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GCSE MATHS

Probability

Edexcel 1MA1 | Subtopic collection Topic 53

Tree diagrams and combined events

Higher tier

Answers and examiner comments

44	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 11

The full source mark scheme begins on page 71. Use the original paper code, tier and question number shown above.

Original question 14

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

Original question 17

The full source mark scheme begins on page 125. Use the original paper code, tier and question number shown above.

23		$360-(120+140+58)$	42	2	M1 $360-"(120+140+58)"$ or equivalent) or for (a + 58 + 120 + 140 = 360) oe seen A1 cao [Note: The subtraction MUST be from 360]

1380/1F

Question		Working	Answer	Mark	Notes
19	(a)	$\frac{5}{7},\frac{2}{7};\frac{5}{7},\frac{2}{7}\ \frac{5}{7},\frac{2}{7}$		2	B1 for $\frac{5}{7},\frac{2}{7}$ on LH branch B1 for $\frac{5}{7},\frac{2}{7}\ \frac{5}{7},\frac{2}{7}$ on RH branch
	(b)	$\frac{5}{7}\times\frac{2}{7}+\frac{5}{7}\times\frac{2}{7}$ $=\frac{10}{49}+\frac{10}{49}=\frac{20}{49}$	$\frac{20}{49}$	3	M1 for "$\frac{5}{7}\times\frac{2}{7}$" alone M1 for addition of two products from correct braches eg "$\frac{5}{7}\times\frac{2}{7}+\frac{5}{7}\times\frac{2}{7}$" A1 $\frac{20}{49}$ oe Alternative: M2 for an attempt to evaluate $1-\frac{5}{7}\times\frac{5}{7}-\frac{2}{7}\times\frac{2}{7}$ A1 cao SC $\frac{5}{7}\times\frac{2}{6}+\frac{2}{7}\times\frac{5}{6}=\frac{20}{42}$ gets B2

12	(a)		$\frac{3}{10}$ $\frac{6}{9}, \frac{3}{9}, \frac{7}{9}, \frac{2}{9}$	2	B1 for $\frac{3}{10}$ correct for 1st sock B1 for $\frac{6}{9}, \frac{3}{9}, \frac{7}{9}, \frac{2}{9}$ correct for 2nd sock
	(b)	$\frac{7}{10}\times\frac{6}{9}+\frac{3}{10}\times\frac{2}{9}$	$\frac{48}{90}$	3	M1 ft for $\frac{7}{10}\times'\frac{6}{9}'$ or $'\frac{3}{10}'\times'\frac{2}{9}'$ M1 for $\frac{7}{10}\times'\frac{6}{9}'+'\frac{3}{10}'\times'\frac{2}{9}'$ A1 for $\frac{48}{90}$ oe SC B2 for $\frac{58}{100}$ oe seen

5MB1H_01
November 2010

5MB1H/01

Question	Working	Answer	Mark	Notes
11 (a)		0.2 0.4, 0.6, 0.4	2	B1 for Martin correct B1 for Luke correct
(b)		0.08	2	M1 for "0.2" × "0.4" ft values from tree diagram if both < 1 A1 cao

Original question 10

The full source mark scheme begins on page 177. Use the original paper code, tier and question number shown above.

22	(a)	Probability tree diagram	$\frac{6}{10}, \frac{4}{10}$ $\frac{8}{11}, \frac{3}{11}, \frac{7}{11}, \frac{4}{11}$	2	B1 $\frac{6}{10}, \frac{4}{10}$ oe on first two branches B1 $\frac{8}{11}, \frac{3}{11}, \frac{7}{11}, \frac{4}{11}$ on remaining branches
	(b)	$\frac{6}{10} \times \frac{8}{11} + \frac{4}{10} \times \frac{4}{11}$ $= \frac{48}{110} + \frac{16}{110}$ $= \frac{64}{110} = \frac{32}{55}$	$\frac{64}{110}$	4	M3 $\frac{6}{10} \times \frac{8}{11} + \frac{4}{10} \times \frac{4}{11}$ oe (M2 $\frac{6}{10} \times \frac{8}{11}$ or $\frac{4}{10} \times \frac{4}{11}$ oe or $\frac{6}{10} \times$ their $\frac{8}{11} + \frac{4}{10} \times$ their $\frac{4}{11}$ oe) (M1 their $\frac{6}{10} \times$ their $\frac{8}{11}$ or their $\frac{4}{10} \times$ their $\frac{4}{11}$ oe provided each component < 1) A1 $\frac{64}{110}$ oe

8	(a)		11 13 9 10 12 13 15 10 11 13 14 16	1	B1 table completed correctly
	(b)	$\frac{6}{20}$ or 0.3	$\frac{6}{20}$	2	M1 ft for $\frac{a}{20}$ ($a \neq 6$) and a<20 or $\frac{6}{b}$ (b≠20) and b>6 A1 ft for $\frac{6}{20}$ oe
	(c)		£21 with supporting calculations	4	M2 for $\frac{2}{20} \times 60 \times$ (1.50 or 150) oe (M1 for $\frac{2}{20} \times 60$ oe or $\frac{2}{20} \times 1.50$ oe or $\frac{2}{20} \times 150$ oe or 60×150 or 60 × 1.50 or sight of any of numbers (6, 15, 0.15, 9000, 90) M1 (income) 60 × 0.5 (=30) or 60×50 (=3000)

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
					A1 (Dep on at least 2 previous method marks) 21 cao

Question		Working	Answer	Mark	Notes
13	(a)		$\frac{3}{7}, \frac{4}{7}, \frac{3}{7}, \frac{4}{7}, \frac{3}{7}$	2	B2 Fully correct tree (B1 $\frac{3}{7}$ on first branch)
	(b)	$\frac{3}{7} \times \frac{3}{7}$	$\frac{9}{49}$	2	M1 ft for '$\frac{3}{7}$' × '$\frac{3}{7}$' provided 0<'$\frac{3}{7}$'<1 A1 ft for '$\frac{9}{49}$' oe

9	(a)		0.6, 0.4, 0.3, 0.7, 0.3, 0.7	2	B2 for 6 correct probabilities in the correct positions (B1 for 2, 3, 4 or 5 correct)
	(b)	0.6 × 0.7 + 0.4 × 0.3	0.54	3	M1 for '0.6' ×' 0.7' or '0.4' × '0.3' (may be awarded in tree diagram if selected) M1 for '0.6' × '0.7' + '0.4' × '0.3' A1 cao OR M1 for '0.6' × '0.3' + '0.4' × '0.7'(may be awarded in tree diagram if selected) M1 for 1 –('0.6' × '0.3' + '0.4' × '0.7') A1 cao

5MB1H_01

Original question 19

The full source mark scheme begins on page 191. Use the original paper code, tier and question number shown above.

Question		Working	Answer	Mark	Notes
12	(a)		Tree diagram with p and $1 - p$ on branches	2	B2 cao (B1 for $1 - p$ seen on at least one branch)
	(b)		$p \times p$	1	B1 for $p \times p$ or p^2 or pp oe
	(c)		$p \times (1 - p) + p \times (1 - p)$	2	M1 for $p \times$ '$(1 - p)$' oe, provided the expression is in terms of p only OR ft from their tree diagram where the expressions must be algebraic in terms of p only A1 for $2 \times p \times (1 - p)$ oe but must be algebraically the correct answer OR M1 for $1 - p \times p -$ '$(1 - p)$' $\times$ '$(1 - p)$' oe OR ft from their tree diagram where the expressions must be algebraic in terms of p only A1 for $2 \times p \times (1 - p)$ oe but must be algebraically the correct answer [SC B1 for $2 \times f \times (1 - f)$, where f is a fraction or decimal less than 1 used as a value for p in tree diagram]

5MB1H_01

Original question 14

The full source mark scheme begins on page 211. Use the original paper code, tier and question number shown above.

13	(a)		0.7, 0.4, 0.6 0.4	2	B2 for fully correct tree diagram (B1 for 0.7 or 0.4 in correct position)
	(b)		0.54	2	M1 for 0.3×0.4 or 0.7×0.6 A1 for 0.54 oe or ft their tree diagram

PAPER: 1MA0_1H

Question		Working	Answer	Mark	Notes
23	(a)		$\frac{3}{10}, \frac{6}{9}, \frac{3}{9}, \frac{7}{9}, \frac{2}{9}$	2	B1 for $\frac{3}{10}$ on LH yellow branch B1 for $\frac{6}{9}, \frac{3}{9}, \frac{7}{9}, \frac{2}{9}$ correct on tree diagram
	(b)		$\frac{48}{90}$	3	M1 for $\frac{7}{10} \times "\frac{3}{9}"$ or $"\frac{3}{10}" \times "\frac{7}{9}"$ or $"\frac{3}{10}" \times "\frac{2}{9}"$ M1 for $\frac{7}{10} \times "\frac{3}{9}" + "\frac{3}{10}" \times "\frac{7}{9}" + "\frac{3}{10}" \times "\frac{2}{9}"$ A1 for $\frac{48}{90}$ oe OR M1 for $\frac{7}{10} \times "\frac{6}{9}"$ M1 for $1 - \frac{7}{10} \times "\frac{6}{9}"$ A1 for $\frac{48}{90}$ oe

PAPER: 1MA0_1H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*24			Proof	3	M1 for $\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{ON}$ (= **n** – **m**) or $\overrightarrow{NM} = \overrightarrow{OM} + \overrightarrow{NO}$ (= **m** – **n**) or $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ (= 2**n** – 2**m**) or $\overrightarrow{BA} = \overrightarrow{OA} + \overrightarrow{BO}$ (= 2**m** – 2**n**) M1 for $\overrightarrow{MN}$= **n** – **m** and $\overrightarrow{AB}$= 2**n** – 2**m** oe C1 (dep on M1, M1) for fully correct proof, with $\overrightarrow{AB}$= $2\overrightarrow{MN}$ or $\overrightarrow{AB}$ is a multiple of $\overrightarrow{MN}$ [SC M1 for $\overrightarrow{MN}$ = 0.5**n** – 0.5**m** and $\overrightarrow{AB}$ = **n** – **m** C1 (dep on M1) for fully correct proof, with $\overrightarrow{AB}$= $2\overrightarrow{MN}$ or $\overrightarrow{AB}$ is a multiple of of $\overrightarrow{MN}$]

19	(a)		0.3 0.3, 0.7, 0.3	2	B1 for 0.3 as first spin oe B1 for 0.3, 0.7, 0.3 in correct positions for second spin oe
	(b)		0.42	3	M1 for '0.3' × '0.7' or 0.7 × '0.3' (=0.21) M1 for '0.3' × '0.7 + 0.7 × '0.3 (OR M2 for $1 - 0.7^2 - 0.3^2$) A1 for 0.42 oe

PAPER: 1MA0_2H

8		Braille (i) to (vi) given on diagram and candidates asked to write values for each.	

Original question 15

The full source mark scheme begins on page 232. Use the original paper code, tier and question number shown above.

Question	Working	Answer	Mark	Notes
12 (a)		Probability tree	3	B1 for $\frac{2}{8}$ in the correct place B1 for $\frac{5}{7},\frac{2}{7};\frac{6}{7},\frac{1}{7}$ in the correct place on a probability tree B1 complete probability tree with labelling eg A, B etc.
(b)		$\frac{30}{56}$	2	M1 $\frac{6}{8}\times\frac{5}{7}$ A1 oe eg 0.5357…. or $\frac{15}{28}$
(c)		$\frac{54}{56}$	3	M1 for $\frac{6}{8}\times\frac{5}{7}$ or $\frac{6}{8}\times\frac{2}{7}$ or $\frac{2}{8}\times\frac{6}{7}$ oe eg 0.5357… or 0.214… M1 for $\frac{6}{8}\times\frac{5}{7}+\frac{6}{8}\times\frac{2}{7}+\frac{2}{8}\times\frac{6}{7}$ or $1-\left(\frac{2}{8}\times\frac{1}{7}\right)$ A1 oe eg 0.964…. or $\frac{27}{28}$

Question	Working	Answer	Mark	Notes
21 (a)		0.7 0.2 0.3 0.8 0.05 0.95	3	B1 for 0.2, 0.8 oe B1 for 0.7, 0.3 oe B1 for 0.05, 0.95 oe
(b)		0.04	2	M1 for "0.8" × "0.05" A1 oe

Question	Working	Answer	Mark	Notes
25		$\frac{52}{72}$	4	B1 for $\frac{3}{8}$ or $\frac{2}{8}$ or $\frac{1}{8}$ seen as second probability M1 for $\frac{4}{9}\times\frac{3}{8}$ or $\frac{3}{9}\times\frac{2}{8}$ or $\frac{2}{9}\times\frac{1}{8}$ M1 for $1-(\frac{4}{9}\times\frac{3}{8}+\frac{3}{9}\times\frac{2}{8}+\frac{2}{9}\times\frac{1}{8})$ or $\frac{4}{9}\times\frac{3}{8}+\frac{4}{9}\times\frac{2}{8}+\frac{3}{9}\times\frac{4}{8}+\frac{3}{9}\times\frac{2}{8}+\frac{2}{9}\times\frac{4}{8}+\frac{2}{9}\times\frac{3}{8}$ A1 for $\frac{52}{72}$ oe OR B1 for $\frac{5}{8}$ or $\frac{6}{8}$ or $\frac{7}{8}$ seen as second probability M1 for $\frac{4}{9}\times\frac{5}{8}$ or $\frac{3}{9}\times\frac{6}{8}$ or $\frac{2}{9}\times\frac{7}{8}$ M1 for $\frac{4}{9}\times\frac{5}{8}+\frac{3}{9}\times\frac{6}{8}+\frac{2}{9}\times\frac{7}{8}$ A1 for $\frac{52}{72}$ oe SCB2 $\frac{52}{81}$ oe

