

INTERNATIONAL GCSE MATHEMATICS

9260/1E

Extension Tier Paper 1E

Mark scheme

June 2024

Version: 1.0 Final



2 4 6 Y 9 2 6 0 / 1 E / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

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Key to mark types and abbreviations

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq \text{value} < b$
3.14...	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Q	Answer	Mark	Comments
1(a)	m/s	B1	
	Additional Guidance		
	Ignore any circling of units in the list		

Q	Answer	Mark	Comments
1(b)	kg/m ³	B1	
	Additional Guidance		
	Ignore any formulae		

Q	Answer	Mark	Comments
2	$r^2 = \frac{81}{16}$ or $\frac{9}{4}$	M1	oe eg $\frac{d^2}{4} = \frac{81}{16}$
	$\frac{9}{2}$ or 4.5	A1	oe SC1 4.5π oe
	Additional Guidance		
	$r^2 = \frac{81}{16}$ followed by $r = -2.25$ and $r = 2.25$ is not choice		

Q	Answer	Mark	Comments
3	$\frac{3}{8}$	B1	oe fraction

Q	Answer	Mark	Comments
4	13^2 or 169 and 8^2 or 64	M1	implied by 105 or 233 or $\sqrt{233}$ or 15.2(6...) or 15.3
	$\sqrt{13^2 - 8^2}$ or $\sqrt{105}$	M1dep	
	10.2(4...) or 10.25	A1	
	Additional Guidance		
	Ignore incorrect rounding / truncation once correct answer seen		
	Answer 10.2(4...) or 10.25 with no working		M1M1A1
	Answer 10.2(4...) or 10.25 from trigonometry or accurate drawing		M0M0A0

Q	Answer	Mark	Comments
5	75×8 or 600 or $(75 + 2) \times 9$ or 693	M1	oe
	$(75 + 2) \times 9 - 75 \times 8$ or $693 - 600$	M1dep	oe eg $75 + 9 \times 2$
	93	A1	
	Additional Guidance		
	Correct answer followed by further work		M1M1A0

Q	Answer	Mark	Comments
6(a)	The fixed cost is \$3.5(0) and the cost per kilometre is \$1.25	B2	B1 The fixed cost is \$3.5(0) oe or the cost per kilometre is \$1.25 oe
	Additional Guidance		
	Allow equivalents for B1 but not for B2		
	eg1 (fixed cost \$) $\frac{14}{4}$		B1
	eg2 (cost per kilometre \$) $\frac{5}{4}$		B1
	eg3 The fixed cost is \$ $\frac{14}{4}$ and the cost per kilometre is \$ $\frac{5}{4}$		B1
	\$1.25d oe (with no other creditworthy work)		B0

Q	Answer	Mark	Comments
6(b)	Alternative method 1		
	Method to find gradient or correct cost per n kilometres (excluding the fixed cost)	M1	eg $\frac{10-4}{5}$ or $\frac{6}{5}$ or 1.2 or $\frac{5.2-4}{1}$ eg 2.4 for 2 or 3.6 for 3 or 4.8 for 4 or 6 for 5 may be on diagram
	Scaling for 12 kilometres (with or without the fixed cost) or $\frac{92}{5}$	M1dep	eg their 1.2×12 or $\frac{72}{5}$ or 14.4 or 2.4×6
	18.4(0)	A1	
	Alternative method 2		
	Combines correct readings for 12 kilometres	M1	eg $10 + 10 + 6.4$ or 6.4×6
	Correct method for total cost	M1dep	eg $10 + 10 + 6.4 - 4 - 4$ or $6.4 \times 6 - 4 \times 5$ or $\frac{92}{5}$
	18.4(0)	A1	
	Additional Guidance		
	In Alt 2 the calculation must be seen to award M1 eg1 $10 \times 2 + 6.4$ eg2 26.4 with no calculation eg3 $26.4 - 8$ (original calculation not seen but recovered to give fully correct method)	M1 M0 M1M1	
	Only using the formula from part (a)	M0M0A0	

