



# Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE  
In Mathematics A (4MA1) Paper 2H

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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
- eeoo – 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 mark the one that leads to the answer on the answer line. If there is no answer given then mark the method that gives the lowest mark and award this mark.

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.

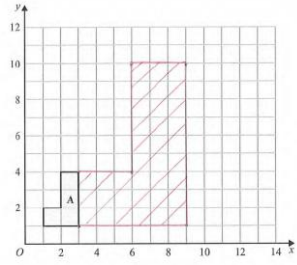
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

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 in another.

International GCSE Maths					
Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.					
Question	Working		Answer	Mark	Notes
1*			1 <sup>st</sup> card = 4	3	B1
			2 <sup>nd</sup> card = 6		B1 or a list of 6 numbers with a mode of 6
			4 <sup>th</sup> card = 9		B1
					SCB2 for 4, 6 and 9 in the incorrect order
					<b>Total 3 marks</b>

Question	Working	Answer	Mark	Notes	
2 (a)		Correct shape drawn in correct position	2	B2	Shape drawn with coordinates (3, 1), (9, 1), (9, 10), (6, 10), (6, 4), (3, 4) (B1 for a shape of the correct size but in the wrong position)  NB Overlay is available
(b)	'Turn' is not sufficient	Rotation	3	B1	with no mention of any other transformation words or move, flip, transform, up, right etc
		180°		B1	allow 'half turn'
		(centre) (5, 5)		B1	must be a coordinate and not a vector
					<b>Total 5 marks</b>

Question	Working	Answer	Mark	Notes
3	$\frac{22}{3}(-)\frac{25}{7}$ or $(7)\frac{7}{21}(-)(3)\frac{12}{21}$ or $(7)\frac{7a}{21a}(-)(3)\frac{12a}{21a}$		3	M1 for correct improper fractions or fractional part of numbers written correctly over a common denominator
	$\frac{154}{21} - \frac{75}{21}$ or $\frac{22 \times 7}{21} - \frac{25 \times 3}{21}$ or $\frac{22 \times 7 - 25 \times 3}{21}$ $\frac{154a}{21a} - \frac{75a}{21a}$ or $7\frac{7}{21} - 3\frac{12}{21} = 4 - \frac{5}{21}$ oe or $7\frac{7}{21} - 3\frac{12}{21} = 6\frac{28}{21} - 3\frac{12}{21}$			M1 for correct fractions with a common denominator with minus sign or mixed numbers to the stage shown  $\frac{154}{21} - \frac{75}{21}$ or $\frac{22 \times 7}{21} - \frac{25 \times 3}{21}$ implies the first M1
	$\frac{154}{21} - \frac{75}{21} = \frac{79}{21} = 3\frac{16}{21}$ or $4 - \frac{5}{21} = 3\frac{16}{21}$ or $7\frac{7}{21} - 3\frac{12}{21} = 6\frac{28}{21} - 3\frac{12}{21} = 3\frac{16}{21}$  <i>Working required</i>	A fully correct solution shown		A1 Dep on M2 for a correct answer from fully correct working  If a student shows that $3\frac{16}{21} = \frac{79}{21}$ then they must show correct working to $\frac{79}{21}$ and can gain full marks for this
				<b>Total 3 marks</b>

Question	Working	Answer	Mark	Notes
4*		Bisector with construction arcs	2	<p>B2 B2 for a fully correct perpendicular bisector with 2 pairs of intersecting arcs shown</p> <p>(the line and the arcs can intersect on or within the overlay guidelines)</p> <p>(B1 for 2 pairs of intersecting arcs and no perpendicular bisector drawn or for a correct bisector perpendicular drawn within or on guidelines but no arcs or insufficient arcs or one pair of intersecting arcs and perpendicular bisector drawn on just one side of <math>AB</math>)</p> <p>NB Overlay is available</p>
				<b>Total 2 marks</b>

Question	Working	Answer	Mark	Notes
5* (a)	$\frac{10}{4} \left( = \frac{5}{2} = 2.5 \right)$ or $\frac{4}{10} \left( = \frac{2}{5} = 0.4 \right)$ or $\frac{x}{5} = \frac{10}{4}$ oe or $\frac{x}{10} = \frac{5}{4}$ oe		2	M1 for a correct SF can be expressed as a fraction, decimal or ratio (may or may not be used)  or  for a correct equation in $x$ Allow any letter for $x$
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	12.5		A1 oe eg $\frac{50}{4}$ or $\frac{25}{2}$ or $12\frac{1}{2}$ or $12\frac{2}{4}$
(b)	$24 \div [2.5]$ oe or $\frac{y}{24} = \frac{4}{10}$ oe or $\frac{y}{24} = \frac{5}{[12.5]}$ oe or $\frac{y}{4} = \frac{24}{10}$ oe or $\frac{y}{5} = \frac{24}{[12.5]}$ oe		2	M1 ft ie [2.5] is their SF from (a)  or  for a correct equation in $y$ Allow any letter for $y$  ft their answer to (a) ie [12.5] is their answer to (a)
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	9.6		A1 oe eg $\frac{48}{5}$ or $9\frac{3}{5}$  If (a) $x = 9.6$ and (b) $y = 12.5$ then M1A0M1A0
				<b>Total 4 marks</b>