PAPER: 1MA0/1H

13	(a)		$\frac{2}{5}$ $\frac{3}{5}, \frac{2}{5}$ $\frac{3}{5}, \frac{2}{5}$	2	B1 for $\frac{2}{5}$ on first branch B1 for $\frac{3}{5}, \frac{2}{5}$ and $\frac{3}{5}, \frac{2}{5}$ on other branches
	(b)		$\frac{6}{25}$	2	M1 f.t. for '$\frac{3}{5} \times \frac{2}{5}$' A1 f.t. for $\frac{6}{25}$ oe

PAPER: 5MB1H_01

Question	Working	Answer	Mark	Notes
23 (a)		$\frac{42}{110}$	3	M1 for use of 11 and 10 in the denominators M1 for $\frac{7}{11} \times \frac{6}{10}$ oe A1 for $\frac{42}{110}$ oe **SC for replacement**: B1 for $\frac{7}{11} \times \frac{7}{11}$ $(= \frac{49}{121})$
(b)		$\frac{62}{110}$	3	M1 for correct method for GG $\frac{3}{11} \times \frac{2}{10}$ $(= \frac{6}{110})$ M1 (dep) $1 - (BB + GG)$ $= 1 - (\text{“}\frac{42}{110}\text{”} + \text{“}\frac{6}{110}\text{”})$ A1 for $\frac{62}{110}$ oe OR M1 for at least two of $\frac{7}{11} \times \frac{3}{10}$, $\frac{7}{11} \times \frac{1}{10}$, $\frac{3}{11} \times \frac{1}{10}$ oe M1 for a complete method eg $2 \times (\frac{7}{11} \times \frac{3}{10} + \frac{7}{11} \times \frac{1}{10} + \frac{3}{11} \times \frac{1}{10})$ oe A1 for $\frac{62}{110}$ oe **SC for replacement**: B2 for $2 \times (\frac{7}{11} \times \frac{3}{11} + \frac{7}{11} \times \frac{1}{11} + \frac{3}{11} \times \frac{1}{11})$ oe $(= \frac{62}{121})$ or $(\frac{7}{11} \times \frac{4}{11} + \frac{3}{11} \times \frac{8}{11} + \frac{10}{11} \times \frac{1}{11})$ oe $(= \frac{62}{121})$ or $1 - (\text{“}\frac{49}{121}\text{”} + \frac{9}{121} + \frac{1}{121})$ oe $(= \frac{62}{121})$ (B1 for at least two of $\frac{7}{11} \times \frac{3}{11}$, $\frac{7}{11} \times \frac{1}{11}$, $\frac{3}{11} \times \frac{1}{11}$ oe)

Paper: 1MA0/1H

19	(a)		0.98 0.95, 0.05, 0.95	2	B1 for 0.98 oe for machine A B1 for 0.95, 0.05, 0.95 in correct positions for machine B
	(b)		0.069	3	M1 for 0.02 × 0.05 or 0.02 × "0.95" or "0.98" × "0.05" or "0.98" × "0.95" M1 for 0.02 × 0.05 + 0.02 × "0.95" + "0.98" × "0.05" or 1 – "0.98" × "0.95" A1 for 0.069 oe

Paper: 1MA0/2H

Question	Working	Answer	Mark	Notes
17		$\frac{28}{72}$	P1	for $\frac{6}{8}$ or $\frac{2}{8}$ or $\frac{7}{8}$ or $\frac{1}{8}$ oe seen on diagram or in a calculation
			P1	for $\frac{7}{9}\times\frac{2}{8}$ or $\frac{2}{9}\times\frac{7}{8}$ or $\frac{14}{72}$ oe for $\frac{7}{9}\times\frac{6}{8}$ or $\frac{2}{9}\times\frac{1}{8}$ or $\frac{42}{72}$ or $\frac{2}{72}$ or $\frac{44}{72}$ oe
			P1	for $\frac{7}{9}\times\frac{2}{8}+\frac{2}{9}\times\frac{7}{8}$ for $1-(\frac{7}{9}\times\frac{6}{8}+\frac{2}{9}\times\frac{1}{8})$ or $1-("\frac{42}{72}"+"\frac{2}{72}")$
				or "$\frac{14}{72}$"+"$\frac{14}{72}$"oe or $1-"\frac{44}{72}"$ oe
			A1	oe SC B1 for $\frac{14}{81}$ B2 for $\frac{28}{81}$

Question	Working	Answer	Mark	Notes
12 (a)		comment	C1	for comment e.g. incorrect denominator for the 2nd student or probabilities for 2nd student do not add up to 1
(b)		No (supported)	C1	for "no" with supporting evidence, e.g. probabilities should be multiplied together or 0.4×0.25

12		48	M1 M1 A1	for 0.25×0.6 (= 0.15) or 0.75×0.4 (= 0.3) for 0.25×0.6 (= 0.15) and 0.75×0.4 (= 0.3) or for 24 ÷ “0.15” (= 160) cao

Question	Answer	Mark	Mark scheme	Additional guidance
15 (a)	0.55, 0.67, 0.33, 0.35, 0.65	B1	for 0.55 in correct position	Can be seen as fractions or percentages
		B1	for the branches for the second game correct	
(b)	0.341	M1	for one correct product, eg 0.45 × "0.33" (=0.1485) **or** "0.55" × "0.35" (=0.1925) **or** 0.45 × "0.67" (=0.3015) **or** "0.55" × "0.65" (=0.3575)	Follow through acceptable for method marks from their tree in part (a) providing probabilities are less than 1. Accept fractional equivalents
		M1	for correct method eg (0.45 × "0.33") + ("0.55" × "0.35") **or** 1 – (0.45 × "0.67") – ("0.55" × "0.65")	
		A1	answer in range 0.34 – 0.341 oe	

Question	Answer	Mark	Mark scheme	Additional guidance
4	Probabilities should sum to 1	C1	for stating that the probabilities should total 1 eg 0.25 should be 0.35	
	0.35 and 0.65 reversed	C1	for recognising that the 0.35 and 0.65 in the first branches for the 2nd throw should be reversed eg, “for the second throw, the probability it lands on 4 should be 0.65”	Can be shown on the diagram

10	(a)	Diagram completed 0.85 0.15, 0.85, 0.15, 0.85	M1 A1	for 1 – 0.15 (=0.85) fully correct diagram	
	(b)	0.2775	M1 M1 A1	for one correct product eg 0.15 × 0.15 (= 0.0225) or 0.15 × 0.85 (= 0.1275) or 0.85 × 0.85 (= 0.7225) for a complete method eg "0.0225" + 2×"0.1275" **OR** 1 – "0.7225" oe oe, eg $\frac{111}{400}$	ft their diagram provided probabilities are less than 1 ft their diagram provided probabilities are less than 1

Paper: 1MA1/2H

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
16	$\frac{52}{72}$	P1	for $\frac{4}{9}\times\frac{3}{8}\left(\frac{12}{72}\right)$ **or** $\frac{4}{9}\times\frac{5}{8}$ **or** $\frac{5}{9}\times\frac{4}{8}\left(\frac{20}{72}\right)$	
		P1	for $1-\left(\frac{5}{9}\times\frac{4}{8}\right)$ **or** $\frac{4}{9}\times\frac{3}{8}+\frac{4}{9}\times\frac{5}{8}+\frac{5}{9}\times\frac{4}{8}$ oe	
		A1	for $\frac{52}{72}$, $\frac{13}{18}$ oe SC B1 for answer of $\frac{56}{81}$ (replacement)	Accept equivalent fractions, decimals (0.72…) or percentages (72.22…..%)

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
11	0.1709	M1	for one product, 0.07 × 0.98 (=0.0686) **or** 0.93 × 0.11 (=0.1023) **or** 0.07 × 0.02 (=0.0014) **or** 0.93 × 0.89 (= 0.8277)	If all products shown, award this mark
		M1	for a fully correct method, eg 0.07 × 0.98 + 0.93 × 0.11 **or** 1 – (0.07 × 0.02) – (0.93 × 0.89)	
		A1	oe	

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
5 (a)	$\frac{1}{3}, \frac{2}{3}$ $\frac{1}{3}, \frac{2}{3}, \frac{1}{3}, \frac{2}{3}$	B2	six fully correct probabilities	Accept any equivalent fraction, decimal form 0.33(3...) and 0.66(6...) or 0.67 or percentage form 33(.3...)% and 66(.6...)% or 67%
		(B1	at least 2 correct probabilities)	
(b)	$\frac{2}{9}$	M1	for $\frac{1}{3} \times \frac{2}{3}$ oe or ft probabilities from diagram	
		A1	for $\frac{2}{9}$ oe	Accept any equivalent fraction, decimal form 0.22(2...) or percentage form 22(.2...)%

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	0.7	B1	for 0.7 on the first branch	Accept equivalent fractions or percentages for probabilities
	0.65, 0.65	B1	for 0.65, 0.65 on the second branches	
(b)	0.105	M1	for 0.3 × 0.35	
		A1	oe	

Question	Answer	Mark	Mark scheme	Additional guidance
12	$\frac{62}{72}$	M1	for one correct product, eg $\frac{5}{8}\times\frac{7}{9}$ $(=\frac{35}{72})$ oe **or** $\frac{3}{8}\times\frac{2}{9}$ $(=\frac{6}{72})$ oe **or** $\frac{3}{8}\times\frac{7}{9}$ $(=\frac{21}{72})$ oe **or** $\frac{5}{8}\times\frac{2}{9}$ $(=\frac{10}{72})$ oe	
		M1	for a full method, eg $\frac{5}{8}\times\frac{7}{9}+\frac{3}{8}\times\frac{2}{9}+\frac{3}{8}\times\frac{7}{9}$ oe **or** $1-\frac{5}{8}\times\frac{2}{9}$ oe	
		A1	for $\frac{62}{72}$ oe eg $\frac{31}{36}$	

Paper: 1MA1/3H

Question	Answer	Mark	Mark scheme	Additional guidance
24	$\frac{5x^2-23x+50}{9x^2-3x}$	P1	for using $y = 3x$ or $x = \frac{1}{3}y$ to obtain an expression for a probability in one variable	This may be awarded at any time
		P1	for a correct second probability eg $\frac{x-1}{y-1}$ or $\frac{x-1}{3x-1}$ or $\frac{4}{y-1}$ or $\frac{4}{3x-1}$ or $\frac{y-x-6}{y-1}$ or $\frac{2x-6}{3x-1}$	
		P1	for forming a correct product eg $\frac{x}{y} \times \frac{x-1}{y-1}$ or $\frac{x}{3x} \times \frac{x-1}{3x-1}$ or $\frac{5}{y} \times \frac{4}{y-1}$ or $\frac{5}{3x} \times \frac{4}{3x-1}$ or $\frac{y-x-5}{y} \times \frac{y-x-6}{y-1}$ or $\frac{2x-5}{3x} \times \frac{2x-6}{3x-1}$	
		P1	for adding the 3 correct probabilities eg $\frac{x}{y} \times \frac{x-1}{y-1} + \frac{5}{y} \times \frac{4}{y-1} + \frac{y-x-5}{y} \times \frac{y-x-6}{y-1}$ or $\frac{x}{3x} \times \frac{x-1}{3x-1} + \frac{5}{3x} \times \frac{4}{3x-1} + \frac{2x-5}{3x} \times \frac{2x-6}{3x-1}$	Can be seen after processing of algebra
		A1	$\frac{5x^2-23x+50}{9x^2-3x}$	

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 3H

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

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

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
1	(b)	Letter 'x' changed to 'y'.	Standard mark scheme but note change of letter.
2	(a)	Letter 'g' at end of answer line changed to 'grams'	Standard mark scheme
3		Wording added 'Look at the diagram for Question 3 in the Diagram Booklet. It shows triangle AGF and two straight lines ACF and ADG.' Wording removed 'ACF and ADG are straight lines.' Wording added 'Angle CDG = 110°; Angle EFC = 125°' Diagram enlarged. Angles moved outside of angle arcs. Angle arcs made smaller.	Standard mark scheme
5	(b)	Wording added 'Remember: A = $2^2 \times 3^4 \times 7$ B = $3^2 \times 7^2$'	Standard mark scheme
7		Wording added 'Look at the diagram for Question 7 in the Diagram Booklet. It shows'. Wording 'Here is' removed. Diagram enlarged. Axes labels moved to above the vertical axes and right of the horizontal axes.	Standard mark scheme
8		Letter 'g' at end of answer line changed to 'grams'	Standard mark scheme

10		Wording added 'Look at the diagram for Question 10 in the Diagram Booklet. It shows a triangle ABD.' Wording removed 'ABD is a triangle.' Diagram enlarged. Angles moved out of angle arcs. Angle arcs made smaller. Right angles made more obvious. Wording added 'AB = 6.8 cm; Angle ABC = 41°; Angle ADC = 55° ' Wording added: Angle ACB and angle ACD are right angles.	Standard mark scheme
11		Wording added 'below'. Table enlarged and left aligned. Values changed in the table, so values can be plotted on the modified grid. 169 cm changed to 170 cm; 186 cm changed to 185 cm; 177 cm changed to 177.5 cm, 174 cm changed to 175 cm	
11	(a)	Wording added 'Look at the diagram for Question 11(a) in the Diagram Booklet. It shows a grid.' Diagram enlarged, no small squares. Open headed arrow. Axis label moved to the left of the horizontal axis.	Standard mark scheme but using the key values: 170, 175, 177.5, 180, 185
11	(b)	Wording added 'Look at the diagram for Question 11(b) in the Diagram Booklet. It is a box plot showing the distribution of the heights of a group of teenagers.' Wording removed 'below'. Diagram enlarged. Small squares removed. Open headed arrow. Axis label moved to the left of the horizontal axis. Box plot changed so values can be read on the modified grid: Key values now at 157.5, 165, 167.5, 172.5, 177.5	Standard mark scheme but using the new key values: Median Range IQR Adults 177.5 15 5 Teenagers 167.5 20 7.5
14		Wording added 'Look at the diagram for Question 14 in the Diagram Booklet.' Diagram enlarged. Angles moved out of angle arcs. Angle arcs made smaller. Wording added 'BA = 9 cm; AO = 6 cm; Angle BAO = 35°; Angle BOC = 80	Standard mark scheme
15	(a)	Letter 'a' changed to 'x'; Letter 'b' changed to 'y'.	Standard mark scheme but note change of letter.

