



Mark Scheme (Results)

Summer 2026

Pearson Edexcel International GCSE In Mathematics A
4MA1/2HR

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- 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.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

- **Types of mark**

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

- **Abbreviations**

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

- awrt – answer which rounds to
- eooo – each error or omission

- **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.

- **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.

If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review. If there is a choice of methods shown, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown. If there is no answer on the answer line then check the working for an obvious answer.

- **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.

- **Parts of questions**

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

International GCSE Maths				
Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.				
Q	Working	Answer	Mark	Notes
1	$(x^2 =) 48^2 + 20^2 (= 2704)$ oe or $\tan^{-1}\left(\frac{20}{48}\right) (= 22.6(198\dots))$ and $\cos 22.6^\circ = \frac{48}{x}$ oe or $\tan^{-1}\left(\frac{48}{20}\right) (= 67.3(801\dots))$ and $\sin 67.3^\circ = \frac{48}{x}$ oe or $\tan^{-1}\left(\frac{20}{48}\right) (= 22.6(198\dots))$ and $\frac{x}{\sin 90^\circ} = \frac{20}{\sin 22.6^\circ}$ oe or $\tan^{-1}\left(\frac{48}{20}\right) (= 67.3(801\dots))$ and $\frac{x}{\sin 90^\circ} = \frac{48}{\sin 67.3^\circ}$ oe or $(x^2 =) 48^2 + 20^2 - (2 \times 48 \times 20 \times \cos 90^\circ) (= 2704)$ oe		3	M1 Allow the use of different trigonometrical techniques to find 52
	$(x =) \sqrt{48^2 + 20^2} (= \sqrt{2704})$ oe or $(x =) \frac{48}{\cos 22.6^\circ}$ oe or $(x =) \frac{48}{\sin 67.3^\circ}$ oe or $(x =) \frac{20}{\sin 22.6^\circ} (\times \sin 90^\circ)$ oe or $(x =) \frac{48}{\sin 67.3^\circ} (\times \sin 90^\circ)$ oe or $(x =) \sqrt{2304 + 400} (= \sqrt{2704})$			M1
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	52		A1 cao
				Total 3 marks

1 ALT	$(x^2 =) \sqrt{5^2 + 12^2} (= \sqrt{169} = 13) \text{ oe}$		3	M1 for recognising a Pythagorean triple
	$(x =) "13" \times \frac{20}{5} \text{ oe or}$ $(x =) "13" \times \frac{48}{12} \text{ oe}$			M1
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	52		A1 cao
				Total 3 marks

2			2	M1 for $-6n + k$ ($k \neq 20$) or $k - 6n$ or $-6 \times n + k$ ($k \neq 20$) or $n \times -6 + k$ ($k \neq 20$) (k may be zero or absent)
		$-6n + 20$		A1 oe e.g. $20 - 6n$ or $14 - 6(n - 1)$ oe or $14 - 6n + 6$ oe or $14 + (n - 1) \times -6$ oe or $-6 \times n + 20$ oe or $n \times -6 + 20$ oe NB: award full marks for eg “ $x =$ ” $-6n + 20$ oe or “ $x =$ ” $n \times -6 + 20$ oe or “ $x =$ ” $-6 \times n + 20$ oe or n th term = $-6n + 20$ oe or n th term = $-6 \times n + 20$ oe or n th term = $n \times -6 + 20$ oe “ x ” can be U_n or T_n or a_n etc but only M1A0 for $n = -6n + 20$ oe
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>			Total 2 marks

3		5 7 8 9 10 11	1	B1 in any order and no repeats and no extras
				Total 1 mark

4	(a)	$3x+6=1-5x$ oe or $x+2=\frac{1}{3}-\frac{5}{3}x$ oe or $x+2=\frac{1-5x}{3}$ oe		3	M1 for expansion of the bracket on the LHS in a correct equation or dividing the RHS by 3 in a correct equation
		$3x+5x=1-6$ oe or $8x=-5$ oe or $6-1=-5x-3x$ oe or $5=-8x$ oe or $x+\frac{5}{3}x=\frac{1}{3}-2$ oe or $\frac{8}{3}x=-\frac{5}{3}$ oe or $2-\frac{1}{3}=-\frac{5}{3}x-x$ oe or $\frac{5}{3}=-\frac{8}{3}x$ oe			M1 ft (dep on 4 terms) for terms in x on one side of the equation and numerical terms on the other side
		<i>Working required</i>	$-\frac{5}{8}$		A1 (dep on M1) oe eg -0.625
	(b)	$49 \pm \dots$ or $\dots - 15$ or $(-7)^2 - 5 \times 3$ oe or $(-7)^2 - 5(3)$ oe or $-7 \times -7 - 5 \times 3$ oe or $-7 \times -7 - 5(3)$ oe		2	M1 for either 49 or -15 shown in the correct place or the correct substitution shown with brackets around -7 Allow 7^2 for $(-7)^2$
		<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	34		A1 SC B1 for -64
	(c)		1	1	B1 cao
	(d)		$64r^6t^3$	2	B2 for $64r^6t^3$ (B1 a single product with 2 of 64, r^6 , t^3 correct eg $64r^6t^n$ where $n \neq 3$ or $64r^m y^3$ where $m \neq 6$ or pr^6t^3 where $p \neq 64$. One term can be missing with 2 correct for B1 eg $64r^6$ or $64t^3$ or $(4)r^6t^3$ or $a r^6 b t^3$ where a and b are integers as long as not added to any other terms)
					Total 8 marks