Question	Working	Answer	Mark	Notes
<b>6*</b>	$240 \div (3 + 4 + 5) (= 20)$ or $240 \times \frac{3}{3+4+5} (= 60)$ oe or $240 \times \frac{4}{3+4+5} (= 80)$ oe or $240 \times \frac{5}{3+4+5} (= 100)$ oe		4	M1 for a correct method to find the value of one share  NB $(240 \div 3 =) 80$ , $(240 \div 4 =) 60$ and $(240 \div 5 =) 48$ scores M0
	For two of (Pau:) $3 \times "20" + 10 + 10 (= 80)$ or $"60" + 10 + 10 (= 80)$ (Sam:) $4 \times "20" - 10 (= 70)$ or $"80" - 10 (= 70)$ (Tia:) $5 \times "20" - 10 (= 90)$ or $"100" - 10 (= 90)$			M1 for the correct values for 2 of the people after S and T give P £10
	80, 70 and 90  or  eg $9 : 7 : 8$ oe  or  eg $4 : 3.5 : 4.5$ oe			M1 for all 3 of 80, 70, and 90 correct (ignore units)  or  for the correct values for the final ratio in the wrong order (ignore units)  or  for the correct values for the final ratio unsimplified (ignore units)
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	8 : 7 : 9		A1 other orders are acceptable if labelled correctly
				<b>Total 4 marks</b>

Question	Working	Answer	Mark	Notes	
<b>7*</b>	$0.07 \times 4000 (= 280)$ <b>or</b> $1.07 \times 4000 (= 4280)$		3	M1 for finding 7% of 4000 or 107% of 4000	M2 for $1.07^3 \times 4000$ or $1.07^4 \times 4000 (= 5243....)$
	$4000 + "280" (= 4280)$ <b>or</b> $0.07 \times "4280" (= 299.6)$ <b>and</b> $"4280" + "299.6" (= 4579.6)$ <b>and</b> $0.07 \times "4579.6" (= 320.572)$ <b>or</b> $"280" + "299.6" + "320.572" (= 900(.172))$			M1	
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	4900		A1 allow answers in the range 4900 – 4901  If no other mark awarded, SCB1 for $4000 \times 0.07 \times 3 (= 840)$ or $4000 \times 0.21 (= 840)$ or $4000 + 4000 \times 0.07 \times 3 (= 4840)$ or $4000 \times 1.21 (= 4840)$ or $0.93 \times 4000 (= 3720)$ or $0.79 \times 4000 (= 3160)$ or $0.93^3 \times 4000 (= 3217...)$ or $4000 \times 1.07^2 (= 4579...)$	
				<b>Total 3 marks</b>	

Question	Working		Answer	Mark	Notes
<b>8*</b>	eg $3x + 5y = 8$ $20x + 5y = -17.5$ <b>Subtracting</b> $(3x - 20x = 8 - -17.5 \text{ or } -17x = 25.5)$ <b>or</b> $3x + 5(-3.5 - 4x) = 8$ <b>or</b> $4x + \frac{8-3x}{5} = -3.5$	eg $12x + 20y = 32$ $12x + 3y = -10.5$ <b>Subtracting</b> $(20y - 3y = 32 - -10.5 \text{ or } 17y = 42.5)$ <b>or</b> $3\left(\frac{-3.5 - y}{4}\right) + 5y = 8$ <b>or</b> $4\left(\frac{8-5y}{3}\right) + y = -3.5$		3	M1 for a correct method to eliminate $x$ or $y$ : coefficients of $x$ or $y$ the same <b>and</b> correct operator to eliminate selected variable (condone any one arithmetic error in multiplication) <b>or</b> writing $x$ or $y$ in terms of the other variable and correctly substituting (condone missing brackets)  NB The mark is for the method and not for the result of the method. However, if the correct result of the method is seen, the mark can be awarded.
	$3 \times "-1.5" + 5y = 8$ <b>or</b> $4 \times "-1.5" + y = -3.5$ <b>or</b> $y = -3.5 - 4 \times "-1.5"$ <b>or</b> $y = \frac{8-3 \times "-1.5"}{5}$	$3x + 5 \times "2.5" = 8$ <b>or</b> $4x + "2.5" = -3.5$ <b>or</b> $x = \frac{-3.5 - "2.5"}{4}$ <b>or</b> $x = \frac{8-5 \times "2.5"}{3}$			M1 dep on first M1 for a correct method to find other variable by substitution of found variable into one equation <b>or</b> for repeating the above method to find the second variable.
	<i>Working required</i>		$x = -1.5$ $y = 2.5$		A1 oe dep on M1
					<b>Total 3 marks</b>

Question	Working	Answer	Mark	Notes
<b>9*</b> (a)	$-3t - 2t < 15 - 7$ or $-5t < 8$ oe or $7 - 15 < 2t + 3t$ or $-8 < 5t$ oe or $t = -1.6$ or $t < -1.6$		2	M1 for correctly isolating terms in $t$ on one side and number terms on the other side (use of = or any inequality symbol or variable is permitted)
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	$t > -1.6$		A1 oe eg $-1.6 < t$ or $t > -\frac{8}{5}$ or $-\frac{8}{5} < t$ oe  Must have correct inequality symbol on answer line  NB Sight of correct answer in working space and just $(t =) -1.6$ oe on answer line gains M1 only
(b)		$x \geq 2$	3	B1 oe allow $x > 2$ or $2 < x$
		$y \geq 3$		B1 oe allow $y > 3$ or $3 < y$
		$x + y \leq 9$		B1 oe allow $x + y < 9$ or $y < 9 - x$ or $9 > x + y$  SC B2 for all of $x \leq 2, y \leq 3, x + y \geq 9$ oe or $x < 2, y < 3, x + y > 9$  SC B1 for all of $x = 2, y = 3, x + y = 9$ oe
				<b>Total 5 marks</b>