Q	Answer	Mark	Comments
7	Alternative method 1		
	$3x + x = 25 + 6$	M1	oe correct equation with elimination of one variable implied by $4x = a$, where $a > 25$ or $bx = 31$, where $b > 3$
	$4x = 31$ or $x = 7.75$	A1	oe
	$x = 7.75$ and $y = 1.75$	A1	oe
	Alternative method 2		
	$y - 3y = 25 - 3 \times 6$	M1	oe correct equation with elimination of one variable implied by $3x - 3y = 18$ and $4y = a$, where $a < 25$ and $a \neq 18$ or 6
	$4y = 7$ or $y = 1.75$	A1	oe
	$x = 7.75$ and $y = 1.75$	A1	oe
	Alternative method 3		
	$25 - 3x = x - 6$ or $\frac{25 - y}{3} = 6 + y$	M1	oe correct equation with elimination of one variable eg $3x + (x - 6) = 25$ or $3(6 + y) + y = 25$
	$4x = 31$ or $x = 7.75$ or $4y = 7$ or $y = 1.75$	A1	oe
	$x = 7.75$ and $y = 1.75$	A1	oe
	Additional Guidance		
	M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	For the A marks accept fractions eg $\frac{31}{4}$ but not divisions eg $31 \div 4$		
	One correct value (not from incorrect working) with one incorrect value (or no second value)		M1A1A0
	Embedded correct values in both equations		M1A1A0
	Embedded correct values in one equation only		M1A0A0

Q	Answer	Mark	Comments
8(a)	$2x - 14 \leq 30$ or $2x \leq 44$ or $x - 7 \leq 15$ or 22	M1	oe
	$x \leq 22$ or $22 \geq x$	A1	
	Additional Guidance		
	Allow use of other symbols if recovered to $x \leq 22$ or $22 \geq x$		M1A1
	$x \leq 22$ seen in working, Answer 22		M1A0
	$x \leq = 22$ or $x <= 22$		M1A0
	Embedded answer $2(22 - 7) \leq 30$		M1A0
	Answer only $x < 23$		M0A0
	Allow interval notation eg $(-\infty, 22]$		

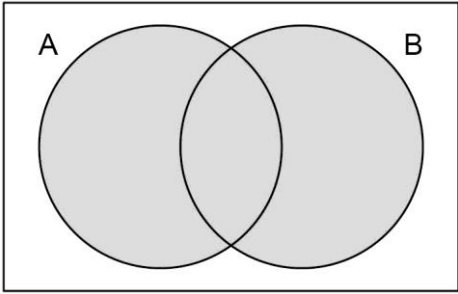
Q	Answer	Mark	Comments
8(b)	-2 -1 0 1 2	B2	B1 4 correct values and no extras or 5 correct values and 1 extra value or $-3 < y \leq 2$ or $(-3, 2]$ or $-3 < y$ or $y \leq 2$ or -6 -3 0 3 6
	Additional Guidance		
	-3 -2 -1 0 1 2		B1
	-2 -1 1 2		B1
	-2 -1 0 1		B1
	-3 -2 -1 0 1		B0

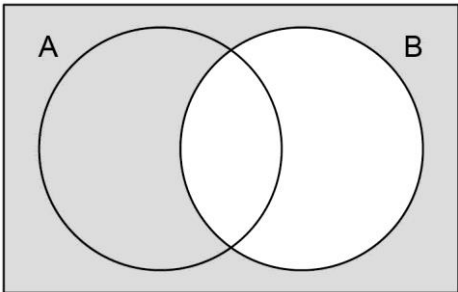
Q	Answer	Mark	Comments
9	True May be true True May be true	B4	B1 for each
	Additional Guidance		
	A tick and a cross in the same row – mark the tick		
	Allow any unambiguous indication		

Q	Answer	Mark	Comments
10	180 – 120 or 60 or 120 + 180	M1	oe may be seen on diagram
	300	A1	
	Additional Guidance		
	M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Correct answer followed by further work		M1A0

Q	Answer	Mark	Comments
11(a)	6×10^9	B1	

Q	Answer	Mark	Comments
11(b)	6.25×10^{-2}	B2	B1 0.0625 or $\frac{1}{16}$ or $\frac{1}{2^4}$ or an answer equal to 0.0625 in the form $x \times 10^{-n}$ where $x \neq 6.25$ and $n \neq -2$
	Additional Guidance		
	625×10^{-4}		B1
	0.625×10^{-1}		B1
	$6.25 \cdot 10^{-2}$		B1
	6.25×10^{-2} in working and 6.3×10^{-2} or 6×10^{-2} on answer line		B2
	6.3×10^{-2} only or 6×10^{-2} only		B0
	Only $6.25 - 2$ or $6.25 \cdot 10^{-2}$		B0

