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GCSE MATHS

Ratio, proportion and rates of change

Edexcel 1MA1 | Subtopic collection Topic 34

Direct and inverse proportion

Higher tier

Answers and examiner comments

63	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 17

The full source mark scheme begins on page 98. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
21	(a)	15 **25** 14 54 **22** 8 16 **46** 37 **33** **30** 100	Table	3	B3 for all 5 correct (B2 for 3 or 4 correct) (B1 for 1 or 2 correct)
	(b)		$\frac{37}{100}$	1	B1 $\frac{37}{100}$ oe
	(c)		$\frac{24}{46}$	2	B2 for $\frac{"'46'-'22'"}{'46'}$ oe, ft from no of girls (B1 16 + 8 or 24 or '46' seen)

25	(a)	$y = kx$ $10 = k \times 500$	$y = \frac{1}{50}x$	3	M2 for $10 = k \times 500$ oe or $10 = \frac{500}{k}$ oe (M1 for $y = kx$ or $y = \frac{x}{k}$ or $y \propto x$) A1 for $y = \frac{1}{50}x$ oe (eg $y = 0.02x$)
	(b)		7	1	B1 ft from linear $y = kx$

1380 4H

1380/4H

Question	Working	Answer	Mark	Notes
1	120×1.5 8×1.5 420×1.5 180×1.5	180 12 630 270	3	M1 for $\times 6 \div 4$ or $\frac{6}{4}$ or ÷4×6 oe (120+60) or 1.5 seen or sight of any one of the four correct answers A1 for 2 or more correct answers A1 for 4 correct answers

26	(a)	$P = \frac{k}{V}$: 5 = $\frac{k}{8}$; k = 40	$P = \frac{40}{V}$	3	M1 for $P \propto \frac{1}{V}$ **or** $P = \frac{k}{V}$, k algebraic M1 for subs P = 5 and V = 8 into $P = \frac{k}{V}$ A1 for $P = \frac{40}{V}$
	(b)	$P = \frac{40}{2}$	20	1	B1 ft on k for $P = \frac{'k'}{V}$

1380_3H

1380/3H

4	(a)	3×100	300	2	M1 for 3×100 or $100 \div 6 \times 18$ oe A1 cao
	(b)	$2 \div \frac{1}{2} \times 6$	24	2	M1 for $2 \div \frac{1}{2} \times 6$ oe A1 cao

1380_4H

1380/4H

Question		Working	Answer	Mark	Notes
1		15 ÷ 10 80 × 1.5 60 × 1.5 30 × 1.5 36 × 1.5	120, 90, 45, 54	3	M2 for any one of 80 + 40 or 60 + 30 or 30 + 15 or 36 + 18 or 120 or 90 or 45 or 54 seen A1 cao OR M1 for 15 ÷ 10 or 3 ÷ 2 or sight of 1.5 M1(dep) for 80 × '1.5' or 60 × '1.5' or 30 × '1.5' or 36 × '1.5' A1 cao OR M1 for 80 ÷ 10 or 60 ÷ 10 or 30 ÷ 10 or 36 ÷ 10 or 8 or 6 or 3 or 3.6 M1(dep) for '8' × 15 or '6' × 15 or '3' × 15 or '3.6' × 15 A1 cao OR M1 for 80 ÷ 2 or 60 ÷ 2 or 30 ÷ 2 or 36 ÷ 2 or 40 or 30 or 15 or 18 M1 (dep) for '40' × 3 or '30' × 3 or '15' × 3 or '18' × 3 A1 cao

Question	Working	Answer	Mark	Notes
3 (a)	$\frac{15}{100} \times 2400 = 360$ 2400 – 360 = 2040 2040 ÷ (1 + 2 + 5) = 255 255 × 1, 255 × 2, 255 × 5	Cement = 255 Sand = 510 Stone = 1275	4	M1 for $\frac{15}{100} \times 2400$ or $\frac{85}{100} \times 2400$ M1 for '2040' ÷ (1 + 2 + 5) M1 (dep on previous M1) for '255' × 1 or '255' × 2 or '255' × 5 either explicitly or with answer(s) on the answer line. A1 for all 3 correct masses
(b)*	255 × 30 – 6500 = 1150 so not enough OR 6500 ÷ 255 = 25.5 m^3 worth of cement Which is less than 30 so not enough OR 6.5 tonnes of concrete gives 6.5 × 8 = 52 tonnes of dry mixture 30 m^3 of concrete requires 30 × 2400 × 0.85 kg of dry mixture = 61200kg of dry mixture (=61.2 tonnes)	No, with justification	3	B1 for a correct conversion between kg and tonnes e.g. 6.5 tonnes = 6500 kg (but not 1 tonne = 1000 kg) M1 for '255' × 30 C1(dep on M1) for an answer of No (Yes), supported by (ft) calculations. OR B1 for a correct conversion between kg and tonnes e.g. 6.5 tonnes = 6500 kg (but not 1 tonne = 1000 kg) M1 for 6500 ÷ '255' C1(dep on M1) for an answer of No (Yes), supported by (ft) calculations OR M1 for 6.5 × 8 and 30 × 2400 × 0.85 B1 for a correct between kg and tonnes e.g. 61200 kg = 61.2 kg (but not 1 tonne = 1000 kg) C1 (dep on M1) for an answer of No (Yes), supported by (ft) calculations.

5MB1H_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**

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)

Original question 6

The full source mark scheme begins on page 152. Use the original paper code, tier and question number shown above.

13	(a)	$y = kx$ $10 = 600k$ $k = 10 \div 600 = \frac{1}{60}$	$y = \frac{1}{60}x$	3	M2 for $10 = k \times 600$ oe or $10 = \frac{600}{k}$ oe or $k = \frac{1}{60}$ (M1 for $y=kx$ or $y = \frac{x}{k}$ or $y \propto x$, k any letter or value) A1 for $y = \frac{1}{60}x$ oe SC: B2 for $60y = x$ NB: for 1/60 accept 0.016 to 0.017
	(b)	$y = x \div 60 = 540 \div 60 =$	9	1	B1 for 9 or 8.6 to 9.2 or ft 540 × "k"

5MB3H_01

Question		Working	Answer	Mark	Notes
1		180×1.5 40×1.5 110×1.5 30×1.5	Flour = 270 Ginger = 60 Butter = 165 Sugar = 45	3	M1 for ×24÷16 oe or 24/16 or 1.5 seen or 180 + 90 (=270) or 40 + 20 (=60) or 110 + 55 (=165) or 30 + 15 (=45) or sight of any one of the correct answers A2 for all 4 correct answers (A1 for 2 or 3 correct answers)

Question		Working	Answer	Mark	Notes
7		17.8 ÷ 160 × 210 = 0.11125 × 210 = 23.3625 g **OR** 210 ÷ 160 × 17.8 = 1.3125 × 17.8 = 23.3625 g **OR** 210 − 160 (=50) $\frac{17.8}{160}\times'50'(=5.5625)$ 17.8 + 5.5625	23.3(625)	3	M1 17.8 ÷ 160 (=0.11125) **or** 17.8 × 210 (=3738) **or** 210 ÷ 160 (=1.3125) M1 (dep) '0.11125' × 210 **or** '3738'÷160 **or** '1.3125'× 17.8 A1 for answer in range 23.3 - 23.4 **OR** M1 for $\frac{17.8}{160}\times(210-160)(=5.5625)$ M1 (dep) for 17.8 + '5.5625' A1 for answer in range 23.3 - 23.4 **OR** M1 for correct method to find weight of 2 cm **or** 5 cm **or** 10 cm M1 (dep) for complete method A1 for answer in range 23.3 - 23.4

1MA0_2H

2	(a)	5 ÷ 2 2.5 × 4 10 × 28	280	3	M2 for 4 × 28 × 5 ÷ 2 oe (M1 for 5 ÷ 2 × 4 (=10) or 4 × 28 (=112) or 4 ÷ 2 × 28 (=56) oe or 560 seen) A1 cao
	(b)	140 ÷ 28 5 × 2	10	2	M1 for 140 ÷ 28 × 2 or 140 ÷ 14 oe A1 cao

Original question 2

The full source mark scheme begins on page 172. Use the original paper code, tier and question number shown above.

Original question 2

The full source mark scheme begins on page 193. Use the original paper code, tier and question number shown above.