Q	Working	Answer	Mark	Notes
10	$(AC^2 =) 12^2 + 16^2 (= 144 + 256 = 400)$ <b>or</b> $(BAC =) \tan^{-1}\left(\frac{12}{16}\right) (= 36.8(698...))$ <b>or</b> 36.9 <b>or</b> $(BCA =) \tan^{-1}\left(\frac{16}{12}\right) (= 53.1(301...))$		5	M1 for a correct method using triangle <i>ABC</i>
	$(AC =) \sqrt{12^2 + 16^2} (= \sqrt{144 + 256} = \sqrt{400} = 20)$ <b>or</b> $(AC =) \frac{16}{\cos 36.8^\circ} (= 20)$ <b>or</b> $(AC =) \frac{12}{\sin 36.8^\circ} (= 20)$ <b>or</b> $(AC =) \frac{16}{\sin 53.1^\circ} (= 20)$ <b>or</b> $(AC =) \frac{12}{\cos 53.1^\circ} (= 20)$			M1 for a correct method to find <i>AC</i>
	$(BD^2 =) (1.5 \times 20)^2 - 16^2 (= 644)$ <b>or</b> $(BD^2 =) 30^2 - 16^2 (= 900 - 256 = 644)$ <b>or</b> $(BAD =) \cos^{-1}\left(\frac{16}{30}\right) (= 57.7(690...))$ <b>or</b> 57.8 <b>or</b> $(BDA =) \sin^{-1}\left(\frac{16}{30}\right) (= 32.2(309...))$ <b>or</b> $(BCA =) \sin^{-1}\left(\frac{16}{20}\right) (= 53.1(301...))$ <b>and</b> $\frac{(CD)}{\sin(180 - 126.9 - 32.2)} = \frac{30}{\sin(180 - 53.1)}$ oe			M1 for a correct method using triangle to find $BD^2$ or angle <i>BAD</i> or angle <i>BDA</i> or for a correct equation for side <i>CD</i>
	$(BD =) \sqrt{(1.5 \times 20)^2 - 16^2} (= 25.3(771)...) $ <b>or</b> $(BD =) \sqrt{30^2 - 16^2} (= \sqrt{900 - 256} = \sqrt{644} = 2\sqrt{161} = 25.3(771...))$ <b>or</b> $(BD =) 16 \times \tan 57.7^\circ (= 25.3(771...))$ <b>or</b> $(BD =) 30 \times \sin 57.7^\circ (= 25.3(771...))$ <b>or</b> $(BD =) \sqrt{16^2 + 30^2 - 2 \times 16 \times 30 \times \cos 57.7^\circ} (= 25.3(771...))$ <b>or</b> $(BD =) 30 \times \cos 32.2^\circ (= 25.3(771...))$ <b>or</b> $(BD =) \frac{16}{\tan 32.2^\circ} (= 25.3(771...))$ <b>or</b> $(BD =) \frac{16}{\sin 32.2^\circ} \times \sin 57.7^\circ (= 25.3(771...))$ <b>or</b> $(CD =) \frac{30}{\sin 126.9^\circ} \times \sin 20.9^\circ$ oe			M1 for a correct method to find <i>BD</i> or <i>CD</i>
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	13.4		A1 awrt 13.4
				<b>Total 5 marks</b>

Question	Working	Answer	Mark	Notes
11	$(17 + 28) \div (9 - 4)$ or $45 \div 5$ or $1 - \frac{4}{9} \left( = \frac{5}{9} \right)$ or $(17 + 28) = \frac{5}{9}$ oe or $\frac{p}{p + 28 + 17} = \frac{4}{9}$ oe or $\frac{p}{p + 45} = \frac{4}{9}$ or $\frac{m - 45}{m} = \frac{4}{9}$		3	M1 Allow 0.55(555...) or 55(.555...) % truncated or rounded
	$(17 + 28) \div 5 \times 4$ or $45 \div 5 \times 4$ or $(17 + 28) \div \frac{5}{9} (= 81)$ or $45 \div \frac{5}{9} (= 81)$ or $(17 + 28) \times \frac{9}{5} (= 81)$ or $45 \times \frac{9}{5} (= 81)$ or $(17 + 28) \div 5 \times 4$ or $45 \div 5 \times 4$ or $\frac{5}{9} = \frac{17 + 28}{n}$ oe or $n = 81$ or $9p = 4(p + 28 + 17)$ or $9p - 4p = 180$ oe or $5p = 180$ oe or $9(m - 45) = 4m$ or $9m - 4m = 405$ oe or $5m = 405$ oe or $m = 81$			M1 for the correct calculation for the total number of counters or for the correct calculation for the number of orange counters or for the correct equation for the total number of counters (removing the denominators) or for the correct equation for the number of orange counters (removing the denominators)
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	36		A1 cao
				<b>Total 3 marks</b>