5*	400 ÷ (2 + 3) (= 80) oe or $400 \times \frac{2}{2+3}$ (= 160) oe	M2 for $400 \times \frac{3}{2+3}$ (= 240)		5	M1
	3 × “80” (= 240) oe or 400 – (2 × “80”) (= 240) oe or 400 – “160” (= 240)				M1 for a complete method for the amount Sarah gives to Charity B
	375 ÷ (1 + 2) (= 125) oe	M2 for $375 \times \frac{2}{3}$ (= 250)			M1
	2 × “125” (= 250) oe or 375 – “125” (= 250)				M1 for a complete method for the amount Dej gives to Charity B
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>		10		A1
					Total 5 marks

6*	5^{th} (card/number) = 8 or 1^{st} (card/number) = 1 or $8 - 7 (= 1)$		4	M1 8 may be written in or by the 5^{th} card or 1 for the first card indicated
	$31 - (1 + 3 + 7 + 8 + 8) (= 4)$ oe or $31 - 27 (= 4)$ oe or $1 + 3 + x + 7 + 8 + 8 = 31$ oe or 			M1 dep on 1 and 8 found
	$\frac{[\text{their } 4] + 7}{2}$ oe or $2 + 3.5$ oe or $7 - ((7 - [\text{their } 4]) \div 2)$ oe or $7 - 1.5$ oe or $4 + ((7 - [\text{their } 4]) \div 2)$ oe or $4 + 1.5$ oe			M1 indep provided $3 \leq [\text{their } 4] \leq 7$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	5.5		A1 cao oe eg $\frac{11}{2}$ or $5\frac{1}{2}$ provided 1, 4 and 8 have been correctly found
				Total 4 marks

7*	(a)		0.00004	1	B1
	(b)	$12 \times 10^{158+72}$ or $2 \times 6 \times 10^{230}$ or 12×10^{230} oe eg 120×10^{229} or 0.12×10^{232} 1.2×10^n where $n \neq 231$		2	M1
		<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	1.2×10^{231}		A1
					Total 3 marks

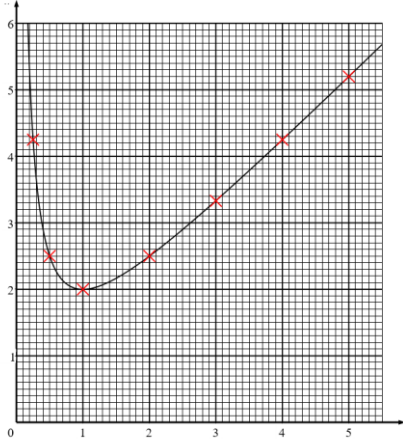
8*		$1 + 0.04 (= 1.04)$ oe or $x + 0.04x = 36\,400$ oe or $100(\%) + 4(\%) (= 104(\%))$ oe or $\frac{36\,400}{104} (= 350)$ oe		3	M1 Do not accept $(1 + 4\%)$ unless it leads to a correct answer
		$36\,400 \div "1.04"$ oe or $36\,400 \div \frac{"104"}{100}$ oe or $36\,400 \times \frac{100}{"104"}$ oe or "350" $\times 100$ or $36\,400 - (4 \times "350")$ oe			M1
		<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	35 000		A1
					Total 3 marks