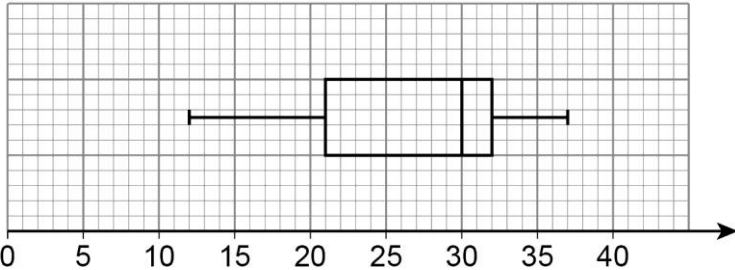
Q	Answer	Mark	Comments
12(a)		B1	any indication

Q	Answer	Mark	Comments
12(b)		B1	any indication

Q	Answer	Mark	Comments
13	$125 - 13$ or 112 or $125 = 13 + 8d$ or $125 = a + 8d$	M1	
	their $112 \div 8$ or 14	M1dep	implied by $14n$
	$14n - 1$	A1	oe eg $13 + 14(n - 1)$
	Additional Guidance		
	Condone $T_n = 14n - 1$ or $n = 14n - 1$		M2A1
	Allow other letters eg $14x - 1$		M2A1
	Do not ignore further working for A1 eg $14n - 1 = 13n$		M2A0
	$n14 \dots$		M2
	$13 + 14n$		M2A0
	$-1 + 14(n - 1)$		M2A0
	$n + 14$		M2A0
	$14n - 1n$ (with no other creditworthy work)		M0

Q	Answer	Mark	Comments
14	$(-2, -1.8)$ and $(0.8, 1)$	B2	oe either order B1 $(-2, -1.8)$ or $(0.8, 1)$ or $y = -8$ drawn on graph or one vertical line to the x -axis from the curve at $(-2, -1.8)$ or $(0.8, 1)$
	Additional Guidance		
	Solutions found using the formula or by completing the square		B0

Q	Answer	Mark	Comments
15	$\frac{3}{5}$ or $\frac{3}{6}$ or $\frac{1}{2}$	M1	oe
	$\frac{3}{5} \times \frac{1}{2}$	M1dep	oe
	$\frac{3}{10}$	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore simplification or conversion if correct answer seen		
	Fully correct sample space with 30 possible outcomes and the correct nine selected with answer $9/30$ oe		M1M1A1

Q	Answer	Mark	Comments
16(a)	Box plot drawn with minimum at 12 lower quartile at 21 median at 30 upper quartile at 32 maximum at 37	B3	$\pm \frac{1}{2}$ square B2 box plot drawn with three or four of minimum at 12 lower quartile at 21 median at 30 upper quartile at 32 maximum at 37 B1 (range) 25 seen or indicated
	Additional Guidance		
	Group B 	B3	
	Box plot must have two whiskers and a central box with no more than one vertical division for B2 or B3		
	Mark intention eg the box can be any height		
	Allow ends of whiskers to be vertical lines of any length, dots, crosses or missing		
	For the B1, 25 must be indicated in this part of the question		

Q	Answer	Mark	Comments
16(b)	$32 - 21$ or 11	M1	group B IQR
	18 or 31 or 13	M1	group A LQ, UQ or IQR
	Ticks Group B and 11 and 13	A1	oe
	Additional Guidance		
	If neither box ticked, decision can be implied eg Group B was more consistent because 11 is less than 13		M1M1A1
	Ignore any reference to range		
	Values may be seen on the diagram or next to the table		

Q	Answer	Mark	Comments
17	Alternative method 1		
	$30 \div 0.4$ or 75	M1	oe
	$(\text{their } 75 - 30) \div 9 \times 4$	M1dep	oe eg $75 \times 0.6 \div 9 \times 4$
	20	A1	
	Alternative method 2		
	$30 \times \frac{60}{40}$ or 45	M1	oe eg $(30 - 0.4 \times 30) \div 0.4$ or $18 \div 0.4$
	their $45 \div 9 \times 4$	M1dep	oe $30 \times \frac{100 - 40}{40} \times \frac{4}{9}$ oe is awarded M2
	20	A1	

