ELITE

IGCSE Mathematics A • Pearson Edexcel

13_January_2023 • Unit 1

1H + 2H source-order past paper

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L-to-M | CONVERTED MODULAR EDITION

Selected from Linear Higher papers; not an original Modular examination paper.

Contents

1H Q02 • Solving Linear Equations • 3 marks

1H Q07 • Probability Toolkit • 4 marks

1H Q08 • Circles, Arcs & Sectors • 5 marks

1H Q12 • Algebraic Roots & Indices • 2 marks

1H Q13 • Expanding Brackets • 3 marks

1H Q14 • Graphs of Functions • 3 marks

1H Q15 • Probability Diagrams - Venn & Tree Diagrams • 7 marks

1H Q16 • Sine, Cosine Rule & Area of Triangles • 5 marks

1H Q19 • Rounding, Estimation & Bounds • 5 marks

1H Q21 • Circles, Arcs & Sectors • 5 marks

1H Q23 • Coordinate Geometry • 6 marks

2H Q01 • Fractions • 3 marks

2H Q02 • Standard & Compound Units • 3 marks

2H Q03 • Set Notation & Venn Diagrams • 3 marks

2H Q04 • Area & Perimeter • 4 marks

2H Q05 • Rounding, Estimation & Bounds • 4 marks

2H Q06 • Coordinate Geometry • 3 marks

2H Q09 • Linear Graphs (y = mx + c) • 7 marks

2H Q10 • Right-Angled Triangles - Pythagoras & Trigonometry • 5 marks

2H Q11 • Graphs of Functions • 3 marks

2H Q13 • Algebraic Fractions • 3 marks

2H Q16 • Fractions, Decimals & Percentages • 2 marks

2H Q18 • Histograms • 5 marks

2H Q23 • 3D Pythagoras & Trigonometry • 5 marks

2H Q26 • Algebraic Roots & Indices • 5 marks

2 Solve $3(2 - 4x) = 5 - 8x$
Show clear algebraic working.

$x =$ .....

(Total for Question 2 is 3 marks)

2	$6-12x$ or $2-4x=\frac{5}{3}-\frac{8}{3}x$		3	M1 for expansion of bracket on the LHS or dividing the RHS by 3 with two terms
	$6-5=12x-8x$ or $1=4x$ or $-12x+8x=5-6$ oe or $-4x=-1$ or $\frac{8}{3}x-4x=\frac{5}{3}-2$ oe or $2-\frac{5}{3}=-\frac{8}{3}x+4x$ oe			M1 ft (dep on 4 terms) for terms in x on one side of equation; number terms on the other
	Working required	$\frac{1}{4}$		A1 oe dep on M1 awarded
				Total 3 marks

7 Some members of a library were asked to name the type of book that they each liked to read the best.

One of the members is chosen at random.
The table shows information about the probability of the type of book that this member answered.

Type of book	comedy	romance	mystery	thriller
Probability	0.24	0.40	$3x$	x

48 members answered comedy books.

Work out how many of the members answered mystery books.

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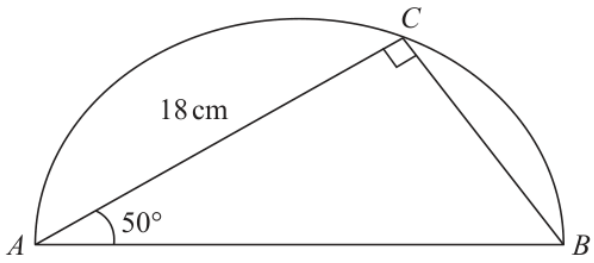
(Total for Question 7 is 4 marks)

7	1 – (0.24 + 0.4) (= 0.36) oe or $3x + x = 1 – (0.24 + 0.4)$ oe		4	M1
	48 ÷ 0.24 (= 200) or "0.36" ÷ 4 (= 0.09) or "0.36" ÷ 4 × 3 (= 0.27)			M1
	"0.27" × "200" or "200" × "0.36" ÷ 4 × 3 ("200" – 48 – "80") ÷ 4 × 3			M1 for a complete method
		54		A1
				Total 4 marks

7 **ALT**	1 – (0.24 + 0.4) (= 0.36) oe or $3x + x = 1 – (0.24 + 0.4)$ oe		4	M1
	48 ÷ 24 (= 2) oe or $\left(\frac{"0.36"}{4}\times 3\right)\div 0.24\left(=\frac{9}{8}=1.125\right)$ oe or $\left(\frac{"36"}{4}\times 3\right)\div 24\left(=\frac{9}{8}=1.125\right)$ oe			M1
	$"2"\times\left(\frac{"36"}{4}\times 3\right)$ oe or $"\frac{9}{8}"\times 48$ oe or $("27"\div 24)\times 48$ oe			M1 for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	54		A1
				Total 4 marks

8 The diagram shows a triangle ABC inside a semicircle.

Diagram **NOT** accurately drawn



A, B and C are points on the semicircle.