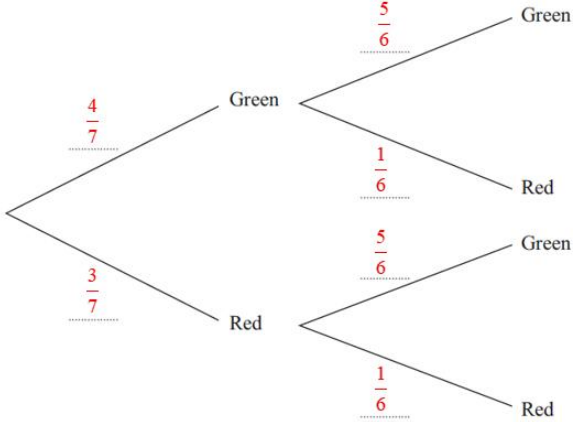
9	$198 \times 1000 (= 198\,000)$ oe or $\frac{198}{60 \times 60} \left(= \frac{198}{3600} = \frac{11}{200} = 0.055 \right)$ or $\frac{60 \times 60}{1000} \left(= \frac{3600}{1000} = \frac{18}{5} = 3.6 \right)$ oe or $\frac{1000}{60 \times 60} \left(= \frac{1000}{3600} = \frac{5}{18} = 0.277(777...) \right)$ oe		3	M1 for one of $\times 1000$ or $(\div 60 \div 60)$ or $\div 3600$ or $\div (60 \times 60)$ ie correct conversion of distance units or time units
	$\frac{"198\,000"}{60 \times 60} \left(= \frac{"198\,000"}{3600} = \frac{1980}{36} \right)$ oe or "0.055" $\times 1000$ oe or $198 \div "3.6"$ oe or $198 \times \frac{5}{18}$ oe			M1 for a complete method
	<i>Working required</i>	55		A1 cao dep on M1
				Total 3 marks

10	$(V =) \pi \times 4^2 \times 11 (= 176\pi = 552(.920...))$		3	M1 Accept 552.6 – 553.2 Allow 3.14.... or $\frac{22}{7}$ for π NB the value of the volume may be embedded in $d = \frac{m}{V}$ oe Do not award this mark for using $(V =) \frac{1}{3} \times \pi \times r^2 \times h$
	$0.6 = \frac{m}{"552"}$ oe or $(m =) 0.6 \times "552"$ oe or $\frac{528\pi}{5}$ oe or 105.6π oe			M1
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	332		A1 allow 331 – 332
				Total 3 marks

11	$\sqrt{36}(=6)$ or 6×6 or 6^2		5	M1
	$\tan 25 = \frac{FG}{"6"}$ oe or $\tan(90 - 25) = \frac{"6"}{FG}$ oe or $\cos 25 = \frac{"6"}{EF}$ oe or $\sin(90 - 25) = \frac{"6"}{EF}$ oe or $\frac{FG}{\sin 25} = \frac{6}{\sin(90 - 25)}$ oe FG or EF can be labelled with any letter			M1ft [their EG] for “6” If the first M mark is not awarded [their EG] may be 9 with or without labelling or [their EG] may be any other length but must be labelled on the diagram or clearly labelled as EG eg $\tan 25 = \frac{FG}{[\text{their } EG]}$
	$(FG =) "6" \times \tan 25 (= 2.79(784...))$ oe or $(FG =) \frac{"6"}{\tan(90 - 25)} (= 2.79(784...))$ oe or $(EF =) \frac{"6"}{\cos 25} (= 6.6(2026...))$ oe or $(EF =) \frac{"6"}{\sin(90 - 25)} (= 6.6(2026...))$ oe or $(EF =) \sqrt{"6"{}^2 + "2.79..."{}^2} (= 6.6(2026...))$ oe or $(FG =) \sqrt{"6.62..."{}^2 - "6"{}^2} (= 2.79(784...))$ oe or $(FG =) \frac{6}{\sin(90 - 25)} \times \sin 25 (= 2.79(784...))$ oe			M1ft [their EG] for “6” eg $(FG =) [\text{their } EG] \times \tan 25$ Allow 2.8 or better for FG
	$0.5 \times "6" \times "2.79"$ oe or $0.5 \times "6" \times "2.79" \times \sin 90$ oe or $0.5 \times "6" \times "6.6" \times \sin 25$ oe or $0.5 \times "6.6" \times "2.79" \times \sin(90 - 25)$ oe			M1ft [their EG] for “6”
	Working required	8.4		A1 dep on M2 allow in the range 8.3 – 8.4
				Total 5 marks

12*		$x \leq 0$	1	B1oe allow $<$ in place of $\leq$ Accept $0 \geq x$ oe Accept $-4 \leq x \leq 0$ oe
		$2x + 5y \leq 12$	1	B1oe allow $<$ in place of $\leq$ Accept $y \leq -\frac{2}{5}x + \frac{12}{5}$ oe
		$y \geq -x$	1	B1oe allow $>$ in place of $\geq$ Accept $x \geq -y$ oe or $-x \leq y$ oe or $y + x \geq 0$ oe
				If no marks have been awarded then SCB2 for identifying the outside region eg $x \geq 0$ and $2x + 5y \geq 12$ and $y \leq -x$ oe Allow $<$ in place of $\leq$ Allow $>$ in place of $\geq$
				Total 3 marks

