	1	B1 cao
	(c)		31	2	M1 for 60 – 29 **or** 29 – 60 **or** any correct method that is attempting to find the difference between 29 and 60 (allow 1 arithmetic error) A1 cao

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
21*		Angle *DBC* = (180 – 50) ÷ 2 Base angles of isosceles triangle are equal Angle *ABD* = 180 – 65 Angles on a straight line add up to 180 *x* = 180 – 20 – 115 Angles in a triangle add up to 180 **OR** Angle *DBC* = (180 – 50) ÷ 2 Base angles of isosceles triangle are equal *x* = 65 – 20 Exterior angle of triangle is equal to sum of interior opposite angles **OR** Angle *DCB* = (180 – 50) ÷ 2 Base angles of isosceles triangle are equal *x* = 180 – 50 – 20 – 65 Angles in a triangle add up to 180	45 with reasons	4	M1 for (180 – 50) ÷ 2 oe **or** 65 seen M1 for 180 – 20 – (180 – "65") **or** "65" – 20 or 180 – 50 – 20 –'65' oe C2 for *x* identified as 45 with full reasons QWC: Reasons clearly laid out with correct geometrical language used (C1 (dep on M1) for one reason QWC: Reasons clearly laid out with correct geometrical language used) NOTE: *x* = 45 with no working or without any correct angles marked on the diagram cannot score.

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(a)	360 ÷ 60 = 6 300 ÷ 60 = 5 6 × 5 =	Yes and 30	3	M1 for dividing side of patio by side of paving slab eg 360 ÷ 60 **or** 300 ÷ 60 **or** 3.6 ÷ 0.6 **or** 3 ÷ 0.6 **or** 6 and 5 seen **or** 6 divisions seen on length of diagram **or** 5 divisions seen on width of diagram M1 for correct method to find number of paving slabs eg (360 ÷ 60) × (300 ÷ 60) oe **or** 6 × 5 **or** 30 squares seen on diagram (units may not be consistent) A1 for Yes **and** 30 (or 2 extra) with correct calculations **OR** M1 for correct method to find area of patio **or** paving slab eg 360 × 300 **or** 108000 seen **or** 60 × 60 **or** 3600 seen **or** 3.6 × 3 **or** 10.8 seen **or** 0.6 × 0.6 **or** 0.36 seen M1 for dividing area of patio by area of a paving slab eg. (3.6 × 3) ÷ (0.6 × 0.6) oe (units may not be consistent) A1 for Yes **and** 30 (or 2 extra) with correct calculations **OR** M1 for method to find area of patio and area of 32 slabs eg. 60 × 60 × 32 **or** 360 × 300 M1 for method to find both areas eg. 60 × 60 × 32 **and** 360 × 300 (units may not be consistent) A1 for Yes **and** 115200 **and** 108000 **OR** Yes **and** 11.52 **and** 10.8 **NB :** Throughout the question, candidates could be working in metres or centimetres

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(b)	1726 25890 27616 **8 6 3** **2** 2 4 1 8 9 **3** **7** 1 6 1 2 6 **2** 6 1 6 800 60 3 30 24000 1800 90 2 1600 120 6 24000 + 1800 + 90 + 1600 + 120 + 6 = 27616	276.16	3	M1 for complete correct method with relative place value correct. Condone 1 multiplication error, addition not necessary. **OR** M1 for a complete grid. Condone 1 multiplication error, addition not necessary. **OR** M1 for sight of a complete partitioning method, condone 1 multiplication error. Final addition not necessary. A1 for digits 27616 A1 ft (dep on M1) for correct placement of decimal point after addition (of appropriate values) (SC: B1 for attempting to add 32 lots of 8.63)
23	(a)		30	2	M1 for 25 ÷ 10 **or** 2.5 seen **or** 10 ÷ 25 **or** 0.4 seen **or** 12+12+6 oe **or** a complete method eg. 25×12÷10 oe A1 cao
	(b)	1000 ÷ 200 × 12	60	2	M1 for 500 ÷ 50 **or** 1000 ÷ 200 **or** 500 ÷ 10 **or** correct scale factor clearly linked with one ingredient eg 10 with sugar or 5 with butter or flour or 50 with milk **or** an answer of 120 or 600 A1 cao

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
24		Acton after 24, 48, 72, 96, .. Barton after 20, 40, 60, 80, .. LCM of 20 and 24 is 120 9:00 am + 120 minutes **OR** Acton after 24, 48, 1h 12 min... Barton after 20, 40, 1 h LCM is 2 hours 9:00 am + 2 hours **OR** Times from 9:00 am when each service leaves the bus station Acton at 9:24, 9:48, 10:12.. Barton at 9:20, 9:40, 10:00.. **OR** 20 = 2 × 2 × 5 24 = 2 × 2 × 2 × 3 2 × 2 × 2 × 3 × 5 = 120	11:00 am	3	M1 for listing multiples of 20 and 24 with at least 3 numbers in each list ; multiples could be given in minutes or in hours and minutes (condone one addition error in total in first 3 numbers in lists) A1 identify 120 (mins) **or** 2 (hours) as LCM A1 for 11:00 (am) **or** 11(am) **or** 11 o'clock **OR** M1 for listing times after 9am when each bus leaves the bus station, with at least 3 times in each list (condone one addition error in total in first 3 times after 9am in lists) A1 for correct times in each list up to and including 11:00 A1 for 11:00 (am) **or** 11(am) **or** 11 o'clock **OR** M1 for correct method to write 20 and 24 in terms of their prime factors 2, 2, 5 and 2, 2, 2, 3 (condone one error) A1 identify 120 as LCM A1 for 11:00 (am) **or** 11(am) **or** 11 o'clock

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		$6y - 15$	1	B1 cao
	(b)		$4x(2x + y)$	2	B2 cao (B1 for $x(8x + 4y)$ **or** $2x(4x + 2y)$ **or** $4(2x^2 + xy)$ **or** $4x(ax + by)$ where a, b are positive integers **or** $ax(2x + y)$ where a is a positive integer **or** $4x(2x \quad y)$)
	(c)	$10t = gh$ $h = \frac{10t}{g}$	$\frac{10t}{g}$	2	M1 for clear intention to multiply both sides of the equation by 10 (eg. ×10 seen on both sides of equation) **or** clear intention to divide both sides of the equation by g (eg. ÷ g seen on both sides of equation) **or** $10t = gh$ **or** $\frac{t}{g} = \frac{h}{10}$ **or** fully correct reverse flow diagram eg. ← ×10 ← ÷g ← A1 for $\frac{10t}{g}$ oe

1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
26	(a)	$2 \times 5 \times 2 = 20$ $300 \div 20 =$	15	3	M2 for $300 \div (2 \times 5 \times 2)$ oe (M1 for $2 \times 5 \times 2$ **or** 20 seen **or** $300 \div (2 \times 5)$ **or** 30 seen A1 cao
	(b)	$c = \frac{30 \times 40}{150}$ =	8	2	M1 for $\frac{30 \times 40}{150}$ **or** 1200 seen A1 cao
27		$3x - 15 = 2x + 24$ $x = 39$ **OR** $2x + 3x - 15 + 2x + 2x + 24 = 360$ $9x + 9 = 360$ $9x = 351$ $x = 39$ **OR** $2x + 2x + 24 = 180$ $4x + 24 = 180$ $4x = 156$ $x = 39$ **OR** $2x + 3x - 15 = 180$ $5x - 15 = 180$ $5x = 195$ $x = 39$	39	3	M1 for forming an appropriate equation eg $3x - 15 = 2x + 24$ **or** $2x + 3x - 15 + 2x + 2x + 24 = 360$ oe **or** $2x + 2x + 24 = 180$ oe **or** $2x + 3x - 15 = 180$ oe **or** $2x + 3x - 15 = 2x + 2x + 24$ M1 (dep) for correct operation(s) to isolate x and non-x terms in an equation to get $ax = b$ A1 cao **OR** M2 for $\frac{351}{9}$ **or** $\frac{195}{5}$ **or** $\frac{156}{4}$ oe A1 cao

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GCSE Mathematics (2MB01) Higher
5MB2H (Non-Calculator) Paper 01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*1		Angle *BED* = 68° 180 – (68 + 68) OR Angle *BEF* = 180 – 68 = 112 Angle *BED* = 180= 112 = 68 180 – (68 + 68)	*x* = 44°	4	M1 for Angle *BED* = 68° seen in the diagram or correctly used in the working space M1 for 180 – 2 × "68" A1 for *x* = 44° (accept angle *BDE* = 44°) [Note: 44° only seen in the body of the script without the "*x* =" gets M1M1A0] C1 (dep on at least M1) for alternate angles are equal (or equivalent) and one other reason; either angles in a triangle add to 180° or base angles of an isosceles triangle are equal OR for allied angles (or equivalent, eg co-interior) add up to 180° and angles on a straight line add up to 180° and one other reason; either angles in a triangle add to 180° or base angles of an isosceles triangle are equal
2			4*n* + 2	2	B2 for 4*n* + 2 oe (eg 4×*n* + 2 or *n*4 + 2, …) or *n*th = 4*n* + 2 (B1 for a linear expression in 4*n* e.g. 4*n* + a ($a \neq 2$) or *n* = 4*n* + 2) (B0 for *n* = 4*n* and *n* + 4)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3		35 ÷ (5 + 2) = 5 5 × 5 OR 5 2 10 4 15 6 20 8 25 10	25	2	M1 for 35 ÷ (5 + 2) or 35 ÷ 7 or 35 × $\frac{5}{7}$ A1 for 25 cao OR M1 for listing 5, 10, 15, ….. and 2, 4, 6, ….. to at least 15 and 6 A1 for 25 cao [SC: B1 for an answer of 25:10 if M0 scored]
4		$\frac{16}{40} + \frac{15}{40} = \frac{31}{40}$ OR | | 2 | 5 | | 3 | | 15 | | 8 | 16 | 40 | OR 0.4 + 0.375	$\frac{31}{40}$ or 0.775	2	M1 for attempt to write both fractions with a common denominator (a multiple of 40) with at least one of them correct A1 for $\frac{31}{40}$ oe OR M1 for 40 in the correct cell and 15 or 16 in the correct cell A1 for $\frac{31}{40}$ oe OR M1 for changing both fractions to decimals with both 0.4 and 0.375 seen A1 for 0.775

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		$\frac{15}{100} \times 400 = 60$ $400 - 60 =$ OR $\frac{85}{100} \times 400$	340	3	M1 for $\frac{15}{100} \times 400$ (= 60) oe or 40 + 20 or 400 × 0.15 M1 (dep) for 400 – "60" A1 for 340 cao OR M1 for 100–15 (=85) M1 (dep) for $\frac{'85'}{100} \times 400$ or '0.85' × 400 A1 for 340 [SC: B1 for an answer of 460 if M0 scored]
6	(a)		$5(2a + 1)$	1	B1 for $5(2a + 1)$ or $5\times(2a + 1)$ or $(2a + 1)5$ or $5(1 + 2a)$, etc
	(b)	$5x + 35 + 3x - 6$	$8x + 29$	2	M1 for $5x + 35$ or $3x - 6$ or $8x$ or 29 A1 for $8x + 29$
	(c)		$3ab(a + 2b)$	2	B2 for $3ab(a + 2b)$ (B1 for correct partial factorisation $a(3ab + 6b^2)$ or $b(3a^2 + 6ab)$ or $3a(ab + 2b^2)$ or $3b(a^2 + 2ab)$ or $ab(3a + 6b)$ OR $3ab(ma + 2b)$ or $3ab(a + nb)$ where $m \neq 1$, $n \neq 2$) [B0 for partial factorisation using only an integer e.g. $3(a^2b + 2ab^2)$]

5MB2H_01

Question		Working	Answer	Mark	Notes
7		515 × 35 2575 15450 18025 10 × 515 = 5150 10 × 515 = 5150 10 × 515 = 5150 5 × 515 = 2575 18025 15000 + 2500 + 300 + 50 + 150 + 25 =18025	£180.25	4	M1 for 515 × 0.35 or 515 × 35 This may be implied from an incomplete method of multiplication M1 for a complete method with relative place value correct. Condone one multiplication error, addition not necessary Or for a complete grid, condone one multiplication error, addition not necessary Or for sight of a complete partitioning method. Condone one multiplication error final addition not necessary M1 (dep on the previous M1) for addition of appropriate elements of the calculation A1 for £180.25(p) or 18025p (with '£' sign deleted)

	5	1	5	×
	1 / 5	0 / 3	1 / 5	3
1	2 / 5	0 / 5	2 / 5	5
8	0	2	5	

	500	10	5
30	15000	300	150
5	2500	50	25

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
		OR 3307 × 35 = 115 745 2792 × 35 = 97720 115745 – 97720			OR M1 for 3307 × 0.35 − 2792 × 0.35 or 3307 × 35 − 2792 × 35 M1 for a correct method of multiplication of at least one product, using digits 3307 and 35 or 2792 and 35 Condone one multiplication error, addition not necessary M1 (dep on the previous M1) for addition of appropriate elements of the calculation A1 for £180.25 or 18025p (with '£' sign deleted)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		**Triangular ends** $\frac{1}{2} \times 5 \times 12 = 30$ $\frac{1}{2} \times 5 \times 12 = 30$ **Base** $20 \times 5 = 100$ **Vertical face** $20 \times 12 = 240$ **Slant face** $20 \times 13 = 260$ **Total area** $= 30 + 30 + 100 + 240 + 260$ OR $(5 + 12 + 13) \times 20 + 2 \times \frac{1}{2} \times 5 \times 12$	660	3	M1 for $\frac{1}{2} \times 5 \times 12$ (= 30) or 20×5 (= 100) or 20×12 (= 240) or 20×13 (= 260) M1 (dep) for adding at least 3 areas found from correct methods (of no more than 5 faces) A1 cao OR M1 for $(5 + 12 + 13) \times 20$ or $\frac{1}{2} \times 5 \times 12$ (= 30) M1 (dep) for adding "$(5 + 12 + 13) \times 20$" to at least "$1 \times \frac{1}{2} \times 5 \times 12$" A1 cao Note: Sight of $\frac{1}{2} \times 5 \times 12 \times 20$ or 600 (ie a volume calculation) scores no marks

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		Table of values x : –2, –1, 0, 1, 2 y : –7, –5, –3, –1, 1 OR Using $y = mx + c$ Gradient 2 intercept –3	Single line drawn from (–2, –7) to (2, 1)	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 (dep) ft for correctly plotting at least 2 of their points (any points plotted from their table must be plotted correctly) A1 for the correct line from (-2, -7) to (2, 1) OR **(No table of values)** M2 for at least 2 correct points (and no incorrect points) correctly plotted or for a line segment of the graph of $y = 2x – 3$ drawn (ignore any additional incorrect line segments) [M1 for at least 3 correct points plotted with no more than 2 incorrect points] A1 for the correct line from (-2, -7) to (2, 1) OR **(Use of $y = mx + c$)** M2 for a single straight line of gradient 2, passing through (0, -3) [M1 for a single straight line of gradient 2 or for a single straight line passing through (0, -3)] A1 for the correct line from (-2, -7) to (2, 1)

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		$\frac{1}{2}$ (6 + 4) × 3 OR 6 × 3 – $\frac{1}{2}$ × 2 × 3 OR 4 × 3 + $\frac{1}{2}$ × 2 × 3	15 cm²	4	M2 for $\frac{1}{2}$ (6 + 4) × 3 oe A1 for 15 cao B1 for cm² OR M1 for 6 × 3 (=18) or $\frac{1}{2}$ × 2 × 3 (=3) M1 (dep on "6 × 3" and "$\frac{1}{2}$ × 2 × 3") for "18" – "3" from correct methods A1 for 15 cao B1 for cm² OR M1 for 4×3 (=12) or $\frac{1}{2}$ × 2 × 3 (=3) M1 (dep on "4×3" and "$\frac{1}{2}$ × 2 × 3") for "12" + "3" from correct methods A1 for 15 cao B1 for cm^2