Q	Working	Answer	Mark	Notes	
12	$3x(2x+5)=6x^2+15x$ or $3x(7x-4)=21x^2-12x$ or $(2x+5)(7x-4)=14x^2-8x+35x-20$ $(14x^2+27x-20)$		3	M1 An expansion with only one error. Do not award this mark for $6x^2+15x+21x^2-12x$ or $(6x^2+15x)(21x^2-12x)$	M2 for 3 (out of a maximum of 4) of $42x^3+105x^2-24x^2-60x$  (M1 for 2 correct out of a maximum of 4)
	$(6x^2+15x)(7x-4)=42x^3-24x^2+105x^2-60x$ $(21x^2-12x)(2x+5)=42x^3+105x^2-24x^2-60x$ $3x(14x^2-8x+35x-20)=42x^3-24x^2+105x^2-60x$ $3x(14x^2+27x-20)=42x^3+81x^2-60x$			M1 ft dep on M1  allow one further error	
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	$42x^3+81x^2-60x$		A1 cao (terms may be in any order but must be simplified) dep on M1  ISW correct factorisation eg $3(14x^3+27x^2-20x)$ Do not ISW incorrect simplification eg $14x^3+27x^2-20x$	
				Total 3 marks	

Question	Working	Answer	Mark	Notes
<b>13*</b> (a)		8, 21, 33, 50, 57, 60	1	B1
(b)	<b>USE OVERLAY</b>  (NB A histogram/bar chart type graph scores zero marks unless a CF diagram is drawn over their histogram/bar chart)  (Ignore any part of the graph before (10, 8))		2	M1 for at least 5 points plotted correctly at end of interval <b>or</b> ft from an ascending table (ft from a table with only one arithmetic error that may be continued through table) for all 6 points plotted consistently within each interval in the <b>freq table</b> at the correct height
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	Correct cf diagram		A1 for fully correct plotting with points joined accept curve or line segments accept curve that is not joined at (0, 0)
(c)		27 – 28	1	B1 accept answer in the range or ft an ascending graph
(d)	(60 –) 54		2	M1 ft for a line going up from the $x$ -axis at 45 to the line and across to the $y$ -axis <b>or</b> for a mark on the line at the correct point <b>or</b> for a correct reading from the vertical scale eg 54 or 53.5
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	5 or 6 or 7		A1 accept integer value 5 or 6 or 7 or ft from their ascending graph for an integer value
				<b>Total 6 marks</b>



Question	Working	Answer	Mark	Notes
<b>14</b> (a)		B	1	B1    cao
(b)		C	1	B1    cao
				<b>Total 2 marks</b>

Question	Working	Answer	Mark	Notes
<b>15</b>		$125a^{12}c^6$	3	<p>B3    for <math>125a^{12}c^6</math> oe</p> <p>eg <math>\frac{125a^{12}}{c^{-6}}</math> or <math>\frac{125c^6}{a^{-12}}</math> or <math>\frac{125}{a^{-12}c^{-6}}</math> or <math>\frac{a^{12}}{125^{-1}c^{-6}}</math></p> <p>or <math>\frac{1}{125^{-1}a^{-12}c^{-6}}</math> or <math>\frac{a^{12}c^6}{125^{-1}}</math></p> <p>B2 for 2 correct terms (Allow eg <math>125a^{12}</math> or <math>125c^6</math> or <math>ka^{12}c^6</math> as long as not added to any other terms)</p> <p>B1 for one correct term (allow eg <math>a^{12}</math> or <math>a^{-12}c^6</math> or <math>\frac{1}{125^{-1}}</math> or <math>\frac{1000a^{21}c^6}{8a^9}</math> as long as not added to any other terms)</p>
				<b>Total 3 marks</b>

<b>16*</b>	$7c - 8ct^2 = t^2 + 3$ oe		4	M1	for multiplying both sides by denominator <b>and</b> expanding the brackets
	$7c - 3 = t^2 + 8ct^2$ oe or $-8ct^2 - t^2 = 3 - 7c$ oe			M1	ft dep on 2 terms in $t^2$ and 2 other terms for collecting $t^2$ terms on one side and other terms on the other side
	$7c - 3 = t^2(1 + 8c)$ oe or $t^2(-8c - 1) = 3 - 7c$ oe			M1	ft dep on previous M1 for factorising for $t^2$
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	$t = (\pm) \sqrt{\frac{7c-3}{1+8c}}$		A1	oe eg $t = (\pm) \sqrt{\frac{3-7c}{-8c-1}}$ or $t = (\pm) \left(\frac{7c-3}{1+8c}\right)^{\frac{1}{2}}$ or $t = (\pm) \left(\frac{7c-3}{1+8c}\right)^{0.5}$ NB To award A1 we must see $t = (\pm) \sqrt{\frac{7c-3}{1+8c}}$ in working if $(\pm) \sqrt{\frac{7c-3}{1+8c}}$ alone is given as an answer
				<b>Total 4 marks</b>	