13	(a)	<table><tr><td>x</td><td>0.25</td><td>0.5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>4.25</td><td>2.5</td><td>2</td><td>2.5</td><td>3.33</td><td>4.25</td><td>5.2</td></tr></table>	x	0.25	0.5	1	2	3	4	5	y	4.25	2.5	2	2.5	3.33	4.25	5.2	2.5 2 4.25 5.2	2	B2 for all correct (B1 for 2 or 3 correct) NB Allow equivalent fractions for 2.5, 4.25 and 5.2
x	0.25	0.5	1	2	3	4	5														
y	4.25	2.5	2	2.5	3.33	4.25	5.2														
	(b)	 <p>Use overlay</p>		2	M1 ft their table for at least 6 points plotted correctly (tolerance within or on the circles on the overlay)																
		Correct answer scores full marks (unless from obvious incorrect working)	Correct graph		A1 for a fully correct graph – a smooth curve that passes within or on all the circles on the overlay (be generous if intention is clearly a smooth curve within tolerance) Ignore curve drawn for $x < 0.25$ and $x > 5$																
					Total 4 marks																

14 (a)		$\frac{4}{7}, \frac{3}{7}$ $\frac{5}{6}, \frac{1}{6}$ $\frac{5}{6}, \frac{1}{6}$	2 B2 for all 3 correct pairs of probabilities on the correct branches (B1 for 1 correct pair of probabilities on the correct branch) Allow $\frac{4}{7} = 0.57(142\dots)$, $\frac{3}{7} = 0.42(857\dots)$, $\frac{5}{6} = 0.83(333\dots)$, $\frac{1}{6} = 0.16(666\dots)$ Allow decimals/percentages to at least 2 sf truncated or rounded
(b)	$\frac{4}{7} \times \frac{5}{6}$ oe or $1 - \left(\frac{4}{7} \times \frac{1}{6} + \frac{3}{7} \times \frac{5}{6} + \frac{3}{7} \times \frac{1}{6} \right)$ oe		2 M1ft (probabilities < 1) for a complete method
		$\frac{20}{42}$	A1ft oe eg $\frac{10}{21}$ or 0.47(619...) or 47(.619...) % truncated or rounded

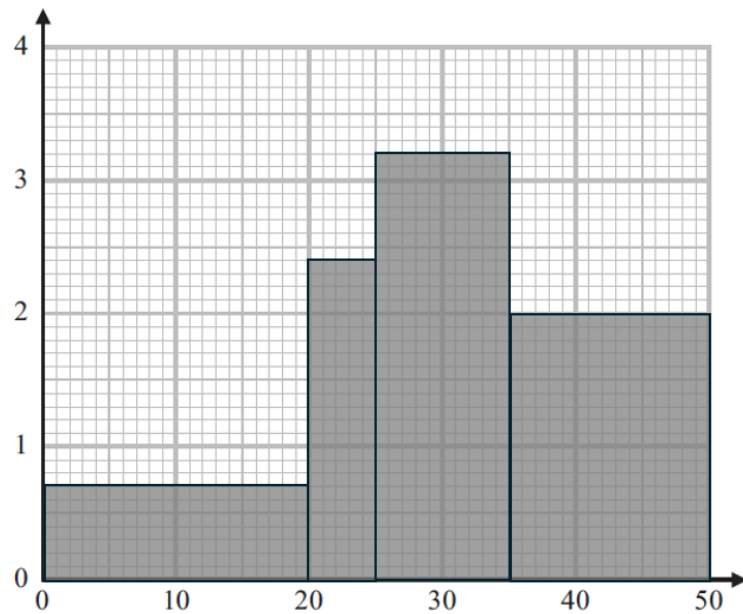
(c)	$\frac{3}{7} \times \frac{1}{6} \times P(R_C) = \frac{3}{70} \text{ oe or } \frac{3}{42} \times P(R_C) = \frac{3}{70} \text{ oe or}$ $\frac{3}{70} \div \left(\frac{3}{7} \times \frac{1}{6} \right) \left(= \frac{3}{5} \right) \text{ oe or } \frac{3}{70} \div \frac{3}{42} \left(= \frac{3}{5} \right)$		4	<p>M1 Allow any variable for R_c</p> <p>NB $\frac{3}{5}$ oe may be labelled correctly on the tree diagram</p> <p>Allow decimals/percentages to at least 2 sf truncated or rounded</p>
	$P(G_A R_B R_C) = \frac{4}{7} \times \frac{1}{6} \times \frac{3}{5} \left(= \frac{12}{210} = \frac{2}{35} = 0.057(142...) \right) \text{ oe or}$ $P(R_A G_B R_C) = \frac{3}{7} \times \frac{5}{6} \times \frac{3}{5} \left(= \frac{45}{210} = \frac{3}{14} = 0.21(428...) \right) \text{ oe or}$ $P(R_A R_B G_C) = \frac{3}{7} \times \frac{1}{6} \times \frac{2}{5} \left(= \frac{6}{210} = \frac{1}{35} = 0.028(571...) \right) \text{ oe}$ $P(G_A G_B G_C) = \frac{4}{7} \times \frac{5}{6} \times \frac{2}{5} \left(= \frac{40}{210} = \frac{4}{21} = 0.19(047...) \right) \text{ oe or}$ $P(G_A G_B R_C) = \frac{4}{7} \times \frac{5}{6} \times \frac{3}{5} \left(= \frac{60}{210} = \frac{2}{7} = 0.28(571...) \right) \text{ oe or}$ $P(G_A R_B G_C) = \frac{4}{7} \times \frac{1}{6} \times \frac{2}{5} \left(= \frac{8}{210} = \frac{4}{105} = 0.038(095...) \right) \text{ oe or}$ $P(R_A G_B G_C) = \frac{3}{7} \times \frac{5}{6} \times \frac{2}{5} \left(= \frac{30}{210} = \frac{1}{7} = 0.14(285...) \right) \text{ oe}$			<p>M1 dep on previous M1 for one product from</p> <p><i>GRR or RGR or RRG or GGG or GGR or GRG or RGG</i></p> <p>NB $P(R_A R_B R_C)$ is given as $\frac{3}{70}$ in the question</p>
	$\frac{12}{210} + \frac{45}{210} + \frac{6}{210} \text{ oe or}$ $\left(\frac{40}{210} + \frac{60}{210} + \frac{8}{210} + \frac{30}{210} + \frac{3}{70} \right) \left(= \frac{7}{10} = 0.7 \right) \text{ oe}$			M1 dep on previous M1
		$\frac{3}{10}$		A1 oe $\frac{63}{210}$ or 0.3 or 30%
				Total 8 marks