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		10 000 × 0.8 8000 × 0.9 = 7200 OR 10 000 – $\frac{20}{100}$ × 10 000 = 8000 8000 – $\frac{10}{100}$ × 8 000 OR 10 000 × 0.8 × 0.9	7200	3	M1 for 10 000 × 0.8 (= 8000) M1 (dep) for "8000" × 0.9 (= 7200) A1 for £7200 cao OR M1 for 10 000 – $\frac{20}{100}$ × 10 000 oe M1 (dep) for "8000" – $\frac{10}{100}$ × "8 000" oe A1 7200 cao OR M1 for 0.8 × 0.9 (=0.72) M1 (dep)for 10 000 × "0.72" A1 for 7200 cao [SC: B1 for an answer of 7000 if M0 scored]
12	(a)		$x^2 - 3x - 40$	2	M1 for 3 terms correct (out of no more than 4 terms) from x^2, $5x$, $-8x$ and -40 or 4 terms x^2, $5x$, $8x$ and 40 (ignoring signs) A1 for $x^2 - 3x - 40$ [Note: $x^2 - 3x + 40$ and $x^2 + 3x - 40$ with no working get M0A0]
	(b)		$(x + 4)(x - 4)$	1	B1 for $(x + 4)(x - 4)$ oe
13	(a)		(0, 2, 4)	1	B1 cao
	(b)	$\left(\frac{0+6}{2}, \frac{2+2}{2}, \frac{4+4}{2}\right)$	(3, 2, 4)	2	M1 for an answer of (a, 2, 4) or (3, b, 4) or (3, 2, c) or for[("0" + 6) ÷2, ("2" + 2) ÷2, ("4" + 4) ÷2] This may be implied by their answer with no working seen A1 for (3, 2, 4) cao

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	$x = 0.25555\ldots$ $10x = 2.555\ldots$ $100x = 25.5555\ldots$ $90x = 25 - 2 = 23$ OR $x = 0.25555\ldots$ $10x = 2.555\ldots$ $100x = 25.5555\ldots$ $9x = 2.3$ OR $0.2 + (x = 0.0555\ldots.)$ $10x = 0.555\ldots$ $100x = 5.5555\ldots$ $0.2 + 5/90$	$\frac{23}{90}$	3	M1 for $0.255(5\ldots.)$ or $0.2 + 0.055(5\ldots)$ This can be implied in subsequent working M1 for 2 correct recurring decimals which when subtracted will leave an integer or a terminating decimal number A1 for $\frac{23}{90}$ [Note: $\frac{2.3}{9}$ gets A0] [SC: B1 for an answer of $\frac{25}{99}$ oe $(= 0.\dot{2}\dot{5})$, with or without working if M0 scored]
	(b)	$\frac{12}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{12\sqrt{6}}{6}$	$2\sqrt{6}$	2	M1 for multiplying numerator and denominator by $\sqrt{6}$ A1 for $2\sqrt{6}$ (accept $\frac{2\sqrt{6}}{1}$)

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*15		180 –(90 + 20) = 70 2 × 70 = 140	Angle *TOR* =140º	4	M1 for angle *PTO* (*PRO*) = 90º or seeing it marked on the diagram with a right angle or as 90° M1 (dep) for 180 –(90 + 20) (=70°) or for 360 – (90 + 90 + 40) (=140) A1 for (angle) *TOR* = 140º or for 140º seen in the correct place in the diagram [140º alone without the '*TOR* =' gets A0] C1 (dep on at least M1) for angle between a tangent and a radius = 90° plus at least one other correct reason from: Sum of angles in a triangle is 180º Sum of angles in a quadrilateral is 360º Triangles *PTO* and *PRO* are congruent Tangents from a point are equal in length OR
		(180 – 40)÷2 =70 180 – 2×(90 –70) = 140			M1 for angle *PTO* (*PRO*) = 90º or seeing it marked on the diagram with a right angle or as 90° M1 for (180 – 40)÷2 (=70) and [180 – 2×(90 –"70")] (=140) A1 for (angle) *TOR* = 140º or for 140º seen in the correct place in the diagram [140º alone without the '*TOR* =' gets A0] C1 (dep on at least M1) for angle between a tangent and a radius = 90° plus at least one other correct reason from: Sum of angles in a triangle is 180º Base angles of an isosceles triangle are equal Triangles *PTO* and *PRO* are congruent Tangents from a point are equal in length

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5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		$80 \times \frac{5}{8} = 50$ 50×2.75 OR $80 \times 2.75 = 220$ $220 \times \frac{5}{8}$	136 to 138 inc.	3	M1 for $80 \times \frac{5}{8}$ or $80 \div 1.6$ oe (= 50) M1 (indep) for "50" × 2.75 [accept "50"× 165 (=8250)] or "50" + "50" + "50"÷2 (=25) + "25" ÷2 (=12.5) Note: "50" is what is considered to be their speed in miles per hour calculated using an explicitly stated conversion factor A1 for an answer in the range 136 to 138 inc. OR M1 for 80 × 2.75 (=220) [accept 80 × 165 (=13200)] or 80 + 80 + 80÷2 (=40) + "40"÷2 (=20) M1 (indep) for "220" × $\frac{5}{8}$ Note: "220" is what is considered to be their distance in kilometres calculated using an explicitly stated conversion factor A1 for an answer in the range 136 to 138 inc.
17		$y = -\frac{1}{2}x + 2.5$ *mm'* = –1 shows gradient is 2 $y = 2x + c$ goes through (3, 7) $7 = 2 \times 3 + c$	$y = 2x + 1$	4	M1 for establishing gradient of original line is $-\frac{1}{2}$ or sight of $y = -\frac{1}{2}x + c$ M1 (indep) for (gradient of perpendicular) × "$-\frac{1}{2}$" = –1 This can be implied by a gradient of 2 or ft on "$-\frac{1}{2}$" M1 (dep on the previous M1) for substituting (3, 7) into y = "2"x + c A1 for $y = 2x + 1$ (or equivalent algebraic equation)

PMT

5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$\frac{2x^2-9x-5}{4x^3+2x^2}$ $\frac{(2x+1)(x-5)}{2x^2(2x+1)}$	$\frac{x-5}{2x^2}$	3	M1 for factorising the numerator correctly M1 for fully factorising the denominator correctly A1 for $\frac{x-5}{2x^2}$ oe eg. $\frac{-5+x}{2x^2}$

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ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
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Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

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Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*1			small and correct answers	3	M1 for 4.2 ÷ 1.75 (=2.4(0)) **or** 8.68 ÷ 3.5 (=2.48) M1 for 4.2 ÷ 1.75 (=2.4(0)) **and** 8.68 ÷ 3.5 (=2.48) C1 (dep on at least M1) for small and (£)2.4(0) and (£)2.48 **OR** M1 for 1.75 ÷ 4.2 (=0.41(6)) **or** 3.5 ÷ 8.68 (=0.40(3)) M1 for 1.75 ÷ 4.2 (=0.41(6)) **and** 3.5 ÷ 8.68 (=0.40(3)) C1 (dep on at least M1) for small and 0.41(6)(kg) and 0.40(3)(kg) **OR** M1 for 4.2 ÷ 1.75 (=2.4(0)) **or** 8.68 ÷ 3.5 (=2.48) M1 for (4.2 ÷ 1.75) × 3.5 (=8.4(0)) or (8.68 ÷ 3.5) × 1.75 (=4.34) C1 (dep on at least M1) for small and (£)8.4(0) or for small and (£)4.34 **OR** M1 for 1.75 ÷ 4.2 (=0.41(6)) or 3.5 ÷ 8.68 (=0.40(3)) M1 for (1.75 ÷ 4.2) × 8.68 (=3.61(6)) or (3.5 ÷ 8.68) × 4.2 (=1.69(3)) C1 (dep on at least M1) for small and 3.61(6)(kg) or 1.69(3)(kg) **OR** M2 for 8.68 ÷ 2 (=4.34) or 4.20 × 2 (=8.40) C1 (dep on at least M1) for small and (£)4.34 or (£8.40) **OR** Any other method considered equivalent. Figures may be truncated or rounded as long as their method is clear.

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2		$7 \times 8^2 + 320 = 448 + 320$ 768p = 7.68	£7.68	3	M1 for 7×8^2 or 448 seen A1 for 768 B1 for correct monetary answer written correctly eg £7.68 or 768p
3			correct shaded region	2	B1 for arc of circle, centre oak tree, radius 4cm(±2mm) B1 for shaded region where the tree can be planted, bounded by sides of garden and arc of circle centre oak tree
4	(a)		−3, −2, −1,0,1	2	B2 for all 5 values and no others (B1 for 4 correct values and no others or -4,-3,-2,-1,0,1 or -3,-2,-1,0,1,2
	(b)		$-2 \leq x < 4$	2	B2 for $-2 \leq x < 4$ (B1 for $-2 \leq x$ or $x < 4$ or $-2 < x \leq 4$) [Note: accept the use of any letter other than x throughout and ignore any attempt to list integer values]
5			25.1-25.2	2	M1 for $2 \times 3.142 \times 4$ or 8π oe A1 for 25.1 – 25. 2
6	(a)		5, −4, −3	2	B2 for 5, −4 and −3 (B1 for 5 or −4 or −3)
	(b)		correct curve	2	B2 for fully correct curve (B1 ft for at least 5 points plotted correctly)

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5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			enlargement, scale factor 2, centre (6, −5)	3	B1 for enlargement B1 for (scale) factor 2 or ×2 or sf 2 B1 for (6, −5) NB: award 0 marks for an explanation that includes reference to more than one transformation.
*8		Cost of wages, rent and other expenses last year 92 000+10 800+7000=109 800 Cost of wages, rent and other expenses this year $1.075\times92\,000 + \frac{7}{9} \times 10$ 800 + 7000÷2 = 98 900+8400+3500 = 110 800 Costs are more this year, so she cannot increase the amount she spends on goods	no, with working and reason	4	M1 for an attempt to calculate using 7.5% and 92000 (eg 7.5% of 92000 or increase of 7.5%) eg 92000 + 6900 or 98900 M1 for an attempt to find a fractional amount of 10800 (eg $\frac{7}{9}$ × 10800 or 8400 or $\frac{2}{9}$ × 10800 or 2400) M1 for complete method of increasing 92000 by 7.5%, finding $\frac{7}{9}$ of 10800, and halving 7000, with at least all of these three added together. C1 for statement eg "no" with both 110800 & 109800 seen, OR "no" with "1000 more" OR "no" and compares 181800 with 182800, oe.
9	(a)	$\sqrt{30} = 5.4772255\ldots$ $2.5^2 = 6.25$ 5.4772255...÷ 6.25 =	0.876	2	M1 for $\sqrt{30} \div 6.25$ or $5.4(7\ldots) \div 2.5^2$ A1 for any answer in the range 0.876 to 0.877
	(b)	4.5 × 1000 × 1000	4 500 000	2	M1 for complete method equivalent to 4.5 × 1000 × 1000 A1 for 4 500 000 oe

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		3 → 21 4 → 56 3.1 → 23.5(9) 3.2 → 26.3(6) 3.3 → 29.3(3) 3.4 → 32.5(0) 3.5 → 35.8(7) 3.6 → 39.4(5) 3.7 → 43.2(5) 3.8 → 47.2(7) 3.9 → 51.(5) 3.35 → 30.8(9)	3.3	4	B2 for a trial between 3.3 and 3.4 inclusive (B1 for a trial between 3 and 4 inclusive) B1 for a different trial between 3.3 and 3.4 exclusive B1 (dep on at least one previous B1) for 3.3 NB trials should be evaluated to at least 1dp truncated or rounded
11			45	3	M1 for 60000 × 0.75 or ÷1000 or digits 45 or the numbers 60 or 0.00075) M1 for the complete method 60 000 × 0.75 ÷ 1000 oe A1 cao
12	(a)		−7	2	M1 for an attempt to get *x*s on one side or number terms on one side A1 cao
	(b)		8.5	2	M1 for an attempt to divide each side by 4 or an attempt to expand the bracket eg $4 \times x - 4 \times 5$ A1 for 8.5 oe

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*13		2500×0.04×2 =£200 2500×$(1.039)^2$ = £2698.80 £2698.80 – £2500 = £198.80 Scheme A gives £1.20 more	statement	4	M1 for a correct method to find 4% of 2500 or 3.9% of 2500 A1 for a correctly calculated amount 2700 or 2698.8(0) or 200 or 198.8(0); or percentage rate calculated over the 2 years for comparison: 3.93% or 3.976% oe M1 for a correct compound interest method using 3.9% and 2500 over 2 years C1 for statement of scheme A, with two correct comparable figures.
14		$3x - 2y = 7$ $7x + 2y = 13$ $10x = 20$ $x = 2$ $3\times2 - 2y = 7$ $-2y = 1$ $y = -0.5$	2, −0.5	3	M1 for a correct process to eliminate either x or y (allow one arithmetic error) M1 (dep) for correct substitution of their found variable or an otherwise correct method to eliminate the other variable A1 for 2 and −0.5 oe
15	(a)		3.7×10^{-3}	1	B1 cao
	(b)		49 000	1	B1 cao
	(c)	500 ÷ 250 000 [= 0.002] OR $(5 \times 10^2) \div (2.5 \times 10^5)$ [= $(5\div2.5)\times10^{2-5}$] OR $\frac{500}{250} \times \frac{1}{10^3}$ [= 2×10^{-3}] OR $\frac{500\div100}{250000\div100} = \frac{5}{2500}$ [= 0.002]	2×10^{-3}	2	M1 for an attempt to divide using two numbers that are in consistent form eg following an attempt to convert to ordinary numbers, or standard form numbers. A1 for 2×10^{-3}

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5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16			12.7	3	M1 for 3.142 × 5 × 5 oe or 3.142 × 5 × 5 × '*h*' (=78.5 – 78.55) M1 for 1000 ÷ (3.142 × 5 × 5) A1 for 12.7 – 12.8 NB: multiples of π acceptable for M marks
17		$4x - 3 = 2x + 2y$ $2x - 3 = 2y$ $2x = 2y + 3$ $x = y + 1.5$	$x = y + 1.5$	3	M1 for attempt to expand brackets eg $2\times x+2\times y$ or divide through by 2 (each term). M1 for attempt to get x on one side of equation. A1 for $(x =) y + 1.5$, $\frac{2y + 3}{2}$, oe
18			(11, 21)	3	M1 for 5 – 2 or 9 – 3 OR 3 or 6 as long as these are not related to the 3 from *A* or multiple 3 or 9,18 M1 for 2 + 3 × "3" and 3 + 3 × "6" OR for 5 + 2 × "3" and 9 + 2 × "6" OR for 2 + 3 × "3" (=11) and (y=) 2 × '11' – 1 A1 cao SC: B1 if no method shown and answer shows x coordinate as 11 or y coordinate as 21.

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5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19			4.6	5	M1 for $AC = \sqrt{(3^2+4^2)}$ (=5) or $DA = \sqrt{(5^2+2^2)}$ M1 for tan BAC = 0.75 oe or (BAC=) 36.8(6) or 36.9 M1 for tan DAC = 0.4 oe or (DAC=) 21.8(0) M1 for $\sqrt{'5'^2+2^2}$ × sin("36.8(6)"+"21.8(0)") or 5.385 × sin 58.7 A1 for 4.59 – 4.61 OR M1 for $AC = \sqrt{3^2+4^2}(=5)$ or $DP = \sqrt{(29 - AP^2)}$ M1 for cos BAC = 0.8 oe or (BAC=) 36.8(6) oe M1 for angle CDP = angle BAC M1 for (DP=) 3 + 2×cos CDP or (AP=) 4 – 2×sin CDP A1 for 4.59 – 4.61
20			0.5, −3	3	M1 for $(2x \pm 1)(x \pm 3)$ M1 for $(2x - 1)(x + 3)$ A1 cao OR M1 for $\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -3}}{2 \times 2}$ allow sub. of $c = \pm 3$ M1 for $\frac{-5 \pm \sqrt{49}}{4}$ A1 cao NB: any other method put in review.