16		Wording added 'Look at the diagram for Question 16 in the Diagram Booklet. It shows triangle T and triangle U on a grid.' Diagram enlarged. Open headed arrows. Axes labels moved to above the vertical axes and right of the horizontal axes. Triangle U added on the grid. Shapes labelled as 'triangle T' and 'triangle U'. Shading changed. Question changed. Wording removed 'On the grid, enlarge triangle T by scale factor -2 with centre of enlargement (-2,-2)' Wording added 'Describe fully the single transformation that maps triangle T onto triangle U.'	B2 for enlargement scale factor −2 centre (−2, −2) (B1 for two of these three aspects) Award no marks if more than one transformation is given.
17		Wording removed 'Here is'. Wording added 'Look at the diagram for Question 17 in the Diagram Booklet. It shows'. Diagram enlarged. Open headed arrows. Right axis labelled. Small squares removed.	Standard mark scheme
18		Wording added 'Look at Diagram 1, Diagram 2 and the formula for Question 18 in the Diagram Booklet. You may be provided with two models for this question and an additional formula model. They show a cone and a frustum.' Wording removed 'in the diagram.' Wording added 'by Diagram 1 and the models. Diagram 2 is a simplified 2D diagram of the frustum.' Formula diagram enlarged and a formula model provided. Wording added to the formula 'You may be provided with a model.' 3D frustum diagram enlarged. Dashed lines made longer and thicker. Open headed arrows. 2D diagram added. Model of frustum provided. Braille additional wording: Ask for the model for Question 18. The model is a large cone made from a small cone and a frustum. The small cone is detachable from the frustum. On the model: the slant height of the small cone is 6 cm; the slant height of the large cone is 10 cm the slant height of the frustum is 4 cm; the radius of the base of the large cone is 3 cm."	Standard mark scheme

19		Wording added 'Look at the diagram for Question 19 in the Diagram Booklet. It shows a graph.' '$0 \leq x \leq 4$' changed to '$0 \leq x \leq 2$' Wording added 'in the Diagram Booklet' Diagram enlarged but produced only in the range $0 \leq x \leq 2$.. Small squares removed. Right axis labelled. y axis cut at 10; x axis cut at 2. Axes labels moved to above the vertical axes and right of the horizontal axes.	Standard mark scheme
21		Letter 'x' changed to 'y'.	Standard mark scheme but note change of letter.

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
10 (a)	0.13, 0.94, 0.06, 0.73, 0.27	B2 (B1	for all values correctly placed for at least 2 correct values placed)	
(b)	0.9649	M1 M1 A1	(ft their diagram) for one correct product, eg 0.87 × 0.94 (= 0.8178) **or** 0.87 × 0.06 (= 0.0522) **or** 0.13 × 0.73 (= 0.0949) **or** 0.13 × 0.27 (= 0.0351) for a full method, eg "0.8178" + "0.0522" + "0.0949" **or** 1 – "0.0351" for 0.9649, 96.49% or $\frac{9649}{10000}$	Allow values that are truncated or rounded as long as the intention is clear.

Paper: 1MA1/3H

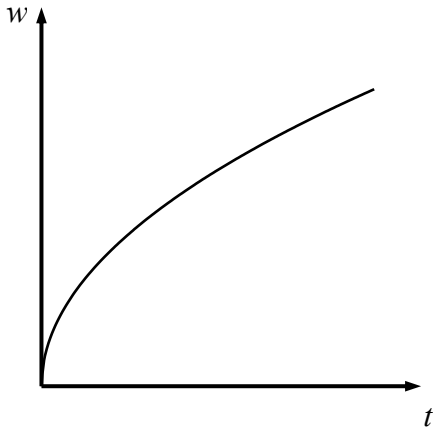
Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	0.4	B1	for 0.4 in correct position	Accept equivalent fractions or percentages for probabilities
	0.45, 0.55, 0.45	B1	for the correct probabilities for coin **B** in the correct place on the branches	
(b)	0.33	M1	for a correct method, eg 0.6×0.55 only	
		A1	for 0.33 oe	An answer of $\frac{0.33}{1}$ scores M1A0

Question	Answer	Mark	Mark scheme	Additional guidance
22	26	P1	for a correct 2nd probability, eg $\frac{2x-1}{5x-1}$ **or** $\frac{3x-1}{5x-1}$ **or** $\frac{2x}{5x-1}$ **or** $\frac{3x}{5x-1}$ or $\frac{\frac{3}{5}n-1}{n-1}$ **or** $\frac{\frac{2}{5}n-1}{n-1}$	
		P1	for a correct product, eg $\frac{3x}{5x}\times\frac{3x-1}{5x-1}$ **or** $\frac{2x}{5x}\times\frac{2x-1}{5x-1}$ **or** $\frac{3}{5}\times\frac{2x}{5x-1}$ **or** $\frac{2}{5}\times\frac{3x}{5x-1}$ **or** $\frac{3}{5}\times\frac{\frac{3}{5}n-1}{n-1}$ or $\frac{2}{5}\times\frac{\frac{2}{5}n-1}{n-1}$ oe	Award of this mark implies P2
		P1	for process to form equation, eg $\frac{3x}{5x}\times\frac{3x-1}{5x-1}+\frac{2x}{5x}\times\frac{2x-1}{5x-1}=\frac{41}{80}$ **or** $2\times\frac{3}{5}\times\frac{2x}{5x-1}=\frac{39}{80}$ **or** $\frac{3}{5}\times\frac{\frac{3}{5}n-1}{n-1}+\frac{2}{5}\times\frac{\frac{2}{5}n-1}{n-1}$ oe	Award of this mark implies P3
		P1	for process to eliminate fractions and reduce equation to linear or quadratic form, eg $1040x-400=1025x-205$ **or** $960x=975x-195$ **or** $1040x^2-400x=1025x^2-205x$ **or** $960x^2=975x^2-195x$ **or** $\frac{208}{5}n-80=41n-41$ **or** $x=13$ **or** $n=65$	
		A1	cao	

Question 3

	London	Zurich
100g	3.5 ÷ 2 = **£1.75** 1.75 × 1.25 = **2.1875 F**	7.2 ÷ 360 = **2.00 F** 2.00 ÷ 1.25 = **£1.60**
200g	**£3.50** 3.5 × 1.25 = **4.375 F**	7.2 ÷ 360 × 200 = **4.0 F** 4.0 ÷ 1.25 = **£3.20**
360g	3.5 ÷ 200 × 360 = **£6.30** 6.30 × 1.25 = **7.875 F**	**7.20 F** 7.20 ÷ 1.25 = **£5.76**
1g	£3.50 ÷ 200 = **£0.0175** × 1.25 = **0.021875 F**	7.20 ÷ 360 = **0.02 F** ÷ 1.25 = **£0.016**
40g	£3.50 ÷ 5 = **£0.70** 0.7 × 1.25 = 0**.875 F**	7.20 ÷ 9 = **0.8 F** 0.8 ÷ 1.25 = **£0.64**
By weight	350 ÷ 200 = **1.75 p/g** 350 × 1.25 = 4.375 4.375 ÷ 200 = **0.021875 F/g**	720 ÷ 360 = **0.02 F/g** 720 ÷ 1.25 = 576 576 ÷ 360 = **1.6 p/g**

Question 13(b) (ii)



Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 2H

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

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

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
2		Wording changed: 'Look at the diagram for Question 2 in the Diagram Booklet. It is a scatter graph showing information about some ships.' Diagram enlarged. Crosses changed to dots. Vertical axis cropped so it starts at 15. Open headed arrows. m changed to metres.	
	(b)	Wording added: 'in the Diagram Booklet' For Braille: sentence added 'Drawing film is provided if you wish to use it.'	Standard mark scheme
	(c)	Value '194' changed to '190'.	Standard mark scheme
3		Information in boxes removed. g changed to gram.	Standard mark scheme
4		Wording added: 'Look at the diagram for Question 4 in the Diagram Booklet. It shows a Venn diagram.' Wording 'Here is his answer.' removed and replaced with 'His answer is shown in the Diagram Booklet.' Diagram enlarged. Numbers arranged in two rows.	Standard mark scheme
5	(a)	Word added 'below'. Wording added 'There are five spaces to fill.' Table enlarged, turned vertically and left aligned. For Braille: missing values labelled (i), (ii), (iii), (iv) and (v)	Standard mark scheme
	(b)	Wording added: 'Look at the diagram for Question 5(b) in the Diagram Booklet. It shows a grid.' Diagram enlarged. Open headed arrows. Vertical axis cropped at -5. For Braille: sentence added 'Bumpons and drawing film are provided if you wish to use them.'	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
6		p changed to pence.	Standard mark scheme
7		Wording changed: 'Look at the diagram for Question 7 in the Diagram Booklet. It…' Wording added: 'AC = 2x + 11 AB = 2x + 5 BC = 4x – 4' Diagram enlarged. Lines on the sides made longer.	Standard mark scheme
9		Wording changed: 'Look at the diagram for Question 9 in the Diagram Booklet. It …' Diagram enlarged.	Standard mark scheme
11		Wording added: 'Look at the diagram for Question 11 in the Diagram Booklet. It shows triangle A and triangle B on a grid.' Diagram enlarged. Open headed arrows. Shapes relabelled 'triangle A' and 'triangle B'. Shading changed.	Standard mark scheme
12		Wording changed: 'Look at Diagrams 1-4 for Question 12 in the Diagram Booklet. You may be provided with two models. They are NOT accurate. The models show a solid cylinder and a solid cube. The cylinder has base radius 3 cm and height 8 cm The cube has side length h cm Diagram 1 shows a 3D view of the cylinder. Diagram 2 shows the base of the cylinder. Diagram 3 shows a side view of the cylinder. Diagram 4 shows a 3D view of the cube. Diagram enlarged. 2 additional 2D views added. Open headed arrows.	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
13	(a)	Wording changed: 'Look at the table for Question 13 in the Diagram Booklet. It shows a…' Table turned vertical.	Standard mark scheme
	(b)	Wording changed: 'Look at the diagram for Question 13(b)(ii) in the Diagram Booklet. It shows axes labelled t and w.' Wording 'below' removed. For Braille: sentence added 'Drawing film is provided if you wish to use it.' Diagram enlarged. Open headed arrows.	Standard mark scheme
16		Wording changed: 'Look at the diagram for Question 16 in the Diagram Booklet. It is a histogram giving …' Value '11' changed to '15' Diagram enlarged. Open headed arrows. Frequency density of first bar changed to 3. Frequency density of the last bar changed to 0.5. For Braille: sentence added 'Drawing film and bumpons are provided if you wish to use them.'	M1 for method to use area to find at least one frequency, eg 10 × 1.5 (= 15) or 20 × 0.5 (= 10) M1 for method to find unknown frequencies, eg (60 – 15 – "15" – "10") ÷ 2 (= 10) M1 for method to find an unknown frequency density, eg "10" ÷ 5 (= 2) or "10" ÷ 10 (= 1) **or** one correct bar drawn
18		Wording changed: 'Look at the diagram for Question 18 in the Diagram Booklet. It shows A, B and C, three points on a circle, centre O' Diagram enlarged. For Braille: sentence added 'Drawing film is provided if you wish to use it.'	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
19		Letter ‘a’ changed to ‘p’ Letter ‘c’ changed to 'q’	Standard mark scheme but note change of letters
20		Wording changed: ‘Look at Diagram 1, Diagram 2 and Diagram 3 for Question 20 in the Diagram Booklet. You may be provided with two models. They are NOT accurate. Model 1 and Diagram 1 show solid pyramid VABC. ABC is the base of the pyramid. V is the vertex above the base. M is the midpoint of AB. F is a point on the line MC. Model 2 shows the base of the pyramid ABC with a framework to show the other three sides. There is a rod, FV, inside the framework, to show the vertex V vertically above point F on the base. Diagram 2 shows side ABC’ Wording added: ‘Diagram 3 shows the cross section VMC’ Diagram enlarged. 2 additional 2D views added.	Standard mark scheme