15*	3 and 13		2	M1 for identifying 3 and 13 (and 9) only (condone 9 also indicated in list)
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	10		A1
				Total 2 marks

16	$(\sqrt{a})^{-6}$ or $a^{-\frac{1}{2}}$ or $\frac{1}{a^{\frac{6}{2}}}$ or $\frac{1}{a^3}$ or $a^{-\frac{6}{2}}$ oe or $1 = a^n \times a^{\frac{6}{2}}$ oe		2	M1 Condone missing brackets around $\sqrt{a}$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	-3		A1 cao Allow a^{-3}
				Total 2 marks

17	<p>eg $\begin{array}{r} (1000x =) 814.814... \\ \underline{ (x =) 0.814...} \end{array}$</p> <p>or $\begin{array}{r} (10\ 000x =) 8148.14... \\ \underline{ (10x =) 8.14...} \end{array}$</p> <p>or $\begin{array}{r} (100\ 000x =) 81481.4... \\ \underline{ (100x =) 81.4...} \end{array}$</p> <p>or $\begin{array}{r} (1000\ 000x =) 814814... \\ \underline{ (1000x =) 814...} \end{array}$</p>		2	<p>M1 for 2 correct recurring decimals that when subtracted should give a whole number or terminating decimal with <u>intention to subtract</u>. (ie may give 814 or 8140 or 81400 or 814000 etc)</p> <p>eg $(1000x =) 814.814....$ and $(x =) 0.814....$</p> <p>or $(10\ 000x =) 8148.14....$ and $(10x =) 8.14....$</p> <p>or $(100\ 000x =) 81481.4....$ and $(100x =) 81.4....$</p> <p>with intention to subtract. x is not required to award this mark (If recurring dots not shown in both numbers then showing at least one of the numbers to at least 6sf) NB Accept bar notation for dot notation to indicate recurring decimals</p>
	<p>eg $1000x - x = 814.814... - 0.814... = 814$ and $\frac{814}{999} = \frac{22}{27}$</p> <p>or $10\ 000x - 10x = 8148.14... - 8.14... = 8140$ and $\frac{8140}{9990} = \frac{22}{27}$</p> <p>or $100\ 000x - 100x = 81481.4... - 81.4... = 81400$ and $\frac{81400}{99900} = \frac{22}{27}$</p>	Shown		<p>A1 for completion to $\frac{22}{27}$ dep on M1 and must use algebra for this final mark to be awarded</p> <p>No algebra used gets a maximum of 1 mark</p>
	<i>Working required</i>			Total 2 marks

19	$14 \div 20 (= 0.7)$ $12 \div 5 (= 2.4)$ $32 \div 10 (= 3.2)$ $30 \div 15 (= 2)$ USE THE OVERLAY	Correct histogram	3	<p>B3 for a fully correct histogram</p> <p>B2 for 3 correct frequency density calculations (can be implied by heights/points plotted within the interval) or 3 correct bars drawn</p> <p>B1 for 2 correct frequency density calculations (can be implied by heights/points plotted within the interval) or 2 correct bars drawn</p> <p>SCB2 for 4 bars with correct widths and heights in the correct ratio (eg drawn at 0.35, 1.2, 1.6, 1)</p> <p>SCB1 for 3 bars with correct widths and heights in the correct ratio (eg drawn at 0.35, 1.2, 1.6, 1)</p> <p>Allow $\pm$half square tolerance for heights</p>
				Total 3 marks