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5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$1180.5 \div \frac{4}{3}\pi(6.15)^3$	1.21	4	M1 for 1180 ± 0.5 or 6.2 ± 0.05 M1 for 'max. mass' ÷ 'min. volume' where "min volume" is defined as any expression involving 6.15 M1 for $1180.5 \div \frac{4}{3}\pi(6.15)^3$ A1 for 1.21 – 1.22
22			proof	3	B1 for *AD* = *AB* and *AE* = *AG* B1 for angle *EAB* = angle *DAG* (= 90 + angle *DAE*) B1 (dep on previous B marks) for 2 sides and included angle (SAS) oe
23	(a)		$3\boldsymbol{a} + \boldsymbol{b}$	1	B1 oe
	(b)		3**c**	4	M1 for writing *QB* as a combination of vectors eg $\frac{1}{2}$ ('3**a** + **b**') + **b** or 3**a** + 2**b** – $\frac{1}{2}$ ('3**a** + **b**') or 2**a** + 2**b** − **c** oe M1 for equating **a** + **b** = 2**c** or writing *PQ* in terms of vectors **a** and **b** eg −**a** + $\frac{1}{2}$ ('3**a** + **b**') or 2**a** + **b** – $\frac{1}{2}$ ('3**a** + **b**') A1 for (*PQ*=) $\frac{1}{2}$**a** + $\frac{1}{2}$**b or** (*QB*=) $\frac{3}{2}$**a** + $\frac{3}{2}$**b** or (*QB*=) 2**c**−**a** + **a** + **c** A1 cao NB: accept equivalent expressions throughout

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PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		331.705	1	B1 cao
	(b)		179300	1	B1 cao
2			24	4	M1 for 0.15 × 240 (= 36) oe M1 for $\frac{3}{4}$ × 240 (= 180) oe M1 (dep on both prev M1) for 240 – "180" – "36" A1 cao **OR** M1 for 15(%) + 75(%) (= 90(%)) M1 for 100(%) – "90(%)" (= 10(%)) M1 (dep on both prev M1) for " $\frac{10}{100}$ " × 240 oe A1 cao **OR** M1 for 0.15 + 0.75(= 0.9) oe M1 for "0.9" × 240(= 216) oe M1 (dep on both prev M1) for 240 "216" A1 cao **OR** M1 for 0.15 + 0.75(= 0.9) oe M1 for 1 – "0.9"(= 0.1) oe M1 (dep on both prev M1) for "0.1" × 240 oe A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
3			2| 4 7 8 3| 0 3 3 5 7 8 8 4| 1 1 2 4 4 5 Key,eg 4|1 is 4.1(kg)	3	B2 for correct ordered stem and leaf (B1 for fully correct unordered or ordered with one error or omission) B1 (indep) for key (units not required)
4	(a)		$6 + 3t$	1	B1 for $6 + 3t$
	(b)		$6x^2 + 15x$	2	B2 for $6x^2 + 15x$ (B1 for $6x^2$ or $15x$)
	(c)	$m^2 + 10m + 3m + 30$	$m^2 + 13m + 30$	2	M1 for all 4 terms (and no additional terms) correct with or without signs or 3 out of no more than four terms correct with signs A1 for $m^2 + 13m + 30$
5		5|525 5|105 3|21 7	$3 \times 5 \times 5 \times 7$	3	M1 for continual prime factorisation (at least first 2 steps correct) or first two stages of a factor tree correct M1 for fully correct factor tree or list 3, 5, 5, 7 A1 $3 \times 5 \times 5 \times 7$ or $3 \times 5^2 \times 7$

PMT

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
6			7	3	M1 for 4 ×10 or 40 or $\frac{12+6+15+x}{4}$ or a correct equation M1 for a complete and correct method A1 cao
7	(a)	(4,0) (3, 0) (3, -1) (2, -1) (2, 2) (4, 2)	Correct position	2	B2 for correct shape in correct position (B1 for any incorrect translation of correct shape)
	(b)		Rotation 180° (0,1)	3	B1 for rotation B1 for 180° (ignore direction) B1 for (0, 1) **OR** B1 for enlargement B1 for scale factor -1 B1 for (0, 1) (NB: a combination of transformations gets B0)

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		$\frac{20 \times 300}{0.5}$	12000	3	B1 for 20 or 300 used M1 for "20" × "300" or $\frac{"20"}{0.5}$ or $\frac{"300"}{0.5}$, values do not need to be rounded A1 for answer in the range 11200 –13200 SC B3 for 12000 with or without working
9		LCM (80, 50) = 400 Matt 400 ÷ 50 = 8 Dan 400 ÷80 = 5 **OR** 50 = 2 × 5 (× 5) 80 = 2 × 5 (× 2 × 2 × 2)	Matt 8 Dan 5	3	M1 lists multiples of both 80 (seconds) and 50 (seconds) (at least 3 of each but condone errors if intention is clear, can be in minutes and seconds) or use of 400 seconds oe. M1 (dep on M1) for a division of "LCM" by 80 or 50 or counts up "multiples" (implied if one answer is correct or answers reversed) A1 Matt 8 and Dan 5 SC B1 for Matt 7, Dan 4 **OR** M1 for expansion of both 80 and 50 into prime factors. M1 demonstrates that both expansions include 10 oe A1 Matt 8 and Dan 5 SC B1 for Matt 7, Dan 4

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
10			1.5	4	M1 for correct expression for perimeter eg. $4 + 3x + x + 6 + 4 + 3x + x + 6$ oe M1 for forming a correct equation eg. $4 + 3x + x + 6 + 4 + 3x + x + 6 = 32$ oe M1 for $8x = 12$ or $12 \div 8$ A1 for 1.5 oe **OR** M1 for correct expression for semi-perimeter eg. $4 + 3x + x + 6$ oe M1 for forming a correct equation eg. $4 + 3x + x + 6 = 16$ oe M1 for $4x = 6$ or $6 \div 4$ A1 for 1.5 oe

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
***11 QWC**		$\frac{30}{24} \times 60 = 75$	Debbie + explanation	4	M1 for reading 24 (mins) and 30 (km) or a pair of other values for Debbie M1 for correct method to calculate speed eg. 30 ÷ 24 oe A1 for 74 – 76 or for 1.2 – 1.3 and 1.1 C1 (dep on M2) for correct conclusion, eg Debbie is fastest from comparison of "74 – 76" with 66 (kph) or "1.2 – 1.3" and 1.1 (km per minute) **OR** M1 for using an appropriate pair of values for Ian's speed eg 66 and 60, 33 and 30, 11 and 10 M1 for pair of values plotted on graph A1 for correct line drawn C1 (dep on M2) for Debbie is fastest from comparison of gradients. **OR** M1 for reading 24 (mins) and 30 (km) or a pair other values for Debbie M1 for Ian's time for same distance or Ian's distance for same time. A1 for a pair of comparable values. C1 (dep on M2) for Debbie is fastest from comparison of comparable values.

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		x – 2 -1 0 1 2 3 4 y 4 4.5 5 5.5 6 6.5 7	$y = ½ x + 5$ drawn	3	**(Table of values/calculation of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be plotted correctly) A1 for correct line between $x =$ -2 and $x = 4$ **(No table of values)** M1 for at least 2 correct points with no more than 2 incorrect points M1 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = ½ x + 5$ drawn A1 for correct line between $x =$ -2 and $x = 4$ **(Use of y=mx+c)** M1 for line drawn with gradient 0.5 **OR** line drawn with y intercept at 5 M1 for line drawn with gradient 0.5 **AND** line drawn with y intercept at 5 A1 For correct line between $x =$ -2 and $x = 4$ SC B2 for a correct line from $x = 0$ to $x = 4$
*13 QWC			Yes with explanation	3	M1 for bearing ± 2 ° within overlay M1 for use of scale to show arc within overlay or line drawn from C to ship's course with measurement C1(dep M1) for comparison leading to a suitable conclusion from a correct method

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	Line joins an empty circle at -2 to a solid circle at 3	diagram	2	B2 cao (B1 for line from -2 to 3)
	(b)	$2x \geq 7$	$x \geq 3.5$	2	M1 for correct method to isolate variable and number terms (condone use of =, >, ≤, or <) or (x =) 3.5 A1 for $x \geq 3.5$ oe as final answer
*Q15 QWC			No + explanation	3	M1 for $500 \times 9 \times 10^{-3}$ oe A1 for 4.5 C1 (dep M1) for correct decision based on comparison of their paper height with 4 **OR** M1 for $4 \div 500$ oe A1 for 0.008 C1 (dep M1) for correct decision based on comparison of their paper thickness with 0.009 **OR** M1 for $4 \div (9 \times 10^{-3})$ oe A1 for 444(.4...) C1 (dep M1) for correct decision based on comparison of their number of sheets of paper with 500
16			£500	3	M1 for 70% = 350 or $\frac{350}{70}$ M1 for $\frac{350}{70} \times 100$ oe A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17			1 hour 45 mins	6	M1 for method to find volume of pond, eg $\frac{1}{2}(1.3 + 0.5) \times 2 \times 1$ (= 1.8) M1 for method to find the volume of water emptied in 30 minutes, eg $1 \times 2 \times 0.2$ (= 0.4), $100 \times 200 \times 20$ (= 400000) A1 for correct rate, eg 0.8 m³/hr, 0.4 m³ in 30 minutes M1 for correct method to find total time taken to empty the pond, eg "1.8" ÷ "0.8" M1 for method to find extra time, eg 2 hrs 15 minutes − 30 minutes A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins **OR** M1 for method to find volume of water emptied in 30 minutes,.eg. $1 \times 2 \times 0.2$ (= 0.4), $100 \times 200 \times 20$ (= 400000) M1 for method to work out rate of water loss eg. "0.4" × 2 A1 for correct rate, eg 0.8 m³/hr M1 for correct method to work out remaining volume of water eg. $\frac{1}{2}(1.1 + 0.3) \times 2 \times 1$ (= 1.4) M1 for method to work out time, eg "1.4" ÷ "0.8" A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins NB working could be in 3D or in 2D and in metres or cm throughout

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$12x + 21y = 3$ $12x + 40y = 60$ $19y = 57$ $y = 3$ $3x + 10\times 3 = 15$ $3x = -15$ Alternative method $x = \left(\frac{1-7y}{4}\right)$ $3\left(\frac{1-7y}{4}\right) + 10y = 15$ $3 - 21y + 40y = 60$ $19y = 57$ $x = \left(\frac{1-7\times 3}{4}\right)$	$x = -5$, $y = 3$	4	M1 for a correct process to eliminate either x or y or rearrangement of one equation leading to substitution (condone one arithmetic error) A1 for either $x = -5$ or $y = 3$ M1 (dep) for correct substitution of their found value A1 cao
19		$-5, 0.2, 0.5, 1$	$-5, 5^{-1}, 0.5, 5^{0}$	2	M1 for either 5^{-1} or 5^{0} evaluated correctly A1 for a fully correct list from correct working, accept original numbers or evaluated (SC B1 for one error in position or correct list in reverse order)

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20			$5x^2$	4	M1 for $4x \times 4x$ M1 for $(2x \times 4x)/2$ or $(2x \times x)/2$ or $(3x \times 4x)/2$ M1(dep M2) for "$16x^2$" – "$4x^2$" – "x^2" – "$6x^2$" A1 for $5x^2$ **OR** M1 for $\sqrt{(2x)^2 + (4x)^2}$ $(= \sqrt{20x^2} = \sqrt{20}\,x)$ M1 for $\sqrt{(x)^2 + (2x)^2}$ $(= \sqrt{5x^2} = \sqrt{5}\,x)$ M1(dep M2) for $\frac{"\sqrt{5}\,x" \times "\sqrt{20}\,x"}{2}$ $(= \frac{\sqrt{100}}{2}\,x^2)$ A1 for $5x^2$
21	(a)	Cf table: 4, 9, 25, 52, 57,60 cf graph	Correct Cf graph	3	B1 Correct cumulative frequencies (may be implied by correct heights on the grid) M1 for at least 5 of "6 points" plotted consistently within each interval A1 for a fully correct CF graph
	(b)(i)		172	3	B1 for 172 or read off at cf = 30 or 30.5 from a cf graph, ft provided M1 is awarded in (a)
	(ii)	IQR = UQ – LQ	12 - 14		M1 for readings from graph at cf = 15 or 15.25 and cf = 45or 45.75 from a cf graph with at least one of LQ or UQ correct from graph (± ½ square). A1ft provided M1 is awarded in (a)

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
22			1200 cm^3	4	M1 for 10 × 2 × 2 and 15 × 2 M1 for "40" × "30" A1 for 1200 B1 (indep) for cm^3 OR M1 for 10 × 15 or 2^3 or 8 indicated as scale factor M1 for 10 × 15 × 2 × 2 × 2 A1 for 1200 B1 (indep) for cm^3 SC B2 for 600 cm^3 (B1 for 600)
23		$\frac{4(x+5)}{(x+5)(x-3)}$	$\frac{4}{x-3}$	2	M1 for $(x \pm 5)(x \pm 3)$ A1 for $\frac{4}{x-3}$
24		12 ÷ 10 = 1.2 15 ÷ 5 = 3 13 ÷ 5 = 2.6 18 ÷ 10 = 1.8 3 ÷ 15 = 0.2	Histogram	3	B3 for fully correct histogram (B2 for 4 correct blocks) (B1 for 3 correct blocks) (If B0, SC B1 for correct key eg $1cm^2$ = 2 (calls) Or frequency ÷ class interval for at least 3 frequencies) **NB** Apply the same mark scheme if a different frequency density is used.

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PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		$a = 4, b = 5$	3	M1 for sight of $(x-4)^2$ M1 for $(x-4)^2 - 16 + 21$ A1 for $a = 4, b = 5$ OR M1 for $x^2 - 2ax + a^2 + b$ M1 for $-2a = -8$ and $a^2 + b = 21$ A1 for $a = 4, b = 5$
	(b)		(4, 5)	1	B1 ft
26		50 1 1 1 50 1 1 1 50	$\frac{126}{720}$	4	M1 for 3 fractions $\frac{a}{10}$, $\frac{b}{9}$, $\frac{c}{8}$ where a < 10, b < 9 and c < 8 M1 for $\frac{7}{10}\times\frac{3}{9}\times\frac{2}{8}$ or $\frac{3}{10}\times\frac{7}{9}\times\frac{2}{8}$ or $\frac{3}{10}\times\frac{2}{9}\times\frac{7}{8}$ $(=\frac{42}{720})$ M1 for $\frac{7}{10}\times\frac{3}{9}\times\frac{2}{8} + \frac{3}{10}\times\frac{7}{9}\times\frac{2}{8} + \frac{3}{10}\times\frac{2}{9}\times\frac{7}{8}$ or $3\times\frac{3}{10}\times\frac{2}{9}\times\frac{7}{8}$ A1 for $\frac{126}{720}$ oe. eg. $\frac{7}{40}$ **Alternative Scheme for With Replacement** M1 for $\frac{7}{10}\times\frac{3}{10}\times\frac{3}{10}$ $(=\frac{63}{1000})$ M1 for $\frac{7}{10}\times\frac{3}{10}\times\frac{3}{10}\times 3$ $(=\frac{189}{1000})$ M0 A0 No further marks

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
27	(a)		**a - b**	1	B1 for **a - b** oe
	(b)		$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$	3	M1 for a correct vector statement for $\overrightarrow{NR}$ eg. ($\overrightarrow{NR}$ =) $\overrightarrow{NQ} + \overrightarrow{QR}$ or ($\overrightarrow{NR}$ =) $\overrightarrow{NS} + \overrightarrow{SR}$ M1 for $\frac{2}{5}SQ$ (+ QR) or $\frac{3}{5}QS$ (+ SR) (SQ, QR, QS, SR may be written in terms of **a** and **b)** A1 for $\frac{2}{5}(\mathbf{a} - \mathbf{b}) + \mathbf{b}$ oe or $\frac{3}{5}(\mathbf{b} - \mathbf{a}) + \mathbf{a}$ oe
28	(a)		(90, 0)	1	B1 for (90, 0) (condone ($\frac{\pi}{2}$, 0))
	(b)		Correct graph	1	B1 for graph through (0, 2) (90, 0) (180, -2) (270, 0) (360, 2) professional judgement

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Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
3		Stem and leaf diagram: Additional horizontal line was inserted in the diagram.	Standard mark scheme
4	(b)	MLP only: *x* changed to *y*.	Standard mark scheme
7	(a) (b)	2cm grid – shape P moved up two squares. 2cm grid. No shading of shapes – x axis -2 and -4 removed as they would obscure shape	Note that the original shape **P** is in a different position Standard mark scheme
10		Braille and MLP *x* changed to *y*.	Standard mark scheme
11		2 cm for 5 on both axes.	Change of scale
12		1.5 cm grid.	Standard mark scheme