AB is the diameter of the semicircle.

Angle $ACB = 90°$
Angle $BAC = 50°$
$AC = 18$ cm

Work out the perimeter of the semicircle.
Give your answer correct to 2 significant figures.

..... cm

(Total for Question 8 is 5 marks)

8	$\cos 50 = \frac{18}{(AB)}$ or $\sin 40 = \frac{18}{(AB)}$ or $\frac{(AB)}{\sin 90} = \frac{18}{\sin 40}$		5	M1	M2 for $(AB =)\sqrt{18^2 + (18\tan 50)^2}$ oe (= 28.0030…) or 28
	$(AB =)\frac{18}{\cos 50}(= 28.0030...)$ oe or 28 or $(AB =)\frac{18}{\sin 40}(= 28.0030...)$ oe or 28			M1	
	$\frac{1}{2} \times \pi \times "28.0030..."(= 43.9...)$ oe or 44 $\pi \times "28.0030..."(= 87.9...)$ oe or 88			M1 for use of πd or $\frac{1}{2}\pi d$ oe Allow any value of $AB > 18$ if M2 not scored	
	"28…" + "43.9…" (= 71.9900…) or "28" + "44"			M1ft from previous M1 Allow *their d* + *their* $\frac{1}{2}\pi d$	
	Correct answer scores full marks (unless from obvious incorrect working)	72		A1 awrt 72	
				Total 5 marks	

12 $3^{\frac{1}{2}} \times 3^{\frac{2}{5}} = 3^m$

(a) Work out the value of m

$m =$ .....

(1)

$5^{-10} \div 5^{-4} = 5^n$

(b) Work out the value of n

$n =$ .....

(1)

(Total for Question 12 is 2 marks)

12	(a)		$\frac{9}{10}$	1	B1 oe
	(b)		-6	1	B1
					Total 2 marks

13 Expand and simplify $3x(2x - 5)^2$
Show clear algebraic working.

(Total for Question 13 is 3 marks)