22			1.33	3	M1 for $3.4 = \frac{k}{5^2}$ oe or 3.4×5^2 (=85) M1 for '3.4×5^2' $\div 8^2$ A1 for answer in range 1.32 to 1.33 or $\frac{85}{64}$

Question		Working	Answer	Mark	Notes
1			600, 150, 75, 375	3	M2 a complete correct method seen to calculate the required ingredients (M1 for a method to find a scale factor or the weight of one scone or dividing ALL by the same number or multiplying by 30) A1 cao **SC** B2 for three out of four ingredients correct

Question		Working	Answer	Mark	Notes
5		250 ÷ 100 = 2.5 300 ÷ 50 = 6 600 ÷ 120 = 5 60 ÷ 15 = 4	40	3	M1 for 250 ÷ 100 or 300 ÷ 50 or 600 ÷ 120 or 60 ÷ 15 M1 for 250 ÷ 100 **and** 16 × '2.5' or 2.5 oe seen **and** 16 × '2.5' A1 cao **SC** M2 (16+16+16÷2) oe A1 cao **SC** M2 $(250\div\frac{100}{16})$oe A1 cao

PAPER: 5MB2H_01

17			40960	3	M1 for $T \propto \frac{1}{d^2}$ or $T = \frac{k}{d^2}$ or $k = Td^2$ M1 for $k = 160 \times 8^2$ (= 10240) A1 for 40960

PAPER: 5MB3H_01

PAPER: 1MA0_1H

Question		Working	Answer	Mark	Notes
1			90 450 225 1.5 960	3	M1 for 6 ÷ 4 (= 1.5) or 4 ÷ 6 (= 0.66..) or ÷4 × 6 oe or sight of any one of the correct answers A1 for three correct A1 for all correct

21			100	4	M1 $y = kx^2$ oe or $36 = k \times 3^2$ A1 $k = 4$ M1 (dep on M1) ($y =$) '4'$\times 5^2$ A1 cao

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*22		$360 - y$	$180 - \frac{y}{2}$	4	M1 $ADC = \frac{y}{2}$ A1 $180 - \frac{y}{2}$ C2 (dep on M1) for both reasons Angle at centre is twice the angle at the circumference Opposite angles in cyclic quadrilateral add to 180° (C1 (dep on M1) for one appropriate circle theorem reason) OR M1 reflex $AOC = 360 - y$ A1 $\frac{360 - y}{2}$ oe C2 (dep on M1) for both reasons Angles around a point add up to 360° Angle at centre is twice the angle at the circumference (C1 (dep on M1) for one appropriate circle theorem reason)

Question		Working	Answer	Mark	Notes
5	(a)		400	2	M1 for the correct scale factor 2.5 oe eg $\frac{20}{8}$, $\frac{8}{20}$, 160+160+80 or 160÷8×20 oe A1 cao
	*(b)		12	3	M1 for number of scones for limiting ingredients, eg 2×6 (=16) or 8+4 (=12) A1 for 12 cao C1 ft (dep on M1) for displaying both limiting calculations and reaching correct conclusion for their working OR M1 for proportion of limiting ingredient e.g. 80 ÷ 40 (=2) or 300 ÷ 200 (=1.5) A1 for 12 cao C1 ft (dep on M1) for displaying both limiting calculations and reaching correct conclusion for their working OR M1 for relating proportion in list to proportion Sophie has. e.g. 200 ÷ 40 or 300 ÷ 80 or 5 or 3.75 or 3.8 oe A1 for 12 cao C1 ft (dep on M1) for displaying both limiting calculations and reaching correct conclusion for their working

4		480	2	M1 for using a correct ratio of $\frac{800}{150}$ oe or $\frac{150}{800}$ oe or $\frac{90}{150}$ oe or $\frac{150}{90}$ oe A1 cao [SC: B1 for 477 ≤ answer < 480 if no working and M0 scored]

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*5	Key ring: 1.6 × 9 = 14.4 Purse : 3.2 × 8 = 25.6	Key ring £1.60 Purse £3.20	4	M1 for 9x or 8 ×2x (where x is the price of a key ring) M1 for equation 9x + 8 ×2x = 40 oe A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M1 for (8×2) : 9 (= 16 : 9) M1 for 40 ÷ (16 + 9) A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M2 for trial with attempt to evaluate 9x and 8 × 2x with £1 < x < £2 (M1 for trial with attempt to evaluate 9x and 8 × 2x with £1 ≤ x ≤ £4) A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation [SC: B2 for both £1.60 cao and £3.20 cao clearly identified for correct items with correct money notation if no working shown]

PAPER: 5MB3H_01

4		480	2	M1 for using a correct ratio of $\frac{800}{150}$ oe or $\frac{150}{800}$ oe or $\frac{90}{150}$ oe or $\frac{150}{90}$ oe A1 cao [SC: B1 for 477 ≤ answer < 480 if no working and M0 scored]

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
*5	Key ring: 1.6 × 9 = 14.4 Purse : 3.2 × 8 = 25.6	Key ring £1.60 Purse £3.20	4	M1 for $9x$ or $8 \times 2x$ (where x is the price of a key ring) M1 for equation $9x + 8 \times 2x = 40$ oe A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M1 for $(8\times2) : 9$ (= 16 : 9) M1 for $40 \div (16 + 9)$ A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation OR M2 for trial with attempt to evaluate $9x$ and $8 \times 2x$ with £1 < x < £2 (M1 for trial with attempt to evaluate $9x$ and $8 \times 2x$ with £1 ≤ x ≤ £4) A1 for 1.6 and 3.2 C1 (dep on M2) for both "£1.60" and "£3.20" clearly identified for correct items with correct money notation [SC: B2 for both £1.60 cao and £3.20 cao clearly identified for correct items with correct money notation if no working shown]

PAPER: 5MB3H_01

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
24			8	3	M1 for $p = \frac{k}{t}$ oe $(k \neq 1)$ or $12 = \frac{k}{4}$ M1 for correct method to find k or $p = \frac{48}{t}$ oe or (dep on M1) for k=48 A1 cao OR M1 for $\frac{6}{4}$ oe M1 for $12 \div \frac{6}{4}$ oe A1 cao

3			375 25 1250 500	3	M1 for 15 ÷ 6 (= 2.5) oe (can be implied by one answer correct) A1 for two answers correct B1 all correct
*4			Yes 200 > 180 oe	4	M1 for converting using figures from the graph or for 5 miles = 8 km oe M1 for correct method to convert 240 km into miles (=150 miles) or to convert 350 miles into km (= 560 km) or to convert 180 miles into km (= 288 km) M1 (dep on M2) for correct method for comparison eg 180 miles with 350 − 150 (= 200) miles eg 288 km with 560 − 240 (= 320) km C1 for a correct statement that she will have to stop oe with appropriate supporting evidence eg Yes and 200 miles is too far eg Yes and 330 < 350 eg Yes and 20 miles under" oe eg Yes and 320 > 288

PAPER: 5MB2H_01

2			7.4	3	M1 for a correct method to find the weight of 1 metre of hosepipe, eg. (1 ÷ 0.5) × 150 (= 300) M1 (dep) for a correct method to find the weight of the hosepipe alone, eg. "300" × 20 (= 6000) A1 for 7.4 (accept 7400 g)

15			57.6	2	M1 for $\frac{D}{8} = \frac{36}{5}$ oe A1 for 57.6 oe

PAPER: 1MA0_2H

Question		Working	Answer	Mark	Notes
1	(a)		360	2	M1 30 ÷ 10 (= 3) or 120 ÷ 10 (=12) or 120 + 120 + 120 oe A1 cao
	(b)		25	2	M1 for $\frac{750}{300}$ (=2.5) oe 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
18		$y = \frac{375}{x^2}$	3	M1 for $y \propto \frac{1}{x^2}$ or $y = \frac{k}{x^2}$ or $k = yx^2$ M1 for $5^2 \times 15$ (=375) A1 for $y = \frac{375}{x^2}$ or $y = \frac{k}{x^2}$ and $k = 375$

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

Original question 1

The full source mark scheme begins on page 214. Use the original paper code, tier and question number shown above.

19			36	3	M1 for $100 = k \times 5^2$ oe or $(k=)\ 4$ M1 for $(y =)\ \frac{100}{5^2} \times 3^2$ or "4" $\times 3^2$ A1 cao

5MB3H_01 November 2015

24		100, 25, 4	4	M1 for $y = \frac{k}{x^2}$ oe or $1 = \frac{k}{10^2}$ M1 for complete method to find k or $y = \frac{100}{x^2}$ oe OR (dep on M1) for $k = 100$ A1 for one entry correct A1 for other two entries correct

PAPER: 1MA0_1H

3	(a)		15	2	M1 for $\frac{10}{8}$ (= 1.2…) A1 cao
	(b)		$3\frac{3}{4}$ and 4.4	3	B1 for 1 kg = 2.2 lbs M1 for $2\frac{1}{2} \times 1.5$ $(= 3\frac{3}{4})$ oe, eg $2\frac{1}{2} \times \frac{12}{8}$ or $2\frac{1}{2} + 1\frac{1}{4}$ A1 for $3\frac{3}{4}$ and 4.4 oe (lbs.) OR B1 for 1 kg = 2.2 lbs M1 for "2.2" × 2 ÷ 2.5 × 8 oe A1 for 14(.08)

PAPER: 5MB2H/01

Original question 20

The full source mark scheme begins on page 227. Use the original paper code, tier and question number shown above.