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
13		N line increased to 9 cm. Shading removed. 'Land' and 'Sea' labelled. 037 degrees was changed to 040 degrees.	037° changed to 040°
14		2 cm spaces between numbers.	Standard mark scheme
17	(b)	Model as well as diagram provided. Braille only: 90 degrees written on diagram instead of the right angle sign.	Standard mark scheme
21		Frequency table: numbers changed to 5, 5, 10, 25, 10 and 5. Grid: 1.5 cm for 5 on both axes. Right axis labelled.	Frequency numbers changed to 5, 5, 10, 25, 10, 5 (a) Cumulative frequencies 5, 10, 20, 45, 55, 60 (b) Greater tolerance needed. Median and IQR will be different to those in standard scheme.
22	(b)	Models as well as diagram provided.	Standard mark scheme
24		2cm grid both axes. In the table, the number of calls is changed to 12 14 13 20 6	Number of calls changed to 12, 14, 13, 20, 6 So frequency density will be 1.2, 2.8, 2.6, 2, 0.4
27		vectors 'a' and 'b' in larger font size	Standard mark scheme
28		Size of diagram enlarged. Cross at A changed to a filled-in circle	Standard mark scheme

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Mark Scheme (Results)

Summer 2014

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In Mathematics B (2MB01)
Unit 1: 5MB1H_01 (Higher)

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will awards mark for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark for correct method A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

Paper_5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			2 reasons	2	B2 for 2 aspects from: Bias or leading question; No time frame; Vague response boxes (B1 for 1 aspect)
2	(a)		Point plotted	1	B1 for point plotted at (6,35)
	(b)			1	B1 for description of dynamic relationship or negative correlation
	(c)			1	B1 for single straight line of best fit which could be used to take readings
	(d)		21 - 26	1	B1 for answer in the range 21 - 26 or ft from single straight line segment (if previous B0)
3			56	3	M1 for correct method to find 20% of 120 (=24) or $\frac{1}{3}$ of 120 (= 40) M1 (dep) for 120 − "24" − "40" A1 cao OR M1 for $1-\frac{20}{100}-\frac{1}{3}\left(=\frac{7}{15}\right)$ oe or $\left\{\frac{20}{100}+\frac{1}{3}\right\}\times 120\ (=64)$ oe M1 (dep) for "$\frac{7}{15}$" × 120 oe or 120 − "64" A1 cao (if M0, then SCB1 for 64)

Paper_5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*4			4	4	M1 for 200 ÷ (1 + 9) (= 20) M1 for 750 ÷ 20 (= 37.5) A1 for 3.7(3….) or $3\frac{11}{15}$ or 37.5 **and** 150 C1 ft (dep on M1) for clear statement of 4 bottles with working shown **OR** M1 for 750 × 10 (= 7500) M1 for 200 × 140 (= 28 000) A1 for 3.7(3….) or $3\frac{11}{15}$ or 28000 **and** 30000 C1 ft (dep on M1) for clear statement of 4 bottles with working shown **OR** M1 for 200 × 140 (= 28 000) M1 for 28 000 ÷ (9 + 1) (= 2800) A1 for 3.7(3….) or $3\frac{11}{15}$ or 2800 **and** 3000 C1 ft (dep on M1) for clear statement of 4 bottles with working shown **OR** M1 for 200 ÷ (1 + 9) (= 20) M1 for 140 × "20" = 2800 A1 for 3.7(3….) or $3\frac{11}{15}$ or 2800 **and** 3000 C1 ft (dep on M1) for clear statement of 4 bottles with working shown

<table>
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<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
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A1 for $\frac{20-x}{20}$ or $1 - \frac{x}{20}$ oe</td></tr>
<tr><td>6</td><td></td><td></td><td>2.55</td><td>3</td><td>B1 for max as 42.5 or 42.4$\dot{9}$
M1 for max × 60 or 2550
A1 for 2.55 (accept 2.54$\dot{9}$)</td></tr>
<tr><td>7</td><td>(a)</td><td></td><td>1 | 0 3 4 5 6 8
2 | 0 3
3 | 2 6
4 | 2 3 5 5 6
5 | 4</td><td>3</td><td>B2 for a fully ordered diagram
(B1 for a correct unordered diagram or ordered with at most two errors)
B1 for a correct key</td></tr>
<tr><td></td><td>*(b)</td><td><table><tr><td></td><td>Gym</td><td></td><td>Pool</td></tr><tr><td>HV</td><td>45</td><td><</td><td>54</td></tr><tr><td>LV</td><td>18</td><td>></td><td>10</td></tr><tr><td>Mean</td><td>32</td><td>></td><td>29.5</td></tr><tr><td>Median</td><td>34</td><td>></td><td>27.5</td></tr><tr><td>Range</td><td>27</td><td><</td><td>44</td></tr></table>
1 | 8 9
2 | 0 1 7 9
3 | 2 4 5 6 9 9
4 | 2 4 5</td><td>Compares:
medians/means
+
Spread</td><td>3</td><td>A maximum of two B marks from:
B1 for a correct mean or median for either the gym ages or the pool ages.
B1 for a correct range for either the gym ages or the pool ages.
B1 for a correct stem and leaf diagram drawn for the gym ages (no need for a key)

C1 for any correct comparison which relates to the context of the gym ages and pool ages, of either medians means or ranges from correct figures, or from stem & leaf diagrams</td></tr>
</table>

Paper_ 5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8			154	3	M1 for $\frac{56}{200}$ or $\frac{550}{200}$ M1 for $\frac{56}{200} \times 550$ A1 cao
9	(a)		48	1	B1 cao
	(b)		12	1	B1 cao
	(c)		20	2	M1 for $80 \div 4$ A1 cao
10	(a)	$5 \times 5 = 25$ $11 \times 20 = 220$ $23 \times 40 = 920$ $13 \times 65 = 845$ $8 \times 90 = 720$ $2730 \div 60$	45.5	4	M1 for fx with x consistent within intervals (including the end points) allow one error M1 (dep) for use of all correct mid-interval values M1 (dep on first M1) for $\Sigma fx \div 60$ A1 cao
	(b)		5, 16, 39, 52, 60	1	B1 cao
	(c)		Cumulative frequency graph	2	M1 ft for at least 4 of 5 points from their cf table (values must be cumulative) plotted consistently within each interval A1 for a fully correct cf graph
	(d)		15, 16 or 17	2	M1 for method shown to read off from $x = 60$ on their cf graph or linear interpolation from the table A1 ft from their cf graph

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Paper_ 5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11			68	3	M1 for 30 × 60 (= 1800) or 20 × 56 (= 1120) M1 for ("1800" – "1120") ÷ 10 A1 cao Or M1 for (60 − 56) × 20 or 4 × 20 (=80) M1 for "80" ÷ 10 = 8 A1 cao
12		$\frac{11264}{27500}$ (= 0.4096) $0.8^n = 0.4096$	4	2	$\frac{11264}{27500}$ (= 0.4096) M1 for and 0.8^n evaluated for n = 2 OR attempt to evaluate 27500×0.8^n for at least one value of n (not equal to 1) OR finding at least 2 deductions, ie 2 of 5500, 4400, 3520 A1 for 4 cao
13	(a) (b)		14 1.20	1 2	B1 cao M1 for attempt to find the gradient oe of the line eg drawing a right angled triangle with base & height shown, or $\frac{y_2 - y_1}{x_2 - x_1}$, values shown A1 for 1.20 (accept 1.2)
14			17	2	M1 for $\frac{117}{1034} \times 150$ or 16.9(729…..) A1 for 17

Paper_ 5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15			$\frac{54}{90} = \frac{3}{5}$	4	M1 for use of 9 as denominator of second probability M1 for a correct method to find the probability of at least one possible combination, $\frac{1}{10}\times\frac{6}{9}$ or $\frac{6}{10}\times\frac{1}{9}$ or $\frac{3}{10}\times\frac{1}{9}$ or $\frac{1}{10}\times\frac{3}{9}$ or $\frac{6}{10}\times\frac{3}{9}$ or $\frac{3}{10}\times\frac{6}{9}$ or $\frac{1}{10}\times\frac{9}{9}$, $\frac{6}{10}\times\frac{4}{9}$ or $\frac{3}{10}\times\frac{7}{9}$ M1 for complete and correct method shown eg $2\times(\frac{1}{10}\times\frac{6}{9}+\frac{6}{10}\times\frac{3}{9}+\frac{3}{10}\times\frac{1}{9})$ or $1-(\frac{6}{10}\times\frac{5}{9}+\frac{3}{10}\times\frac{2}{9})$ A1 for $\frac{54}{90}$ oe **Alternative scheme for replacement** M1 for $\frac{6}{10}\times\frac{6}{10}$ or $\frac{3}{10}\times\frac{3}{10}$ or $\frac{1}{10}\times\frac{1}{10}$ M1 for $1-(\frac{6}{10}\times\frac{6}{10}+\frac{3}{10}\times\frac{3}{10}+\frac{1}{10}\times\frac{1}{10})$ OR M1 for $\frac{1}{10}\times\frac{6}{10}$ or $\frac{6}{10}\times\frac{3}{10}$ or $\frac{3}{10}\times\frac{1}{10}$ M1 for $2\times(\frac{1}{10}\times\frac{6}{10}+\frac{6}{10}\times\frac{3}{10}+\frac{3}{10}\times\frac{1}{10})$ OR B2 for $\frac{54}{100}$ oe

Paper_ 5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	16 ÷ 20 = 0.8 27 ÷10 = 2.7 36 ÷ 15 = 2.4 6 ÷ 5 = 1.2	Correct histogram	3	M1 for recognising and showing evidence of using frequency density, eg at least 2 correct frequency densities or a key . A1 for all bars in correct proportions OR for one error with bars and correct labelling and scaling of axes A1 for fully correct histogram including axes labelled and scaled.
	(b)		$\frac{18}{85}$	3	M1 for using 40 cm on horizontal scale and using a correct method to convert area of bar to the right of 40 cm to frequency, eg 2.4 × 5. M1 (dep) for '12' + 6 A1 for $\frac{18}{85}$ oe OR M1 for $\frac{36}{3}$ M1 (dep) for '12' + 6 A1 for $\frac{18}{85}$ oe

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PAPER: 5MB1H_01			
Question		**Modification**	**Notes**
Q02		2cm grid crosses, cha nged to solid circles. Right axis labeled	
Q07 Q09		Box for key put top left Box plot: median changed to 47.5, upper quartile changed to 52.5	
Q09	(C)	52kg changed to 52.5 kg	
Q10	 (C)	Frequencies changed: 5, 20, 15, 15, 5 grid x axis – 2 cm for 10, y axis 2cm for 5	
Q13		2 cm grid, line moved parallel to original graph line to go through (0,20) (50, 80) (75, 110)	
Q16		Frequency column: 27 changed to 28 2 cm grid Number of weather stations changed from 85 to 86	

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Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Non-Calculator) Unit 2

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The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
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If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

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Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

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It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
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If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
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Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

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Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

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Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PMT

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		$7n - 2$	2	M1 for $7n + k$ where $k \neq -2$ or absent A1 cao
	(b)		31	2	M1 for correct substitution $4\times3^2 - 5$ oe A1 cao
2			108	5	M1 for a method for finding the dimensions eg length & width = 12 or 2 × length + width = 21 A1 for length = 9 (could be shown on diagram) A1 for width = 3 (could be shown on diagram) M1 for area = "9" × "3" × 4 A1 cao
3			50	3	M1 for 625 ÷ 250 (= 2.5) or 360 ÷ 120 (= 3) or 1000 ÷ 300 (=3⅓) M1 for correct method to calculate the number of cookies for one ingredient e.g. 625 ÷ 250 or 2.5 oe **and** 20 × "2.5" A1 cao OR M1 for multiples of 250 : 120 : 30 e.g. for 40 cookies 500, 240, 600 M1 for multiples linked with the weight of ingredients available e.g. (625, 2½) or (360, 3) or (1000. 3⅓) A1 cao

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		x -2 -1 0 1 2 3 y -7 -5 -3 -1 1 3	correct line	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between -2 and 3 **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $2x$-3 drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between -2 and 3 **(Use of y=mx+c)** M2 line segment of $2x$-3 drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of 2 OR line drawn with a y intercept of -3 and a positive gradient) A1 for correct line between -2 and 3

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(i)		candles 3 holders 5	5	M1 for listing multiples of either 30 or 18 (at least 3 but condone errors if intention is clear) M1 for listing multiples of both 30 and 18 (at least 3 but condone errors if intention is clear) M1 (dep on M1) for division by 30 or 18 or counts up multiples (implied if one answer is correct or answers are reversed) A1 candles (packs) 3, holders (packs) 5 or any same multiple of 3,5 OR M1 expansion of either number in factors M1 demonstrates one of the expansions that includes 6 oe M1 demonstrates second expansion that includes 6 oe A1 candles (packs) 3, holders (packs) 5 or any same multiple of 3,5
	(ii)		90		B1 for 90 or ft on both their packs or ft "common multiple" NB: accept consistent multiples of the given answer
*6			NO figures and comparisons	5	M1 for 100 × 40 × 60 (= 240 000) M1 for "240 000" ÷ 8000 (= 30) M1 for "30"× 2.50 (= 75) A1 for 240 000 and 75 C1 (dep on M1) for comparing the cost of grit with £70 ft from their working OR M1 for 70 ÷ 2.50 (= 28) M1 for "28"× 8000 (= 224 000) M1 for 100 × 40 × 60 (= 240 000) A1 for 240 000 and 224 000 C1 (dep on M1) for comparing values of grit needed with that which can be bought for £70 ft from their working

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PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*7			broke the record	5	M1 conversion between km and miles M1 for a first step to find comparable figures M1 for a complete method to find comparable figures A1 for correct comparable figures C1 (dep on first 2 M marks) for statement e.g broke the record with comparison of their figures
8			$14\frac{2}{3}$	3	M1 for method to write fractions as improper fractions with one correct M1 (dep on M1) for multiplying numerators and denominators A1 cao SC: B2 for $\frac{220}{15}$ oe
9			(–3,–12,–1)	2	B2 cao B1 for two out of three coordinates correct
10	(a)		1	1	B1
	(b)		$\frac{1}{16}$	1	B1
	(c)		$2\sqrt{7}$	2	M1 for multiplying numerator and denominator by $\sqrt{7}$ A1 for $2\sqrt{7}$

PAPER: 5MB2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		$6x^5y^8$	2	M1 for any two of 6, x^5, y^8 A1 cao
	(b)		$6x^2-11x+3$	2	M1 for 3 out of 4 correct terms with correct signs, or all 4 terms correct ignoring signs A1 cao
	(c)		$4x^3y^2(2y^3-3x)$	2	M1 for $4x^3y^2$ (two terms involving x and/or y) or correct partial factorising taking out two from 4 or x or y A1 cao
	(d)		$(2+x)(e-2f)$	2	M1 for partial factorising of at least two terms eg $2(e-2f)$ or $x(e-2f)$ or $e(2+x)$ or $2f(2+x)$ oe A1 cao
12			$y=\frac{10}{3}x+\frac{130}{3}$	5	B1 for stating B as (0, 5) or $OB = 5$ (could be written on the diagram) B1 for C as (10, 0) or $OC = 10$ (could be written on the diagram) or A is (-10, 10) or ft from their BC M1 gradient of $DA = \frac{10}{3}$ or $y=\frac{10}{3}x+c$ M1 for substitution of $x=-13$, $y=0$ or $x=-10$, $y=10$ in their equation A1 $y=\frac{10}{3}x+\frac{130}{3}$ oe
13			$\frac{7x-6}{x(2-x)}$	3	M1 for intention to use $x(2-x)$ as the denominator M1 for $\frac{4x-3(2-x)}{x(2-x)}$ oe A1 cao allow $2x-x^2$ as a denominator

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
*14			Proof	5	B1 for matching two lines of the same length with reasons B1 for matching two sides of the kite with reasons B1 for showing $AD = AB$ and $DC = CB$ with reasons C1 for "Tangents from an external point are equal in length." C1 for a complete proof