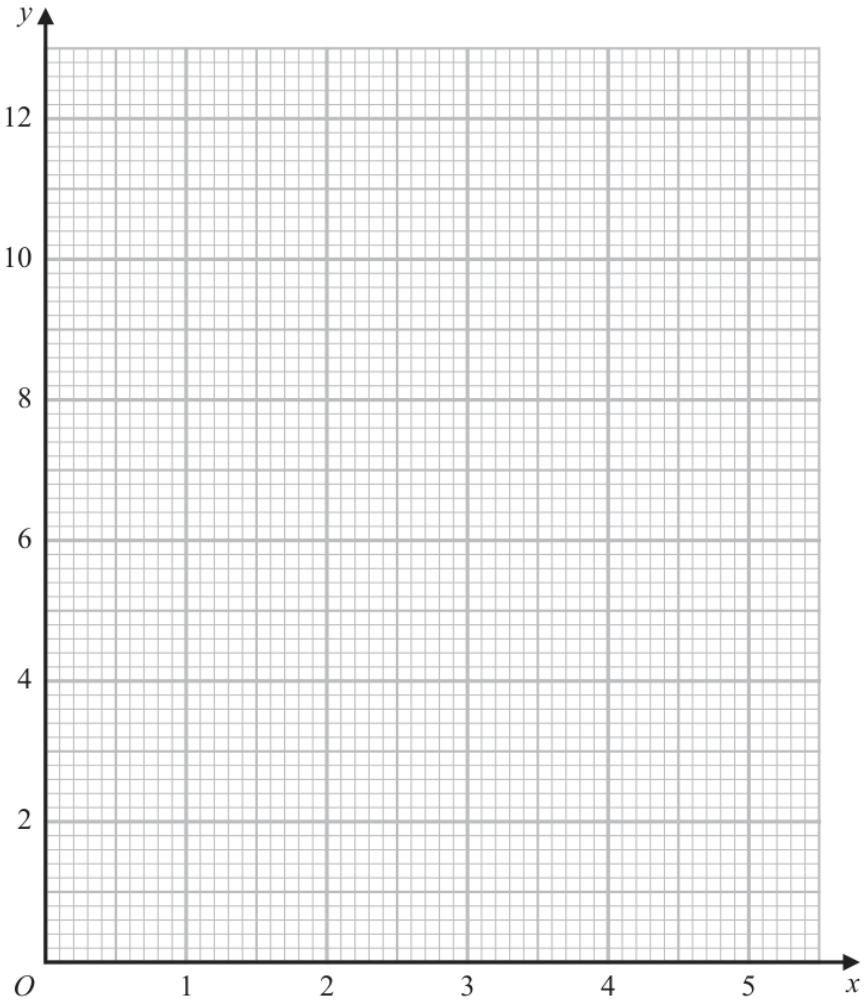
13	$3x(2x-5)=6x^2-15x$ **or**		3	M1 for multiplying $3x$ by $(2x-5)$ with **both** terms correct or
	$(2x-5)^2=4x^2-10x-10x+25$ **or**			for multiplying $(2x-5)$ by $(2x-5)$ with 3 out of 4 terms correct or
	$(2x-5)^2=4x^2-20x+25$			for multiplying $(2x-5)$ by $(2x-5)$ and getting $4x^2-20x\ldots$ **or** $\ldots-20x+25$ (not for $4x^2+25$)
	$(6x^2-15x)(2x-5)=12x^3-30x^2-30x^2+75x$ oe **or**			M1ft (dep) for multiplying the product of $3x$ and $(2x-5)$ by $(2x-5)$ with 3 out of 4 terms correct or
	$(6x^2-15x)(2x-5)=12x^3-60x^2+75x$ oe **or**			for multiplying the product of $3x$ and $(2x-5)$ by $(2x-5)$ and getting $12x^3-60x^2\ldots$ **or** $\ldots-60x^2+75x$
	$3x(4x^2-10x-10x+25)=12x^3-30x^2-30x^2+75x$ oe **or**			for multiplying the product of $(2x-5)$ and $(2x-5)$ by $3x$ with 3 out of 4 terms correct or
	$3x(4x^2-20x+25)=12x^3-60x^2+75x$			for multiplying the product of $(2x-5)$ and $(2x-5)$ by $3x$ with 2 out of 3 terms correct or
				Expansion in one stage will lead to $12x^3-30x^2-30x^2+75x$ without firstly expanding two factors – award M2 for 3 out of 4 terms correct M1 for 2 out of 4 terms correct
	Working required	$12x^3-60x^2+75x$		A1 dep on M1
				Total 3 marks

14 (a) Complete the table of values for $y = \frac{2}{x}\left(5 - \frac{1}{x}\right)$

x	0.5	1	2	3	4	5
y		8		3.1	2.4	1.9

(1)

(b) On the grid, draw the graph of $y = \frac{2}{x}\left(5 - \frac{1}{x}\right)$ for $0.5 \leqslant x \leqslant 5$



(2)

(Total for Question 14 is 3 marks)

14	(a)		12 and 4.5	1	B1 allow $\frac{9}{2}$ oe May be awarded if plotted correctly on the graph
	(b)		Correct graph	2	M1 ft for at least 5 points plotted correctly (± half square)
		Correct answer scores full marks (unless from obvious incorrect working)			A1 for correct curve between $x = 0.5$ and $x = 5$ (clear intention to go through all the points and which must be curved) **Note**: If a fully correct graph is shown, but an incomplete table is shown in (a), then award the marks for (a)
					Total 3 marks