24		1.2	3	M1 for $I \propto \frac{1}{d^2}$ or $I = \frac{k}{d^2}$ or $k = Id^2$ or $30 = \frac{k}{2^2}$ or $k = 120$ M1 (dep) for $I = \frac{"120"}{10^2}$ A1 cao

PAPER: 1MA0/1H

2	(a)		120	2	M1 for $\frac{2}{3} \times 180$ oe A1 cao
	(b)		75	2	M1 for $1000 \div 400 \times 30$ or $30 + 30 + 15$ oe A1 cao OR M1 for $3 \times 25 : 40 \times 25$ oe or $75 : 1000$ A1 cao

Question	Working	Answer	Mark	Notes
20		3072	3	M1 for $12 = \frac{k}{8^2}$ or 12×8^2 (= 768) oe or $(8\div 0.5)^2$ (= 256) M1 (dep) for substituting into $T = \frac{k}{d^2}$ e.g $(T =)\frac{"768"}{0.5^2}$ oe eg $12\times 8^2 \div 0.5^2$ oe A1 cao

13 (a)		$y = \frac{9}{x^2}$	M1	begins to work with $y = \frac{k}{x^2}$ oe e.g. subs of a pair of numbers into $y = \frac{k}{x^2}$ or states k=9
			A1	for $y = \frac{9}{x^2}$ Accept $y = 9x^{-2}$
(b)		$\frac{3}{4}$	M1	ft (dep on previous M1) subs y = 16 into proportional formula of the form $y = \frac{k}{x^2}$ oe
			A1	oe

16		$\frac{7}{3}$	M1 M1 A1	for $y = k\sqrt[3]{x}$ oe **or** $\frac{7}{6} = \sqrt[3]{8}\,k$ oe for $k = \frac{7}{6 \times \sqrt[3]{8}}$ oe for $\frac{7}{3}$ oe

Question	Answer	Mark	Mark scheme	Additional guidance
14	$y = \frac{100}{9x^4}$	P1	for setting up a correct proportional relationship, eg $d \propto x^2$ **or** $d = kx^2$	Condone the use of '$\propto$' instead of '=' for the four P marks
		P1	for setting up a second proportional relationship, eg $y \propto \frac{1}{d^2}$ **or** $y = \frac{K}{d^2}$	
		P1	(dep P1) for a process to find one of the constants of proportionality eg $24 = k \times 2^2$ ($k = 6$) **or** $4 = K \div 100$ ($K = 400$)	
		P1	full process to find y in terms of x eg $y = \frac{"400"}{("6"x^2)^2}$ oe	Both constants must come from a correct process
		A1	$y = \frac{100}{9x^4}$ oe	Expression must have been simplified, but could be given other equivalent ways eg $y = 11.111.. x^{-4}$

Paper: 1MA1/1H

12	BDAC	B2 (B1	all correct for at least 2 correct)	

Paper: 1MA1/2H

14	Evidence of solution	M1 M1 C1	for constructing an equation eg $y \propto \frac{1}{x^3}$ or eg $y = \frac{k}{x^3}$ oe for substituting in the values a and 44 into $y = \frac{k}{x^3}$ for a complete method to use the equation, the value of k and $x = 2a$ to show $y = 5.5$ eg $(2a)^3y = 44a^3$ and $y = 44a^3 \div 8a^3 = 5.5$	 Must show all steps clearly

Paper: 1MA1/3H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
20	$h = \frac{120}{\sqrt{t}}$	P1	for setting up a proportional relationship between h and p, eg $h \propto \frac{1}{p}$ **or** $h = \frac{k}{p}$ **OR** a proportional relationship between p and t, eg $p \propto \sqrt{t}$ **or** $p = K\sqrt{t}$	Condone the use of '$\propto$' instead of '=' for the first two P marks Relationship may be implied by substitution
		P1	for process to substitute at least 2 values, eg $10 = \frac{k}{6}$ $(k = 60)$ **or** $6 = K\sqrt{144}$ $(K = 0.5)$	
		P1	for full process leading to $h = \frac{"60"}{p}$ oe **and** $p =$ "0.5"$\sqrt{t}$ oe	Both constants must come from a correct process
		A1	$h = \frac{120}{\sqrt{t}}$ oe eg $h = \frac{120\sqrt{t}}{t}$ **or** $h = \frac{60}{0.5\sqrt{t}}$	Formula for h in terms of t Does not need to be in simplest form

Question	Answer	Mark	Mark scheme	Additional guidance
			he has used the wrong centre	
9	10	P1	for a process to start to solve the problem eg 6 × 9 (= 54) machine days needed or 12 (machine days used in first 3 days) or 42 (machine days needed after first 3 days) or 6 (machine days not used in first 3 days) or 3 + 4 + 5 equivalent to 2 days with 6 machines or has used 48 machine days in first 9 days	 eg 3 + 4 + 5 (= 12) eg 6 ×9 – 12 (= 42) eg 3 + 2 + 1 = 6 eg 12 ÷ 6 = 2
		P1	for "42" ÷ 6 (= 7) (more days needed) or 3 days − 2 (equivalent) days (= 1) extra day needed to make up for the days not used	
		A1	cao	

17	B, A, D, C	B2 (B1	for all correct for two or three correct)	

Paper: 1MA1/3H

8	6	M1 M1 A1	for 720 ÷ 40 (= 18) **or** 720 ÷ 30 (= 24) for a complete process eg (720 ÷ 30) – (720 ÷ 40) **or** "18" × 4/3 – "18" **or** "24" – "24" × 3/4 cao	

16	−7.5	M1 A1 A1	for stating a correct relationship, eg $y = \frac{k}{x^2}$ **or** $8 = \frac{k}{2.5^2}$ for $k = 50$, could be seen in an equation −7.5 oe	Accept $y \propto \frac{k}{x^2}$ where k may be 1

Paper: 1MA1/3H

18	20	P1 P1 A1	for a statement of proportionality eg $x = k\sqrt{y}$ **or** 1.44 oe for using $\sqrt{1.44}$ as multiplier eg $(x_2 =) k\sqrt{1.44y}$ **or** 1.2 oe cao	Must be written in the form of an equation with a constant term, accept $x \propto k\sqrt{y}$

Paper: 1MA1/1H

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
4 (a)	Yes (supported)	P1	for start of process, eg 5 × 9 (= 45) **or** 10 × 14 (= 140) **or** 5 × 2 (= 10 (kg)) **or** 3 ÷ 2 (= 1.5 (boxes))	Accept values rounded or truncated to 1dp in both (a) and (b). Ignore units
		P1	for process using ratio of areas, eg "140" ÷ "45" (= 3.1...) **or** for using ratio of amount of seed eg "10" ÷ 3 (= 3.3...) **or** for finding coverage for 1 kg of grass seed, eg "45" ÷ 3 (= 15 (m^2))	
		P1	for process to find amount of seed needed, eg "140" ÷ "45" × 3 (= 9.3...kg) **or** "140" ÷ "45" × "1.5" (= 4.6...(boxes)) oe **or** "15" × 2 (= 30 (m^2 per box)) **and** "140" ÷ "30" (= 4.6...(boxes)) **or** for process to find area that can be seeded, eg "10" ÷ 3 × "45" (= 150 (m^2)) **or** "140" ÷ "10" (= 14 (m^2)) oe	Accept 9.4 Accept 4.7
		C1	for "Yes" supported by correct figures eg 4.6...(and 5), **or** 9.3...and 10 **or** 150 and 140 (or 140 to 148.5) **or** 15 and 14	
(b)	Yes, (does not have enough) (supported)	C1	for reasoning supported with correct figures, eg does not have enough seed and compares 9 (kg) with 9.3…(kg) or 4.5 (boxes) with 4.6… (boxes) or 135 (m^2) with 140 (m^2) ft from (a)	Values used in (a) do not need repeating in (b) as long as intention is clear

Paper: 1MA1/3H

8	(a)	Graph sketched	C1	Sketch	Accept freehand provided intention is clear
	(b)	Graph sketched	C1	Sketch	

Paper: 1MA1/3H	

17	$x = \frac{1}{2}z^6$	M1 M1 M1 A1	for setting up an equation eg $x = ky^2$ oe **or** $y = cz^3$ oe for eliminating y eg $x = k(cz^3)^2$ oe OR substitutes values in both equations, eg $32 = ky^2$ and $y = c2^3$ for substituting in 32 and 2 to find the constant, eg $32 = m2^6$ OR combines equations, eg $32 = k\,c^2 2^6$ oe	Accept use of proportionality sign, eg $x \propto y^2$ or $y \propto z^3$ or $x \propto ky^2$ or $y \propto cz^3$ Accept use of proportionality sign, eg $32 \propto ky^2$ and $y \propto c2^3$

Paper: 1MA1/3H	

17	$y = \frac{40}{\sqrt{x^3}}$	P1	for setting up an equation with a constant term, eg $y = k\sqrt{t}$ **or** $t = \frac{K}{x^3}$	Condone the use of 'α' instead of '=' for the first two P marks Equation can be implied by correct substitution
		P1	for a process to substitute values in one equation, eg $15 = k\sqrt{9}$ or $k = 5$ **or** $8 = \frac{K}{2^3}$ or $K = 64$	
		P1	(dep P2) for combining the two equations ft their values of k and K, eg $y = 5\sqrt{\frac{64}{x^3}}$ **OR** for $y = 5\sqrt{t}$ **and** $t = \frac{64}{x^3}$	
		A1	oe	Formula must include 40 Accept other forms for the power of x but must be a single term in x

Paper: 1MA1/1H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
13	$t = 20$ $p = 4, 50$	M1	for method to find a missing value of p, eg $\frac{100}{25}$ oe (= 4) or $\frac{100}{2}$ oe (= 50) **or** for $p = \frac{100}{t}$	Marks for 4 or 50 can only be awarded if in correct cell of table or unambiguous in working
		M1	for method to find the missing value of t, eg $100 \div \frac{5}{1}$ (= 20) **or** for finding both missing values of p	Mark for 20 can only be awarded if in correct cell of table or unambiguous in working
		A1	cao	