Question	Working	Answer	Mark	Notes
17(a)	Two of $12x^2 + 10x + 2$		2	M1 for differentiating 2 or 3 terms correctly
		$12x^2 + 10x + 2$		A1 for all 3 terms correct
(b)	$(3x + 1)(4x + 2) (= 0)$ or $(6x + 2)(2x + 1) (= 0)$ or $2(3x + 1)(2x + 1) (= 0)$ or $(3x + 1)(2x + 1) (= 0)$ $\frac{-10 \pm \sqrt{10^2 - 4 \times 12 \times 2}}{2 \times 12}$ or $\frac{-5 \pm \sqrt{5^2 - 4 \times 6 \times 1}}{2 \times 6}$ or $12 \left[ \left( x + \frac{10}{24} \right)^2 - \left( \frac{10}{24} \right)^2 \right] + 2 (= 0)$ oe or $6 \left[ \left( x + \frac{5}{12} \right)^2 - \left( \frac{5}{12} \right)^2 \right] + 1 (= 0)$ oe		4	M1 ft dep on M1 for a correct method to solve their <b>3 term quadratic</b> equation (with at least 2 correct coefficients) using any correct method (if factorising, allow brackets which expanded give 2 out of 3 terms correct) (if using formula allow one sign error and some simplification – allow as far as $\frac{-10 \pm \sqrt{100 - 96}}{24}$ ) Derivative must be a <b>3 term quadratic</b> for this M mark NB Can be implied by answers of $(x =) -\frac{1}{2}$ <b>and</b> $(x =) -\frac{1}{3}$
		$-\frac{1}{2}, -\frac{1}{3}$		A1 oe dep on previous M1 Allow $-0.33(333)$ or $-0.\dot{3}$ for correct $x$ values
	$(y =) 4 \times \left( -\frac{1}{2} \right)^3 + 5 \left( -\frac{1}{2} \right)^2 + 2 \left( -\frac{1}{2} \right) \left( = -\frac{1}{4} \right)$ or $(y =) 4 \times \left( -\frac{1}{3} \right)^3 + 5 \left( -\frac{1}{3} \right)^2 + 2 \left( -\frac{1}{3} \right) \left( = -\frac{7}{27} \right)$			M1 ft dep on previous M1 for substituting at least one $x$ value into $y$ NB Can be implied by one correct value of $y$
	Working required	$\left( -\frac{1}{2}, -\frac{1}{4} \right)$ $\left( -\frac{1}{3}, -\frac{7}{27} \right)$		A1 oe dep on M1 for correct coordinates $(-0.5, -0.25), (-0.33, -0.25(9\dots))$
				<b>Total 6 marks</b>

18	$(1000x =) 702.702..._$ eg $\underline{\quad (x =) \quad 0.702...}$  $(10000x =) 7027.02..._$ <b>or</b> $\underline{\quad (10x =) \quad 7.02...}$  $(100000x =) 70270.20..._$ <b>or</b> $\underline{\quad (100x =) \quad 70.20...}$		2	M1 for 2 recurring decimals that when subtracted give a whole number or terminating decimal with <u>intention to subtract</u> . (ie give 702 or 7020 or 70200 etc) eg $(1000x =) 702.702... \text{ and } (x =) 0.702...$ <b>or</b> $(10000x =) 7027.02.... \text{ and } (10x =) 7.02....$ <b>or</b> $(100000x =) 70270.20.... \text{ and } (100x =) 70.20....$ with intention to subtract <i>x</i> is not required to award this mark (if recurring dots not shown in both numbers then showing at least <b>one</b> of the numbers to at least 6sf) NB Accept bar notation for dot notation to indicate recurring decimals
	eg $1000x - x = 702.70... - 0.702... = 702$ $(999x = 702)$ <b>and</b> $\frac{702}{999} = \frac{26}{37}$ <b>or</b> $10000x - 10x = 7027.02... - 7.02... = 7020$ $(9990x = 7020)$ <b>and</b> $\frac{7020}{9990} = \frac{26}{37}$ <b>or</b> $100000x - 100x = 70270.20... - 70.20 = 70200$ $(99900x = 70200)$ <b>and</b> $\frac{70200}{99900} = \frac{26}{37}$	shown		A1 for completion to $\frac{26}{37}$ dep on M1 and must use algebra for this final mark to be awarded  <b>No algebra used gets a maximum of 1 mark</b>
	<i>Working required</i>			<b>Total 2 marks</b>

Question	Working	Answer	Mark	Notes
19	$(2x - 3)(2x + 5)$ or $\frac{-4 \pm \sqrt{4^2 - 4 \times 4 \times -15}}{2 \times 4}$ or $4 \left[ \left( x + \frac{1}{2} \right)^2 - \left( \frac{1}{2} \right)^2 \right] - 15 (= 0)$ or $4 \left( x + \frac{4}{2 \times 4} \right)^2 - \frac{4^2}{4 \times 4} + -15 (= 0)$		3	M1 for a correct method to solve the quadratic equation $4x^2 + 4x - 15 = 0$  Allow $(4x - 6)(x + 2.5)$ or $(4x + 10)(x - 1.5)$ or $(4x - 6)(4x + 10)$ leading to $(x - 1.5)(x + 2.5)$ or $(4x - 6)(4x + 10)$ leading to correct values of $x$  Do not allow $(x - 1.5)(x + 2.5)$ without previous working  (If using formula allow some simplification – allow as far as $\frac{-4 \pm \sqrt{16 + 240}}{8}$ )
	1.5, - 2.5 oe			A1 oe dep on M1
		$-2.5 < x < 1.5$		A1 oe dep on M1 Allow $x > -2.5$ (and) $x < 1.5$ oe Allow any variable as long used all the way through
				<b>Total 3 marks</b>