4	(a)	(0.3) 0.7 0.3 0.7 0.3 0.7	B2 (B1	all probabilities correctly placed for 0.7 correctly placed for Game 1)	Accept equivalent fractions or percentages for probabilities
	(b)	0.49	M1 A1	for a correct method, ft their tree diagram eg 0.7×0.7 only oe, ft their tree diagram	ft their diagram provided probabilities are less than 1 An answer of $\frac{0.49}{1}$ scores M1A0 unless 0.49 seen

Paper: 1MA1/3H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
14	No (supported)	P1	for P(OO) = $\frac{5}{9}\times\frac{4}{8}$ (= $\frac{20}{72}$) **or** P(OE) = $\frac{5}{9}\times\frac{4}{8}$ (= $\frac{20}{72}$) **or** P(EO) = $\frac{4}{9}\times\frac{5}{8}$ (= $\frac{20}{72}$) **or** P(EE) = $\frac{4}{9}\times\frac{3}{8}$ (= $\frac{12}{72}$)	Accept equivalent probabilities throughout
		P1	for P(OO) = $\frac{5}{9}\times\frac{4}{8}$ (= $\frac{20}{72}$) **and** P(EE) = $\frac{4}{9}\times\frac{3}{8}$ (= $\frac{12}{72}$) **OR** for P(OE) = $\frac{5}{9}\times\frac{4}{8}$ (= $\frac{20}{72}$) **and** P(EO) = $\frac{4}{9}\times\frac{5}{8}$ (= $\frac{20}{72}$) **and** P(EE) = $\frac{4}{9}\times\frac{3}{8}$ (= $\frac{12}{72}$)	
		P1	for a process to find probability of sum being even, eg P(OO) + P(EE) = $\frac{5}{9}\times\frac{4}{8}$ + $\frac{4}{9}\times\frac{3}{8}$ (= $\frac{32}{72}$)	Sample space diagram or listing: Award P3 for P(sum even) = $\frac{32}{72}$ or P(product even) = $\frac{52}{72}$, P4 for both
		P1	for a process to work with probability of product being even, eg P(EO) + P(OE) + P(EE) = $\frac{4}{9}\times\frac{5}{8}$ + $\frac{5}{9}\times\frac{4}{8}$ + $\frac{4}{9}\times\frac{3}{8}$ (= $\frac{52}{72}$) or 1 – P(OO) = 1 – $\frac{5}{9}\times\frac{4}{8}$ (= $\frac{52}{72}$)	
		C1	for No supported by correct probabilities, eg $\frac{32}{72}$ **and** $\frac{52}{72}$ SC B2 for $\frac{41}{81}$ **and** $\frac{56}{81}$ **and** No SC B1 for $\frac{41}{81}$ **and** $\frac{56}{81}$ with no decision or incorrect decision	

Paper: 1MA1/1H

11	(a)	0.2, 0.15,0.85,0.15	B2 (B1	all placed correctly for 2 or 3 placed correctly)	
	(b)	0.29	M1 M1 A1	for one correct product, ft their tree diagram eg 0.8 × 0.85 (= 0.68) **or** 0.8 × "0.15" (= 0.12) **or** "0.2" × "0.85" (= 0.17) **or** "0.2" × "0.15" (= 0.03) for a complete method, ft their tree diagram eg "0.2" × "0.85" + 0.8 × "0.15" or 1 – (0.8 × 0.85 + "0.2" × "0.15") for 0.29 oe or ft their tree diagram	Working for part (b) may be seen in part (a) To apply ft values must be <1 Cannot award A1ft if answer > 1

Paper: 1MA1/2H

GCSE

Mark Scheme

Mathematics A (1387)

June 2003

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NOTES ON MARKING PRINCIPLES

NOTES ON MARKING PRINCIPLES

1 Three types of mark are available

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

2 Abbreviations

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

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

3 If no working shown, then

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

4 Marking instructions

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

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

5 Style of marking

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

6 Follow Through Marks

Follow throughs are guided by two principles:

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

7 Probability

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

8 Linear Equations

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

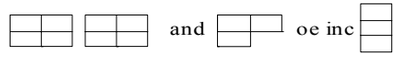
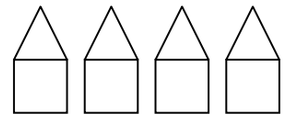
9 Parts of questions

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

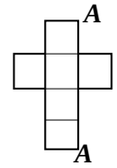
Paper 5501

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

Paper 5501

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

Paper 5501

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

Paper 5501

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

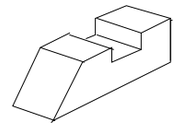
Paper 5501

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

Paper 5501

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

Paper 5501

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5502

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

Paper 5503

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

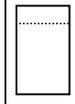
Paper 5503

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

Paper 5503

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

Paper 5503

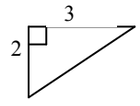
No	Working	Answer	Mark	Notes
11 (a)	Bryani was correct $4 \times 3^2 = 4 \times 9 = 36$	Bryani	2	M1 for 4×9 or $4 \times 3 \times 3$ or "square the three/x then multiply by four" A1 Bryani **SC** 4×3^2 with Bryani gets B2
(b)			1	B1 cao
12 (a)			3	B2 for rectangle height 4 squares, base 3 squares (B1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

Paper 5503

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

Paper 5503

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



Paper 5503

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

Paper 5504

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

Paper 5504

No	Working	Answer	Mark	Notes
3 (a)		60	1	B1 cao
(b)	360 – 60 – 90 – 90	120	2	M1 for 360 – "60" – 90 – 90 or 180 – "60" A1 cao
(c)	6 × 2	12	2	M1 for 6 × 2 A1 cao 12
(d)		Correct drawing	2	B2 for triangle and construction lines (see overlay) (B1 for 1 line of length 4cm and correct arcs crossing OR for correct triangle with either no arcs or incorrect arcs) SC: B1 similar triangle drawn with construction lines
4 a(i)	240 × 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 $2.5 \times 100 \times 100$ A1 cao
10 (a)	$\sum f = 90$ (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	$2 \times 2 \times 3 \times 5$	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

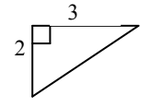
No	Working	Answer	Mark	Notes
22 (a)		No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice	1	B1 for a consistent answer
(b)	$\frac{1}{6}, \frac{5}{6}$ + labels		3	B1 for $\frac{5}{6}$ on the red dice, *not six* branch B1 for a fully complete tree diagram with all 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)	$\overrightarrow{AY} = \frac{5}{3}\overrightarrow{AB}$ or $\overrightarrow{BY} = \frac{2}{3}\overrightarrow{AB}$ $\overrightarrow{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\overrightarrow{XY} = 4\mathbf{b} - \mathbf{a}$ $\overrightarrow{EY} = 4\overrightarrow{XY}$ or $\overrightarrow{EX} = 3\overrightarrow{XY}$ or $\overrightarrow{EY} = \frac{4}{3}\overrightarrow{EX}$	Printer Answer	3	B1 for either $\overrightarrow{AY} = \frac{5}{3}\overrightarrow{AB}$ or $\overrightarrow{BY} = \frac{2}{3}\overrightarrow{AB}$ oe B1 ft for either $\overrightarrow{EY} = 16\mathbf{b} - 4\mathbf{a}$ or $\overrightarrow{XY} = 4\mathbf{b} - \mathbf{a}$ ft only on parts (*a*) and (*b*) B1 for either $\overrightarrow{EY} = 4\overrightarrow{XY}$ or $\overrightarrow{EX} = 3\overrightarrow{XY}$ or $\overrightarrow{EY} = \frac{4}{3}\overrightarrow{EX}$ 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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June 2007

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Mark Scheme

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NOTES ON MARKING PRINCIPLES

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

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

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

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

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

6 Ignoring subsequent work

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

7 Probability

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

8 Linear equations

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

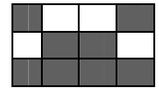
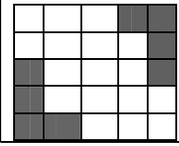
9 Parts of questions

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

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

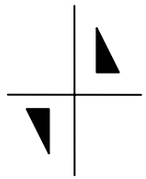
Paper 5521_01					
No		Working	Answer	Mark	Notes
1		Cat |||| /||| 8 Dog |||| | 6 Fish || 2 Hamster |||| 4	8, 6, 2, 4	3	M1 for attempt to tally or one frequency correct in either column A1 for 1 frequency correct or all tallies correct in correct column A1 for all frequencies correct (accept if /20)
2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

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

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

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

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

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

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

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

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

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

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

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

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

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

Paper 5523_03

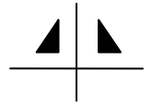
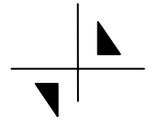
No	Working	Answer	Mark	Notes
5	315 × 24 24 × 315 1260 6300 7560 7200 7560 **3 1 5** 0 6 | 0 2 | 1 0 **2** 1 2 | 0 4 | 2 0 **4** 7 5 6 0 **300 10 5** 6000 200 100 **20** 1200 40 20 **4** 6000+200+100+1200+40+20 = 7560 **3 0.1 0.05** 60 2 1 **20** 12 0.4 0.2 **4** 60 + 2 + 1 + 12 + 0.4 + 0.2 = 75.6	75.6(0)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

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

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

Paper 5523_03

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Paper 5525_06					
No		**Working**	**Answer**	**Mark**	**Notes**
	(b)	$T = 25 \times 15 =$	375	1	B1 ft on k , $k \neq 1$
	(c)	$600 = 25x$; $x = 600 \div 25 =$	24	1	B1 ft on k , $k \neq 1$
19		$\frac{120}{570} \times 50 = 10.5263$ $\frac{250}{570} \times 50 = 21.9298$ $\frac{200}{570} \times 50 = 17.5438$	10 22 18	3	M1 method shown eg $\frac{120}{120+250+200} \times 50$ or one of 10.5(263) 21.9(298), 17.5(438) **OR** 570 ÷ 50 = 11.4 and one of 120 ÷ 11.4 =10.526…) , 270 ÷ 11.4 (=21.9298…) , 200 ÷ 11.4 (=17.5438…) A1 for 10.5(263), 21.9(298), 17.5(438) or 11, 22, 18 B1 correction to add to 50: 10, 22, 18 or 11, 22, 17
20		$x(x+1) + 4(2x–3) = (2x–3)(x+1)$ $x^2 + x + 8x – 12 = 2x^2 + 2x – 3x – 3$ $x^2 – 10x + 9 = 0$ $(x – 9)(x – 1) = 0$	$x = 1, 9$	5	M1 for multiplying through by common denominator $(2x–3)(x+1)$ M1 (dep)for either $x^2 + x + 8x – 12$ or $2x^2 + 2x – 3x – 3$ oe A1 for correct quadratic (= 0) M1 for a correct method to solve 3 term quadratic A1 cao for both solutions
21		$AB^2 = 8^2 + 9^2 – 2\times8\times9\times\cos40$ $AB^2 = 64 + 81 – 144\times\cos40$ $AB^2 = 145 – 144 \times 0.766$ $AB^2 = 145 – 110.31… = 34.6896$ $AB = \sqrt{34.6796} = 5.8897877$	5.89	3	M1 Subs in Cos Rule: $8^2 + 9^2 – 2\times8\times9\times\cos40$ M1 correct order of evaluation of $8^2 + 9^2 – 2\times8\times9\times\cos40$ A1 cao 5.88 – 5.89 SC: Award B2 for one of $AB^2 = 241.03…$ or $AB = 15.525…$ (radians) $AB^2 = 28.50…$ or $AB = 5.33…$ (gradians)
22	(a)		24 30	2	B1 24 cao B1 30 cao
	(b)	Column $60 \leq w < 75$ at 10 Column $75 \leq w < 95$ at 4	10 4	2	B1 10 and correct width (tol $\pm\frac{1}{2}$ small square) B1 4 and correct width (tol $\pm\frac{1}{2}$ small square)

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

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

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Mark Scheme (Results)

June 2011

Modular Mathematics (GCSE)
Unit 1: 5MB1H_01 (Higher)

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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.