13	80	M1 M1 A1	for setting up an equation with a constant term, eg $y = kx$ oe or $24 = k \times 1.5$ oe or $k = 16$ **or** for starting to work with direct proportion, eg $24 \div 1.5$ (= 16) or $5 \div 1.5$ (= 3.33…) for substituting in $y = kx$, eg $y =$ "16" $\times 5$ **or** for a complete method, eg $24 \div 1.5 \times 5$ or $5 \div 1.5 \times 24$ cao	Condone the use of "α" instead of "=" for the M marks

Paper: 1MA1/1H

11	D A B C	B2 (B1	for all correct for at least 2 correct)	

14	0.48	P1 P1 P1 P1 A1	for setting up an equation with a constant term, eg $y = kx^2$ **or** $x = \frac{j}{w}$ for a process to substitute values in one equation, eg $3 = k \times 0.5^2$ or $k = 12$ **or** $2 = j \div 0.2$ or $j = 0.4$ (dep P2) for combining the two equations ft their values of k and j eg $y =$ "12" $\times \left(\frac{"0.4"}{w}\right)^2$ oe **OR** for correct process to find the value of x when $w = 2$, eg $x =$ "0.4" $\div 2$ (= 0.2) for substitution into their formula, eg $y = \frac{"1.92"}{2^2}$ **OR** for using found value of x to find the value of y, eg $y =$ "12" $\times$ "0.2"^{2} oe	Condone the use of "$\propto$" instead of "=" for the first two P marks Equation can be implied by correct substitution $y = \frac{1.92}{w^2}$

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
12 (a)	$f = \frac{224}{d^2}$	M1	for $3.5 = \frac{k}{8^2}$ oe ($k = 224$)	Accept use of $\propto$ for the M mark
		A1	for $f = \frac{224}{d^2}$ oe	
(b)	4.73	M1	for $10 = \frac{"224"}{d^2}$ or $d^2 =$ "224" ÷ 10 **or** ft their value for k provided $f = \frac{k}{d^2}$ is used	
		A1	for answer in range 4.73 to 4.733	

Question	Answer	Mark	Mark scheme	Additional guidance
13 (a)	No with reason	C1	for No with reason, **Acceptable examples** No, $4 \div 4 \neq 8 \div 6$ No, $4 \div 4 \neq 8 \div 6$ so they don't have the same constant No because $y = kx$ doesn't work No, it wont pass through (0, 0) **Not acceptable examples** Yes, ... No, they don't increase by the same number No, they don't have the same constant	
(b)(i)	49	M1	for stating a correct relationship, eg $w = k \times \sqrt{t}$ **or** $140 = k \times \sqrt{64}$ oe	Condone the use of 'α' instead of '=' for both M marks
		M1	for method to find constant of proportionality, eg $140 \div \sqrt{64}$ (= 17.5 oe)	Award of this mark implies the previous mark
		A1	cao	
(ii)	sketch	C1	for sketch	Sketch at end of mark scheme

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
11	125	P1	for setting up an equation with a constant term, eg $T=\frac{k}{w}$ or $w=K\sqrt[3]{d}$	Condone the use of 'α' instead of '=' for the first two P marks Equation can be implied by correct substitution
		P1	for a process to substitute values in one equation, eg $20=\frac{k}{6}$ or $k = 120$ or $1=K\sqrt[3]{8}$ or $K=\frac{1}{2}$ oe	
		P1	(dep P2) for combining the two equations ft their values of k and K, eg $T=\frac{"120"}{"\frac{1}{2}"\sqrt[3]{d}}$ oe **OR** for a correct process to find the value of w when $T = 48$, eg $w=\frac{"120"}{48}$ (= 2.5 oe)	$T=\frac{120}{w}$ $w=\frac{1}{2}\sqrt[3]{d}$
		P1	for substitution into their formula, eg $48=\frac{"120"}{"\frac{1}{2}"\sqrt[3]{d}}$ **OR** for substitution of found value of w in the equation for d, eg $"2.5"="\frac{1}{2}"\sqrt[3]{d}$	
		A1	cao	

Paper: 1MA1/1H

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.
√ - 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.

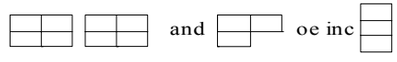
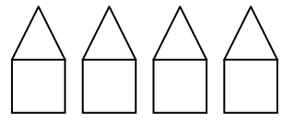
9 Parts of questions

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

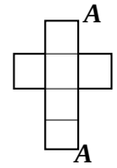
Paper 5501

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)			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)	$2 \times 2 \times 2$	8	2	M1 for $2 \times 2 \times 2$ A1 for 8 cao
16 (a)		30	1	B1 cao
(b)		3	1	B1 cao
(c)	$2 \times 29 = 58$ $5 \times 30 = 150$ $2 \times 31 = 62$ $1 \times 32 = 32$ $\frac{302}{10} = 30.2$	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 $\frac{2}{3}$

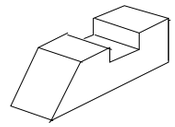
Paper 5501

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)

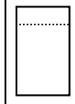
Paper 5503

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

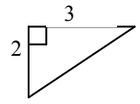
No	Working	Answer	Mark	Notes
11 (a)	Bryani was correct $4 \times 3^2 = 4 \times 9 = 36$	Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or "square the three/x then multiply by four" A1 Bryani **SC** 4×3^2 with Bryani gets B2
(b)			1	B1 cao
12 (a)			3	B2 for rectangle height 4 squares, base 3 squares (B1 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 × 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 20^{th} 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 21^{st} value is in the same interval	1	B1 20.5^{th} or 21^{st} 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

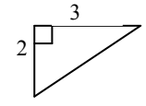
No	Working	Answer	Mark	Notes
22 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all 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 $\times 1\frac{1}{2}$ 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 20^{th} 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 21^{st} value is in the same interval	1	B1 for 20.5^{th} or 21^{st} 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

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.

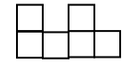
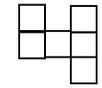
12 Parts of questions
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

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

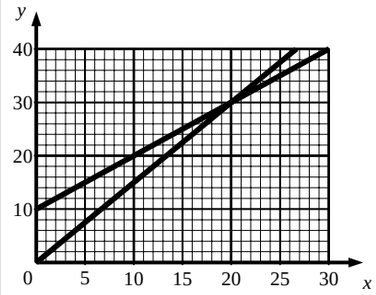
1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		380	1	B1 cao
	(b)		6.2	1	B1 cao
	(c)		Arrow at 34	1	B1 cao
2	(a)		8	1	B1 for 8 ± 0.2
	(b)		35	1	B1 for 35 ± 2°
	(c)		Circle drawn	1	B1 for all parts within ± 2mm, (use overlay)
3	(a)		4, 7, 4, 3, 2	2	M1 for at least 3 correct tallies **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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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) (ii) (b)		(2, 3) (–3, 1) Point plotted at (3, –4)	2 1	B1 cao B1 cao B1 cao
6	(a) (b) (c)		– 5 6 3	1 1 1	B1 cao B1 for 6 or – 6 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) (b)	 24 ÷ 4 =	Walk 6	1 2	B1 cao M1 for 24 ÷ 4 oe or ¼ oe seen A1 cao

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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.

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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)

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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

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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.

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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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NOTES ON MARKING PRINCIPLES

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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.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

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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.

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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.

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_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			1 | 7 8 8 9 2 | 0 0 1 2 3 5 9 3 | 3 7 7 4 | 2 1 | 8 represents 18	3	B2 for a fully correct ordered diagram (B1 for correct unordered diagram or ordered with at most two errors or omissions) B1 for a correct key Accept stem written as 10, 20 etc but key only acceptable if consistent with this
*2			No + comparison	3	M1 for a correct start to the process eg. $\frac{225}{9}$ **or** $\frac{\mathbf{475}}{\mathbf{225}}$ **or** $\frac{\mathbf{20}}{\mathbf{9}}$ **or** $\frac{475}{20}$ M1 for completion of a fully correct method that will lead to an appropriate comparison C1 (dep on M2) for a correct statement with conclusion with 500 g **or** 25g more needed **or** 19 cakes **or** 25g **and** 23.75g SC :If **no** working then B1 for a correct statement with correct figures and units

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		30	1	B1 for 30 minutes
	(b)		20	1	B1 cao
	(c)		graph completed	2	B1 for horizontal line from (5, 20) to (5.30, 20) B1 for a single straight line with the correct gradient from '(5.30, 20)' to the time axis
4	(a)	1 − 0.2 − 0.1 0.7 ÷ 2	0.35	3	M1 for correctly using total probability is 1 or 100% if percentages used M1 (dep) for complete correct method to complete the solution A1 for 0.35 or 35% or $\frac{35}{100}$oe
	(b)		20	2	M1 for 0.1 × 200 oe A1 cao SC : If M0 then award B1 for an answer of $\frac{20}{200}$
5		π × 5 × 1.80	28.27	3	M1 for use of π × x (with x = 5 or x = 2.5) **or** 2 × π × x (with x = 5 or x = 2.5) M1 for π × 5 × 1.8(0) **or** 2 × π × 2.5 × 1.8(0) A1 for 28.26 or 28.27 or 28.28 or 28.3(0) or 28.8(0)