20	(a)		10 6 14 15 12 20 14 29	3	B3 for all numbers in correct regions (B2 for 5, 6 or 7 correct numbers B1 for 3 or 4 correct numbers)
	(b)		16	1	B1 ft for their $a +$ their $b$  Do not ft if there are no values for $a$ and $b$
	(c)			2	M1 for $\frac{n}{43}$ where $n < 43$ or $\frac{18}{m}$ where $m > 18$ or ft their $\frac{b+c}{p}$ where $p > b + c$ or ft their $\frac{q}{a+b+c+d}$ where $q < a + b + c + d$ Do not ft if there are no values for $a, b, c$ and $d$
			$\frac{18}{43}$		A1 oe eg 0.41(860...) or 41(.860...) % truncated or rounded or ft their $\frac{b+c}{a+b+c+d}$ as a fraction or a decimal or a percentage
					<b>Total 6 marks</b>

Question	Working	Answer	Mark	Notes
21*	$3x \times 2x \times y = 1014$ oe or $6x^2 y = 1014$ oe or $x^2 y = 169$ oe		3	M1 for an equation for volume in terms of $x$ and $y$
	$2 \times 3x \times y + 2 \times 2x \times y + 2 \times 3x \times 2x$ oe or $2 \times (3xy + 2xy + 6x^2)$ oe or $6xy + 4xy + 12x^2$ oe or $10xy + 12x^2$ oe			M1 (indep) for a correct expression for the surface area NB May not explicitly see the surface area expression in terms of $y$ eg $2 \times 3x \times \frac{169}{x^2} + 2 \times 2x \times \frac{169}{x^2} + 2 \times 3x \times 2x$ oe May be fully substituted using $y = \frac{169}{x^2}$ oe
	Using $y = \frac{1014}{6x^2} \left( = \frac{169}{x^2} \right)$ in formula for surface area to obtain correct expression eg $(SA =) 2 \times 5x \times \frac{169}{x^2} + 2 \times 6x^2 = 12x^2 + \frac{1690}{x}$ or equating their surface area equations eg $10xy + 12x^2 = 12x^2 + \frac{1690}{x}$ leading to $x^2 y = 169$ oe	Shown		A1 dep on M2 For completing the 'show that' by clearly showing the stages that lead to the given expression for the surface area.
	Working required			<b>Total 3 marks</b>

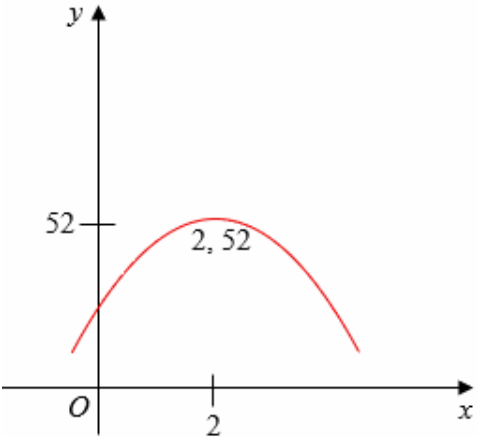
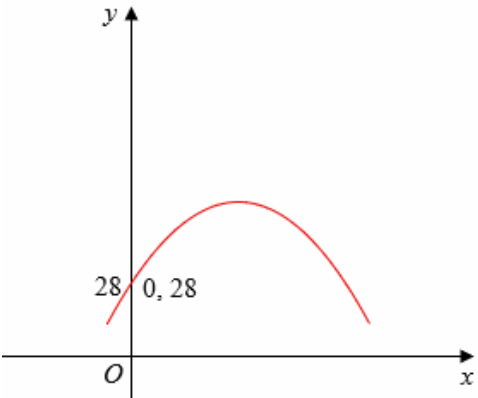
Question	Working	Answer	Mark	Notes
22	11.25, 11.75, 9.15, 9.25, 4.05, 4.15		4	B1 for a correct bound  Accept $11.74\dot{9}$ for 11.75 or $11.74\bar{9}$ for 11.75 $9.24\dot{9}$ for 9.25 or $9.24\bar{9}$ for 9.25 $4.14\dot{9}$ for 4.15 or $4.14\bar{9}$ for 4.15
	$11.75 \times 9.25 - 4.05^2 (= 92.285)$			M1 for a correct method to find the UB of X, allow $(11.5 < AB \leq 11.75) \times (9.2 < BC \leq 9.25) - ((4.05 \leq s < 4.1)^2)$
	$11.25 \times 9.15 - 4.15^2 (= 85.715)$			M1 for a correct method to find the LB of X, allow $(11.25 \leq AB < 11.5) \times (9.15 \leq BC < 9.2) - ((4.1 < s \leq 4.15)^2)$
	<i>Working required</i>	90		A1 dep on M2 90 and both UB and LB correct using correct values 11.25, 11.75, 9.15, 9.25, 4.05 and 4.15
				<b>Total 4 marks</b>