Q	Answer	Mark	Comments
18(a)	5 : 6 or 1 : 1.2	B1	oe ratio

Q	Answer	Mark	Comments
18(b)	$120 \div (7 - 2)$ or $120 \div 5$ or 24	M1	implied by $120 \times (4 + 7 + 2) \div 5$ or 312
	their 24×4 or $120 - \text{their } 24$	M1dep	oe eg $312 \times 4 \div 13$
	96	A1	

Q	Answer	Mark	Comments
19	Alternative method 1		
	$(DAB =) \frac{180 - x}{2}$	M1	oe eg $180 - (90 + \frac{x}{2})$
	$\frac{180 - x}{2} - 60$	M1dep	oe eg $180 - (90 + \frac{x}{2}) - 60$
	$30 - \frac{x}{2}$ with M2 scored	A1	
	Alternative method 2		
	(reflex $ACB =$) 300	M1	
	$\frac{360 - (300 + x)}{2}$	M1dep	oe eg $\frac{360 - 300 - x}{2}$
	$30 - \frac{x}{2}$ with M2 scored	A1	
	Alternative method 3		
	$60 + DAC + 60 + DAC + x = 180$ or $DAC = y$ and $60 + y + 60 + y + x = 180$	M1	oe any letter other than x may be labelled on diagram
	$(DAC =) \frac{180 - 2 \times 60 - x}{2}$ or $(y =) \frac{180 - 2 \times 60 - x}{2}$	M1dep	oe eg $\frac{180 - 120 - x}{2}$
	$30 - \frac{x}{2}$ with M2 scored	A1	

Alternative methods 4 & 5 and Additional Guidance on the next page

Q	Answer	Mark	Comments
19 cont	Alternative method 4		
	(DCA =) 150	M1	line <i>DC</i> need not be drawn
	$180 - 150 - \frac{x}{2}$	M1dep	
	$30 - \frac{x}{2}$ with M2 scored	A1	
	Alternative method 5		
	Forms a correct equation using $30 - \frac{x}{2}$	M1	eg sum of angles in <i>ABD</i> $30 - \frac{x}{2} + 30 - \frac{x}{2} + 60 + 60 + x = 180$
	Correct simplification of the equation to be one step away from showing that both sides are equal	M1dep	eg $180 - x + x = 180$
	Concluding statement with M2 scored	A1	eg therefore $DAC = 30 - \frac{x}{2}$
	Additional Guidance		
	Working may be seen on the diagram		

Q	Answer	Mark	Comments
20(a)	$\frac{1}{2} + 3$ or 3.5 or $\frac{8}{x} + 24$ or $\frac{8}{2} + 24$	M1	oe
	28	A1	

Q	Answer	Mark	Comments
20(b)	$\frac{1}{x^2} + 3$	B1	oe eg $\frac{3x^2 + 1}{x^2}$ or $x^2 + 3$
	Additional Guidance		
	Ignore fg(x) = ...		

Q	Answer	Mark	Comments
21	Alternative method 1		
	$w(x + y) = xy$	M1	
	$wx + wy = xy$	M1dep	oe with brackets expanded
	$wx = xy - wy$ or $wx = y(x - w)$ or $\frac{wx}{x - w}$ or $\frac{-wx}{w - x}$	M1dep	oe collection of terms in y eg $wy - xy = -wx$
	$y = \frac{wx}{x - w}$	A1	oe with y as the subject eg $y = \frac{-wx}{w - x}$

Alternative methods 2 & 3 and Additional Guidance on the next page

Q	Answer	Mark	Comments
21 cont	Alternative method 2		
	$w = \frac{x}{\frac{x}{y} + 1}$ <p>or</p> $w\left(\frac{x}{y} + 1\right) = x$	M1	divides through by y first
	$\frac{wx}{y} + w = x$ <p>or</p> $\frac{x}{y} + 1 = \frac{x}{w}$	M1dep	oe with brackets expanded
	$\frac{wx}{y} = x - w$ <p>or</p> $\frac{x}{y} = \frac{x}{w} - 1$ <p>or</p> $\frac{wx}{x-w} \text{ or } \frac{x}{\frac{x}{w} - 1}$	M1dep	oe with single term containing y isolated
	$y = \frac{wx}{x-w}$	A1	oe with y as the subject eg $y = \frac{x}{\frac{x}{w} - 1}$