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
6			414.96	5	M1 for a correct method to work out the amount of oil required to fill the tank M1 for a correct method to find the cost of oil required before the discount M1 for a correct method of finding 5% of their calculated cost M1 (dep on previous M1) for a correct method to find the discounted cost A1 for correct answer of 414.96 or 41496p **OR** M1 for a correct method of finding 5% of the cost of 1 litre of oil M1 (dep on previous M1) for a correct method to find the discounted cost of 1 litre of oil M1 for a correct method to work out the amount of oil required to fill the tank M1 for a correct method to find the discounted cost of the oil required A1 for correct answer of 414.96 or 41496p **OR** M1 for a correct method to work out the amount of oil required to fill the tank M1 for a correct method of finding 5% of their calculated amount of oil M1 (dep on previous M1) for a correct method to find the reduced amount of oil M1 for a correct method to find the cost of the reduced amount of oil A1 for correct answer of 414.96 or 41496p

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7*	(a)		2.5	2	M1 for 15 ÷ 6 oe A1 for 2.5 or $2\frac{1}{2}$
	*(b)		Yes + evidence	2	M1 for a correct method to change 15 miles into kilometres C1(dep M1) for 24 km **and** statement with correct conclusion [SC: B1 for "Yes" oe and 24 km shown if M0 scored] or M1 for a correct method to change 20 kilometres into miles C1(dep M1) for 12.5 miles **and** statement with correct conclusion [SC: B1 for "Yes" oe and 12.5 miles shown if M0 scored]

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		<table><tr><td>x</td><td>$x^3 - 3x$</td></tr><tr><td>2</td><td>2</td></tr><tr><td>2.1</td><td>2.(961)</td></tr><tr><td>2.2</td><td>4.(048)</td></tr><tr><td>2.3</td><td>5.(267)</td></tr><tr><td>2.4</td><td>6.(624)</td></tr><tr><td>2.5</td><td>8.(125)</td></tr><tr><td>2.6</td><td>9.(776)</td></tr><tr><td>2.7</td><td>11.(583)</td></tr><tr><td>2.8</td><td>13.(552)</td></tr><tr><td>2.9</td><td>15.6(89)</td></tr><tr><td>3</td><td>18</td></tr><tr><td></td><td></td></tr><tr><td>2.85</td><td>14.5(99...)</td></tr><tr><td>2.86</td><td>14.8(13...)</td></tr><tr><td>2.87</td><td>15.0(29...)</td></tr><tr><td>2.88</td><td>15.2(47...)</td></tr><tr><td>2.89</td><td>15.4(67...)</td></tr></table>	2.9	4	B2 for a trial $2.8 \leq x \leq 2.9$ evaluated correctly (B1 for a trial evaluated correctly for $2 \leq x \leq 3$) B1 for a different trial evaluated correctly for $2.85 \leq x < 2.9$ B1 (dep on at least one previous B1) for 2.9 NB For trials where x has one decimal place: $x \leq 2.6$ trials must be evaluated to at least 1 sf truncated or rounded $2.6 < x < 2.85$ trials must be evaluated to at least 2 sf truncated or rounded $2.85 \leq x \leq 2.9$ trials must be evaluated to at least 3 sf truncated or rounded NB. Accept 15 or 15.0 for trial at x =2.87 No working scores 0 marks. **If candidate is clearly working with $x^3 - 3x - 15 = 0$ then use same scheme as above but subtract 15 from all evaluated values in the table**

1MA0_2H					
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
10			Translation; $\begin{pmatrix}6\\-1\end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix}6\\-1\end{pmatrix}$ NB: B0 if more than one transformation given
11	(a)	$3x + 12 + 10x - 2$	$13x + 10$	2	M1 for correct method to expand one bracket eg $3 \times x + 3 \times 4$ **or** $3x + 12$ or $2\times5x - 2\times1$ **or** $10x - 2$ A1 for $13x + 10$
	(b)	$2x^2 - 8x + x - 4$	$2x^2 - 7x - 4$	2	M1 for all 4 terms (and no additional terms) correct ignoring signs **or** 3 out of no more than four terms correct A1 for $2x^2 - 7x - 4$
	(c)		$3y(2y - 3x)$	2	B2 for $3y(2y - 3x)$ (B1 for $3(2y^2 - 3xy)$ **or** $y(6y - 9x)$ **or** $3y(2y + 3x)$ **or** $3y(2y - ax)$ where a is any positive integer except 3 **or** $3y(by - 3x)$ where b is any positive integer except 2)

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		−2, −1, 0, 1,	2	B2 for all 4 correct values; ignore repeats, any order (B1 for 3 correct (and no incorrect values) eg. −2, −1, 0 **or** one additional value eg. −3, −2, −1, 0, 1)
	(b)		$p>6$	2	M1 for clear intention to add 7 to both sides **or** $3p > 11 + 7$ **or** clear intention to divide all 3 terms by 3 as a first step **or** $3p > 18$ **or** $3p = 18$ **or** $3p < 18$ **or** $\frac{18}{3}$ A1 for $p > 6$ as final answer NB: (p =) 6 on the answer line scores M1 A0
13	(a)		11.5	3	M1 for $13^2 - 6^2$ or 169 − 36 or 133 M1 (dep on M1) for $\sqrt{"13^2 - 6^2"}$ **or** $\sqrt{133}$ A1 for answer in the range 11.5 − 11.6
	(b)		47.2	3	M1 for cos (RPQ)= $\frac{17}{25}$ oe **OR** sin PQR = $\frac{17}{25}$with PQR clearly identified M1 for (RPQ =+) $\cos^{-1}\frac{17}{25}$oe **OR** PQR = $\sin^{-1}\frac{17}{25}$with PQR clearly identified A1 for answer in the range 47.1 − 47.2 SC : B2 for an answer of 0.823(033...) **or** 52.3(95...) **or** 52.4

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1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	$100 = 4 \times 2 \times c$	12.5	2	M1 for correct substitution into formula A1 for 12.5 oe
	(b)	$m^2 = \frac{k+1}{4}$ $4m^2 = k + 1$ $k = 4m^2 - 1$ or $2m = \sqrt{(k+1)}$ $4m^2 = k + 1$ $k = 4m^2 - 1$	$k = 4m^2 - 1$	3	M1 for correct method to clear fraction **or** remove square root sign M1 (dep) for a fully correct method to both clear fraction **and** remove square root sign A1 for $k = 4m^2 - 1$ **or** $k = (2m + 1)(2m - 1)$
15	(a)	$\frac{1}{2} \times (4 + 12) \times 10$	80	2	M1 for a fully correct method for area of *QRST* A1 cao
	(b)	**For example** $\frac{PT+10}{PT} = \frac{12}{4} = 3$ $PT + 10 = 3PT$ $2PT = 10$	5	3	M1 for a correct scale factor or ratio using two corresponding sides from two similar triangles or two sides within the same triangle (may be seen within an equation) eg. $\frac{12}{4}$oe **or** 4 : 12 oe **or** $\frac{PT}{4}$**or** $\frac{PS}{12}$ **or** $\frac{12}{12-4}$ etc. M1 for a correct equation with *PT* or *PS* as the only variable **or** complete correct method using scale factor A1 cao

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	154500 – 150000 $\frac{4500}{150000} \times 100$	3	3	M1 for 154500 – 150000 or 4500 M1 for $\frac{'154500-150000'}{150000} \times 100$ oe A1 cao **OR** M1 for $\frac{154500}{150000}$ (× 100) M1 for "$\frac{154500}{150000} \times 100$ " − 100 oe A1 cao
	(b)	$154500 \times \frac{4}{100} + 154500$ $160680 \times \frac{4}{100} + 160680$ or 154500×1.04^2	167107.20	3	M1 for 154500 × $\frac{4}{100}$ or 6180 **or** 12360 **or** 160680 **or** 166860 **or** 1.04 × 154500 M1 (dep) for (154500 + '6180') × $\frac{4}{100}$ or 6427.2(0) or ' 160680' × 1.04 A1 for 167107.2(0) as final answer **OR** M2 for 154500×1.04^2 (M1 for 154500 × 1.04) A1 167107.2(0) as final answer

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$\sqrt{\frac{2.73\ldots}{0.732\ldots}}$	1.931851…	2	M1 for 2.73… or 0.732…or 3.73…or 1.931 or 1.932 or 1.93 or $(1+\sqrt{3})$ or $(\sqrt{3}-1)$ or $(2+\sqrt{3})$ **or** 1.65... **or** 0.855... A1 for 1.9318(5…) SC: B1 for 2.5127(17...)
18	(a)	minimum = 5 lower quartile = 14 median = 25 upper quartile = 30 maximum = 44	box plot	3	B3 for fully correct box plot (B2 for at least 3 correct values plotted including box **and** tails **or** 5 correct values indicated) (B1 for at least 2 correct values plotted including box **or** tails **or** 3 or 4 correct values indicated)
	(b)		comparisons	2	B1 for a correct comparison (ft) of medians B1 for a correct comparison (ft) of ranges or IQRs
19		$\frac{30}{360}\times\pi\times15^2$	58.8	2	M1 for a correct method to find the area of sector *OAB* A1 for answer in range 58.8 − 58.9125