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PAPER: 5MB2H_01			
Question		**Modification**	**Notes**
4		2 cm grid – inside spaces will be slightly less but equal Q5. Picture removed	
6		Model given – MLP also have diagram Wording inserted: The box is 100 cm long, 40 cm wide and 60 cm high	
11	(a)	x changed to e y changed to f	
	(d)	x changed to y	
14		AC joined with a dotted line	

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Mark Scheme (Results)

November 2015

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Non-Calculator) Paper 1H

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1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			69	4	M1 for finding 15% of £720 (=108) M1 (dep) for finding total of £720 plus interest (or 115% etc) (=828) M1 (dep on previous M1) dividing by 12 A1 cao OR M1 finding 720 ÷ 12 (=60) M1 (dep) finding 15% of "60" (=9) M1 (dep on previous M1) for adding, e.g. 60 + 9 A1 cao
2	(i)		19.44	2	B1 cao
	(ii)		19 440		B1 cao
3	(a)		$6n + 5$	2	B2 for $6n + 5$ (B1 for $6n + k$ where k is an integer or absent)
	(b)		No with explanation	2	M1 for "$6n + 5$" = 121 or any other valid method, e.g. counting on 6s (to get to 119 or more) A1 for No with complete explanation, e.g. $6n$=116 will not give a whole number
4	(a)		60	2	M1 for 200 × 0.3 oe A1 cao
	(b)		0.1	2	M1 subtracting sum of probabilities from 1, e.g. 1−(0.3+0.2+0.4) A1 cao

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
5			20	3	M1 for 330÷120 (=2.75) or 200÷60 (=3 1/3) or 450 ÷180 (=2.5) M1 for 450÷180 (=2.5) AND 8×"2.5" A1 cao OR M1 for 120÷8 (=15) or 60÷8 (=7.5) or 180÷8 (=22.5) M1 for 330÷(120÷8) [=22] or 200÷(60÷8) [=26.6..] or 450÷(180÷8) A1 cao OR M1 for multiples of 120:60:180 M1 for multiplication linked to 450 and 8+8+4 A1 cao
6			40°	4	M1 for angle FBC=70 or CFG = x or ABF = 110 may be seen in diagram M1 for angle CBF = BFC =70 or 90 – ½ x A1 for 40 supported by working C1 (dep on M2) for all reasons and linked to appropriate working, e.g. Alternate angles are equal; Allied angles / Co-interior angles add up to 180°; Base angles of an isosceles triangle are equal; angles in a triangle add to 180°, angles on a straight line equals 180°
7	(a)		explanations	2	B2 for two aspects from: no time frame; responses vague; no "never" box (B1 for one correct aspect)
	(b)		question response boxes+	2	B1 for a question with a time frame (may appear with response boxes) B1 for at least 3 correctly labelled response boxes (non-overlapping and exhaustive) Do not accept inequality symbols.

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		2p 1p ½ p Tot Sat 7 16 (31) 54 Sun (15) 14 17 (46) Tot (22)(30) 48 (100)	14	4	M1 for total Sat bottles 100 – 46 (=54) or for total ½ pint bottles 100 – 22 – 30 (=48) or (total 2 pint bottles on Sat) 22 – 15 (=7) M1 for total Sun bottles of ½ pint "48" – 31 (=17) or for total Sat bottles of 1 pint: "54" – 31 – (22 −15) (=16) M1 for 46 – 15 – "17" or for 30 – "16" A1 cao NB: any of the above figures could be shown in a 2-way table
*9			NO with evidence	4	M1 for 50 × 40 × 30 (=60000) M1 for "60000" ÷ 3000 (=20) M1 for "20" × £3.50 C1 eg for 70 and comparison resulting in NO OR M1 for £60 ÷ 3.50 (=17 bottles) M1 for "17" × 3000 (=51000) M1 for 50 × 40 × 30 (=60000) C1 eg for 51000 and 60000 and comparison resulting in NO

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1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		$x^2 + 2x$	1	B1 cao
	(b)		$3y + 4x + 2$	2	M1 for a method to expand a bracket, e.g. $3y + 6$ or $4x - 4$ A1 cao
	(c)	$2t^2 + 10t - 3t - 15$	$2t^2 + 7t - 15$	2	M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms with signs correct unless ambiguous A1 cao
	(d)		$4a(2a + 3)$	2	M1 for $4a(na+c)$ or $2a(4a+6)$ or $a(8a+12)$ [n,c integers, $c \neq 0$] A1 cao
	(e)		$(y + 1)(y - 2)$	2	M1 for $(y \pm 1)(y \pm 2)$ unless ambiguous A1 cao
11	(a)		150	2	M1 for $180 - (360 - 330)$ or $180 - 30$ or $330 - 180$ or a complete diagram showing the bearing of 330° A1 cao
	(b)		11 40	4	M1 for $200 \div 120$ (=1 2/3 h) M1 for conversion between hours and minutes A1 for 1 h 40 min or 100 minutes B1 (ft dep on M1) for 11 40

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		2, 0, 0, 6	2	B2 for 2, 0, 0, 6 (B1 for at least two of 2, 0, 0, 6); could be taken from graph
	(b)		Correct curve	2	M1 (ft) for at least 5 points plotted correctly A1 for a fully correct curve
	(c)		−0.6, 3.6	2	M1 (ft if M1 awarded in (b) and at least B1 in (a)) for indicating a point or line drawn at $y=4$, or one solution given A1 (ft) for both solutions
13			20	3	M1 for 30 × 14 (=420) or 18×10 (=180) M1 for 30 × 14 – 18 × 10 or "420" – "180" (=240) A1 cao
14			126	4	M1 for method to find exterior or interior angle of octagon M1 for method to find exterior or interior angle of pentagon M1 for complete method A1 cao

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		19, 36, 51, 63, 73, 80	1	B1 cao
	(b)		cf graph	2	M1 for at least 5 of the 6 points plotted at each upper end of the interval (not joined) or 5 of the 6 points plotted consistently within interval (not upper end) and joined (dep on a cf table with no more than one arithmetic error) A1 correct graph
	*(c)		comparable value and conclusion	3	M1 for indication of a reading taken from a cf graph using weight = 3.4 kg or find UQ from 60 A1 for value given between 55 & 57 or 3.6 & 3.8 C1 (dep on at least M1) for conclusion (justified)
16			13.75	5	M1 for finding perimeter of rectangle e.g. $5x + 5 + 5x + 5 + 4x + 4x$ $(= 18x + 10)$ M1 for finding perimeter of trapezium e.g. $9x - 2 + 7x - 2 + 10x$ $(=26x - 4)$ M1 for equation e.g. $26x - 4 = 18x + 10$ (or $8x = 14$) A1 for finding the value of x as 1.75 B1 ft for subs of x into $5x + 5$ and evaluated (=13.75)
17			$x = 3\frac{1}{3}$ $y = -2$	4	M1 for a correct process to eliminate either variable (condone one arithmetic error) or to rearrange and substitute for elimination A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equation or appropriate method after starting again (condone one arithmetic error) A1 cao

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
18			$2\sqrt{5}$	2	M1 for multiplication of denominator and numerator by $\sqrt{5}$ A1 cao
19			756π	5	M1 for $\frac{1}{3}\pi r^2 \times 10$ $(=270\pi)$ A1 for $r = 9$ M1 (dep on M1) for $\frac{1}{2} \times \frac{4}{3}\pi \times "9"^3$ $(= 486\pi)$ M1 for 270π + "486π" oe A1 cao
*20			Proof	5	M1for finding one other vector expressed as **a** and/or **b** M1 for method to find one of $\overrightarrow{DM}$, $\overrightarrow{MA}$ or $\overrightarrow{DA}$ eg $\overrightarrow{DM} = -\mathbf{b} + \frac{1}{2}(3\mathbf{b} + \mathbf{a})$ oe, $\overrightarrow{MA} = \frac{1}{2}(3\mathbf{b} + \mathbf{a}) + \mathbf{a}$ oe or $\overrightarrow{DA} = 2\mathbf{b} + 2\mathbf{a}$ oe M1 for method to find two of $\overrightarrow{DM}$, $\overrightarrow{MA}$ or $\overrightarrow{DA}$ A1 for two of $\overrightarrow{DM} = \frac{1}{2}(\mathbf{a} + \mathbf{b})$, $\overrightarrow{MA} = 1.5(\mathbf{a} + \mathbf{b})$, $\overrightarrow{DA} = 2(\mathbf{a} + \mathbf{b})$ ie simplified but oe C1 (dep on working shown) for conclusion relating to correct working

1MA0 1H November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
21	(a)		$\frac{9x-8}{x(2-x)}$	3	M1 for method to use a common denominator, e.g. $\frac{5(x)-4(2-x)}{x(2-x)}$ M1 (dep on M1) for correct expansion of brackets and combination of numerators e.g. $5x-8+4x$ $(=9x-8)$ A1 for $\frac{9x-8}{x(2-x)}$ or $\frac{9x-8}{2x-x^2}$
	(b)		$y=\frac{2-2t}{t+3}$	4	M1 for intention to multiply both sides by $y+2$ as a first step e.g. $t\times y+2=2-3y$ M1 for intention to correctly isolate their y terms on one side and the other terms on the other side, e.g. $ty+3y=2-2t$ M1 for intention to factorise, e.g. $y(t+3)$ $(=2-2t)$ A1 for $y=\frac{2-2t}{t+3}$ oe
*22			Similarity and proof	5	B1 for method matching a pair of opposite angles, e.g. if $EAB=x$, $BDE=180-x$, $EAB+BDE=180$ B1 for linking angles between quad and triangle, e.g. if $BDE=180-x$ then $BDC=x$ B1 for stating or implying $ACE=BCD$ (same angle) C1 for Opposite angles of a cyclic quadrilateral add up to 180° or statement linking three angles for similarity C1 for complete proof

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q06		Diagram is enlarged.	Standard mark scheme
Q09		Model is provided for all candidates. Diagram also provided for MLP.	Standard mark scheme
Q10	(a)	MLP only: x changed to y Diagram is enlarged.	Standard mark scheme
Q12	(a) (b)	Wording added “There are four spaces to fill.” 1.5 cm grid..Small squares removed.	Standard mark scheme
Q14		Diagram enlarged.	Standard mark scheme
Q15	(c)	Frequencies changed to 25, 20, 15, 10, 5, 5. Grid: 1.5 cm 3.4 kg changed to 3.5 kg.	Standard mark scheme
Q16		“trapezium” and “rectangle” put inside the shapes. MLP only: x changed to y.	Standard mark scheme
Q19		Model provided for all candidates. Diagram also provided for MLP.	Standard mark scheme

PAPER: 1MA0_1H			
Question		**Modification**	**Notes**
Q20		Diagram is enlarged. Lower case vectors enlarged.	Standard mark scheme
Q22		Diagram is enlarged.	Standard mark scheme

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Mark Scheme (Results)

November 2015

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Non-Calculator) Unit 2

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4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

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6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

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It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
1.			6 525 900 450	3	M1 for $\times 6 \div 4$ oe or $\frac{6}{4}$ or 1.5 or 1 correct answer A2 for all correct (A1 for 2 or 3 correct)
2.			$8n + 24$	3	M1 for generating at least 3 terms of sequence 32, 40, 48 or sequence 4, 5, 6 M1 for $8n \pm k$ or $8(n \pm m)$ where $k \neq 24$, $m \neq 3$ A1 for $8n + 24$ or $8(n + 3)$ oe
3.			105 cm^3	4	M1 for writing factor pairs of 35, 21 or 15 M1 for "3" × "5" × "7" using their lengths dep on one at least one correct factor pair A1 ft for 105 (dep on one correct factor pair) B1 for cm^3

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
4.		$y = \frac{1}{2}x + 3$ x : −2, −1, 0, 1, 2, 3, 4 y : 2, 2.5, 3, 3.5, 4, 4.5, 5	Correct line from (−2, 2) to (4, 5)	3	**(Table of values / calculation of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted) A1 for correct line between $x = -2$ and $x = 4$ **(No table of values)** M1 for at least 2 correct points with no more than 2 incorrect points plotted M1 for at least 2 correct points (and no incorrect points) plotted **OR** line segment of $y = \frac{1}{2}x + 3$ drawn A1 for correct line between $x = -2$ and $x = 4$ **(Use of $y = mx + c$)** M1 for line drawn with gradient of $\frac{1}{2}$ **OR** line drawn with a y intercept of 3 M1 for line drawn with gradient of $\frac{1}{2}$ **AND** line drawn with a y intercept of 3 A1 for correct line between $x = -2$ and $x = 4$ **SC** : B2 for correct line from $x = 0$ to $x = 4$

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5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
5.			68	5	B1 for correct conversion of units M1 for 250 ÷ 25 (= 10) or 300 ÷ 20 (= 15) M1 for "10" × "15" M1 (dep on M2) for number of tiles ÷ 20, round up, × 8.5(0) A1 for 68 OR B1 for correct conversion of units M1 for 250 ÷ 20 (= 12.5) or 300 ÷ 25 (= 12) M1 for "12.5" × "12" M1 (dep on M2) for number of tiles ÷ 20, round up, × 8.5(0) A1 for 68 OR B1 for correct conversion of units M1 for 3 × 2.5 (= 7 .5) or 20 × 25 (= 500) M1 for "3 × 2.5" ÷ "0.2 × 0.25" or "300 × 250" ÷ "20 × 25" M1 (dep on M2) for number of tiles ÷ 20, round up, × 8.5(0) A1 for 68
*6		1, 4, 7, 10, 13 8, 6, 4, 2, 0	Explanation	2	M1 for listing at least 3 terms of both sequences C1 for Yes and explanation from fully correct working that 4 is in both sequences; numbers in A are increasing; numbers in B are decreasing

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			7.21 (am)	3	M1 for listing multiples 9,18,27,36 and 12,24,36 (condone 1 arithmetic error) or method to find LCM M1 for identifying 36 as LCM A1 cao OR M1 for listing times 6.54, 7.03, 7.12, 7.21 or for listing times 6.57, 7.09, 7.21 (condone one arithmetic error) M1 for listing times 6.54, 7.03, 7.12, 7.21 **and** 6.57, 7.09, 7.21 (condone one arithmetic error) A1 cao
8	(a)		4(3e +1)	1	B1 cao
	(b)		15c – 10d	1	B1 cao
	(c)		$28a^4b^3$	2	B2 for $28a^4b^3$ (B1 for two of 28, a^4 , b^3 as a product)
	(d)		$(x + 7)(x – 7)$	1	B1 cao
	(e)	$2y^2 – 6y + 7y – 21$	$2y^2 + y – 21$	2	M1 for 3 out of no more than 4 terms correct with correct signs or the 4 terms $2y^2$, $6y$, $7y$ and 21 seen, ignoring signs A1 cao

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		360 – 64 140 + 40 + 296 + 40 = 516 540 − 516 = 24	24°	4	M1 for 1 correct relevant angle calculation A1 for 24 cao C2 for all reasons (C1 (dep M1) for reason relating to parallel lines or parallelogram which is relevant to their chosen method) eg angles on a straight line add to 180° angles at a point add to 360° angles in a triangle add to 180° angles in a quadrilateral add to 360° alternate angles are equal corresponding angles are equal allied angles / co-interior angles add up to 180° opposite angles in a parallelogram are equal
10			$4\frac{8}{35}$	3	M1 for converting both fractions to get a common denominator of a multiple of 35 with at least one correctly converted. M1 (dep on M1) for $3+\frac{"28"}{35}+\frac{"15"}{35}\left(=3\frac{43}{35}\right)$ oe A1 for $4\frac{8}{35}$ cao

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		7.8×10^{-3}	1	B1 cao
	(b)		6 710 000	1	B1 cao
	(c)	$-9,\ 0.9,\ 1,\ 3$	$-9,\ 0.9,\ 9^0,\ 9^{\frac{1}{2}}$	2	M1 for either $9^{\frac{1}{2}}$ or 9^0 evaluated correctly A1 for fully correct list from correct working, accept original numbers or evaluated. (SC: B1 for 1 error in position or a correct list in reverse order)
12.	(a)		(0, 5, 5)	1	B1 cao
	(b)		$(2\frac{1}{2}, 5, 2\frac{1}{2})$	1	B1 for $(2\frac{1}{2}, 5, 2\frac{1}{2})$ oe
13.			120	3	M1 for $80\% = 480$ or $\frac{480}{80}(=6)$ or $\frac{480}{80} \times 100\ (=600)$ oe M1 for $600 - 480$ or $\frac{480}{80} \times 20$ oe A1 cao
14.			$A = 9x^2 + 19x - 6$	4	B1 for one of $5x - 2$ or x found M1 for correct method to find area of one relevant rectangle. M1 for complete method to find whole area or simplified expression $9x^2 + 19x - 6$ or correct but not simplified formula A1 for correct, simplified formula $A = 9x^2 + 19x - 6$