15 Here are 9 cards. Each card has either a number on it or a letter on it.

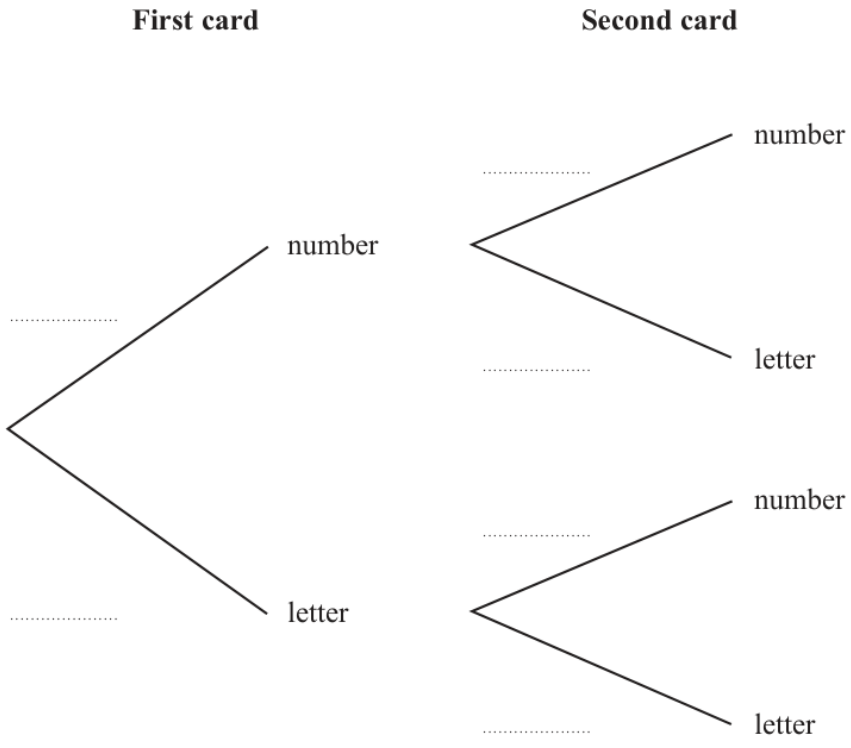
A	7	H	F	E	D	G	5	C

Tomas is playing a game.

Tomas takes at random one of the cards and keeps it.

Tomas then takes at random another card and keeps it.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that each of the two cards has a number on it.

.....

(2)

(c) Work out the probability that there will be one card with a number on it and one card with a letter on it.

.....

(3)

(Total for Question 15 is 7 marks)

15	(a)		$\frac{2}{9}, \frac{7}{9}$	2	B1 for correct probabilities for the first card Allow equivalent probabilities e.g $0.\dot{2}$
			$\frac{1}{8}, \frac{7}{8}, \frac{2}{8}, \frac{6}{8}$		B1 for correct probabilities for the second card Allow equivalent probabilities
	(b)	"$\frac{2}{9}$"×"$\frac{1}{8}$" or 1 – "$\frac{2}{9}$"×"$\frac{7}{8}$" – "$\frac{7}{9}$"×"$\frac{2}{8}$"– "$\frac{7}{9}$"×"$\frac{6}{8}$"		2	M1ft (All probabilities must be less than 1)
		Correct answer scores full marks (unless from obvious incorrect working)	$\frac{1}{36}$		A1ft oe probability must be less than 1 Allow equivalent decimal to at least 2 sf (truncated or rounded) for $\frac{1}{36}$ (= 0.027(77..))
	(c)	"$\frac{2}{9}$"×"$\frac{7}{8}$" or "$\frac{7}{9}$"×"$\frac{2}{8}$"oe or "$\frac{2}{9}$"×"$\frac{1}{8}$" **and** "$\frac{7}{9}$"×"$\frac{6}{8}$"oe or "$\frac{1}{36}$" **and** "$\frac{7}{9}$"×"$\frac{6}{8}$"oe		3	M1ft (All probabilities must be less than 1)
		"$\frac{2}{9}$"×"$\frac{7}{8}$"+"$\frac{7}{9}$"×"$\frac{2}{8}$" or $2\times\frac{14}{72}$ oe or 1 – "$\frac{2}{9}$"×"$\frac{1}{8}$"– "$\frac{7}{9}$"×"$\frac{6}{8}$" oe or 1 – "$\frac{1}{36}$"– "$\frac{7}{9}$"×"$\frac{6}{8}$" oe			M1ft

	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{7}{18}$		A1ft oe probability must be less than 1 Allow equivalent decimal to at least 2 sf (truncated or rounded) for $\frac{7}{18}$ (= 0.38(88..))
				Total 7 marks