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20			15.0	3	M1 for $8^2 + 8^2 - 2 \times 8 \times 8 \times \cos 140$ M1 (dep) for correct order of evaluation **or** 226.(05...) A1 for answer in range 15.0 − 15.04 **OR** M1 for $\frac{PR}{\text{SIN } 140} = \frac{8}{\sin\left(\left(\frac{180-140}{2}\right)\right)}$ M1 for $PR = \frac{8}{\sin\left(\left(\frac{180-140}{2}\right)\right)} \times \sin 140$ A1 for answer in range 15.0 − 15.04 **OR** M1 for $8 \times \sin 70$ or $8 \times \cos 20$ M1 for $2 \times 8 \times \sin 70$ **or** $2 \times 8 \times \cos 20$ A1 for answer in range 15.0 − 15.04

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		Total area = (0.12 × 40) + (0.36 × 20) + (0.7 × 20) + (0.56 × 20) + (0.18× 40) = 44.4 Area (140 < w < 200) = (0.36 × 20) + (0.7 × 20) + (0.56 × 20) = 32.4 32.4 ÷ 44.4	0.73	4	M1 for a method to find the frequency **or** the area of any one block M1 for a method (with correct values) to find total area of all blocks **or** 44.4 **or** 1110 **or** a correct method (with correct values) to find total area of middle 3 blocks **or** 32.4 **or** 810 M1 (dep on M2) for a correct method to find required proportion (could lead to a decimal or a percentage or a fraction) A1 for answer which rounds to 0.73 or 73% or $\frac{27}{37}$ or equivalent fraction

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1MA0_2H					
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 $- \frac{1}{3} \times \pi \times 7.5^2 \times 20$ 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
23			11	2	M1 for a $\frac{68}{300} \times 50$ oe A1 for 11 (accept 12)

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*24			0.229 because the LB and UB agree to that number of figures	5	B1 for 3.465 or 3.475 or 3.474999… B1 for 8.1315 or 8.1325 or 8.132499… M1 for $\frac{\sqrt{3.475}}{8.1315}$ as UB **OR** $\frac{\sqrt{3.465}}{8.1325}$ as LB C1 (dep on all previous marks) for 0.2292… and 0.2288… both values must clearly come from working with correct values C1 for 0.229 from 0.2292… and 0.2288… **and** 'both LB and UB round to 0.229'
25			$1 + \sqrt{5}$	5	M1 for $\frac{1}{2} \times x \times x \times \sin 30°$ oe M1 for $\frac{1}{2}(x-2)(x+1)$ oe **or** $\frac{1}{2} \times (x-2) \times (x+1) \times \sin 90$ M1 (dep on at least one previous M1) for formation of equation from equating areas with x as the only variable A1 for $x^2 - 2x - 4 = 0$ oe in the form $ax^2 + bx + c = 0$ or $ax^2 + bx = c$ A1 cao

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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.

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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

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PAPER: 1MA0_2H					
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)

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		Points plotted at (1,8200) and (3.5,5000)	1	B1 for points accurately plotted ±1/2 square tolerance
	(b)		'the older the car the lower the value' 'the greater the value the newer the car'	1	B1 for an acceptable relationship eg. 'the older the car the lower the value' (accept 'negative correlation' but not just 'negative')
	(c)		5200 to 6600	2	M1 for a single line segment with negative gradient that could be used as a line of best fit or a vertical line from 2.5 or a point at (2.5,*y*) where *y* is from 5200 to 6600 A1 for given answer in the range 5200 − 6600
4			126	3	M1 for 1 – 0.05 – 0.32 (= 0.63) M1 for '0.63' × 200 A1 cao OR M1 for 0.05 × 200 (= 10) or 0.32 × 200 (= 64) or 0.37 × 200 (=74) M1 for 200 – '10' – '64' A1 cao OR M1 for 100 – 5 – 32 (= 63) M1 for $\frac{"63"}{100}\times 200$ A1 cao SC: B2 for $\frac{126}{200}$ as the answer.

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)		Response boxes overlap and are not exhaustive	2	B2 for **TWO** aspects from: No time frame given Non-exhaustive responses Response boxes over-lapping (B1 for ONE correct aspect)
	(b)		How many magazines do you buy each month? 0-4 5-8 over 8	2	B1 for a question with a time frame B1 for at least 3 correctly labelled response boxes (non-overlapping, need not be exhaustive) **or** for a set of response boxes that are exhaustive (could be overlapping) [Do not allow inequalities in response boxes]
	(c)		One reason	1	B1 for ONE reason Eg. All the same age, may all be males, may all like same types of magazines, sample too small, biased
6			4.8	4	M1 for 60 × 60 (=3600) M1 for 15000÷ 20 (=750) or 20÷15000 (=0.00133..) or "3600"÷15000 (=0.24) or 15000÷"3600" (=4.16..) M1 for "3600" ÷ (15000÷20) or "3600"×20÷15000 oe A1 cao

PMT

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			28% or $\frac{14}{50}$	4	M1 for 100 30 (= 70) or $1 - \frac{3}{10}$ $(= \frac{7}{10})$ M1 for "70" ÷ (3 + 2) (= 14) or $"\frac{7}{10}" \div (3+2)$ $(= \frac{7}{50})$ M1 for "14" × 2 or $\frac{7}{50} \times 2$ A1 for 28% or $\frac{14}{50}$ oe **OR** M1 for a correct method to find (100-30)% of any actual sum of money M1 for "350" ÷ (3 + 2) (= 70) M1 for "70" × 2 A1 for 28% or $\frac{14}{50}$ oe **OR** M1 for starting with two numbers in ratio 3:2, eg 21 and 14 M1 for equating sum of their numbers to 100 – 30 (=70%), eg '21' + '14' (=35) M1 for scaling sum of their numbers to 100%, eg '35'÷70×100 (=50) A1 for 28% or $\frac{14}{50}$ oe SC: award B3 for oe answers expressed in an incorrect form eg $\frac{2.8}{10}$

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
8			10752	4	M1 for splitting the pentagon (or show the recognition of the "absent" triangle) and using a correct method to find the area of one shape M1 for a complete and correct method to find the total area M1 (dep on at least one prev M1) for multiplying their total area by 2.56 (where total area is a calculation involving at least two areas) A1 cao
9			55	4	M1 for a correct method to find a different angle using 35° M1 for setting up a complete process to calculate angle x A1 cao B1 states one of the following reasons relating to their chosen method: Alternate angles are equal; Corresponding angles are equal; Allied angles / Co-interior angles add up to 180; the exterior angle of a triangle is equal to the sum of the interior opposite angles.

<table>
<tr><th colspan="5">PAPER: 1MA0_2H</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>10</td><td></td><td><table>
<tr><th>x</th><th>$x^3 + 2x$</th></tr>
<tr><td>4</td><td>72</td></tr>
<tr><td>4.1</td><td>77.(121)</td></tr>
<tr><td>4.2</td><td>82.(488)</td></tr>
<tr><td>4.3</td><td>88.(107)</td></tr>
<tr><td>4.4</td><td>93.(984)</td></tr>
<tr><td>4.5</td><td>100.(125)</td></tr>
<tr><td>4.6</td><td>106.(536)</td></tr>
<tr><td>4.7</td><td>113.(223)</td></tr>
<tr><td>4.8</td><td>120.(192)</td></tr>
<tr><td>4.9</td><td>127.(449)</td></tr>
<tr><td>5</td><td>135</td></tr>
<tr><td></td><td></td></tr>
<tr><td>4.65</td><td>109.8(44625)</td></tr>
<tr><td>4.66</td><td>110.5(14696)</td></tr>
<tr><td>4.67</td><td>111.1(87563)</td></tr>
<tr><td>4.68</td><td>111.8(63232)</td></tr>
<tr><td>4.69</td><td>112.5(41709)</td></tr>
</table></td><td>4.7</td><td>4</td><td>B2 for a trial $4.6 \leq x \leq 4.7$ evaluated correctly
(B1 for a trial evaluated correctly for $4 \leq x \leq 5$)
B1 for a different trial evaluated correctly for $4.65 \leq x < 4.7$
B1 (dep on at least one previous B1) for 4.7

[Note: Trials should be evaluated to at least accuracy shown in table, truncated or rounded]

No working scores 0 marks</td></tr>
<tr><td>11</td><td></td><td></td><td>3.52</td><td>3</td><td>M1 for $1.35^2 + 3.25^2$
M1 (dep) for $\sqrt{(1.35^2 + 3.25^2)}$ $(= \sqrt{12.385})$
A1 for answer in the range 3.51 to 3.52</td></tr>
</table>

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)	$3x - 6 = x + 7$ $2x = 13$	6.5	3	M1 for $3\times x - 3\times 2$ ($=3x - 6$) or $\frac{x}{3} + \frac{7}{3}$ seen M1 for correct method to isolate the terms in x or the number terms on opposite sides of an equation A1 for 6.5 oe
	(b)	$2 - y = 1 \times 5$	-3	2	M1 for intention to multiply both sides by 5 (to give $2 - y = 1 \times 5$) A1 cao
13	(a)		(3, 3.5) oe	2	M1 for a correct method to find the value of either the x coordinate or the y coordinate of the midpoint **or** $x = 3$ **or** $y = 3.5$ A1 cao
	(b)		-1.8 oe	2	M1 for correct method to find the gradient OR (+)1.8 A1 for -1.8 oe