5MB2H_01 November 2015					
Question		**Working**	**Answer**	**Mark**	**Notes**
15.			$y = \frac{3}{2}x - \frac{5}{2}$	4	M1 for attempt to find gradient of AB M1 (dep) for attempt to find gradient of perpendicular line eg use of $-\frac{1}{m}$ M1 for substituting $x = 3, y = 2$ into $y =$ "m" $x + c$ A1 for complete correct equation $y = \frac{3}{2}x - \frac{5}{2}$ oe
16.			$2\sqrt{7}$	3	M1 for multiplying numerator and denominator by $\sqrt{7}$ M1 for correct method to expand $(4+\sqrt{2})(4-\sqrt{2})$ with 3 out of no more than 4 terms correct with correct signs or the 4 terms seen, ignoring signs A1 for $2\sqrt{7}$ (accept $\sqrt{28}$)
17.		$\frac{(x-5)(x+3)}{(x+3)(2x+1)}$	$\frac{x-5}{2x+1}$	3	M1 for correct factorisation of numerator M1 for correct factorisation of denominator A1 for $\frac{x-5}{2x+1}$

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PAPER: 5MB3H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1*			Decision (supported)	3	M1 for correct first step e.g. 15 ÷ 3 M1 for complete method C1 for correct decision with accurate figures
2	(a)		Correct diagram	2	B2 cao (B1 for correct orientation)
	(b)		Enlargement, sf 4, centre (0, 1)	3	B1 for enlargement B1 for scale factor 4 B1 for centre (0, 1)
3			$w = \frac{d+5}{2}$	2	M1 for attempt to add 5 to both sides or divide both sides by 2 as a first step, eg $d + 5 = 2w$ oe or $\frac{d}{2} = w - \frac{5}{2}$ oe A1 for $w = \frac{d+5}{2}$ oe

PMT

PAPER: 5MB3H/01					
Question		Working	Answer	Mark	Notes
4			22.5	4	M1 for $4(x - 8) = 2x + 13$ M1 for expansion of bracket or division of all terms by 4, eg $4x - 32 = 2x + 13$, or $x - 8 = \frac{2x}{4} + \frac{13}{4}$ M1 for isolating x and number terms eg $2x = 45$, $\frac{x}{2} = \frac{45}{4}$ A1 for $\frac{45}{2}$ or 22.5 OR M1 for $(180 - 64) \div 2$ (= 58) M1 for $4(x - 8)$ = "58" or $2x + 13$ = "58" or "58" – 13 (= 45) M1 for isolating x and number terms eg $4x = 90$, $2x = 45$ or "45" ÷ 2 A1 for $\frac{45}{2}$ or 22.5 OR M1 for $64 + 4(x - 8) + 2x + 13$ M1 for $64 + 4(x - 8) + 2x + 13 = 180$ M1 for isolating x and number terms eg $6x = 135$ A1 for $\frac{45}{2}$ or 22.5
5			Correct region shaded	3	M1 for a circle centre M or N (accept arc of sufficient length to define the region) M1 for circle centre M radius 5 cm **and** circle centre N radius 3 cm (accept arc of sufficient length to define the region) A1 for correct region shaded

PAPER: 5MB3H/01					
Question		Working	Answer	Mark	Notes
*6			Conclusion (supported)	4	M1 for $\pi \times 120^2$ (= 45 216 – 45 249) M1 for "$\pi \times 120^2$" ÷ 1800 A1 for 25 – 25.2 C1 ft (dep on M2) for appropriate conclusion from their figures OR M1 for $\pi \times 120^2$ (= 45 216 – 45 249) M1 for 20 × 1800 A1 for 36 000 and 45 216 – 45 249 C1 ft (dep on M2) for appropriate conclusion from their figures OR M1 for $\pi \times 120^2$ (= 45 216 – 45 249) M1 for "$\pi \times 120^2$" ÷ 20 A1 for 2260 – 2263 C1 ft (dep on M2) for appropriate conclusion from their figures OR M1 for 1800 × 20 M1 for 36 000 ÷ π (=11 457 – 11 465) A1 for 107(.0…) C1 ft (dep on M2) for appropriate conclusion from their figures
7			161.50	5	M2 for a correct method to decrease 6720 by 20%, eg 6720 × 0.8 (= 5376) or 6720 × 0.2 (= 1344 and 6720 – 1344 (= 5376)) (M1 for a correct method to find 20% of 6720 eg 6720 × 0.2 or $\frac{20}{100} \times 6720$ (= 1344)) M1 for subtracting 1500 (= 3876) after a percentage calculation M1 "3876" ÷ 24 after the subtraction of 1500 A1 for 161.5(0)

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PAPER: 5MB3H/01

Question		Working		Answer	Mark	Notes
8		3	42	3.7	4	B2 for a trial between 3 and 4 exclusive (B1 for a trial at 3 or 4) B1 for a different trial of $3.7 < x \leq 3.75$ B1 (dep on at least one previous B1) for 3.7 NB. Trials should be evaluated to at least 2 sf truncated or rounded for values of x correct to 1 decimal place. Trials should be evaluated to at least 1 dp truncated or rounded for values of x correct to 2dp. **NB** No working scores 0 marks even if answer is correct
		3.1	45.(291)			
		3.2	48.(768)			
		3.3	52.(437)			
		3.4	56.(304)			
		3.5	60.(375)			
		3.6	64.(656)			
		3.7	69.(153)			
		3.8	73.(872)			
		3.9	78.(819)			
		4	84			
		3.71	69.6(14811)			
		3.72	70.(078848)			
		3.73	70.5(45117)			
		3.74	71.(013624)			
		3.75	71.4(84375)			
9				618	4	M1 for a method to find an area which is part of the cross section M1 (dep) for a complete method to find the total area of the cross section M1 (dep M1) for their cross sectional area × 12 A1 cao **OR** M1 for a method to find the volume of cuboid, 8 × 8 × 12 (= 768) M1 for a method to find the volume of the triangular prism, ½ ×5 × 5 × 12(= 150) M1 (dep M2) for a complete method for the volume of the prism A1 cao

5MB3H_01					
Question		Working	Answer	Mark	Notes
10	(a)		15.2	3	M1 for $12.7^2 + 8.3^2$ or $161.29 + 68.89$ or 230.18 M1 for √"$(12.7^2 + 8.3^2)$" or √"$161.29 + 68.89$" or $\sqrt{230.18}$ A1 for 15.2 or 15.17(168…)
	(b)		16.1	3	M1 for $\sin 40° = \frac{DE}{25}$ oe or $\frac{DE}{\sin 40} = \frac{25}{\sin 90}$ oe M1 for 25 sin 40° A1 for 16.1 or 16.06(969…)
11	(a)		4.081	2	M1 for 8.875 or $\frac{71}{8}$ or 2.979…or 4.08 A1 for 4.081 or 4.0809(5…)…
	(b)		4×10^{-3}	2	M1 for 4×10^n, $n \neq -3$ or $a \times 10^{-3}$, $a \neq 4$ or 0.004 or 0.4×10^{-2} or 1/250 A1 cao
12			$x < 2$	2	M1 for an attempt to isolate x and number terms or multiply all terms by 2, or for $\frac{3}{2}x < 3$ or $-\frac{3}{2}x < -3$ or $x = 2$ A1 cao
13	(a)		0, 6, 4, –6	2	B2 for all values correct (B1 for any one value correct)
	(b)		Graph drawn	2	M1 ft (provided B1 in (a) for at least 6 points plotted correctly from their table A1 cao for correct curve drawn from (–4, –6) to (3, –6)
	(c)		1.5 to 1.6 and –2.5 to –2.6	2	M1 for correct use $y = 2$ (may be implied by one correct estimate) or correct use of formula. A1 for 1.5 to 1.6 and –2.5 to –2.6

5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14*		Sher Yas **Old 19300 12560** New 20265 13502 **Inc 965 942**	Correct comparison (supported)	3	M1 for a correct method to calculate the population at the beginning of the 10 year period for at least one place. eg $\frac{20265}{1.05}$ (= 19 300) oe or $\frac{13502}{1.075}$ (= 12 560) oe A1 for 965 (Sherbury) **and** 942(Yaston) C1 (dep on M1) ft for statement comparing increases leading to conclusion based on two comparable amounts eg increase in Sherbury is greater than increase in Yaston
15		$20x + 10y = 35$ $6x - 10y = -48$ $x = -\frac{1}{2}$ $y = \frac{9}{2}$ OR $12x + 6y = 21$ $12x - 20y = -96$ $26y = 117$ $y = \frac{9}{2}$ $x = -\frac{1}{2}$	$-\frac{1}{2}, \frac{9}{2}$	4	M1 for a correct process to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao OR M1 for full method to rearrange and substitute to eliminate either variable (condone one arithmetic error) A1 cao for either x or y M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again (condone one arithmetic error) A1 cao **NB** Trial and improvement methods score 0 marks unless both x and y are correct
16			226	2	M1 for angle $ABC = 180 - 67$ (= 113) A1 cao OR M1 for obtuse angle $AOC = 2 \times 67$ (= 134) A1 cao

5MB3H_01					
Question		Working	Answer	Mark	Notes
17			– 2.82, 19.82	3	M1 for $\frac{--17 \pm \sqrt{(-17)^2 - 4\times1\times-56}}{2\times1}$ (condone one sign error) or $\left(x - \frac{17}{2}\right)^2$ oe M1 for $\frac{17 \pm \sqrt{513}}{2}$ or for method leading to $\frac{17}{2} \pm \sqrt{\frac{513}{4}}$ oe A1 for answers in the range 19.82 to 19.825; – 2.82 to –2.825
18			21.2	4	M1 for correct use of sine rule to find *AB* or *BC*, eg $\frac{6}{\sin 25} = \frac{AB}{\sin 120}$ or $\frac{6}{\sin 25} = \frac{BC}{\sin(180-120-25)}$ M1 for (*AB* =) $\frac{6}{\sin 25}$ × sin 120 (= 12.2(951…)) or (*BC* =) $\frac{6}{\sin 25}$ × sin 35 (= 8.1(431…) M1(dep M2) for method to find area, eg 0.5 × 6 × "*AB*" sin35 or 0.5 × 6 × "*BC*" sin 120 A1 for answer in the range 21.1 – 21.2 OR (with perpendicular from *A* meeting *BC* extended at a point *X*) M1 for method to find *AX* M1 for method to find *BX* M1(dep M2) for 0.5 × "*AX*" × "*BC*" A1 for answer in the range 21.1 – 21.2
*19			0.38 because the LB and UB agree to that number of figures	5	B1 for 10.75 or 10.85 or 10.84999… B1 for 75.055 or 75.065 or 75.064999… M1 for $\sqrt{\frac{10.85}{75.055}}$ as UB **OR** $\sqrt{\frac{10.75}{75.065}}$ as LB A1 (dep on all previous marks) for both 0.3802… and 0.3784 must clearly come from working with correct values C1 for 0.38 from 0.3784… and 0.3802 … **and** "both LB and UB round to 0.38" **NB** An answer of 038(932….) without working scores no marks

5MB3H_01					
Question		Working	**Answer**	**Mark**	**Notes**
20			7.35	3	M1 for $y \propto \frac{1}{\sqrt{x}}$ or $y = \frac{k}{\sqrt{x}}$ or $9 = \frac{k}{\sqrt{4}}$ M1 for $k = 9\sqrt{4}$ (=18) A1 for 7.35 or 7.348…
*21			$\frac{2}{3}$ (7**a** + 3**b**) and correct conclusion	4	M1 for correct vector for $\overrightarrow{OY}$, or $\overrightarrow{AP}$ eg $(\overrightarrow{OY}) = \overrightarrow{OA} + \overrightarrow{AY}$, or $\overrightarrow{OY} = \overrightarrow{OA} + \frac{2}{3}\overrightarrow{AP}$ may include terms in **a** and **b,** eg. 6**a** + $\overrightarrow{AY}$, 4**b** + 4**a** – **b** + $\overrightarrow{PY}$ or $\overrightarrow{AP} = \overrightarrow{AO} + \overrightarrow{OB} + \overrightarrow{BP}$ or –6**a** + 4**b** + 4**a** – **b** or – 2**a** + 3**b** M1 for $(\overrightarrow{AY}) = \frac{2}{3}\overrightarrow{AP}$ or ⅔(–6**a** + 4**b** + 4**a** – **b**) or ⅔(–2**a** + 3**b**) or $(\overrightarrow{PY} = \frac{1}{3}\overrightarrow{PA}$ or ⅓(– 4**a** + **b** – 4**b** + 6**a**) or ⅓(2**a** – 3**b**) M1 for correct expression for $\overrightarrow{OY}$ in terms of **a** and **b,** eg $\frac{14}{3}$ **a** + 2**b** C1 for $\frac{2}{3}$ (7**a** + 3**b**) and "$\overrightarrow{OY}$ is parallel to the vector 7**a** +3**b**" **oe**

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q2	(a)	Grid enlarged. Shading changed to dotty shading. Labels added to shapes. Image labelled shape A. Rotation given and labelled shape B. Question changed to 'Describe fully the single transformation which maps shape A to shape B. One row top and bottom, one column left and right has been removed. Three answer lines given.	2 cao (B1 for correct orientation in third quadrant or correct quarter turn)
Q2	(b)	Grid enlarged. Shading changed to dotty shading. Labels added next to the triangles 'triangle P' and 'triangle Q'. One column removed from the left.	B1 for enlargement B1 for scale factor 4 B1 for centre (0, 1)

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q4		Diagram enlarged. MLP only – x changed to y. Braille only – measurements given in the text.	M1 for $4(x - 8) = 2x + 13$ M1 for expansion of bracket or division of all terms by 4, eg $4x - 32 = 2x + 13$, $x - 8 = 2x/4 + 13/4$ M1 for isolating x and number terms eg $2x = 45$, $x/2 = 45/4$ A1 for 45/2 or 22.5 OR M1 for $(180 - 64) \div 2$ (= 58) M1 for $4(x - 8) = 58$ or $2x + 13 = 58$ M1 for isolating x and number terms eg $4x = 90$, $2x = 45$ A1 for 45/2 or 22.5 OR M1 for $64 + 4(x - 8) + 2x + 13$ M1 for $64 + 4(x - 8) + 2x + 13 = 180$ M1 for isolating x and number terms eg $6x = 135$ A1 for 45/2 or 22.5
Q5		Diagram kept the same size as original. Scale moved above the diagram and also put in the question paper.	B1 for circle centre M radius 5 cm B1 for circle centre N radius 3 cm B1 for correct region shaded

PMT

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q6		Diagram enlarged. Cross changed to a filled in circle. Arrow heads removed.	M1 for $\pi \times 120^2$ (= 45238….) M1 for "$\pi \times 120^2$" ÷ 1800 A1 for 25.0 – 25.2 C1 for "surface is large enough as 25 > 20" oe OR M1 for $\pi \times 120^2$ (= 45238….) M1 for 20 × 1800 A1 for 36000 C1 for "surface is large enough as 36000 < 45238..." oe OR M1 for $\pi \times r^2 = 1800 \times 20$ M1 for 36000 ÷ π (=11459..) A1 for 107.0… C1 for "surface is large enough as 107…< 120" oe
Q9		Model provided for all candidates. Diagram enlarged and provided for MLP.	M1 for a method to find an area which is part of the cross section M1 (dep) for a complete method to find the total area of the cross section M1 (dep M2) for a complete method for the volume of the prism A1 cao OR M1 for a method to find the volume of cuboid, 8 × 8 × 12 M1 for a method to find the volume of the triangular prism M1 (depM2) for a complete method for the volume of the prism A1 cao