20*	$4y - 2xy = 3x + 5$ oe		3	M1 for multiplying by the denominator and expanding the bracket in a correct equation
	$4y - 5 = 3x + 2xy$ or $-3x - 2xy = -4y + 5$			M1 ft for collecting terms in x on one side and other terms on the other side ft for equations with 2 terms in x and 2 other terms
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$x = \frac{4y - 5}{3 + 2y}$		A1 oe eg $x = \frac{-4y + 5}{-3 - 2y}$ NB for A1 we must see $x = \frac{4y - 5}{3 + 2y}$ oe in working if $\frac{4y - 5}{3 + 2y}$ oe alone is given as an answer
				Total 3 marks

21	$6.6 - 0.05$ or 6.55 or $6.6 + 0.05$ or 6.65 or $2.8 - 0.05$ or 2.75 or $2.8 + 0.05$ or 2.85 or $0.47 - 0.005$ or 0.465 or $0.47 + 0.005$ or 0.475		3	B1 for one correct bound Allow $6.64\dot{9}$ or $6.64\bar{9}$ for 6.65 Allow $2.84\dot{9}$ or $2.84\bar{9}$ for 2.85 Allow $0.474\dot{9}$ or $0.474\bar{9}$ for 0.475 The value of each bound may be embedded in $p = \frac{d - e}{f}$
	$\frac{6.55 - 2.85}{0.475}$ or $\frac{6.6 - 0.05 - (2.8 + 0.05)}{0.47 + 0.005}$			M1 for correct substitution into the <i>LB</i> of p (= 7.789473...) $\frac{LB_d - UB_e}{UB_f}$ where $6.55 \leq LB_d < 6.6$ $2.8 < UB_e \leq 2.85$ $0.47 < UB_f \leq 0.475$
	<i>Working required</i>	7.79		A1 awrt 7.79 dep on M1 and all 3 correct bounds
				Total 3 marks

22*	eg $(3x-5)^2 = x^2 + 7$ oe or $(3x-5-x)(3x-5+x) = 7$ oe	eg $y^2 = \left(\frac{y+5}{3}\right)^2 + 7$ oe		5	M1 for substitution of $y = 3x - 5$ into $y^2 = x^2 + 7$ to obtain an equation in x only or for substitution of $x = \frac{\pm y \pm 5}{3}$ into $y^2 = x^2 + 7$ to obtain an equation in y only
	eg $8x^2 - 30x + 18 (= 0)$ oe or $4x^2 - 15x + 9 (= 0)$ oe	eg $8y^2 - 10y - 88 (= 0)$ oe or $4y^2 - 5y - 44 (= 0)$ oe			M1ft dep on previous M1 for multiplying out and collecting terms, forming a 3-term quadratic in any form of $ax^2 + bx + c (= 0)$ where at least 2 coefficients (a or b or c) are correct
	eg $(4x-3)(x-3)(= 0)$ or $x = \frac{- -15 \pm \sqrt{(-15)^2 - 4 \times 4 \times 9}}{2 \times 4}$ or $\left(x - \frac{15}{8}\right)^2 - \left(\frac{15}{8}\right)^2 = -\frac{9}{4}$ oe or $x = \frac{3}{4}$ and $x = 3$ oe	eg $(4y+11)(y-4)(= 0)$ or $y = \frac{- -5 \pm \sqrt{(-5)^2 - 4 \times 4 \times -44}}{2 \times 4}$ or $\left(y - \frac{5}{8}\right)^2 - \left(\frac{5}{8}\right)^2 = \frac{44}{4}$ oe or $y = -\frac{11}{4}$ and $y = 4$ oe			M1ft dep on first M1 method to solve their 3-term quadratic using any correct method (allow one sign error and some simplification – allow as far as eg $\frac{15 \pm \sqrt{225 - 144}}{8}$ or $\frac{5 \pm \sqrt{25 + 704}}{8}$ or if factorising allow brackets which expanded give 2 out of 3 terms correct) or correct values for x or correct values for y
	$y = 3 \times \frac{3}{4} - 5 \left(= -\frac{11}{4} \right)$ oe and $y = 3 \times 3 - 5 (= 4)$	$x = \frac{-\frac{11}{4} + 5}{3}$ oe and $x = \frac{4 + 5}{3}$			M1ft dep on previous M1 for substituting their 2 found values of x or y into one of the two given equations or fully correct values for the other variable (correct labels for x / y) or for one correct pair of values
			$x = \frac{3}{4}, y = -\frac{11}{4}$ $x = 3, y = 4$		A1 oe dep on M2 for all 4 values (allow coordinates) accept decimals
	Working required				Total 5 marks