Alternative method 3 and Additional Guidance on the next page

Alternative method 3		
$\frac{1}{w} = \frac{x+y}{xy}$	M1	
$\frac{1}{w} = \frac{1}{y} + \frac{1}{x}$	M1dep	oe separates out as 2 fractions
$\frac{1}{y} = \frac{1}{w} - \frac{1}{x}$ or $\frac{1}{y} = \frac{x-w}{wx}$	M1dep	oe with single term containing y isolated
$y = \frac{wx}{x-w}$	A1	oe with y as the subject eg $y = \frac{-wx}{w-x}$
Additional Guidance		
Condone $y = \frac{wx}{x-w}$ in working and $\frac{wx}{x-w}$ on answer line	M1M1M1A1	
Use the scheme that favours the student eg may cross multiply and then expand (Alt 1) and then divide through by y (Alt 2) and continue with that method		
$y = \frac{wx}{x-w}$ followed by further incorrect work	M1M1M1A0	

Q	Answer	Mark	Comments
22(a)	$\sqrt{9 \times 5}$ or $\sqrt{9} \times \sqrt{5}$ or $3\sqrt{5}$ or $\sqrt{5 \times 16}$ or $\sqrt{5} \times \sqrt{16}$ or $4\sqrt{5}$	M1	
	$\sqrt{9 \times 5}$ or $\sqrt{9} \times \sqrt{5}$ or $3\sqrt{5}$ and $\sqrt{5 \times 16}$ or $\sqrt{5} \times \sqrt{16}$ or $4\sqrt{5}$	M1dep	
	$7\sqrt{5}$ or $a = 7$ with M2 awarded	A1	
	Additional Guidance		
	Answer only $7\sqrt{5}$ or with no valid working		M0M0M0
	$7\sqrt{5}$ with only first M mark awarded		M1M0M0

Q	Answer	Mark	Comments
22(b)	$\frac{46}{5+\sqrt{2}} \times \frac{5-\sqrt{2}}{5-\sqrt{2}}$	M1	may be seen as two separate calculations
	$46 \times 5 - 46 \times \sqrt{2}$ or $230 - 46\sqrt{2}$ and $5 \times 5(-5\sqrt{2} + 5\sqrt{2}) - 2$ or $25(-5\sqrt{2} + 5\sqrt{2}) - 2$ or 23	M1dep	with $(5 - \sqrt{2})$ seen allow the numerator as $46(5 - \sqrt{2})$
	$10 - 2\sqrt{2}$ with M2 scored	A1	accept $a = 10, b = 2$ with M2 scored
	Additional Guidance		
	Do not ignore further incorrect work after the correct answer is seen eg $10 - 2\sqrt{2} = 8\sqrt{2}$ eg $10 - 2\sqrt{2} = 2(5 - \sqrt{2})$		M1M1A0 M1M1A1
	$10 - 2\sqrt{2}$ or $2(5 - \sqrt{2})$ with no working shown		M0M0A0
	Allow $\frac{46}{5+\sqrt{2}} \times (5 - \sqrt{2})$ for first M1 only if recovered		

Q	Answer	Mark	Comments										
23	<table><tr><th>Time, t (hours)</th><th>Frequency</th></tr><tr><td>$2 < t \leq 4$</td><td>9</td></tr><tr><td>$4 < t \leq 6$</td><td>24</td></tr><tr><td>$6 < t \leq 7$</td><td>27</td></tr><tr><td>$7 < t \leq 11$</td><td>32</td></tr></table>	Time, t (hours)	Frequency	$2 < t \leq 4$	9	$4 < t \leq 6$	24	$6 < t \leq 7$	27	$7 < t \leq 11$	32	B3	B2 two correct frequencies B1 one correct frequency or correct frequency density scale on y -axis eg one small square high = 0.5 or 1 cm = 2.5 or indication of correct scale eg 12 at height of second bar
	Time, t (hours)	Frequency											
	$2 < t \leq 4$	9											
$4 < t \leq 6$	24												
$6 < t \leq 7$	27												
$7 < t \leq 11$	32												
Additional Guidance													
Examples of indication of correct scale $2 \text{ cm}^2 = 5 \text{ people}$ or $1 \text{ cm}^2 = 2.5 \text{ people}$ or line of 10 small squares = 0.5 person		B1											