PMT

PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q10	(a)	Diagram enlarged. Braille only: measurements given in the text.	M1 for $12.7^2 + 8.3^2$ or $161.29 + 68.89$ or 230.18 M1 for $\sqrt{161.29 + 68.89}$ or $\sqrt{230.18}$ A1 for 15.2 or 15.17(168…)
Q10	(b)	Diagram enlarged. Braille only – measurements given in the text.	M1 for $\sin 40° = \frac{DE}{25}$ oe M1 for $25 \sin 40°$ A1 for 16.1 or 16.06(969…)
Q13	(a)	Wording added 'There are four spaces to fill.'	B2 for all values correct (B1 for any one value correct)
Q13	(b)	Grid enlarged.	M1 ft for at least 6 points plotted correctly from their table A1 cao for correct curve drawn from (–4, –6) to (3, –6)
Q16		Diagram enlarged. Dot added at centre.	M1 for angle ABC = 180 – 67 (= 113) A1 cao OR M1 for obtuse angle AOC = 2 × 67 (= 134) A1 cao

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PAPER: 5MB3H_01			
Question		**Modification**	**Notes**
Q18		Diagram enlarged.	M1 for correct use of sine rule to find *AB* or *BC*, eg $\frac{6}{\sin 25} = \frac{AB}{\sin 120}$ M1 for (*AB* =) $\frac{6}{\sin 25} \times \sin 120$ or (*BC* =) $\frac{6}{\sin 25} \times \sin 35$ M1(dep M2) for method to find area, eg 0.5×6×*AB*sin35 or 0.5×6×*BC* sin 120 A1 for answer in the range 21.1 – 21.2 OR (with perpendicular from *A* meeting *BC* extended at a point *X*) M1 for method to find *AX* M1 for method to find *BX* M1(dep M2) for 0.5 × "*AX*" × "*BC*" A1 for answer in the range 21.1 – 21.2
Q21		Diagram enlarged.	M1 for correct vector for $\overrightarrow{OY}$, eg $(\overrightarrow{OY}) = \overrightarrow{OA} + \overrightarrow{AY}$, may include terms in **a** and **b,** eg. 6**a** + $\overrightarrow{AY}$, 4**b** + 4**a** – **b** + $\overrightarrow{PY}$ M1 for ($\overrightarrow{AY}$ =) $\frac{2}{3}\vec{A}P$ or ($\overrightarrow{PY}$ =) $\frac{1}{3}\overrightarrow{PA}$ M1 for correct expression for $\overrightarrow{OY}$ in terms of **a** and **b,** eg $\frac{14}{3}$**a** + 2**b** C1 for $\frac{2}{3}$(7**a** + 3**b)** and "$\overrightarrow{OY}$ is parallel to the vector 7**a** +3**b" oe**

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Question 12

There was generally a poor understanding of how to tackle this question. A common approach was to assign a value to the volume of P and use it to work out the volumes of Q and R, for example P =100, Q = 150, R = 225. These values were often written on the spheres in the diagram. This was one of the most successful approaches as many students went on to write down an appropriate fraction. Some students made a mistake with the volume of R, writing 100, 150, 200 for example, and gained only the first mark. A different approach was to work out that the multiplier from P to R is 1.5 × 1.5. Whichever method was used the final hurdle for students was to write the volume of P as a fraction of the volume of R. For some this was their downfall. Fractions such as 1/2.25 that contained a decimal were common. These were not awarded the accuracy mark unless they were the result of simplifying a correct fraction. Some students gave an inverted fraction such as 9/4 and there were others who could not complete their method by giving any fraction at all. A common misconception was to assume that the volume of Q is 50% less than the volume of R and the volume of P is 50% less than the volume of Q (writing for example R =100, Q = 50, P = 25 or P = 1/2Q and Q = 1/2R) and give an answer of 1/4.

Question 15

Most students were able to gain the first method mark for using a volume formula with the correct substitution. A common mistake at this stage was to use a radius of 6 cm instead of 3 cm. It was also not uncommon to see 3^2 instead of 3^3 substituted into the formula for the volume of a sphere. Having substituted correctly many students failed to gain the second method mark because they found the total volume of a cone and a sphere, not the total volume of a cone and a hemisphere. However, many of these students were still able to gain the third method mark for simplifying the volume of the cone to 30π. Incorrect answers of 66 or 66π, from adding 30π and the volume of the sphere were very common. Many students struggled to simplify their expressions for volume because they had difficulty dealing with the fractions within the calculations. Some left the volume of the cone as $1/3\pi \times 90$ and $4/3 \times 27$ and $1/2 \times 4/3 \times 27$ were often evaluated incorrectly. Generally, answering in terms of π was understood well. Students who used a value for π usually got into difficulties and made little progress.

Question 4

This was the first problem type question on the paper and was answered very well. The problem required the students to carry out three steps which could be interchangeable in order, as the mark scheme shows. Typically, students followed the path of finding the total volume, then finding $\frac{2}{3}$ of this volume, before finally dividing by 275 and rounding down to find the number of cups. There were a number of errors that brought the loss of one or two marks. Some students worked with the total volume only and were able to score two marks at best. Others worked with $\frac{1}{3}$ rather than $\frac{2}{3}$ of the total volume. These students could gain three marks only. Finally there were the students who rounded the answer up to 9 rather than down to 8, again these lost the final mark. Alongside these problems, some students thought there was a need to convert units due to a misunderstanding of the conversion between cm^3 and millilitres. This was catered for in the mark scheme and students were still able to score all the process marks despite incorrect unit changes. Some students mis-interpreted this as a bounds question and calculated the volume as $30.5 \times 6.5 \times 19.5$. Another incorrect method seen was to calculate the surface area of the cuboid instead of the volume, gaining no marks.

Question 6

This question was also a good discrminator. Unfortunately, a significant proportion of students calculated the volume of the cylinder rather than the surface area and so could not be awarded much credit for their responses. However, there were many fully correct and complete solutions usually comparing the total surface area of the 3 tanks with the total surface area which could be covered with 7 tins of paint but sometimes comparing the number of tins of paint needed to paint the three tanks with the 7 tins of paint available to Jeremy. A good proprtion of students calculated the surface area of only one end of the cylinder or tried to combine the area of one or two ends with a volume or with an incorrect “area” found by calculating 1.6 by 1.8. It was pleasing to see that students often worked with exact expressions in terms of π, thus avoiding the need to round values in intermediate working and minimizing the risk of errors when calculating and writing down decimal values from calculators.

Question 17

This question was very poorly answered, many simply using a scale factor of 2.25 (9 ÷ 4) in an attempt to make progress. Some looked as though they wanted to use the formulae for surface area and volume of a cylinder, but never really made any meaningful start. A few students correctly found the ratio of lengths but could go no further.

Question 9

It was disappointing to find that so many students did not know how to find the surface area. Many only found volumes, which resulted in no marks being awarded. Of those who attempted to find the surface area, many found two of 6×8 and 4 of 6×18, but this still earned credit once they showed that they then wanted to add. Any remaining credit was only awarded for correctly processing their total surface area figure, usually by dividing their total surfaced area by 6 and then taking the square root to get their volume of the cube. Some students assumed that it was the volumes that were equal or that the cube was half the cuboid.

Question 19

Many students did not know the meaning of the word “hemisphere”, or failed to divide by 2 to find the volume of half the sphere. Too many substituted the figure for the diameter rather than the radius. Some cubed rather than squaring, even though the formula was given.

Question 13

Many students gained the first process mark by showing a full substitution of the figures to calculate the volume of the cylinder C or showing the correct figure for the volume of the cylinder *C*. The most common approach was then to work with density and ratio together, rather than with ratio to find the volumes of A and B, however many were not able to show enough understanding for the second mark. Some students did score the second mark for getting as far as 15.68 but then failed to process fully for the final two marks.

The most successful way seen to gain full marks was to find the individual volumes of *A* and *B* and add.

Question 23

This question was not attempted by all students. Those who did attempt the question often gained the first two marks for substituting into the volume formula and rearranging to find the radius. Many of these students then failed to realise that the slant height of the cone had to be found, using Pythagoras. For those that did find the slant height, a good proportion did not use this slant height as the radius of the sector OACB.

A small number of students did gain full marks for this question.

Question 20

When answers were attempted students often gained three marks by finding correct vectors for ZP and ZR. Very few of these students were then able to show the full process to show ZP and ZR in an appropriate ratio.

Others only gained two marks for correct vectors using the given ratios and finding a vector for OZ or XY.

A noticeable error was when students had YX correct as $a - b$ they did not reverse the whole vector to get XY, they simply used $-a-b$.

Summary

Based on their performance on this paper, students should:

- read questions carefully
- practice questions involving time, in different notations and also converting between hours and minutes
- recognise right angled triangles and non right angled triangles and know which trigonometry relationships are appropriate for the different style of triangles.
- always attempt questions as part marks are available for suitable starting points.

Question 8

Many attempts failed at the first hurdle when students either used an incorrect method to find the area of the base of the prism, e.g. 18 × 3 = 54, or did not realise that they needed to find the area of the base. These students gained no marks. Some of the students who divided 18 by 3 to find the area of the base made no further progress but most went on to use the pressure formula. Many gained all three marks for an answer of 450 but some students evaluated 75 × 6 incorrectly and lost the accuracy mark. A few students used the formula incorrectly and worked out 75 ÷ 6 rather than 75 × 6.

Question 13

Many students achieved the first mark for showing a process to find either the volume of liquid **A** or the mass of liquid **B**. Completing the process to find the density of liquid **C** proved problematic for some. Instead of using 20 and 8400 to find the mass and the volume of liquid C a common error was to divide 8400 by 20 and give an answer of 420. Those students who showed a complete process to find the density of liquid **C** usually gave a correct answer although arithmetic slips were frequently seen, most notably in working out 280 × 30 and 9800 ÷ 50. Mistakes in this question were often the result of using the formula for density incorrectly. A very common misconception, even amongst some students who showed some correct working, was that the density of **C** could be found by adding the density of **A** and the density of **B**. An answer of 350 from 70 + 280 was awarded no marks.

Question 12

Students were often able to gain one mark in part (a) for a suitable method to find the gradient, although too many students divided the change in x by the change in y rather than the other way round. Unfortunately, too many students, even after getting an answer in range, missed the negative sign from their gradient and therefore lost the second mark. Part (b) was less often awarded any credit. In many cases students talked about the relationship between variables, or correlation rather than the interpretation of the gradient as a rate of change.

Question 9

Most students were able to score at least one mark for a start to finding the total volume by working out the volume of the cuboid measuring 10 cm by 12 cm by 20 cm. However, this was often as far as they could get. Attempts to find either the height of the isosceles triangle which forms part of the cross section or to find the slant height of the triangle were often flawed. In some cases the wrong trigonometrical equation was used and, in other cases, students assumed that they could use right angled trigonometry on the isosceles triangle. That said, a good number of students successfully completed the question to obtain full marks.

Question 6

Many of the attempts to work out the height of the triangular prism failed because students treated the shape as a cuboid and worked with length × width × height. This meant that 6 was a very common incorrect answer. Some of the students who gained the first mark for dividing 750 by 25 to find the area of the cross section made no further progress but most went on to make an attempt at finding the height of the triangle. These attempts were often not successful because students failed to take into account the fact that the cross section was a triangle. Some students wrote an equation such as $\frac{1}{2} \times 5 \times h \times 25 = 750$ and were awarded the first two marks but they were not always able to solve their equation correctly. For those students who had gained no process marks yet had only omitted division by 2 there was a special case mark for a final answer of 6.

Question 7

This question was not answered particularly well. Many students gained one mark for using the given formula to write a correct expression for the surface area of the sphere, $4 \times \pi \times 3^2$ for example, but not many of these students attempted to find the surface area of the cube. It was very common to see $4 \times \pi \times 3^2$ followed by $x = \sqrt{36\pi}$. Those students who did find an expression for the surface area of the cube generally went on to form a suitable equation and complete the method to gain full marks. Some students found an expression for the area of one face of the cube rather than for the surface area, often writing $x^2 = 36\pi$, and gained the first two marks only.

Question 19

This ratio problem required students to work with scale factors and ratios between 3 spheres. The most common error was to work with the 27 and the ratio 1 : 2 and arrive at 54. The first mark was for the ability to cube root to find 5 and 3, and at this stage the values did not need to be given in a ratio. Many students who succeeded this far then got confused and failed to work with the value of 3 and the ratio 1 : 2. Of those who got to the values of 3 and 6, many then failed to link the 6 from sphere **C** and the 5 from sphere **A**. Even fewer then knew to square to find the ratio of surface areas. Quite a few saw the question as having to find the radius for the sphere and had difficulty rearranging the correct formula or even trying to use an incorrect formula.

Question 1

Most students found this to be a good start to the paper and scored at least 3 of the 4 marks available. Nearly all students gained some credit for their answers.
For part (a), it was unusual to see an incorrect response but where the answer was wrong it was usually because a student had written (18, 100) instead of (100, 18).

Part (b) of the question was answered less well but nevertheless the majority of students gained the 2 marks available for giving an answer in the range of values accepted. Where this was not the case students usually scored a mark for either drawing a line of best fit or for drawing a vertical line from 370 on the horizontal axis.

In part (c) students could usually make a correct decision, that is “no” and give an acceptable reason. The most common accepted reasons were equivalent to stating that the outlier was an anomaly or that there was positive correlation when the outlier was ignored.

Question 15

Higher attaining students often scored full marks for their answers to this question. Where tangents were drawn they were generally accurate and allowed them to be used to get a good estimate of the gradient. However there was a significant number of students who used the coordinates of the point on the curve at $t = 12$ and who simply divided the y coordinate by the x coordinate ($17 \div 12$) to get the gradient. Some of these students had already drawn a tangent to the curve at $t = 12$.

Question 7

The majority of students gained the first mark for a process to find a volume and many went on to give a correct answer. The final mark was sometimes lost because of arithmetic errors, these occurred most often when dividing 81 by 27 or dividing 128 by 64. Having found the volume of each cube some students gained no more marks because they were unable to use density = mass ÷ volume. It was common to see mass × volume and volume ÷ mass being used. Some students did not realise that it was necessary to find the volume of each cube and

scored no marks at all. Often these students simply used the figures in the question, dividing 81 by 3 and dividing 128 by 4 or multiplying 81 by 3 and 128 by 4. There were also some students who calculated the surface area of the cubes and attempted to divide the mass by the surface area and gained no credit. Some students included units in their final answer but they were not penalised.

Question 9

This question was well answered with many students gaining at least two of the three marks. It was pleasing that most students worked with area and attempted to find the total surface area of the solid. Many students showed a correct process to find the total surface area of at least five faces for each solid and gained the first two marks. Those who showed a complete process to find the total surface area of the solid often gained full marks but some solutions were spoilt by arithmetic errors. The main stumbling block to a correct final answer was not dealing correctly with the parts of the cube and cuboid that are hidden. Many students worked out the total surface area of the cube and the total surface area of the cuboid and added them together, leading to the common incorrect answer of 310. Some added the total surface area of five faces of the cube to the total surface area of the cuboid and got an answer that was 16 cm^2 too big. Students who made the mistake of including four 5 cm by 6 cm faces or four 7 cm by 5 cm faces in the surface area calculation for the cuboid gained one mark only. Some students did not read the question with enough care and worked with volume instead of with area. This question benefited from a systematic approach and there were some very good solutions from students who clearly identified what they were calculating. However, there were many solutions that had calculations dotted around the page making the working difficult to follow.

Question 17

This volume problem required students to work with a hemisphere and a cone. The first process mark was for a correct method to find the volume of the hemisphere or for a correct expression for the volume of the cone. Many students were unable to get past this point for 2 reasons. Firstly, they didn't halve the volume of the sphere to find the volume of the hemisphere, or they used 'y' as the height of the cone, which was unacceptable as 'y' was the height of the overall solid.

The second mark was for linking the 3 elements of the problem correctly. This was sometimes seen as an equation, but most commonly seen in multiple steps, normally subtracting the volume of the hemisphere from the total volume, and then equating to the volume. The third mark was for correct manipulation to find the height of the cone and was typically seen again in multiple steps of working. Those who correctly found the height of the cone scored 3 marks.

It was quite common to see students use 120 instead of 120π, but this was dealt with as a misread as per the general marking guidance. Common incorrect methods worth no marks were to use 7 or 4.5 (without showing where 4.5 had come from) as the radius.