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The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

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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.
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Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
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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.
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Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

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

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

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

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(i)	<table><tr><td></td><td>Y4</td><td>Y5</td><td>Y6</td><td>Tot</td></tr><tr><td>S</td><td></td><td>21</td><td>18</td><td></td></tr><tr><td>NS</td><td>11</td><td></td><td></td><td>37</td></tr><tr><td>Tot</td><td></td><td></td><td>30</td><td>96</td></tr></table> OR 96 – 37 = 59 children can swim 18 + 21 = 39 children in Y5 or Y6 can swim 59 – 39	20	4	M1 for including 4 of the 6 pieces of information given in a clearly labeled two-way table A1 for 20 or 20 out of 96 or 20/96 OR M1 for a correct method that leads to the number of children in year 4 that can swim eg 96 – 37 (= 59) children can swim 18 + 21 = (39) children in Y5 or Y6 can swim '59' – '39' A1 for 20 or 20 out of 96 or 20/96
	(ii)	<table><tr><td></td><td>Y4</td><td>Y5</td><td>Y6</td><td>Tot</td></tr><tr><td>S</td><td>20</td><td>21</td><td>18</td><td>59</td></tr><tr><td>NS</td><td>11</td><td>14</td><td>12</td><td>37</td></tr><tr><td>Tot</td><td>31</td><td>35</td><td>30</td><td>96</td></tr></table> OR 20 + 11 = 31children in Y4 30 + 31 = 61 children in Y4 or Y6 96 – 61	35		M1 for one correct calculation leading to a 'new', piece of information in a clearly labeled two-way table A1 for 35 or 35 out of 96 or $\frac{35}{96}$ OR M1 for a correct method that leads to the total number of children in year 5 eg '20' + 11 (= 31) children in Y4 30 + '31' (=61) children in Y4 or Y6 96 – '61' children in Y5 A1 for 35 or 35 out of 96 or $\frac{35}{96}$ SC If M1 not earned then award B1 if ans(ii) = 55 – ans (i)

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2	(a)	See scatter graph	(12,14) and(17,20) plotted	1	B1 for correct plotting of both points
	(b)			1	B1 Positive (accept a correct relationship)
	(c)		16 to 18	2	B2 16 – 18 (M1 for a single line segment from m=11 to m = 16 within overlay or a vertical line drawn from m = 15 A1 for an answer in the range 16-18 or ft their line of best fit ± 2mm)

5MB1H_01					
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.

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)		14 | 8 15 | 2 4 16 | 0 2 4 4 8 17 | 0 3 4 9 14 | 8 = 148 cm	3	B2 for a fully correct ordered diagram (B1 for correct unordered diagram or ordered with at most two errors) B1 for a correct key eg 14 | 8 = 148 cm (cm not required)
	(b) *	Boy's Median = 170 Girl's Media = 164 Boy's Mean = 170(.38) Girl's Mean= 164 Boy's Range = 27 Girl's Range = 31 Boy's IQR = 14 Girl's IQR = 14.5 – 15.25 15 | 7 9 16 | 2 6 8 9 17 | 0 3 4 6 6 18 | 1 4	Compares: medians/means + Range + Spread	3	A maximum 2B marks from: B1 for a correct mean or median for either the boys or the girls. B1 for a correct measure of spread for either the boys or the girls. B1 for a correct stem and leaf diagram drawn for the boys (no need for a key) C1 for any correct comparison based on 2 medians(ft) or 2 means(ft) or 2 ranges(ft) or 2 IQRs (ft) or a correct statement following from comparing the correct stem and leaf diagrams. This comparison must be a general statement which compares the boys' heights with the girls' heights.
5	(a)	$1 - 0.3 - 0.1 - x$	$0.6 - x$	2	M1 for $0.3 + 0.1 + x + P(2) = 1$ oe A1 $0.6 - x$ or $\frac{6}{10} - x$ or $1 - (0.4 + x)$ or $1 - 0.3 - 0.1 - x$
	(b)	$0.3 + 0.1$	0.4	1	B1 cao
	(c)		$300x$	1	B1 for $300x$, $x \times 300$ oe

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		Overlapping response boxes Leading/biased question Age too personal Missing units	2	B2 for any two of: overlapping response boxes, too personal to ask person's age, a leading or biased question, no units (B1 – just one of the above).
	(b)		How many pieces of fruit do you eat each day? 0 to2, 3 to 4, over 4	2	B1 for a sensible question including a time period B1 for at least 3 response boxes. Any pairs of response boxes must not overlap
	(c)	$\frac{73}{536+384+48+73} \times 100$	7	2	M1 for $\frac{73}{536+384+48+73} \times 100$ Or $100 \div \left\langle \frac{536+384+48+73}{73} \right\rangle$ Or 7.01… A1 for 7
7		1200×1.035^3 Or 1200 × 1.035 = 1242 1242 × 1.035 = 1285.47 1285.47× 1.035 = 1330.46	1330.46	3	M2 for 1200×1.035^3 A1 1330.46 – 1330.47 Or M1 1200 × 1.035 M1(dep) for ' 1242'× 1.035 and '1285.47'× 1.035 A1 1330.46 – 1330.47 [SC: B1 for 42 or 84 or 126 or 1242 or 1284 or 1326 seen, if M0 scored]

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)		$25 \leq t < 30$	1	B1 for the interval $25 \leq t < 30$ described unambiguously
	(b)	12.5×6 + 17.5×4 + 22.5×24 + 27.5×44 + 32.5×10 + 37.5×4 =75+70+540+1210+325+150 = 2370 2370 ÷ 92	25.8	4	M1 for finding at least 4 products fx consistently within interval (including end points) M1 (dep) for use of at least 4 correct midpoints M1 (dep on first M) for $\frac{\Sigma fx}{\Sigma f}$ A1 25.76 – 25.8
	(c)	Cf table: 6, 10, 34, 78, 88, 92 Cf graph	Correct CF graph	3	B1 Correct cumulative frequencies (may be implied by correct heights on the grid) M1 for at least 5 of "6 points" plotted consistently within each interval A1 for a fully correct cf graph.
	(d)	Median at the (92+1)÷2 = 46.5 day temp IQR = UQ – LQ = 69.75th day temp – 23.25th day temp	Median = 25.4 IQR = 6.7	3	B1 for a median in the range 24.5−26.5 or B1 ft read off at CF = 46(.5) from a CF graph tol $\frac{1}{2}$ square M1 for reading off temps at CF= 69 or 69.75 (±0.5) and 23 or 23.25(±0.5) from a CF graph and subtracting A1 ft

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		Gradient $= \frac{68-32}{20}$	$m = 1.8$, $k = 32$	3	M1 for attempting to find the gradient of the line eg from height ÷ base of a triangle with the line as hypotenuse A1 for $m = 1.7 - 1.9$ B1 for $k = 31$ - 33
10	(a)		0.8 0.6 0.2 0.4 0.5 0.5	2	B2 for all 6 correct probabilities (B1 for two correct probabilities)
	(b)	0.6 × 0.8	0.48	2	M1 for '0.6' × '0.8' ft probability tree diagram A1 cao
	(c)	1 – (0.4 × 0.5) 1 – 0.2 OR 0.6 × 0.8 + 0.6 × 0.2 + 0.4 × 0.5	0.8	3	M2 for 1 – '0.4' × '0.5' ft probability tree diagram A1 cao OR M2 for '0.6' × '0.8' + '0.6' × '0.2' + '0.4' × '0.5' (M1 for any two of '0.6' × '0.8', '0.6' × '0.2', '0.4' × '0.5'added) A1 cao

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5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
11 (a)		Histogram Fd axis labelled say 0 to 8 5 – 10, fd = 1.6 10 – 12, fd = 7.5 12 – 16, fd = 6 16 – 20, fd = 4 20 – 25, fd = 2	3	M1 for fd axis labeled and 1 correct block or for one correct division eg 8 ÷ 5 or 1.6 A1 for at least 2 additional correct blocks or 2 additional frequency densities calculated A1 for completely correct histogram SC B2 for a fully correct but unlabeled histogram OR M1 for area key and 1 correct block A1 for at least 2 additional correct blocks A1 for completely correct histogram SC B2 for a fully correct but unlabeled histogram
(b)		32	2	M1 for 6 × 1 + 16 + 10 A1 cao

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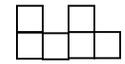
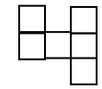
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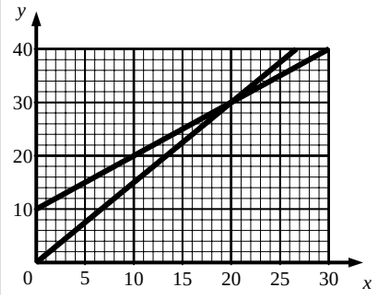
1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		380	1	B1 cao
	(b)		6.2	1	B1 cao
	(c)		Arrow at 34	1	B1 cao
2	(a)		8	1	B1 for 8 ± 0.2
	(b)		35	1	B1 for 35 ± 2°
	(c)		Circle drawn	1	B1 for all parts within ± 2mm, (use overlay)
3	(a)		4, 7, 4, 3, 2	2	M1 for at least 3 correct tallies **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)

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

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

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

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

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

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

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

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

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

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

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

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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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June 2012

GCSE Mathematics (2MB01)
Paper 5MB1H_01 (Calculator)

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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

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	1 – (0.15 + 0.32 + 0.27) 1 – (15 + 32 + 27) $1 - (\frac{15}{100} + \frac{32}{100} + \frac{27}{100})$	0.26 26% $\frac{26}{100}$ (oe)	2	M1 for 1 – "(0.15 + 0.32 + 0.27)" oe A1 for 0.26 or $\frac{26}{100}$ (oe) or 26% (must include the % sign) [Note: 0.26 seen in the table and contradicted by an incorrect answer on the answer line gets M1A0]
	(b)	0.15 × 300	45	2	M1 for 0.15 × 300 (= 45) oe A1 cao

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2	(a)	96 ÷1.20 OR 1÷1.2 = 0.833… 96 × 0.833…	80	2	M1 for 96 ÷1.20 or 1÷1.2 (= 0.833…) and 96 × "0.833…" A1 cao
	(b)	64.80 ÷1.20 = £54 OR 52.50 × 1.20 = €63 OR 64.80 ÷ 52.50 = 1.23(428….)	Comparison	3	M1 for 64.80÷1.20 A1 for £54 ('£' sign must be included although this could be quoted in their comparison, eg difference of £1.50) C1 (dep on M1) for more (expensive) in Paris oe or ft from their '£54' (the difference in cost is not required but one of the values compared must be one of the values given) OR M1 for 52.50 × 1.2 A1 for €63 ('€' sign must be included although this could be quoted in their comparison, eg difference of €1.80) C1 (dep on M1) for less (expensive) in Manchester oe or ft from their '€63' (the difference in cost is not required but one of the values compared must be one of the values given) OR M1 for 64.80 ÷ 52.50 A1 for 1.23(428….) C1 (dep on M1) for more expensive in Paris since the exchange rate of 1.23(428…) is greater than the given exchange rate of 1.20

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5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		(5, 300) plotted	1	B1 for points plotted at (5, 300) allow ± ½ square tolerance
	(b)		The greater the age the less the value	1	B1 for the greater the age the less the value (price, cost etc.) oe Accept negative correlation, but "negative" or "negative relationship" gets B0
	(c)		500 to 800 inc.	2	B2 for an answer in the range 500 to 800 (inc.) OR M1 for a single straight line segment with negative gradient that could be used as a line of best fit A1 ft reading from their line of best fit at Age = 4 [SC: B1 ft reading from their single line of best fit (must be of negative gradient) at Age = 4 if M0 scored]

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*4		2 × 39.50 + 3 × 23.75 = 150.25 150.25 ÷ 3 = 50.08(33..) 150.25 – 50.08(33..) = 100.16(66..) 2 × 40.25 + 3 × 21.85 = 146.05 146.05 ÷ 4 = 36.51(25) 146.05 – 36.51(25) = 109.53(7) $2 \times (1 - \frac{1}{3}) \times 39.50$ $+ 3 \times (1 - \frac{1}{3}) \times 23.75$ + 2 × 0.75 × 40.25 + 3 × 0.75 × 21.85	Easy ferry	5	M1 for 2×39.50 (=79) or 3×23.75 (= 71.25) or 2×40.25 (= 80.50) or 3×21.85 (= 65.55) M1 for 2×39.50+3×23.75 (=150.25) and 2×40.25+3×21.85 (=146.05) M1 for $(1 - \frac{1}{3})$ × '150.25' oe or (100 – 25)% × '146.05' oe A1 for (£)100.16 to (£)100.17 and (£)109.53 to (£)109.54 C1 for "Easy Ferry is cheaper" oe or ft from their 2 totals provided at least 2 Ms scored and it is clearly stated which total relates to which ferry company OR M1 for $(1 - \frac{1}{3})$ × 39.50 oe (= 26.33) or $(1 - \frac{1}{3})$ × 23.75 oe (=15.83) or (100 – 25)% × 40.25 oe (= 30.19) or (100 – 25)% × 21.85 oe (= 16.39) M1 for 2×"26.33" (= 52.66) or 3×"15.83" (= 47.50) or 2×"30.19" (= 60.38) or 3×"16.39 (= 49.17) M1 for 2×"26.33" + 3×"15.83" and 2×"30.19" + 3×"16.39 A1 for (£)100.15 to (£)100.16 and (£)109.55 C1 for "Easy Ferry is cheaper" oe or ft from their 2 totals provided at least 2 Ms scored and it is clearly stated which total relates to which ferry company