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*14			The Friendly Bank	4	M1 for a correct method to find interest for the first year for either bank **OR** correct method to find the value of investment after one year for either bank **OR** use of the multiplier 1.04 or 1.05 M1 for a correct full method to find the value of the investment (or the value of the total interest) at the end of 2 years in either bank A1 for 2100.8(0) and 2110.5(0) (accept 100.8(0) and 110.5(0)) C1 (dep on M1) ft for a correct comparison of *their* total amounts, identifying the bank from their calculations **OR** M1 for either 1.04 × 1.01 or 1.05 × 1.005 M1 for 1.04 × 1.01 and 1.05 × 1.005 A1 for 1.0504 and 1.05525 C1 (dep on M1) ft for a correct comparison of *their* total multiplying factors identifying the bank from their calculations

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)		-2 -1 0 1 2 3 4 **8** 3 0 **-1** **0** 3 **8**	2	B2 for 8, -1, 0, 8 (B1 for at least two of 8, -1, 0, 8)
	(b)		Correct curve	2	M1 (ft) for at least 5 points plotted correctly A1 for a fully correct curve
	(c)	$x^2 - 2x - 3 = 0$ OR $(x - 3)(x + 1) = 0$	3 and −1	2	M1 for the straight line $y = 3$ drawn to intersect the "graph" from (a) A1 for both solutions **OR** M1 for identifying $y = 3$ from the table A1 for both solutions **OR** M1 for $(x \pm 3)(x \pm 1)$ A1 for both solutions

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*16		Angle *POT* = 180 – 90 – 32 = 58 (angle between radius and tangent = 90^o and sum of angles in a triangle = 180^o) Angle *OST* =angle *OTS* = 58÷2 (ext angle of a triangle equal to sum of int opp angles and base angles of an isos triangle are equal) or (angle at centre = 2x angle at circumference) OR Angle *SOT* = 90 + 32 = 122 (ext angle of a triangle equal to sum of int opp angles) (180 – 122) ÷ 2 (base angles of an isos triangle are equal)	29	5	B1 for angle OTP = 90^o, quoted or shown on the diagram M1 for a method that leads to 180 – (90 + 32) or 58 shown at *TOP* M1 for completing the method leading to "58"÷2 or 29 shown at *TSP* A1 cao C1 for "angle between radius and tangent = 90^o" **and** one other correct reason given from theory used NB: C0 if inappropriate rules listed OR B1 for angle OTP = 90^o, quoted or shown on the diagram M1 for a method that leads to 122 shown at *SOT* M1 for (180 – "122") ÷ 2 or 29 shown at *TSP* A1 cao C1 for "angle between radius and tangent = 90^o" **and** one other correct reason given from theory used NB: C0 if inappropriate rules listed

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17	(a)		Box plot overlay	2	M1 for a box drawn with at least 2 correct points from LQ, Med and UQ A1 for a fully correct box plot
	(b)		Comparison of a measure of spread plus a comparison of medians (in context)	2	B1 for a correct comparison of a measure of spread (using either range or iqr) B1 for a correct comparison of medians For the award of both marks at least one of the comparisons made must be in the context of the question.
18		$3p^2 = y + 4$ $p^2 = \frac{y+4}{3}$	$p = \sqrt{\frac{y+4}{3}}$	3	M1 for clear intention to add 4 to both sides or divide all terms by 3(with at least 3 terms) M1 for clear intention to find the square root from p^2 = (expression in y) A1 for $p = \sqrt{\frac{y+4}{3}}$ oe (accept ± a correct root)
19	(a)		$3(2 + 3x)$	1	B1 for $3(2 + 3x)$
	(b)		$(y + 4)(y – 4)$	1	B1 for $(y + 4)(y – 4)$
	(c)		$(2p − 5)(p + 2)$	2	M1 for $(2p \pm 5)(p \pm 2)$ A1 for $(2p − 5)(p + 2)$

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		cos y = 2.25 ÷ 6 y = cos^{-1} (2.25 ÷ 6) OR 6cos 75 = 1.55…	The ladder is not safe because y is not near to 75	3	M1 for cos y = 2.25 ÷ 6 oe M1 for cos^{-1} (2.25 ÷ 6) C1 for sight of 67-68 and a statement eg this angle is NOT (near to) 75° and so the ladder is not steep enough and so not safe. OR M1 for cos 75 = x ÷ 6 M1 for 6cos 75 C1 for sight of 1.55(29…) and a statement eg that 2.25 NOT (near to) 1.55 and so the ladder is not steep enough and so not safe.
21			48 or 49	2	M1 for $\frac{460}{460+320+165}\times 100$ (=48.67 ….) or $\frac{460}{9.5}$ or $\frac{460}{9.45}$ A1 for 48 or 49
22			1.33	3	M1 for $3.4 = \frac{k}{5^2}$ oe or 3.4×5^2 (=85) M1 for '3.4×5^2' ÷ 8^2 A1 for answer in range 1.32 to 1.33 or $\frac{85}{64}$
23		d: UB = 54.5 (or 54.499), LB = 53.5 C: UB = 170.5 (or 170.499), LB = 169.5 170.5 ÷ 53.5 169.5 ÷ 54.5	3.19 3.11..	4	B1 for any one correct bound quoted M1 for 170.5 ÷ 53.5 or 169.5 ÷ 54.5 A1 for UB = answer in range 3.18 to 3.19 from correct working A1 for LB = 3.11.. from correct working

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PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
24	(a)		18.2	2	M1 for ½ × 6 × 7 × sin60 A1 for answer in range 18.1 to 18.2
	(b)		6.56	3	M1 for $6^2 + 7^2 - 2 \times 6 \times 7 \times \cos 60$ M1 for correct order of operation eg 36 + 49 – 42 (=43) A1 for answer in range 6.55 to 6.56
25			$x = 2.87$, $y = -0.87$ and $x = -0.87$, $y = 2.87$	6	M1 for $x^2 + (2 - x)^2 = 9$ M1 for $4 - 4x + x^2$ A1 for $2x^2 - 4x - 5 = 0$ oe 3 term simplified quadratic M1 for a correct method to solve their quadratic Eg $x = \frac{4 \pm \sqrt{(16 - 4 \times 2 \times -5)}}{4}$ A1 for $x = 2.87$, $y = -0.87$ or better A1 for $x = -0.87$, $y = 2.87$ or better Award marks for equivalent algebraic expressions. Apply the same scheme as above for y first.

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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: ±5°
Measurements of length: ±5 mm

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
1		Model as well as diagram provided	Standard mark scheme
3	(a)	*y*-axis 2 cm for 1000. *x*-axis 2 cm for ½ Table: 8200 changed to 8000	Points plotted at (1,8000) and (3.5,5000
8		Braille diagram labelled A B E D C	Standard mark scheme
12	(a)	MLP only: *x* changed to *y*.	Standard mark scheme
13		Crosses at A and B changed to a filled-in circle. Braille: AB is joined with a line.	Standard mark scheme

PMT

PAPER: 1MA0_2H			
Question		**Modification**	**Notes**
15		Table: wording added "There are four spaces to fill." *x*-axis 2 cm for ½. *y*-axis 2 cm for 1. Labelling remains same as on standard paper.	Standard mark scheme
17		Both box plots put on one page and labelled 'Girls' and 'Boys' Girls: LQ changed to 15, UQ changed to 40 Boys: figures changed to 5 20 35 40 50 2 cm grids.	Standard mark scheme
20		'horizontal ground' and 'vertical wall' labelled.	Standard mark scheme
24		Braille: Information about measurements given	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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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 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.

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)

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 × 6 ÷ 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

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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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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Calculator) Unit 3

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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 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.

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 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: 5MB3H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1*			Decision (supported)	3	M1 for correct first step e.g. $15 \div 3$ 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

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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)

PAPER: 5MB3H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		3 42 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)	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
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* =) $\frac{6}{\sin 25}\times\sin 120$ (= 12.2(951…)) or (*BC* =) $\frac{6}{\sin 25}\times\sin 35$ (= 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

PMT

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 20

Many students were able to set up at least one correct proportional relationship and often wrote down both $h \propto 1/p$ and $p \propto \sqrt{t}$. At this stage a few students used direct proportion instead of inverse proportion and vice versa. Students who introduced a constant k and wrote $h = k/p$ or $p = k\sqrt{t}$ were usually able to substitute correctly and find the value of the constant. However, a correct substitution did not always lead to a correct value with $6 = k \times \sqrt{144}$ sometimes leading to $k = 2$, for example. Some students found the value of one constant and used it incorrectly in their second equation. Having found $k = 60$ from $10 = k/6$ they then wrote $p = 60 \times \sqrt{144}$ followed by $p = 720$. Another error was to use k as the constant of proportionality in both relationships and to assume that it had the same value in both equations. The use of two different symbols reduced the potential for error. Some students did not write down an equation involving k and statements such as $6 \propto 12$ were quite common. Many of the students who found the values of both constants failed to use them in their original equations and did not write down $h = 60/p$ and $p = 0.5\sqrt{t}$. Those that did gained the third mark and frequently went on to find a formula for h in terms of t. Many students found the values of the two constants but then continued with incorrect further working. Some simply stopped and went no further.

Question 9

This question was not well answered in general though there were many clear and concise responses which earned full marks. Many students were able to make a start by stating that 54 (6×9) machine days were needed to make all the boxes. A much smaller proportion of students could make further progress. The most common strategy used by students who successfully solved the problem was to identify that 42 machine days were needed in addition to the first 3 days and then that 42 machine days is equivalent to 7 days with all the machines working. A small number of students who used this approach gave 7 as their final answer instead of the correct 10 days ($3 + 7$). The most able students were able to identify that 6 machine days were lost in the first 3 days so one extra day in addition to the 9 days would be needed to make all the boxes.