Q	Answer	Mark	Comments
24	$x^2 - 5x - 5x + 25$ or $x^2 - 10x + 25$	M1	may be seen in a grid may be implied
	$x^3 - 5x^2 - 5x^2 + 25x - 5x^2 + 25x + 25x - 125$ or $x^3 - 10x^2 + 25x - 5x^2 + 50x - 125$ or $x^3 - 15x^2 + 75x - 125$	M1dep	may be seen in a grid
	$6x^2 - 75x$	M1	may be seen in a grid
	$x^3 - 9x^2 - 125$	A1	
	Additional Guidance		
	Terms may be in any order throughout		
	Correct answer then incorrect further work		M3A0
	$x^3 - 9x^2 - 125 = x^2(x - 9) - 125$		M3A0
	One single expansion for the cubic (terms may be in an unsimplified form) is M2 if correct or M0 if not eg $1 \times x^3 + 3x^2 \times (-5) + 3x \times (-5)^2 + (-5)^3$		M2

Q	Answer	Mark	Comments
25	Alternative method 1		
	$d = \frac{k}{e^2}$ or $6.4 = \frac{k}{2.5^2}$ or $(k =) 6.4 \times 2.5^2$	M1	oe any letter for k
	$(k =) 40$	A1	oe may be implied by $d = \frac{40}{e^2}$
	their $40 \div 20^2$	M1dep	oe ft their k with M1 awarded
	0.1 or $\frac{40}{400}$ or $\frac{1}{10}$	A1ft	oe ft their k with M1A0M1 awarded
	Alternative method 2		
	$\left(\frac{20}{2.5}\right)^2$ or 64 or $\left(\frac{2.5}{20}\right)^2$ or 0.015625	M1	oe
	$\frac{6.4}{d} = \left(\frac{20}{2.5}\right)^2$ or $\frac{6.4}{d} = 64$ or $\frac{d}{6.4} = \left(\frac{2.5}{20}\right)^2$ or $\frac{d}{6.4} = 0.015625$	A1	oe
	$6.4 \div \left(\frac{20}{2.5}\right)^2$ or $6.4 \div \text{their } 64$ or $6.4 \times \left(\frac{2.5}{20}\right)^2$ or $6.4 \times \text{their } 0.015625$	M1dep	oe ft their 64 or their 0.015625 with M1 awarded
	0.1 or $\frac{40}{400}$ or $\frac{1}{10}$	A1ft	oe ft their 64 or their 0.015625 with M1A0M1 awarded

Alternative method 3 and Additional Guidance on the next page

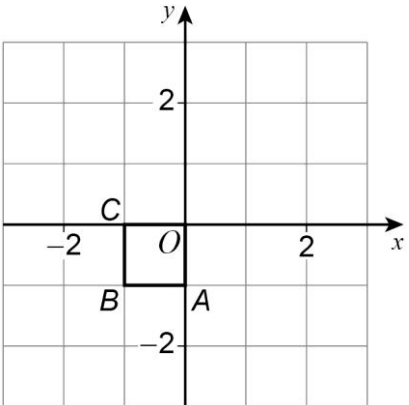
Q	Answer	Mark	Comments
25 cont	Alternative method 3		
	$cd = \frac{1}{e^2}$ or $6.4c = \frac{1}{2.5^2}$ or $(c =) \frac{1}{6.4 \times 2.5^2}$	M1	oe any letter for c
	$(c =) \frac{1}{40}$	A1	oe may be implied by $\frac{d}{40} = \frac{1}{e^2}$
	$\frac{1}{20^2} \div \text{their } \frac{1}{40}$	M1dep	oe ft their c with M1 awarded
	0.1 or $\frac{40}{400}$ or $\frac{1}{10}$	A1ft	oe ft their c with M1A0M1 awarded
	Additional Guidance		
	Using $d = ke^2$		M0A0M0A0
	Using $d = \frac{k}{e}$		M0A0M0A0
	Use of $\propto$ must be recovered		
	Condone sight of $d = \frac{1}{e^2}$ if recovered		
	Using $d \propto \frac{1}{e^2}$ oe is not sufficient on its own for first M mark		