23*	$\sqrt[3]{125} : \sqrt[3]{216} (= 5 : 6)$ oe or $\sqrt[3]{216} : \sqrt[3]{125} (= 6 : 5)$ oe or $\frac{\sqrt[3]{216}}{\sqrt[3]{125}} \left(= \frac{6}{5} \right)$ oe or $\frac{\sqrt[3]{125}}{\sqrt[3]{216}} \left(= \frac{5}{6} \right)$ oe or $L = \frac{\sqrt[3]{216}}{\sqrt[3]{125}} K$ oe or $K = \frac{\sqrt[3]{125}}{\sqrt[3]{216}} L$ oe or $L = \frac{6}{5} K$ oe or $K = \frac{5}{6} L$ oe		5	M1 for correct linear scale factor for K and L . May be given as a fraction or a ratio or a decimal or may be stated eg 5 and 6 or setting up an equation between the lengths of K and L NB Accept 0.83(333...) for $\frac{5}{6}$
	$\sqrt{4} : \sqrt{9} (= 2 : 3)$ oe or $\sqrt{9} : \sqrt{4} (= 3 : 2)$ oe or or $\frac{\sqrt{9}}{\sqrt{4}} \left(= \frac{3}{2} \right)$ oe or $\frac{\sqrt{4}}{\sqrt{9}} \left(= \frac{2}{3} \right)$ oe or or $K = \frac{\sqrt{4}}{\sqrt{9}} M$ oe or $M = \frac{\sqrt{9}}{\sqrt{4}} K$ oe or $K = \frac{2}{3} M$ oe or $M = \frac{3}{2} K$ oe			M1 indep for correct linear scale factor for K and M . May be given as a fraction or a ratio or a decimal or may be stated eg 3 and 2 or setting up an equation between the lengths of K and M NB Accept 0.66(666...) for $\frac{2}{3}$
	(K : L =) 10 : 12 oe and (K : M =) 10 : 15 oe or (K : L : M =) 10 : 12 : 15 oe eg 5 : 6 : 7.5 or : 12 : 15 or (L : M =) 12 : 15 oe eg 6 : 7.5 or $L \times \frac{5}{6} = M \times \frac{2}{3}$ oe or $L \times \frac{3}{2} = M \times \frac{6}{5}$ oe			M1 implies the previous M2 for finding two linear scale factor (ratios) where the value for K is equal for a comparison or (K :) L : M scale factor ratio or setting up an equation between the lengths of M and L SCB3 for a student who gains M2 and gives the answer of 20(%)
	eg $\frac{15-12}{12} (= 0.25)$ oe or $\frac{15}{12} (= 1.25)$ oe or $\frac{15}{12} \times 100 (= 125)$ oe or $\frac{15-12}{12} \times 100$ oe			M1 dep on M2 for a correct method to find 0.25 or 1.25 or 125 or for a complete method to find the value of y
	<i>Working required</i>	25		A1 dep on M2
				Total 5 marks

24	$2 \times \pi \times 4.5 \times \frac{\theta}{360} = \frac{3}{10} \pi$ oe or $\pi \times 9 \times \frac{\theta}{360} = \frac{3}{10} \pi$ oe or $\frac{2 \times \pi \times 4.5}{\frac{3}{10} \pi}$ oe		4	M1 for setting up an equation for the arc length or a calculation leading to the number of sides
	$(\theta =) 12$ or $(n =) 30$			A1
	$\left(\frac{360}{12} - 2 \right) \times 180$ oe or $\frac{360}{12} \times (180 - 12)$ oe or $(30 - 2) \times 180$ oe or $30 \times (180 - 12)$ oe or			M1 for a complete correct method to finding the sum of the interior angles using 12 or 30
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	5040		A1
				Total 4 marks

25* (a)		$a = -3$ $b = 90$	2	B2 for $a = -3$ and $b = 90$ (B1 for $a = -3$ or $b = 90$) SCB1 for $a = 3$ and $b = -90$
(b)		$\left(\frac{1}{2}p, q+5\right)$	2	B2 for $\left(\frac{1}{2}p, q+5\right)$ oe B1 for $\left(\frac{1}{2}p, Y\right)$ or $(X, q+5)$ or $\left(q+5, \frac{1}{2}p\right)$ Allow Q for q and P for p
				Total 4 marks