Question 17

Matching the functions to the graphs in this question produced a good spread of marks with about a third of all students scoring each of the marks available. The graph of a trigonometrical function was identified correctly more frequently than the other graphs and the graphs showing one form of proportionality or another were the least well known.

Question 8

This was a well-answered question. Some incorrect answers showed all numbers multiplied together resulting in nonsensically large answers. The few students that did this thought nothing of giving an answer in thousands suggesting the context of the question had been missed. A common answer was to show $720 \times 40 - 720 \times 30$ (leading to 7200).

Question 16

Many mixed responses were seen here, it would be wise to remind students to read the question carefully as many stated the relationship incorrectly (e.g. using direct proportion, omitting the square, or using a square root instead).

Students who were able to state the correct relationship usually went on to find k successfully but then they found it much harder to substitute the fractional value of y into their formula. Some who managed to correctly find the value of x^2 did not give just the negative value of x as their final answer.

Students are reminded to always read questions carefully.

Question 18

After gaining the first mark for the statement $x = k\sqrt{y}$ many students could not make any further progress. Many attempts using 44 did not lead anywhere. Those that used $\sqrt{1.44}$ as a multiplier gained the second mark but some students could not then make the step from 1.2 or 1.2y to find the percentage increase as 20%. Some students approached this question by using values of x and y. If, for example, y = 100 (and k =1) then x = 10 and after the increase y = 144 and x = 12. This approach often proved successful.

Question 4

A good discriminator, part (a) of this question attracted many fully correct solutions. There were a number of possible routes that students could take to solve the problem. By far the most common route taken was for students to find the number of kilograms of grass seed needed for the 10m by 14m lawn (9.$\dot{3}$ kg) by first calculating the area that could be covered with 1 kg of seed. This route was usually successfully completed with students stating a correct conclusion from correct figures. A second popular route was to find the area which can be seeded with the 5 full boxes of seed (150 m^2) and compare it with 140 m^2, the area of the larger lawn. Of those attempts where a solution was not complete, at least one mark could usually be awarded for a correct process to find either the total amount of seed in 5 boxes or the area of one of the lawns.

A large proportion of students successfully answered part (b) of the question. Reasons given were usually based on finding and stating the area (135 m^2) which could be seeded with 9 kg seed or by comparing the 9 kg of seed now available with the 9.$\dot{3}$ kg of seed needed for the larger lawn.

More than two in every five students obtained full marks for their solution to this question.

Question5

The vast majority of students successfully completed the tree diagram correctly to score the two marks available in part (a) of this question.

Part (b) was less well done. However, a good proportion of students also scored two marks here. A significant number of students indicated the intention to multiply $\frac{1}{3}$ by $\frac{2}{3}$ thereby scoring one mark but then evaluated this incorrectly. Showing the intention to add the fractions meant that some students could not be awarded any credit in this part of the question. A number of students thought they needed to consider two combinations, and gave an answer of $\frac{4}{9}$. Unfortunately, the additional work involved spoilt their method and no marks could be awarded.

Question 8

In this question the great majority of students sketched a straight line from the origin to score the mark available in part (a).

Part (b) was less well answered with many students drawing another straight line but this time with a negative gradient. This did relay the idea that as the value of x increases then the value of y decreases. However, it did not accurately represent the inverse relationship and could not be awarded the mark available.

Question 17

It was relatively rare to see a fully correct solution to this question together with the award of 4 marks. However, many more students were able to access some marks for expressing the proportionalities between x and y and between y and z using symbols, by substituting the 2 given values in their equations and in some cases for getting as far as writing down an equation which would enable them to find the constant of proportionality for the relationship between z and x. Nearly all students used the same constant of proportionality for the relationship between x and y as they did for the relationship between y and z. This was condoned as far as it could be though students should be advised to use different constants in cases like this.

Question 17

Many students were able to set up an equation with a constant term and they often wrote down both $y = k\sqrt{t}$ and $t = k/x^3$. Most then went on to gain the second mark for substituting values in at least one equation. The values found for the constants were usually correct although $8 = k/8$ did sometimes lead to $k = 1$. Having found the values of the constants many students did not use them to write down the two equations $y = 5\sqrt{t}$ and $t = \frac{64}{x^3}$. Centres should encourage students to clearly show the equations as doing so would have gained the third mark and it might also have helped them to find a formula for y in terms of x. Many simply stopped after finding the values of the constants and went no further. Those who did continue and gave $y = 5\sqrt{\frac{64}{x^3}}$ as the final answer were not awarded the accuracy mark because the question required the answer to be given in its simplest form. Simplifying $\sqrt{\frac{64}{x^3}}$ to $\frac{8}{x^2}$ was quite a common mistake. Students should ensure that they read the question carefully as a significant proportion failed to recognise "root", "inversely" and "cube". Notation when attempting to find the constants was often poor and some students omitted the constant from their initial equation.

Question 13

This inverse proportion question was presented in an unfamiliar format but a good proportion of students managed to gain at least one mark. Many completed the table correctly, often without showing any working out. Students who wrote down the equation $p = 100/t$ nearly always found at least one correct value. A common mistake was using direct proportion rather than inverse proportion.

Question 13

This direct proportion question was answered very well. Many of the students who gained the first mark for $y = kx$ or $24 = 1.5x$ went on to give a fully correct answer. When full marks were not gained this was often because of arithmetic errors when dividing 24 by 1.5 to work out the value of k and $k = 1.6$ was frequently seen. A significant number of students used a non-algebraic approach and although these attempts were often successful this approach tended to be more prone to arithmetic errors which resulted in a loss of accuracy. Many who divided 5 by 1.5 lost the final accuracy mark as they rounded 3.33… to 3.3 or 3 before multiplying by 24. Some students used inverse proportion rather than direct proportion and gained no marks.

Question 11

This question required students to match graphs to their type of proportionality. It seems that a good number are not familiar with reciprocal graphs, or the graph of $\sqrt{x}$, and as such were able to gain 1 mark at most.

Question 14

This question required students to work with two difference types of ratios, either individually or by combining the two ratios. Many students were able to gain some marks on this which was really encouraging to see. Two marks were gained often for setting up a correct relationship and substituting to find one of the constants. Candidates then failed in most cases to gain any more marks. The next mark was for either combining the two equations, or for correctly substituting into the equation linking x and w. Unfortunately, the majority attempted the first method, and did so incorrectly, and so gained no further credit. Those who took the simpler path and substituted first, normally had more success.

Question 12

As is often the case with inverse proportion, a significant number lost all marks as they worked with $f = kd^2$ rather than $f = \frac{k}{d^2}$. Those who got the format of this relationship correct typically scored 1 if not 2 marks in part (a). Some found the correct constant but didn't state the equation correctly (including their found value of 224) and so didn't gain the accuracy.

In part (b) students had to use the equation found in part (a). The equation did not need to be fully correct, but it did have to be in the form $f = \frac{k}{d^2}$. Again, those who had the correct form typically scored well in part (b).

Question 13

Much like question 4, in part (a) learners often struggled to articulate themselves clearly enough to gain this mark. Learners had two real avenues for a successful response. The first, and most common, was to work with $y = kx$ and show the value of k was not constant. To do this they needed to complete at least 2 calculations, and this was often not done, meaning the mark was not awarded. A second approach was to realise that the graph of $y = kx$ should pass through the origin, and that is not the case here. Fewer learners seemed to use this approach.
Part (b)(i) was a much more familiar question, and learners experienced more success. Many gaining at least one for setting up a correct equation, and then a good number using this to find the value of k, many of these then went on to gain the third mark too. The most common error seen was for learners to either just work with t, and not $\sqrt{t}$, or when rearranging they worked out $140 \times \sqrt{64}$ instead of $140 \div \sqrt{64}$.
In part (b)(ii) the most common wrong graph was a direct proportion graph for a linear relationship, but various other incorrect sketches of familiar shape were seen.

Question 11

Many responses set up an equation with a constant term and they often wrote down both $T = \frac{k}{w}$ and $w = k\sqrt[3]{d}$. Terminology was sometimes an issue with responses using d^3 or $\sqrt{d}$ instead of $\sqrt[3]{d}$ or incorrectly interpreting inverse proportion as direct proportion and writing $T = kw$. Most then went on to gain the second mark for substituting the given values in at least one equation and the values found for the constants were usually correct. Having found the values of the constants there were two routes available. Some responses combined $T = \frac{120}{w}$ and $w = \frac{1}{2}\sqrt[3]{d}$ to find a formula for T in terms of d and this gained the third mark. Substituting $T = 48$ in the formula earned the fourth mark and gave them an equation to solve to find the value of d. Having found the values of the constants some responses earned the third mark for a correct process to find the value of w when $T = 48$ and the fourth mark was then awarded for substituting the found value of w in the equation $w = \frac{1}{2}\sqrt[3]{d}$. Some responses got as far as $48 = \frac{120}{w}$ but did not rearrange the equation to find or isolate w. Whichever of the two approaches was used, errors were often made when solving the final equation. It was not uncommon for 2.5 to be multiplied by 0.5 instead of being divided by 0.5 or for responses to cube root the answer rather than cube it to find the value of w.