Q	Answer	Mark	Comments
26	$4x^3$ or $(-)32$	M1	oe eg $4 \times x^{4-1}$ or $(-)32 \times 1 \times x^{1-1}$
	their $(4x^3 - 32) = 0$ or $x^3 - 8 = 0$	M1dep	oe ft their 2 term derivative with at least 1 term correct
	2	A1	
	Additional Guidance		
	Ignore any attempt to work out the y -value		
	Ignore any value given for the y -coordinate eg $(2, -48)$		
	$(2, -48)$		M1M1A1
	$4x^3$ or $(-)32x$ followed by $4x^3 - 32x = 0$ (oe)		M1M1

Q	Answer	Mark	Comments
27(a)	$-(2a + 4b) + 5a + 3b (= 3a - b)$	B1	oe

Q	Answer	Mark	Comments
27(b)	Alternative method 1		
	$\overline{AB} \Rightarrow 2(2a + 4b) \text{ or } 4a + 8b$ or $\overline{AC} \Rightarrow 3(5a + 3b) \text{ or } 15a + 9b$	M1	oe may be seen on diagram
	$\overline{BC} \Rightarrow 3(5a + 3b) - 2(2a + 4b)$ or $\overline{BC} \Rightarrow 15a + 9b - (4a + 8b)$	M1dep	oe
	$11a + b \text{ or } b + 11a$	A1	
	Alternative method 2		
	$\overline{EC} \Rightarrow 2(5a + 3b) \text{ or } 10a + 6b$ or $\overline{DB} = 2a + 4b$	M1	oe may be seen on diagram
	$\overline{BC} \Rightarrow -(2a + 4b) + 3a - b + 2(5a + 3b)$ or $\overline{BC} \Rightarrow -(2a + 4b) + 3a - b + 10a + 6b$	M1dep	oe
	$11a + b \text{ or } b + 11a$	A1	
	Additional Guidance		
	Use the scheme that favours the student eg may start with $\overline{DB}$ and $\overline{EC}$ then use $\overline{AB}$ and $\overline{AC}$ when combining them.		

Q	Answer	Mark	Comments
28	$\frac{1}{2} \times 6.2 \times 9.5 \times \sin y$	M1	oe y can be any letter
	(sin y =) $25 \times 2 \div (6.2 \times 9.5)$ or (sin y =) [0.848, 0.85] or [57.99, 58.22]	M1dep	oe
	$6.2^2 + 9.5^2 - 2 \times 6.2 \times 9.5 \times \cos(\text{their } [57.99, 58.22])$ or [66.2, 66.65]	M1	their [57.99, 58.22] must be < 90
	$\sqrt{\text{their } [66.2, 66.65]}$	M1dep	dep on 3rd M
	[8.1, 8.2]	A1	

Q	Answer	Mark	Comments
29	<p>(Reflection in y-axis $\Rightarrow \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$)</p> <p>or</p> <p>$\left(\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \right) = \text{rotation } 270$ (anticlockwise about $(0, 0)$)</p> <p>or</p> 	M1	<p>oe eg $\mathbf{S} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$</p> <p>or</p> <p>$\mathbf{T}$ = rotation 90 clockwise</p> <p>implied by correct description or matrix for ST</p>
	<p>ST is reflection in $y = -x$</p> <p>and $\mathbf{ST} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$</p>	A2	<p>A1 ST is reflection in $y = -x$</p> <p>or $\mathbf{ST} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$</p>
	Additional Guidance		
	Working out matrix or transformation ST in the wrong order can score a maximum of M1		

Q	Answer	Mark	Comments
30	$\sqrt[3]{\frac{8100}{2400}}$ or $\frac{3}{2}$ or 1.5 or $\sqrt[3]{\frac{2400}{8100}}$ or $\frac{2}{3}$ or [0.66, 0.7] or $\sqrt[3]{2400}$ and $\sqrt[3]{8100}$ or [13.38, 13.4] and [20.08, 20.1]	M1	oe eg 2 : 3 or 1 : 1.5 or 0.66... : 1 or $\sqrt[3]{3.375}$
	their 1.5^2 or 2.25 or their $[0.66, 0.7]^2$ or [0.43, 0.49] or their $[13.38, 13.4]^2$ and their $[20.08, 20.1]^2$ or [179, 180] and [403, 404.01]	M1dep	oe eg 4 : 9 or 1 : 2.25 or 0.44... : 1 or $\frac{4}{9}$
	4140	A1	
	Additional Guidance		
	$\frac{2}{2400^3}$ and $\frac{2}{8100^3}$		M1M1
	1840 ÷ 403 × 179 (403 and 179 seen)		M1M1A0