23	$\frac{4(x-6)(x+5)}{5(x-6)(x+6)} \div \frac{x(x+5)}{10x(x+6)} (= p) \text{ or}$ $\frac{4(x-6)(x+5)}{5(x-6)(x+6)} \times \frac{10x(x+6)}{x(x+5)} (= p)$ <p>or 2 from <math>4(x-6)(x+5)</math> or <math>5(x-6)(x+6)</math> or <math>x(x+5)</math> or <math>10x(x+6)</math></p>		4	<p>M1 for factorising 2 or 3 of the quadratics fully – could be implied by 2 factors cancelled correctly</p> <p>NB factors must be in the form <math>(ax + b)</math></p> <p><b>NB Substitution of values of x into the given equation is not an acceptable algebraic method</b></p>
	$\frac{4(x-6)(x+5)}{5(x-6)(x+6)} \div \frac{x(x+5)}{10x(x+6)} (= p) \text{ or}$ $\frac{4(x-6)(x+5)}{5(x-6)(x+6)} \times \frac{10x(x+6)}{x(x+5)} (= p)$ <p>or <math>4(x-6)(x+5)</math> and <math>5(x-6)(x+6)</math> and <math>x(x+5)</math> and <math>10x(x+6)</math></p>			<p>M1 for factorising <b>all</b> of the quadratics fully – could be implied by 2 factors cancelled correctly</p> <p>NB factors must be in the form <math>(ax + b)</math></p>
	$\frac{4x^2 - 4x - 120}{5x^2 - 180} \times \frac{10x^2 + 60x}{x^2 + 5x} (= p)$			<p>M1 for inverting the 2<sup>nd</sup> fraction (this mark can be awarded at any time and may be awarded with incorrect factorisation if meaning is clear)</p>
	Working required	8		A1 oe dep on M3
				<b>Total 4 marks</b>
ALT	$\frac{40x^4 + 200x^3 - 1440x^2 - 7200x}{5x^4 + 25x^3 - 180x^2 - 900x}$			M3 for a correct expression (no errors)
		8		A1 oe dep on M3

Question	Working			Answer	Mark	Notes
24	<b>To find <math>EQ</math></b> eg $MQ = 0.5 (= AQ)$ $\frac{0.5}{\cos 80} (= 2.87(938..))$ eg $MQ = x (= AQ)$ $\frac{x}{\cos 80} (= 5.75..x)$ NB $\cos 80 = \sin 10$	<b>To find <math>EM</math></b> eg $MQ = 0.5 (= AQ)$ $0.5 \tan 80 (= 2.83(564..))$ eg $MQ = x (= AQ)$ $x \tan 80 (= 5.67..x)$ NB $\tan 80 = \frac{1}{\tan 10}$	<b>To find <math>EQ</math></b> eg $EM = y$ $\frac{y}{\sin 80} (= 1.01..y)$ <b>To find <math>MQ (= AQ)</math></b> eg $EQ = h$ $h \cos 80 (= 0.173..h)$		4	M1 Use of a value for the side $AB$ eg 1 or $2x$ or any value etc or Let $EM = y$ or any value or $EQ = h$
	<b>To find <math>EA^2</math></b> eg $AQ = 0.5 (= MQ)$ $"2.87.."^2 + 0.5^2$ $(= 8.54(08..))$ eg $AQ = x (= MQ)$ $x^2 + \left(\frac{x}{\cos 80}\right)^2$	<b>To find <math>AM</math></b> eg $MQ = 0.5 (= AQ)$ $\sqrt{0.5^2 + 0.5^2}$ $\left(= \frac{\sqrt{2}}{2} = 0.707(10..)\right)$ eg $MQ = x (= AQ)$ $\sqrt{x^2 + x^2} (= \sqrt{2}x^2 = x\sqrt{2})$	<b>To find <math>MQ (= AQ)</math></b> eg $EM = y$ $\frac{y}{\tan 80} (= 0.176..y)$ <b>To find <math>EA^2</math></b> eg $EQ = h$ $h^2 + (h \cos 80)^2$			M1
	<b>To find <math>EA</math></b> eg $AQ = 0.5 (= MQ)$ $\sqrt{"2.87.."^2 + 0.5^2}$ $(= \sqrt{8.54(08..)})$ or eg $AQ = x (= MQ)$ $\sqrt{x^2 + \left(\frac{x}{\cos 80}\right)^2} (= 5.84..x)$	<b>To find <math>EA</math></b> eg $AQ = 0.5 (= MQ)$ $\sqrt{"2.83.."^2 + "0.707.."^2}$ $(= \sqrt{8.54(08..)})$ eg $AQ = x (= MQ)$ $\sqrt{"(x \tan 80)"^2 + "(x\sqrt{2})" ^2}$ $(= 5.84..x)$	<b>To find <math>EA</math></b> eg $EM = y$ $\sqrt{"\left(\frac{1}{\sin 80}\right)"^2 + "\left(\frac{1}{\tan 80}\right)"^2}$ $(= 1.03..y)$ $[= 1.03.. \times AQ \times \tan 80]$ eg $EQ = h$ $\sqrt{h^2 + (h \cos 80)^2} (= 1.01..h)$ $[= 1.01.. \times \frac{0.5}{\cos 80}]$			M1
Working not required, so correct answer scores full marks (unless from obvious incorrect working)				2.92		A1 awrt 2.92
						<b>Total 4 marks</b>