PMT

5MB1H_01

Question		Working	Answer	Mark	Notes
5	(a)		5 | 9 6 | 3 5 6 6 7 | 1 2 5 5 6 7 9 9 8 | 3 9 Key: eg, 7/2 represents 72	3	M1 for at least 2 correct 'rows' with correct stem and correct ordered or unordered leaf Note: stem could be 5,6,7,8 or 50,60,70,80 A1 for a fully correct ordered stem and leaf diagram B1 for a key [Ignore spacing on leaves provided the order is` correct]
	(*b)	Gill: HV 95 >, LV 75 >, Mean 80 >, Range 20 < Jamal: HV 89, LV 59, Mean 73, Range 30	Comparison	5	M1 for '72+59+76+...'÷15 or 1095 ÷ 15 (= 73) M1 for 95 – 75 (=20**) or** '89' – '59' (= 30) or '89' and '59' seen ft from their stem and leaf diagram in (a) A1 for mean of Jamal's scores is 73 cao or for ranges of 20 and 30 cao C1 (dep on first M1) ft for a correct comparison of mean scores, e.g. Gill's mean score > Jamal's mean score oe C1 ft for a correct comparison of ranges, (dep on M1 awarded for correct method to find range) e.g. The range of Gill's scores < The range of Jamal's scores **or** a correct comparison of both end values (dep on M1 awarded for '89' and '59' seen) , e.g. Gill's lowest score > Jamal's lowest score and Gill's highest score > Jamal's highest score. oe [For the award of C2, the word 'score' must be explicitly stated. If not deduct 1 mark]

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		(7×35 + 22×45 + 34×55 + 12×65) ÷75 = (245 +990 + 1870 + 780) ÷75 = 3885 ÷75	51.8	4	M1 for use of *fs* with *s* consistent within intervals (including end points) accept one error M1 (dep) for use of *s* as the correct midpoints [Note: ∑*fs* = 3885 seen automatically gets the first two method marks] M1 (dep on 1st M1) for use of ∑"*fs*" ÷75 (or divided by their total of 7+22+34+12 if 75 not used) A1 cao
7	(a)		(4), 11, 24, 36, 40	1	B1 for all correct
	(b)			2	B1 ft for 4 or 5 "points" plotted correctly ± ½ full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) B1 (dep) for points joined by curve or line segments provided no gradient is negative Ignore any part of graph outside the range of their points (SC: B1 if 4 or 5 points plotted not at end but consistent within each interval and joined)
	(c)		36.5 to 38 (inc.)	1	B1 for an answer in the range 36.5 to 38 (inc.) or ft (dep on graph being cf) for reading from graph at 20 ± 1 full (2mm) square

PMT

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		(23×153 + 17×165) ÷ (23+17)	158.1	3	M1 for 23×153 (= 3519) or 17×165 (= 2805) M1 for '3519' + '2805' (= 6324) ÷ '40' (= 23+17) A1 cao [An answer of 158 with no working gets no marks]
9	(a)		Box plot	2	B2 for correct box plot (B1 for box plot with at least 3 pieces of information correctly plotted) Note: There must be a box
	(b)	75% × 60	45	2	M1 for 0.75 × 60 oe A1 cao [SC: B1 for an answer of 15 if M0 scored]

PMT

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		e.g. How often do you visit the sport centre each week? 0, 1, 2, 3 more	2	B1 for an appropriate question with reference to a time period or a question with time period implied by responses B1 for at least 3 non-overlapping boxes (ignore if not exhaustive) **or** for at least 3 exhaustive boxes (ignore if any overlapping) [Note: labels on response boxes must **not** be inequalites] Do not accept frequency tables or data collection sheets
	(b)		Reason	1	B1 for a correct reason, e.g. may be biased, sample too small, not a random sample, ……
	(c)	e.g. 45/365 × 50 = 6.16...	6	2	M1 for 45/365 × 50 (= 6.16….) oe A1 for 6 OR M1 for an attempt to divide 50 in the ratio 45:320 oe A1 for 6

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$\frac{40}{N} = \frac{5}{50}$	400	2	M1 for an attempt to compare fractions, e.g. $\frac{40}{N} = \frac{5}{50}$ or $40\times50 = 5\times N$ or $40:N = 5:50$ A1 cao OR M1 for an attempt to compare percentages, e.g. $\frac{5}{50}\times100 = 10\%$ or $10\%\times N = 40$ A1 cao [SC: B1 for sight of $\frac{40}{N}$ or $\frac{5}{50}$ if M0 scored]

PMT

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		Tree diagram with p and $1 - p$ on branches	2	B2 cao (B1 for $1 - p$ seen on at least one branch)
	(b)		$p \times p$	1	B1 for $p \times p$ or p^2 or pp oe
	(c)		$p \times (1 - p) + p \times (1 - p)$	2	M1 for $p \times$ '$(1 - p)$' oe, provided the expression is in terms of p only OR ft from their tree diagram where the expressions must be algebraic in terms of p only A1 for $2 \times p \times (1 - p)$ oe but must be algebraically the correct answer OR M1 for $1 - p \times p -$ '$(1 - p)$' $\times$ '$(1 - p)$' oe OR ft from their tree diagram where the expressions must be algebraic in terms of p only A1 for $2 \times p \times (1 - p)$ oe but must be algebraically the correct answer [SC B1 for $2 \times f \times (1 - f)$, where f is a fraction or decimal less than 1 used as a value for p in tree diagram]

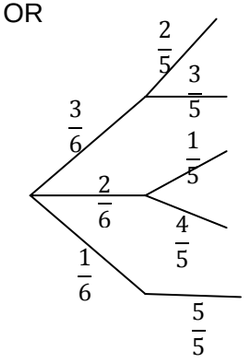
PMT

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13		$\frac{17.24}{57} \times 285 = 86.2$ $\frac{86.2}{285} \times 285 = 86.2$ $\frac{431}{1425} \times 285 = 86.2$	86 or 87 .	3	M1 for an attempt to relate total area to total frequency. Eg. using a fd scale of **1cm = 0.2** 285 ÷ [21+9.8+11.2+10+5 (=57)] (= 5) At least 3 of these 5 frequency values must be correct M1 for ('2.24'+10+5) × '5' A1 for 86 or 87 (accept 86.2) OR M1 for an attempt to relate total area to total frequency. Eg. using a fd scale of **1cm = 1** 285 ÷ [105+49+56+50+25 (=285)] (= 1) At least 3 of these 5 frequency values must be correct M1 for ('11.2'+50+25) × '1' A1 for 86 or 87 (accept 86.2) [SC: B1 can be awarded for correct labelling of fd axis using the scale of 1cm = 1 if M0 scored] OR M1 for an attempt to relate total area to total frequency. Eg. using a fd scale of **1cm = 5** 285 ÷ [525+245+280+250+125 (=1425)] (= 0.2) At least 3 of these 5 frequency values must be correct M1 for ('56'+250+125) × '0.2' A1 for 86 or 87 (accept 86.2)

PMT

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
		(2.24+10+5) × 5 = for 17.24 × 5 = 86.2			OR M1 for 1 cm^2 = 5 farms M1 for ('2.24'+10+5) × 5 A1 for 86 or 87 (accept 86.2)

PMT

5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		$\frac{3}{6}\times\frac{2}{5}+\frac{2}{6}\times\frac{1}{5}$ = 8/30 $1-\frac{8}{30}=\frac{22}{30}$ OR $2\times\frac{3}{6}\times\frac{2}{5}+2\times\frac{3}{6}\times\frac{1}{5}+2\times\frac{2}{6}\times\frac{1}{5}$ OR  	$\frac{22}{30}=\frac{11}{15}$	4	M1 for $\frac{3}{6}\times\frac{2}{5}$ or $\frac{2}{6}\times\frac{1}{5}$ M1 for $\frac{3}{6}\times\frac{2}{5}+\frac{2}{6}\times\frac{1}{5}$ M1 for $1-(\frac{3}{6}\times\frac{2}{5}+\frac{2}{6}\times\frac{1}{5})$ A1 for $\frac{22}{30}$ oe OR M1 for $\frac{3}{6}\times\frac{2}{5}$ or $\frac{3}{6}\times\frac{1}{5}$ or $\frac{2}{6}\times\frac{1}{5}$ M1 for $\frac{3}{6}\times\frac{2}{5}+\frac{3}{6}\times\frac{1}{5}+\frac{2}{6}\times\frac{1}{5}$ M1 for $2\times(\frac{3}{6}\times\frac{2}{5}+\frac{3}{6}\times\frac{1}{5}+\frac{2}{6}\times\frac{1}{5})$ A1 for $\frac{22}{30}$ oe OR M2 for $\frac{3}{6}\times\frac{3}{5}$ or $\frac{2}{6}\times\frac{4}{5}$ or $\frac{1}{6}\times\frac{5}{5}$ M1 for $\frac{3}{6}\times\frac{3}{5}+\frac{2}{6}\times\frac{4}{5}+\frac{1}{6}\times\frac{5}{5}$ A1 for $\frac{22}{30}$ oe

		OR A^1A^2 A^1A^3 $\mathbf{A^1B^1}$ $\mathbf{A^1B^2}$ $\mathbf{A^1C}$ A^2A^1 A^2A^3 $\mathbf{A^2B^1}$ $\mathbf{A^2B^2}$ $\mathbf{A^2C}$ A^3A^1 A^3A^{32} $\mathbf{A^3B^1}$ $\mathbf{A^3B^2}$ $\mathbf{A^3C}$ $\mathbf{B^1A^1}$ $\mathbf{B^1A^2}$ $\mathbf{B^1A^3}$ B^1B^2 $\mathbf{B^1C}$ $\mathbf{B^2A^1}$ $\mathbf{B^2A^2}$ $\mathbf{B^2A^3}$ B^2B^1 $\mathbf{B^2C}$ $\mathbf{CA^1}$ $\mathbf{CA^2}$ $\mathbf{CA^3}$ $\mathbf{CB^2}$ $\mathbf{CB^2}$			OR M2 for diagram showing all 30 possible outcomes (M1 for diagram showing 15 possible outcomes. ie without any repeats) M1 (dep) for identifying all outcomes in their diagram with different letters (underlining, circling, etc.) Or 30 – all outcomes where the letters are the same A1 for $\frac{22}{30}$ oe **Alternative scheme for replacement** M1 for $\frac{3}{6}\times\frac{3}{6}$ or $\frac{2}{6}\times\frac{2}{6}$ or $\frac{1}{6}\times\frac{1}{6}$ M1 for $1-(\frac{3}{6}\times\frac{3}{6}+\frac{2}{6}\times\frac{2}{6}+\frac{1}{6}\times\frac{1}{6})$ OR M1 for $\frac{3}{6}\times\frac{2}{6}$ or $\frac{3}{6}\times\frac{1}{6}$ or $\frac{2}{6}\times\frac{1}{6}$ M1 for $2\times(\frac{3}{6}\times\frac{2}{6}+\frac{3}{6}\times\frac{1}{6}+\frac{2}{6}\times\frac{1}{6})$

					OR M1 for a diagram showing all 36 'possible' outcomes A1 for $\frac{22}{36}$ (= 0.6111…) **Special cases:** B2 for $\frac{22}{36}$ (= 0.6111…) or $\frac{28}{36}$ (= 0.777..) or $\frac{16}{30}$ (= 0.533..) if M0 scored

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Higher (Calculator) Unit 1

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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 as 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

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
1.		12 | 3 5 9 13 | 0 3 3 5 7 8 14 | 7 7 8 9 15 | 0 1	3	B2 for a fully correct ordered diagram (B1 for correct unordered diagram or ordered with at most two errors) B1 for correct key eg 12 | 3 means 123 (cm)
2. (a)		2 different reasons	2	B1 for a reason relating to: Bias – due to gender or due to railway station location Size of sample too small B1 for one other reason
(b)		Question and response boxes	2	B1 for a suitable question with time period and units in question or response boxes B1 for at least 3 non-overlapping and exhaustive response boxes
3.		$\frac{x+x+5+2x}{3}$	2	M1 for intention to add x, $x + 5$, $2x$ or $4x + 5$ seen or ambiguous answer eg "$4x$+5"÷3 A1 for $\frac{x+x+5+2x}{3}$ oe

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
4. (a)		Frequency polygon	2	B2 for fully correct frequency polygon - points plotted at the midpoint (B1 for all points plotted accurately but not joined with straight line segments) **or** all points plotted accurately and joined with last joined to first to make a polygon **or** all points at the correct heights and consistently within or at the ends of the intervals and joined (can include joining last to first to make a polygon) NB: ignore parts of graph drawn to the left of the 1st point or the right of the last point
(b)		$160 < h \leqslant 180$	1	B1 for $160 < h \leqslant 180$ (could be ft from diagram)
5. (a)		0.05	3	M1 for correct method using sum of probabilities = 1 eg $1 - 0.6 - 0.25$ (=0.15) or $0.6 + 0.25 + 2x + x = 1$ M1 (dep) for correct method to use P(blue) = 2 × (Green) Eg "0.15" ÷ 3 A1 cao
(b)		30	2	M1 for 0.6 × 50 oe A1 cao