Part (b) required students to understand the inverse proportional relationship between radius and height when the volume is constant. Many were able to do so, and thus gained this mark.

Question 24

In part (a) many of the students who gained the first mark for equating the two volumes were not able to go on and find the correct ratio. Those that got as far as writing $4r = h$ often gave the ratio $r : h$ as 4 : 1 instead of 1 : 4.

The majority of students made no attempt at part (b) and very few managed to gain more than one mark. The first mark was awarded for equating the surface area of the sphere with the

surface area of the cone but a common error here was to omit the area of the base of the cone and write $4\pi r^2 = \pi rl$. Students making this error could still be awarded the next two process marks if they went on to substitute for l and isolate the terms in r^2.

Summary

Based on their performance on this paper, students should:

- practise their arithmetic skills, particularly division and operations with decimals
- take care when carrying out arithmetic operations and check their working to avoid careless errors
- read each question carefully and ensure that their final answer matches the question asked
- practise subtracting one algebraic expression from another, especially expressions with negative terms, and use brackets more efficiently
- practise finding angles using the circle theorems and stating the circle theorems used

Question 17

A similar solids question, but with an added layer of difficulty. It was pleasing to see so many candidates get some credit. This was normally for either finding the volume scale factor (by dividing the two volumes) or for a process to find the height of **B**, or in a good number of cases, both scoring 2. However, very few candidates were able to take this further. Typically candidates tried to use a scale factor of 27 when working with areas and lengths and gained no further credit e.g. 10.8 ÷ 27. There were also occasions where more marks could have been scored had candidates been able to deal with the half in the area of a triangle. A shame that such a low level skill was denying candidates high grade marks.

Question 21

Well into the Grade 8 questions on the paper and it is not surprising that fewer candidates are now scoring marks. For part (a), failure to draw a tangent at $t = 17.5$ meant that no marks could be scored at all. It was very common to just see $\frac{10.5}{17.5}$ which came from reading the volume at $t = 17.5$, and this scored zero. Those who drew a suitable tangent often then went on to score full marks for an answer in range. However, some were unable to use the scale correctly and then lost marks for their method to find the gradient. Part (b) showed improvements on previous series, and there were many suitable descriptions of what the gradient represented although students still relate this answer to a correlation type response. 'Acceleration' was a commonly seen incorrect answer.

Question 4

A good discriminator, most candidates were able to score at least 2 marks for showing how to get the total volume of 4 tanks. Only the lowest attaining candidates failed to use a correct formula for the volume of a tank. A few candidates used the diameter instead of the radius to work out the volume, in effect working out the value of $\pi d^2 h$ or sometimes πdh instead of $\pi r^2 h$. Some candidates who left their volumes as a multiple of π, for example 256000π, then lost the π in the next step of their working. Correct attempts to use the ratio 1 : 100 were usually restricted to answers from higher attaining candidates and many candidates used 100 where they should have used 101 in their calculations. There was a wide range of possible approaches to answering the question and responses seen were very varied. The most common successful approach was to compare the volume of the 4 tanks with the amount of mixture that could be made with the available fertilizer.

Question 25

Many candidates could make a successful start on the question by using a correct process to find the volume of the top part of the pyramid and so scored the first mark available. This was often the limit to any credit which examiners could give candidates. A common mistake was for candidates to use the average density in a misguided attempt to work out the volume of the bottom part of the pyramid. This was, by design, a challenging question and so, as expected there were only a small number of completely successful solutions seen.

Question 3

Many students gained the first mark for dividing 150 by 6 to find the area of one face of the cube and very often they went on to score full marks for working out the volume of the cube. After finding the area of one face some students could make no further correct progress. It was common to see 25 divided by 2 or by 4 in an attempt to find the side length and some thought that the volume was given by $25 \times 25 \times 25$. A significant number of students could not show a correct first step and gained no marks. Some attempted to draw the cube and gave a first step of $150 \div 3$ (presumably the 3 visible faces). Some misinterpreted the question and assumed that 150 was the surface area of one face and wrote $\sqrt{150}$ or divided 150 by 4.

Question 8

A good proportion of the students who gained the first mark for dividing 1200 by 40 then went on to show a complete process. Many gained all three marks but some students made arithmetic errors and lost the accuracy mark. Errors such as $1200 \div 40 = 300$ and $90 \div 30 = 30$ were quite common. After dividing 1200 by 40 some students did not realise that they had found the value they needed to use in the pressure formula and it was common to see equated πr^2 equated to 30 in an attempt to find the value of r. Some carried out further incorrect work in an attempt to find the 'area' and some made no further progress. A common error was attempting to find the surface area of the cylinder and using this in the pressure formula. Some attempts failed at the first hurdle when students did not know how to use the volume of 1200 cm^3 and the height of 40 cm.

Question 16

Most students started with a process to find the surface area of the sphere. Some made no further progress but many continued with $4\pi r^2 = 200\pi$ or $4r^2 = 200$ and went on to find the radius and gained the first three marks. Inconsistent use of π was a problem for some. It was not uncommon to see a surface area of 200π followed by $4\pi r^2 = 200$. After showing a correct process to find the radius a significant number of students then failed to get the accuracy mark for finding the diameter of the sphere in the required form. Many could not write $\sqrt{50}$ as $5\sqrt{2}$ with $\sqrt{50} = 10\sqrt{5}$ a common mistake and the radius was often given as the final answer . Instead of starting with a process to find the surface area of the sphere some students started by forming the equation $\frac{3}{8} \times 4\pi r^2 = 75\pi$.

Question 8

Most students found this question to be straightforward. However, a minority of students divided 72 by 9 or divided 9 by 72 so could not be awarded any marks.

Question 18

The successful completion of this question depended upon students being able to use direct proportion to find the radius of the top of the frustum. Many students realised this but there was also a significant number of students who merely halved the radius of the base of the frustum and used 1.5 in their calculations. This severely limited the number of marks examiners could award for these students' responses. Students working below the attainment level for which this question was designed often scored the mark available for working out the area of the circular base of the solid or two marks for finding the radius of the top of the frustum and the curved surface area of the frustum. Higher attaining students often gave a complete and correct solution to this question to obtain full marks. Some students subtracted either the curved surface area or the total surface area of the cone with base radius 1.8 cm from the total surface area of the cone with base radius 3 cm and did not properly take into account the area of the top of the frustum.

Question 8

A high percentage of students were able to use the given formula in this question to work out area, given pressure and force. Fewer candidates realised that their result gave them the area of one face of the cube and that they would need to multiply this by the number of faces before they could compare it with a total surface area of 900 cm^2. Consequently, they compared 144 with 900. Nevertheless, many students were able to do this and gained full marks for their responses.
Hardly any students used an accepted alternative approach, for example comparing 144 with 150.

Question 19

Students who were able to use the given formulae for the volume of cones and spheres were able to gain some credit in this question. Many students took advantage of this by showing a correct process to find the volume of the larger cone or of the hemisphere. However, some students found the volume of the sphere but did not halve it to find the volume of the hemisphere. The majority of students realised that they needed to find the radius of the smaller cone in order to find the volume of the frustum, but a relatively low proportion of them were able to use similarity to do this. Instead, students often appeared to halve the radius of the larger cone to find the radius of the smaller cone as 6 cm or to use the volume formula for the cone with the frustum height (5 cm) as the value of h to find the volume of the frustum. Students may find it helps to recognise that the problem involves similarity if they sketch the two cones and annotate them with known dimensions in such cases as this. A significant number of high attaining students scored 4 marks for a fully correct answer.

Question 21

Many students gained the first mark for dividing 300 by 20 to find the area of one face of the cuboid or for forming an equation using the volume such as $20wh = 300$. Many students then gave an answer of 3 because $3 \times 5 = 15$ and the width is greater than the height. Those who did make further correct progress gained the second mark for forming an equation using the surface area. A common mistake at this stage was assuming that four of the faces of the cuboid have the same area. Fewer than half of the students who formed two correct equations went on to gain any more marks. Some students completed the solution by eliminating one variable and solving the resulting quadratic equation. The majority of those who found both 2.5 and 6 then chose the correct value for the height. Others simplified the two equations to $wh = 15$ and $w + h = 8.5$ and hence deduced that $h = 2.5$. An apparent lack of confidence with simultaneous equations meant that a significant number of students resorted to trial and improvement methods once they had equations for volume and surface area. Some tried several pairs of numbers multiplying to 15 until they found the pair that resulted in the correct total surface area. Others were not successful because they only used integer values. A common misconception was to divide the surface area by 6, assuming that the shape was a cube.

Question 17

This question was attempted by most, but only the stronger students were able to score. The first mark was for working with the volume scale factors of **L** and **M** to find the length scale factors, and the second similarly to work with the area scale factors of **M** and **P** to find the length scale factors. Both of these processes required students to take some form of root, and it is perhaps not surprising that students were better when the square root was involved. Many of the students who were able to find the 2 separate length scale factors or ratios, were then unsure as to how to combine them and scored no further credit. Those who did know, typically scored both the 3rd and 4th marks. The A mark was 'or equivalent' and we saw numerous acceptable possibilities, including 9.6 : 12 : 4 which had non-integer values.

Question 5

Most students realised that they needed to find the volume of the flour by dividing the mass by the density. However, many failed to appreciate that the volume of the salt was this volume subtract 700 and so did not gain the second process mark. An unexpectedly high number of students wrote 600/300 but gave the answer as 0.5 or 0.2 instead of 2, hence losing the final accuracy mark. The third process was not for a complete process and a student could gain this mark for 600 / [volume], where [volume] did not have to come from a correct process. Many students gained this mark for a calculation of 600 / 700 or 600 / 1000 but they did not get this mark for 0.857.. seen, this is because the process to arrive at this value had to be shown. Given the more common occurrence of square brackets in the mark scheme it is important that students get into a better habit of showing their method and processes so that they have a greater access to these marks.

Question 9

The vast majority of students gained at least one mark for this question usually for the 6 cubed. The majority of students also gained the second process mark for the process to form an equation or for a process to find h with $0< k \leq 1$, it was only the minority who were able to use the correct value of 1/3 for k. Students were, on the whole, very successful at rearranging their formula to find an answer for h. It is important to note that in future series students will be required to have learnt and to be able to apply the formula for the volume of a pyramid in questions such as these. For the accuracy mark students had to have an answer of 10.125 or an equivalent mixed number eg $10\frac{1}{8}$. A final answer of $\frac{81}{8}$ did not gain A1 if the 10.125 or equivalent mixed number were not seen. In questions such as these it is important that students give a suitable answer, ie one which allows an easy appreciation of its magnitude without carrying out a calculation. Similarly, an answer of 10.1 without the 10.125 or equivalent mixed number seen did not gain A1 – students are expected to give the exact answer to a question if it is a terminating decimal.

Question 7

This question was not answered well with many learners unable to explain what the gradient of the graph represents. Correct explanations contained a reference to 'rate' or 'speed' or 'how fast' or 'each second', for example ‘the rate at which the tank is losing water’. Some of the incorrect explanations did refer to the volume of water and to time but described what the graph shows, not what the gradient represents. Explanations such as ‘the volume of water decreases as time increases’ and ‘the volume of water leaving the tank in 50 seconds’ were very common. There were also many incorrect explanations such as ‘negative correlation’ and ‘direct proportion’ that did not mention the context at all.

Question 12

It was pleasing to see some fully correct solutions but, overall, this question was answered very poorly with relatively few learners showing that they understood the relationships between lengths, areas and volumes in similar solids. Starting the process to find the ratio of the radius of **A** to the radius of **B** by finding $\sqrt[3]{64}$ or $\sqrt[3]{125}$ gained the first mark and some learners reached the ratio 4 : 5. The second mark was awarded for using the information about the radius of sphere **C** and working out $5 \div 2$ or for starting to work with area and working out 4^2. A process to find the ratio of the area of **A** to the area of **C**, such as $4^2 : 2.5^2$, was needed for the third mark but few were able to get this far. Some of those that did gave 16 : 6.25 as the final answer and were not awarded the accuracy mark because the question asked for an answer in the form $a : b$ where a and b are integers. A successful route used by a

few learners was to combine the ratios 4 : 5 and 2 : 1, giving the ratio of the radii as 8 : 10 : 5 from which they could easily see that the required ratio is $8^2 : 5^2$. Many learners could not make a correct start. It was common to see 125, the volume of sphere **B**, divided by 2 and then 64 : 62.5 given as the final answer. Since the question involved three spheres some learners attempted to use the formulae for the surface area or volume of a sphere.

Question 13

There was quite a lot to do in order to work out the value of x so it was pleasing to see some well presented and fully correct solutions. Overall, though, this question was not answered particularly well and many learners failed to score any marks at all. The first mark was awarded for setting up an equation using volumes which could be the first step or it could occur later in the process. This should have been a straightforward mark but many learners failed to set up a correct equation and '+ 142' or '– 142' often appeared on the wrong side of the equation. Some learners only worked with cuboid **A** and it was not uncommon to see the volume of cuboid **A** equated to 142 cm^3. Learners were more successful in gaining the second mark which was awarded for a process to find an expanded expression for the area of one face, where one incorrect term in the expansion of two brackets was condoned. Some went on to earn the third mark for a complete process to find a fully expanded expression for the volume of one cuboid. For this mark the expression could be unsimplified but it had to be correct so errors in their expanding cost some learners this mark. Some of those who had earned the first three marks were able to earn the fourth mark for correctly rearranging the expanded terms in their equation to get a 3-term quadratic.

Question 19

A challenging question with only a few forming an equation in terms of one variable. Of those who correctly linked the radius and the height, only a few used Pythagoras to find the slant height. Of those who were successful on this question, clear algebraic manipulation was used to obtain an expression for the curved surface, most commonly embedded within a full equation for the surface area of the cone. Most learners in this case would then simplify the equation through eliminating π first and then simplifying the fraction to obtain a correct solution.

Question 8

This problem required learners to work with density and unit conversions and as such these two processes provided the basis for the process marks.

These marks could be awarded in either order as the two steps could be done in either order.
The most common approach was to first use the density formula to find the mass of one of the steel rods. Those who attempted this did normally get this step correct, which is pleasing with density being a formula not given in the question. Some used this formula incorrectly but were still able to gain a mark if they completed a correct conversion.
Those who followed this most common approach then needed to either convert the mass of a single rod to kilograms or the maximum load of the trolley to grams. Again, it was common to see this conversion being carried out correctly. However, we did see some using a conversion factor of 100 rather than 1000. Those who started with a conversion of the 300kg quite often gained this mark but then didn't use of the density formula correctly, and so only gained 1 mark.
It was also seen that learners used density correctly but then didn't realise that the two masses were in different units and hence divided the wrong way round, again this response would only gain 1 mark.

Question 16

This similar solid question was one learners found challenging. The first mark was for beginning to work with scale factors and was normally awarded for finding the volume scale factor of 15. Unfortunately, many then didn't know how to find the linear scale factor and tried to use the volume scale factor with the lengths.
The strongest responses were able to take the cube root to find the length scale factor and then use this with the given height to find the missing height and an answer of 4.9.
Credit could have been given in the second process mark for equating scale factors, but this was rarely seen. Some premature rounding affected learners' final answers particularly if they worked with 1/15 as the scale factor rather than 15.
Part (b) effectively asked for the exact value of the volume scale factor. Unfortunately, many learners did not understand the real meaning of 'exact value' and gave a rounded decimal. This alone, without a correct expression as a surd or with indices, could not gain the mark.

Question 16

A range of successful approaches were seen in this question. Many responses set up an accurate equation using a consistent variable for height. Some did not distinguish between the two different heights and made no further progress, gaining only the first mark for correctly stating the volume formula. In other cases, errors occurred during processing of a correct equation. More effective responses substituted $r=8$ early and simplified the volume expressions before rearranging to find the height. Some responses recognised that equal

heights implied equal volumes and worked with a single volume expression (e.g. 320π), which led to more efficient processing.

A few responses did not provide a final answer despite correct working, and it is important to check that the question has been fully answered. Trial and error was also used successfully in some cases, and while this method can lead to full marks, it is recommended that formulae with substituted values are shown to ensure method marks can be awarded if the final answer is not reached.