Question	Working	Answer	Mark	Notes
25 (a)	$\pm 6\left(x \pm \frac{4}{2}\right)^2 \dots\dots$ or $\pm 6(x \pm 2)^2 \dots\dots$ <b>or</b> $\pm 6\left[(x \pm 2)^2 \dots\dots\right]$ or $\pm 6\left[\left(x \pm \frac{4}{2}\right)^2 \dots\dots\right]$ <b>or</b> $\pm 6\left(x \pm \frac{24}{2 \times -6}\right)^2 \dots\dots$		3	M1 for a start to completing the square <b>or</b> correct substitution into $a\left(x + \frac{b}{2a}\right)^2 + \dots$ from the formula $a\left(x + \frac{b}{2a}\right)^2 - \frac{(b)^2}{4a} + c$
	$-6\left[\left(x - \frac{4}{2}\right)^2 - \left(\frac{4}{2}\right)^2\right] \dots\dots$ or $-6[(x-2)^2 - 2^2] \dots\dots$ <b>or</b> $-6\left[\left(x - \frac{4}{2}\right)^2 - \left(\frac{4}{2}\right)^2 \dots\dots\right]$ or $-6[(x-2)^2 - 2^2 \dots\dots]$ <b>or</b> $-6\left(x + \frac{24}{2 \times -6}\right)^2 - \frac{24^2}{4 \times -6} \dots\dots$			M1 for correctly completing the square but terms do not need to be simplified and 28 may or may not be present <b>or</b> correct simplification of the first two parts of $a\left(x + \frac{b}{2a}\right)^2 - \frac{(b)^2}{4a} (+c)$ <b>NB: Please refer to ALT mark scheme after (b) for comparison of coefficients method</b>
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	$52 - 6(x-2)^2$		A1 oe eg $-6(x-2)^2 + 52$
25(a) ALT	$-bx^2 + 2bcx - bc^2 + a$ <b>and</b> $b = 6$ or $b = -6$		3	M1 for multiplying out $a - b(x-c)^2$ <b>and</b> $b = 6$ or $b = -6$
	$2bc = 24$ or $-bc^2 + a = 28$			M1 for equating coefficients
	<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	$52 - 6(x-2)^2$		A1 oe eg $-6(x-2)^2 + 52$

(b)		'∩' or 'U' shaped symmetrical quadratic curve	3	B1 for drawing a '∩' or 'U' shaped symmetrical quadratic curve with the turning point in any quadrant
		Turning point marked as (2, 52)		B1 for drawing a '∩' shaped symmetrical quadratic curve in the correct quadrant with a turning point at (2, 52)
		Intersection with y-axis marked as (0, 28) or crossing at 28 marked		B1 for drawing a '∩' shaped symmetrical quadratic curve in the correct quadrant with an intersection on the y-axis marked as (0, 28) or marked as 28 on the y-axis
				<b>Total 6 marks</b>

Question	Working	Answer	Mark	Notes
26*	$A : B = 31 : 18.6 (= 5 : 3)$ oe or $A^3 : B^3 = 31^3 : 18.6^3 (= 5^3 : 3^3)$ oe or $\frac{31}{18.6} \left( = \frac{5}{3} \right)$ oe or $\frac{18.6}{31} \left( = \frac{3}{5} \right)$ oe or $\left( \frac{18.6}{31} \right)^3$ oe or $\frac{27}{125}$ oe or $\left( \frac{31}{18.6} \right)^3$ oe or $\frac{125}{27}$ oe		4	M1 for correct linear SF or volume SF either as a fraction or ratio. Allow $\frac{5}{3} = 1.6(6....)$ truncated or rounded
	$V_A - \left( \frac{3}{5} \right)^3 V_A (= 735)$ oe or $V_A - \frac{27}{125} V_A (= 735)$ oe or $\frac{98}{125} V_A (= 735)$ oe or $\frac{V_A}{V_A - 735} = \frac{31^3}{18.6^3}$ oe or $\left( \frac{5}{3} \right)^3 V_B - V_B (= 735)$ oe or $\frac{125}{27} V_B - V_B (= 735)$ oe or $\frac{98}{27} V_B (= 735)$ oe or $\frac{V_B + 735}{V_B} = \frac{31^3}{18.6^3}$ oe or $1 - \left( \frac{3}{5} \right)^3 \left( = \frac{98}{125} = 0.784 \right)$ oe or $\left( \frac{5}{3} \right)^3 - 1 \left( = \frac{98}{27} = 3.62(962...) \right)$ oe or $5^3 - 3^3 (= 125 - 27 = 98)$			M1 <b>Note: 735 is given in the equation</b> Allow any letter for $V_A$ or for $V_B$ $V_A - \left( \frac{3}{5} \right)^3 V_A (= 735)$ can be written as $V_A - \frac{V_A}{\left( \frac{5}{3} \right)^3} (= 735)$ or $\left( \frac{5}{3} \right)^3 V_B - V_B (= 735)$ can be written as $\frac{V_B}{\left( \frac{3}{5} \right)^3} - V_B (= 735)$
	$(V_A =) 735 \times \frac{125}{98}$ oe or $(V_A =) 735 \div \frac{98}{125}$ oe or $(V_A =) \frac{31^3 \times 735}{31^3 - 18.6^3}$ oe or $(V_B =) 735 \times \frac{27}{98} (= 202.5)$ oe or $(V_B =) 735 \div \frac{98}{27} (= 202.5)$ or $(V_B =) \frac{18.6^3 \times 735}{31^3 - 18.6^3} (= 202.5)$ oe or $735 \div 98 \times 5^3$ oe or $7.5 \times 125$ oe or $735 \div 98 \times 3^3 (= 202.5)$ oe or $7.5 \times 27 (= 202.5)$ oe			M1 for a correct method to find $V_A$ or $V_B$
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	937.5		A1 oe allow 938 from correct working
				<b>Total 4 marks</b>

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