26*	$(d =) 3$		6	M1 May be embedded in S_n or S_{2n} or an expression in the form $3n \pm \dots$ oe or an expression in the form $a + (n - 1)3$ oe	
	$(S_{2n} =) \frac{2n}{2} [2(k + 2) + (2n - 1)3] (= n(2k + 6n + 1))$ oe or $(S_{2n} =) \frac{2n}{2} [2a + (2n - 1)3] (= n(2a + 6n - 3))$ oe			M1	M2 for $d = 2a$ oe or $d = 2(k + 2)$ oe
	$\frac{2n}{2} [2(k + 2) + (2n - 1)3] = 4 \times \frac{n}{2} [2(k + 2) + (n - 1)3]$ oe or $n(2k + 6n + 1) = 4 \times \frac{n}{2} (2k + 3n + 1)$ oe or $n(2k + 6n + 1) = n(4k + 6n + 2)$ oe or $\frac{2n}{2} [2a + (2n - 1)3] = 4 \times \frac{n}{2} [2a + (n - 1)3]$ oe or $n(2a + 6n - 3) = 4 \times \frac{n}{2} (2a + 3n - 3)$ oe or $n(2a + 6n - 3) = n(4a + 6n - 6)$ oe			M1 dep on M2 for using $S_{2n} = 4 \times S_n$ oe S_{2n} and S_n must be correct initially	
	$k = -0.5$ or $a = 1.5$			A1 dep on M3 oe	
	$-0.5 + 2 + (100 - 1)3$ oe or $1.5 + (100 - 1)3$ oe			M1 for substituting the correct value of $d = 3$ and $k = -0.5$ or $a = 1.5$	
	<i>Working required</i>	298.5		A1 dep on M3 oe eg $\frac{597}{2}$	
				Total 6 marks	

26 ALT	eg $n = 1$ $(S_2 =) k + 2 + k + 5 (= 2k + 7)$ oe or $(S_2 =) a + a + 3 (= 2a + 3)$ oe	eg $n = 2$ $(S_4 =) k + 2 + k + 5 + k + 8 + k + 11 (= 4k + 26)$ oe or $(S_4 =) a + a + 3 + a + 6 + a + 9 (= 4a + 18)$ oe		6	M1
	$(4 \times S_1 =) 4 \times (k + 2)$ oe or $(4 \times S_1 =) 4 \times a$ oe	$(4 \times S_2 =) 4 \times (k + 2 + k + 5) (= 8k + 28)$ oe or $(4 \times S_2 =) 4 \times (a + a + 3) (= 8a + 12)$ oe			M1
	$2k + 7 = 4 \times (k + 2)$ oe or $2a + 3 = 4 \times a$ oe	$4k + 26 = 8k + 28$ oe or $4a + 18 = 8a + 12$ oe			M1 dep on M2 for using $S_2 = 4 \times S_1$ oe or $S_4 = 4 \times S_2$ oe NB S_2 and S_1 or S_4 and S_2 must be correct initially
	$k = -0.5$ or $a = 1.5$				A1 dep on M3 oe
	$-0.5 + 2 + (100 - 1)3$ oe or $1.5 + (100 - 1)3$ oe				M1 for substituting the correct value of $d = 3$ and $k = -0.5$ or $a = 1.5$
	<i>Working required</i>		298.5		A1 dep on M3 oe eg $\frac{597}{2}$
					Total 6 marks

27	$\left(1 + \frac{x}{100}\right)\left(1 + \frac{2x}{100}\right)$ oe or $\left(\frac{100+x}{100}\right)\left(\frac{100+2x}{100}\right)$ oe or $(1+0.01x)(1+0.02x)$ oe or $(1+y)(1+2y)$ oe		4	M1 for setting up an expression in “x” or “y” Allow any letter for x or y Accept $(1+x\%)(1+2x\%)$ Accept $p\left(1+\frac{x}{100}\right)\left(1+\frac{2x}{100}\right)$ where p represents the initial value of the house, maybe a number eg 1 or 100 etc
	$\left(1 + \frac{x}{100}\right)\left(1 + \frac{2x}{100}\right) = 1 + \frac{38.88}{100}$ oe or $\left(\frac{100+x}{100}\right)\left(\frac{100+2x}{100}\right) = \frac{100+38.88}{100}$ oe or $(1+0.01x)(1+0.02x) = 1+0.3888$ oe or $(1+y)(1+2y) = 1+0.3888$ oe			M1ft dep on M1 for setting up an equation in “x” or “y” Allow any letter for x or y Accept $(1+x\%)(1+2x\%) = 1+38.88\%$ oe or $(1+x\%)(1+2x\%) = 138.88\%$ oe or $(1+x\%)(1+2x\%) = 1.3888$ oe or $p\left(1+\frac{x}{100}\right)\left(1+\frac{2x}{100}\right) = p\left(1+\frac{38.88}{100}\right)$ oe
	$0.0002x^2 + 0.03x - 0.3888 (=0)$ oe or $2x^2 + 300x - 3888 (=0)$ oe or $x^2 + 150x - 1944 (=0)$ oe or $2y^2 + 3y - 0.3888 (=0)$ oe			M1 for multiplying out and collecting terms, forming a correct 3-term quadratic in any form of $ax^2 + bx + c (=0)$ or for 0.12 oe (dep on M1)
	Working required	12		A1 dep on M2
				Total 4 marks