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
6.		15.42	4	M1 for method to find litres needed for either car A (eg 450÷10.3 (= 43.69)) or car B (eg 450÷14.6 = (30.82)) M1 for method to find cost of fuel for either car A (eg 1.39×43.69 (=60.73) or car B (eg 1.47×30.82 (=45.31)) M1 (dep M2) or method to find difference in fuel costs for car A and B A1 cao Or M1 for method to find cost per mile for car A (eg 1.39÷10.3 (=0.135) or for car B (eg 1.47÷14.6 (=0.101)) M1 for method to find total cost of fuel for either car A (eg 450×0.135 (=60.73)) or for car B (eg450×0.101 (=54.31)) M1 (dep M2) for method to find difference in fuel costs for car A and B A1 for £15.42 NB: Working throughout may be in £ or pence.
7.		28	5	M1 for method to find $\frac{1}{5}$ of children eg 60 ÷ 5 (=12) M1 for method to find number of boys or girls eg "12" × 2 (=24) or "12"×3 (=36) M1 for method to find total number going in the morning eg $\frac{3}{4} \times 60$ (= 45) M1 for complete method to find number of girls going in the morning eg 45 – (24 - 7) A1 cao
8.		0.7, 0.3 0.9, 0.1, 0.9, 0.1	2	B1 for 0.7, 0.3 in correct position B1 for 0.9, 0.1, 0.9, 0.1 in correct position

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
9. (a)		Point at (47, 34)	1	B1 point plotted
(b)		Positive	1	Positive (correlation)
(c)		48 to 51 inclusive	2	M1 for a single straight line segment with positive gradient that could be used as a line of best fit or a horizontal line from 35 or point marked at (n,35). A1 for given answer in the range 48 – 51
10.		1615.34	3	M1 for correct method to find value of investment after 1 year eg 1500×0.025 or 37.5 or 1500×1.025 or 1537.5 oe) M1 for a complete compound interest method to to find value of investment after 3 years eg 1500×1.025^3 A1 cao
*11		Justification	4	M1 for method to find total mileage eg 55 × 5 + 50 (= 325) M1 for method to find mean eg 325 ÷ 6 A1 for 54.1 – 54.2 C1 (dep on at least M1) for justification comparing means. OR M1 for method to find total mileage for Andy's mean 52.5 × 6 (= 315) M1 for method to find correct total mileage 55 × 5 + 50 (= 325) A1 for 315 and 325 C1 (dep on at least M1) for justification comparing correct totals

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
12. (a)		40	1	B1 cao
(b)		22-24	3	M1 for reading graph up from 43 and across [36-38] A1 for 22 or 23 or 24
(c)		Correct box plot	3	B3 for fully correct box plot (allow ft for median from (a)) (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 plotted) Min LQ Median UQ Max 17 32 "40" 46 50
13.		223	3	B1 for using 4.5, 4. 4$\dot{9}$, 0.0045 or 0.0044$\dot{9}$ M1 for 1000 or 1 kg divided by 4.5, 4. 4$\dot{9}$, 0.0045 or 0.0044$\dot{9}$ (=222.72) or 222 seen A1 cao
14. (a)		Correct explanation	1	B1 for groups in the sample are in the same proportion as they are in the population.
(b)		33	2	M1 for $\frac{494}{1786} \times 120$ oe A1 cao

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
15.	(50,10) (10,50) (20,20) (20,50) (50,20)	$\frac{12}{30}$	4	M1 for method to identify all correct pairs eg sample space or tree diagram (may be implied by correct products) M1 for all correct products $\frac{1}{6}\times\frac{3}{5}, \frac{3}{6}\times\frac{1}{5}, \frac{2}{6}\times\frac{1}{5}, \frac{1}{6}\times\frac{2}{5}, \frac{2}{6}\times\frac{1}{5}$ M1 for finding sum of correct products $\frac{1}{6}\times\frac{3}{5}+\frac{3}{6}\times\frac{1}{5}+\frac{2}{6}\times\frac{1}{5}+\frac{1}{6}\times\frac{2}{5}+\frac{2}{6}\times\frac{1}{5}$ A1 for $\frac{12}{30}$ oe OR M1 for method to identify all correct pairs < 40p eg sample space or tree diagram (may be implied by correct products) M1 for all correct products $\frac{3}{6}\times\frac{2}{5}, \frac{3}{6}\times\frac{2}{5}, \frac{2}{6}\times\frac{3}{5}$ M1 for completing working $1-(\frac{3}{6}\times\frac{2}{5}+\frac{3}{6}\times\frac{2}{5}+\frac{2}{6}\times\frac{3}{5})$ A1 for $\frac{12}{30}$ oe

Paper_5MB1H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
16. (a)		Correct histogram	3	B3 fully correct histogram with vertical axis correctly scaled. (B2 for 4 correct blocks or 5 correct blocks with incorrect or no scale) (B1 for 2 correct blocks of different widths or any 3 correct blocks or correct FD values for at least 3 frequencies) eg fd of 1.2, 2.1, 2.2, 1.6, 0.4
(b)		38	2	M1 for $\frac{1}{3} \times 33 + 21 + 6$ A1 cao OR M1 for vertical line at m= 20 or showing one third of $15 < m \leqslant 30$ bar. A1 cao

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

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

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

PAPER: 5MB1H_01			
Question		**Modification**	**Notes**
1		Size x 1½. 4th horizontal line drawn in.	
4		Grid: 2 cm squares both axes, right axes labelled. Horizontal axis – heavier lines at 120, 140, 160, 180, and 200 Vertical axis heavier lines at 5, 10 and 15	
8		Braille (i) to (vi) given on diagram and candidates asked to write values for each.	
9		2 cm grid. Crosses changed to filled in circles. Right axis labelled	
12		Graph line changed – Curve goes through (15,1) (30, 15) (40, 30) (45, 45) (50, 60)	
	(c)	17 changed to 15 – will mean five points are 15, 30, 40, 45 and 50	
16		Table: 21 changed to 20 Top line 84 changed to 83 Grid: 2 cm	

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Question 10

As would be expected on the higher paper, the completion of the tree diagram was done very well, with a majority of students scoring both marks in part (a).

In part (b) many students scored the first mark for a suitable product, but then lost the remaining marks as their method was incomplete. This was usually because they dealt with the two possibilities of being late on exactly one day, but missed the words “at least” in the question, and failed to consider being late on both days. For those who gained the second mark, the third almost always followed.

Question 16

Using a tree diagram was the most successful method seen which often led to at least one mark. A significant number of students chose to try to list all possibilities. This approach was largely unsuccessful, either because they failed to list various possibilities in the process, or because their work was not sufficiently organised to produce the necessary lists to enable them to see where they were going. A few used an incorrect replacement process.

Question 11

Most students attempted this question and it was common to see at least one correct product to gain the initial mark. It was pleasing to see that almost a third of the cohort went on to complete the question fully giving the correct answer

The most common incorrect responses involved adding the probabilities, e.g. $0.07 + 0.02 + 0.11 = 0.2$ or adding in the product 0.07×0.02. Although very few arithmetic errors were seen the most common one was $0.07 \times 0.98 = 0.686$ not 0.0686, using this often led to the student gaining two out of the three marks.

Question 6

In part (a), the great majority of candidates were able to complete the probability tree diagram successfully to score 2 marks. Some candidates gave 2 different probabilities for the probability of a candidate not winning the music quiz when both should have had the same value, 0.65.
Part (b) was also answered well and and a majority of candidates scored 2 marks for a fully correct answer. The most common error seen was the addition rather than multiplication of 0.3 and 0.35. Some candidates gave more than one combined outcome and, as a consequence, could not be awarded any marks for this part of the question.

Question 12

After gaining the first mark for writing at least one correct product many students were able to go on and show a complete method by finding the sum of the three relevant products. Some students chose to subtract the probability of Martha winning both games from 1. The majority of those that showed a full method were able to complete the arithmetic and give a correct final answer. A very common error was failing to include the probability of Martha losing both games and finding the sum of only two products suggesting that the students missed or misunderstood the words 'at least' in the question. Some students did not know what to do with the probabilities, often adding them rather than multiplying.

Question 24

This question also discriminated well between high attaining students. Most students who made a good attempt at the question recognised the non-replacement nature of the problem and were able to make a start by forming expressions for probabilities in terms of x and/or y. A good proportion of these students were also able to use the ratio given in the question to make a substitution in order to get their expressions in terms of x only or y only. However, a significant number of students used "$y = 4x$" instead of the correct "$y = 3x$". Invariably and sensibly, the overwhelming majority of students opted for getting their expressions in terms of x only. Those students who attempted substituting $3x$ for y into their probabilities before combining their products had more success than those who substituted later as the algebra became more complex. A significant number of students obtained correct expressions for the probability of Freda taking two pink counters and the probability of her taking two blue counters but gave the probability of her taking two green counters as $\frac{2x-5}{3x} \times \frac{2x-4}{3x-1}$ instead of $\frac{2x-5}{3x} \times \frac{2x-6}{3x-1}$. This had clearly arisen from an error with signs earlier on in a student's working. It was encouraging to see a good number of fully correct solutions from students working at the highest level.

Summary

Based on their performance on this paper, students are offered the following advice:

- carry out a check to make sure you have not miscopied any numbers given in a question before you complete the question.
- check that you have not miscopied algebraic expressions from a previous line in your working.
- practise solving equations involving algebraic fractions.
- compare the medians and either the ranges or the interquartile ranges in context when asked to compare two distributions represented by box plots.
- ensure you can write and manipulate algebraic expressions accurately particularly with regard to the use of brackets and the signs of terms.
- practise solving real life problems involving inverse proportionality.
- carry out common sense checks where possible.

Question 10

The probability tree question is a familiar one and most were able to gain at least one mark in part (a) for at least two correct probabilities, with many completing the tree correctly. In part (b) however there was less success. A number gained a single mark for one correct product. The issue it seems was that many didn't really understand the meaning of 'at least' and worked out the probability of only passing one test. This resulted in many gaining no further credit as their method was incomplete.

Question 6

As would be expected on the higher paper, the completion of the tree diagram was done very well, with a majority of students scoring both marks in part (a). A few students seemed unsure of the probabilities for coin B seemingly thinking it was a conditional probability. In part (b) students scored one of the two marks for writing but calculating incorrectly 0.6×0.55; it was surprising how many students gained only this one mark given that they had access to a calculator. Of those that gained 0 marks for part (b) it was usually because the probabilities were added instead of being multiplied. A significant number of students gained no marks for part (b) as although they calculated 0.6×0.55 they spoilt their method by multiplying or dividing this by 2 or by subtracting it from 1 or adding to another product. All of these resulted in 0 marks being awarded as M1 was for only 0.6×0.55. Students need to be aware that workings seen in part a) ie. 0.33 on the end of the correct path was superseded by new workings in part b) so it is important to show correct processes in the relevant workings area.

Question 22

The final question was a probability problem in which learners had to generate their own expressions without any scaffolding provided in the question. Many tried to work simply with numerical probabilities, and this scored zero.
To gain the first mark a correct second probability was needed, and this did need to include algebra. The second mark was for a correct product, either for both red, both yellow, or one of each. The third mark was for forming a correct equation. Those who gained the first two, often failed to gain this mark as they only worked with one product and not two.
The final two marks came from manipulating the algebra into an equation to solve (either quadratic or linear), and then the correct answer.

Summary

Based on the performance on this paper, learners/centres should:

- Spend time learning how to describe the various regions in Venn diagrams clearly, ideally using set notation.
- Practise articulating their mathematics in verbal discussions to aid them in written responses.
- Learn the shapes of common graphs. In particular remembering quadratic graphs are curves and not a series of line segments.
- With transformations take care to read the question carefully so they know which shape is the object and which is the image. Also, that if asked for a single transformation giving two will result in zero marks.
- Continue to work on annotating working clearly, especially in extended problem questions, to ensure all marks can be awarded.
- Practise further working with iterative formulae.
- Whenever possible use accurate figures without prematurely rounding or truncating in calculations and only round at the final stage.
- Practise working with multiple negative signs when working with algebra.

Question 4

A standard question for which most learners gained a good number of marks. Part (a) was well answered although there were a small number of learners who didn't correctly place the probabilities for Game 2. Of those that gained 0 marks for part (b) it was usually because the probabilities were added instead of being multiplied. A significant number of candidates gained no marks for part (b) as although they calculated 0.7×0.7 they spoilt their method by multiplying or dividing this by 2 or by subtracting it from 1 or adding to another product. All of these resulted in 0 marks being awarded as M1 was for 0.7×0.7 as a standalone product. A number of learners scored 2 marks through the follow through mark from their diagram.

Question 14

Probability tree diagrams were very common and these helped some candidates to organise their thinking. Many responses were able to make a start to the process and gain the first mark for finding at least one correct product and they often went on to gain the second mark for finding two or three correct products. In order to decide whether Lee is correct, candidates needed to work out the probability that the sum of the numbers is even and the probability that the product of the numbers is even. They were more successful at working out the probability that the sum is even and this gained the third mark. Having worked out the probability that the sum is even a common error was to compare this probability with the probability that the sum is odd. When attempting to work out the probability that the product is even some responses did not show a complete process because they did not consider both P(even, odd) and P(odd, even). This usually led to the incorrect conclusion that the probability of an even sum and the probability of an even product are equal. The majority of those that showed a full process to find both probabilities were able to complete the arithmetic and make a correct decision. Some lost the final mark because they stated that Lee is correct or they made no clear decision. Cancelling fractions early in the process was unhelpful to some responses when they then came to add them. Some responses chose to try to answer the question by drawing sample space diagrams or by listing possible outcomes. These approaches were sometimes successful but often all the possible outcomes were not found. For some responses the tree diagram was all they managed; they did not know what to do with the probabilities and some added rather than multiplied the probabilities. Some responses worked with the first counter being replaced and they could be awarded at most two marks.

Question 11

This probability tree question is very familiar to learners and as such many answered it well. Less successful responses in part (a) still typically gained 1 mark for 2 correct values but commonly had the last two values incorrect.

Part (b) required learners to decide which branches of the tree were appropriate, calculate the correct products and add to find the correct probability. Most were able to gain at least 1 mark for a single correct product. Stronger responses found the correct 2 products and added to an answer of 0.29 or 29%. Unfortunately, some responses found the correct probability but then subtracted this from 1. This negated the 'complete method' for the 2nd mark, and this response would only score 1.
It is also worth noting that all 3 marks in part (b) can be followed through from an incorrect probability tree in part (a) providing the answers were still less than 1.



Examiners' Report
Principal Examiner Feedback

November 2020

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 3H

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Higher Paper 3

Introduction

Most students who sat this paper seemed to have been entered appropriately for the higher tier. Responses were generally clearly and logically presented though a small proportion of responses to questions 4, 9, 17 and 19 appeared to lack a coherent structure. Where fully complete and correct solutions were not seen, examiners could usually award some marks for a student's working.

The paper gave the opportunity for students of all abilities to demonstrate positive achievement. All questions were accessible to some students and there were some excellent scripts attracting a high total number of marks. In a few cases of questions later in the paper, a significant number of less able students made no attempt to answer the question though there were not many scripts with a very low total number of marks. Questions 1 - 5 and 8 were answered well by most students. Questions 13 and 16 - 21 attracted fully correct solutions from only a small number of students. It was noticeable that questions involving the use and interpretation of graphs were generally not well answered. Centres and students may wish to spend more time on this aspect of the specification.

Report on Individual Questions

Question 1

This question provided a good start to the paper. Most students scored at least four of the five marks available and nearly all students gained some credit for their answers.

Part (a) of this question required students to use the index law for multiplication of powers of *n*. Nearly all students applied the law correctly. n^{15} was the most commonly seen incorrect answer.

Part (b) of the question was answered less well but nevertheless the great majority of students gained the two marks available. Examiners condoned answers of the form c^1d^3 and $c \times d^3$. It was not unusual for students who did not give a fully correct answer to get one mark for either c or d^3.

In part (c) students could usually find the critical value giving it as either 2.8 or $\frac{14}{5}$.

These students scored at least one mark. A significant number of students gave their final answer as 2.8 or as $x = 2.8$ instead of the correct $x > 2.8$

Question 2

This question was a good discriminator between less able students taking this paper. Many students at this level used "time = distance ÷ average speed" to get 1.25 hours and 1.5 hours before adding to get 2.75. A surprising number of students were, however, unable to convert this correctly to 2 hours 45 minutes. 2 hours 75 minutes and 3 hours 15 minutes were common incorrect answers seen.

Question 3

A majority of students scored both marks on this question. Where only one mark was scored, it was usually for the lower end of the interval and where the student had used 9.44 or 9.4 for the upper end of the interval.

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 m²) and compare it with 140 m², 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 m²) 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 6

There were a good number of totally correct responses to this question. However, in part (a) some students attempted to solve the equations algebraically usually without success.

Part (b) was not answered well and a significant number of students did not attempt the question. Students who included correct solutions in an incorrect format, such as (0.6, 0) and (3.4, 0) or $0.6 < x < 3.4$ were given one mark on the basis that they had clearly used the intercepts of the x axis. One mark was also available to students who marked the two intercepts of the x axis on the diagram but not to those students who also marked extra intercepts, for example at (0, 2).

Question 7

This question was done well by a majority of students who were awarded all three marks. Some students merely found the mean of 16.2 and 16.7. This method could not, of course, be awarded any marks. Students nearly always scored three marks for a fully correct response rather than one mark or two marks for a partially correct response.

Question 8

In this question nearly all students realised that they needed to subtact 0.32 and 0.20 from 1 to find the total of the probabilities of taking a red counter or a yellow counter. These students usually went on to give a correct solution to the problem, most frequently by dividing 0.48 by 6 then multiplying by 300 to find the number of yellow counters. Where there were errors in working, it was usually where students divided 0.48 by 5 instead of 6 to find the probability of taking a yellow counter. The alternative route of finding the number of blue and/or green counters as a first stage was also used in a small but significant number of cases.

Question 9

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

Question 10

This question involving standard form was quite well answered. In part (a) students were expected to work out an estimate for the number of times a person's heart beats in their lifetime. There was no expectation for students to round the 81 or 365 but the acceptable range in the mark scheme was constructed to allow for this. Students who did not give a correct answer often did not consider the number of days in a year and used 81×10^5 instead of $81 \times 365 \times 10^5$. Of those students who did show a complete and correct calculation, a significant number of them did not convert their answer correctly into standard form.

In part (b) many students gave the correct answer, 4.5×10^{-11}. Where mistakes were made, a common error was for a student to divide 2×10^{12} by 90 to get $2.\dot{2} \times 10^{10}$. Some students who wrote down a correct calculation, that is $\frac{90}{2 \times 10^{12}}$, went on to evaluate it incorrectly as $90 \div 2 \times 10^{12}$ instead of $90 \div (2 \times 10^{12})$. Disappointingly few students recognised that an answer of either 4.5×10^{13}grams or $2.\dot{2} \times 10^{10}$grams for the average mass of 1 red blood cell is unrealistic.

Question 11

This question proved to be a good discriminator. A high percentage of students were able to score at least one mark by correctly carrying out one or both of the two transformations and

showing their results on the grid provided. About a third of students were able to describe the single equivalent transformation as a rotation of 180° with about a third of these students also able to give the correct centre of rotation. It was encouraging to see very few students describing more than one transformation. About half of the students who scored all three marks in part(a) understood the meaning of the term "invariant point" and were able to write down the coordinates of their centre of rotation as their response in part (b).

Question 12

Students usually scored well in this question requiring the addition of two algebraic fractions in part (a) and the expansion of a product of three linear expressions in part (b). The question was a good discriminator at the level set and tested skills and confidence in the area of algebraic manipulation and simplification.

About a half of students taking this paper scored at least two of the three marks available in part (a). They were able to decide on a common denominator and combine the fractions with accuracy. However, a large number of students then went on to make errors in simplifying their expressions. It was common to see a correct answer of $\frac{3x^2}{x^2-2x-8}$ spoiled by incorrect cancelling leading to an incorrect final answer. Examples of incorrect final answers seen quite frequently are $\frac{2x^2}{-2x-8}, \frac{3}{-2x-8}$ and $\frac{x}{-5}$. Another commonly seen error occurred when students obtained a correct result of the form $\frac{3x^2}{(x+2)(x-4)}$ only to make the decision to multiply out the brackets but then to do this incorrectly. Students should be advised that it is generally acceptable to leave the denominator in factorized form.

More students scored full marks in part (b) than in part (a) of this question. Errors in part (b) were usually restricted to incorrect terms rather than a flawed strategy although some students omitted terms from their expansion. Most students earned at least two of the available marks. Less able students sometimes either stopped after multiplying two linear expressions together or lacked a clear strategy and tried to multiply all three brackets together at once.

Question 13

This question was not generally well answered. However, there were a significant number of the more able students who were able to gain full marks.

In part (a) most students attempted to draw lines on the grid but only a minority of the scripts seen contained diagrams with at least two of the lines $x = 2$, $y = x + 3$, $2x + 3y = 6$ drawn correctly. This was the minimum requirement to gain any credit in this part of the question. The line $x = 2$ was often seen drawn incorrectly as $y = 2$. About one in ten of students obtained full marks in part (a).

Part (b) of the question attracted an encouraging number of responses which examiners could give credit for. To score the mark in part (b), students were expected to state that Geoffrey was not correct and give a reason for their response. Examiners accepted a range of possible reasons equivalent to stating that the point with coordinates (2, 4) was in fact in the region or that it satisfied the inequalities given. There were many excellent responses from students who clearly showed they had a very good understanding of the situation by referring to the equals signs in the inequalities or to the solid lines in the diagram.

Question 14

This question was answered well by a significant proportion of students who produced a logically written and accurate solution, accompanied by clear reasons. Just under a half of all students scored some marks for their answers. However, many students either did not attempt the question or used incorrect assumptions or results. Most common among these were assuming that angle *BDE* and angle *BFE* were right angles or that "opposite angles of a cyclic quadrilateral are equal" leading to the belief that angle *DBF* was 100°. There were two possible routes to a correct solution and both were used by a good number of students. Students who scored part marks usually either failed to give adequate reasons for their working or could not complete the last stage in their reasoning to find the size of angle *ABD* successfully. A typical example of this was where a student successfully found the size of angles *DBF* and *BFD* but could not recall or use the alternate segment theorem.

Question15

About a quarter of students provided a clear proof in answer to this question. Sometimes the lack of any indication that values used were recurring decimals spoiled a student's working. Examiners accepted a dot above a 3 (eg $73.\dot{3}$) or dots at the end of a number (eg 73.3…) to signify a recurring decimal. Terminating decimals such as 73.33 were not accepted as part of a proof. A small number of students resorted to a purely numerical approach dividing 11 by 15 to show this gave $0.7\dot{3}$. This approach could not, of course, be given any credit and students are advised to follow the request to "prove algebraically" in similar questions set in the future.

Question 16

Many students worked out an estimate for the distance the car travelled by drawing a triangle under the curve, perhaps the expected approach. Working written by these students was generally accurate and the answers 132 and 135 within the given range and scoring two marks in part (a) were common. Unfortunately, as many if not more students merely multiplied either 8.8 or 9 by 30. This estimate was viewed as being too far from the actual distance travelled and did not convince examiners that students realized that the area under the curve gives the distance travelled. Some students used more than 1 triangle, for example using 2 strips and requiring the student to find the total area of a triangle and a trapezium. This method, an example of one providing a better estimate than when using a single triangle, was, of course, awarded full marks provided it was accurately carried out.

Answers to part (b) were often well expressed. The mark was awarded for a clear answer linked to an acceptable method for estimating the area in part (a). Vague answers such as "an underestimate because of the curve" could not be given the mark. Some students based their answers on the effects of rounding values of the speed rather than comparing the estimate calculated for the area under the curve with the exact area.

Part (c) was answered correctly only by better students who focused on the need to draw the tangent to the curve at time 60 seconds or on calculating the gradient of the curve at this point (or both). Many students attempting to answer this part of the question restricted their answers to a discussion of rounding. This was not accepted as an explanation worth crediting.

Question 17

It was relatively rare to see a fully correct solution to this question with the consequent award of 4 marks. However, many more students were able to access the two marks for correct processes to work out the frequencies represented by each bar. These marks were given provided that these frequencies were linked to the method leading to the student's final answer. As is often the case with a question involving a histogram, weaker students often used the heights of the bars as frequencies and so no marks could be awarded.

Question 18

Very few students showed a full understanding of what was required to answer this question. The award of any marks was generally limited to the one mark for the appreciation that finding the lower bound for the length of the cube requires a bound (11.25) to be used for the length of the diagonal *AH*. About a half of all students gained this mark. It was rare to see students use Pythagoras' rule correctly in this context of three dimensions. Students who tried to make further progress often either assumed incorrectly that the lengths of *AF* and *FH* were equal or that the size of angles *FAH* and *FHA* were both 45°.

Question 19

There were some excellent responses to this question from the most able students taking this paper but these were few and far between. Able students who were unable to get as far as the given result were sometimes able to score some marks for successfully finding expressions for the area of part of a hexagon or for a whole hexagon, whether it be *ABCDEF* or *FGHIJK*. Where this applied, students usually used trigonometry to find the height of a constituent triangle and then its area by using $\frac{1}{2} \times$ base $\times$ height or they found an area using the formula $\frac{1}{2}ab\sin C$.

Some weaker students used the given result and tried to justify it by using substitution or by algebraic manipulation whilst other students seemed to think that the question revolved around finding angles of a polygon. No marks could be awarded for these approaches.

Question 20

This question was often not attempted but it also proved to be a good discriminator between the most able students. The most common incorrect answer seen was 98. Less than 1 in 10 of students were able to give the correct answer.

Question 21

Though a significant proportion of students did not attempt this question, many of those students who did attempt it scored 1 or more marks, usually for a correct first step in either part (a) or part (b) or in both parts.

In part (a) many students isolated terms in one variable, usually showing $4c = 3d$. However, a great majority of these students then gave the final answer 4 : 3 rather than the correct answer 3 : 4.

Part (b) was done less well but some students scored one mark, usually for taking all terms to one side of the equation. Hardly any students made any progress by using the method of dividing throughout by one variable. A few students included factorisation as part of their solution in part (b). Success here led to the award of at least two marks in this part.

Summary

Based on their performance on this paper, students are offered the following advice:

- Check on the answers to calculations, so for example you should expect the mass of a red blood cell to be a small number
- practise less straightforward cases of finding the volume of a prism
- learn standard techniques involving combined transformations, for example the identification of the single equivalent transformation
- improve your skills in dealing with algebraic fractions, particularly in deciding when a fraction is in its simplest form and cannot be “cancelled” further
- practise questions which involve the use and interpretation of graphs, for example questions 6, 11, 13, 16 and 17 on this paper

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