16 Here is a shape formed from two triangles ABC and CDE
ACD and BCE are straight lines.

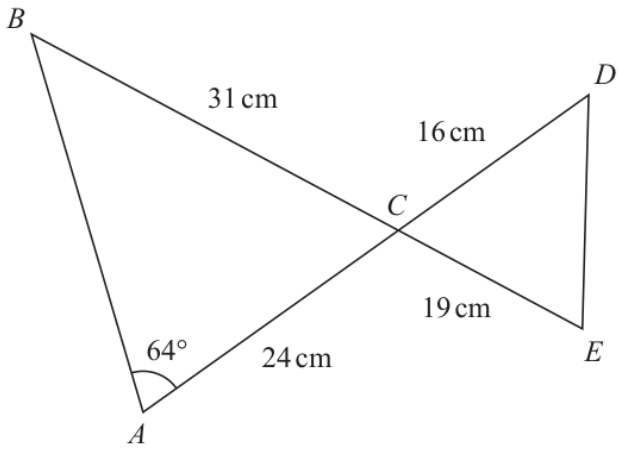


Diagram **NOT** accurately drawn

$AC = 24\,\text{cm}$ $BC = 31\,\text{cm}$ $CE = 19\,\text{cm}$ $CD = 16\,\text{cm}$

Angle $BAC = 64°$

Work out the length of DE
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 16 is 5 marks)

16	$\frac{\sin ABC}{24} = \frac{\sin 64}{31}$ oe		5	M1
	$(ABC =)\sin^{-1}\left(\frac{24\times\sin 64}{31}\right)(=44.\ldots)$			M1
	$180 - \text{“}44.\ldots\text{”} - 64\ (=71.9\ldots)$			M1 accept 72
	$(DE^2 =)16^2+19^2-2\times16\times19\times\cos\text{"}71.9...\text{"}$ or $(DE =)\sqrt{16^2+19^2-2\times16\times19\times\cos\text{"}71.9...\text{"}}$ or $(DE =)\sqrt{617-181.8...}$ or $\sqrt{428.166...}$			M1 for DE^2 or DE
	Correct answer scores full marks (unless from obvious incorrect working)	20.7		A1 awrt 20.7
				Total 5 marks

19 The acceleration, a, of an object is given by

$$a = \frac{v - u}{t}$$

where

$v = 45.23$ correct to 2 decimal places
$u = 5.12$ correct to 2 decimal places
$t = 8.5$ correct to 2 significant figures

By considering bounds, work out the value of a to a suitable degree of accuracy.
Show your working clearly and give a reason for your answer.

$a =$ .....

(Total for Question 19 is 5 marks)

19	45.225 or 45.235 or 5.115 or 5.125 or 8.45 or 8.55		5	B2 for all 6 correct (B1 for 4 or 5 correct) Accept $45.234\dot{9}$ for 45.235 $5.124\dot{9}$ for 5.125 $8.54\dot{9}$ for 8.55
	$\frac{45.235-5.115}{8.45}(=4.7479\ldots)$			M1 for correct substitution into the *UB* $a=\frac{v-u}{t}$ where $45.23 < v_{(UB)} \leq 45.235$ $5.115 \leq u_{(LB)} < 5.12$ $8.45 \leq t_{(LB)} < 8.5$
	$\frac{45.225-5.125}{8.55}(=4.6900\ldots)$			M1 for correct substitution into the *LB* $a=\frac{v-u}{t}$ where $45.225 \leq v_{(LB)} < 45.23$ $5.12 < u_{(UB)} \leq 5.125$ $8.5 < t_{(UB)} \leq 8.55$
	Working required	4.7 and correct reason		A1 dep on M2 4.7 and both answers round to 4.7 oe e.g.1 dp or 2 sf
				Total 5 marks

21 The diagram shows the cross section of a circular water pipe.

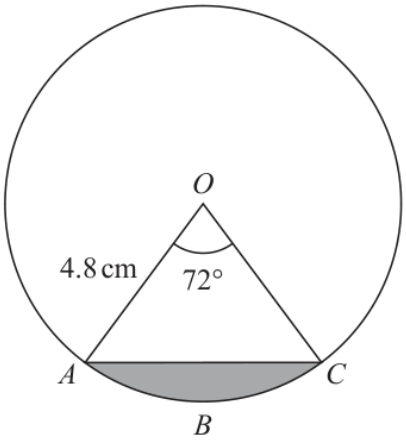


Diagram **NOT** accurately drawn

OABC is a sector of the circle, centre *O*

The shaded region in the diagram represents the water flowing in the pipe.

The water flows at 14 cm/s in the pipe.

Work out the volume of water that has flowed through the pipe in 3 minutes.
Give your answer in cm^3 correct to 3 significant figures.

..... cm^3

(Total for Question 21 is 5 marks)

21	$\pi \times 4.8^2 \times \frac{72}{360}$ (= 14.4(76…)) oe		5	M1 for finding the area of the sector
	$\frac{1}{2} \times 4.8^2 \times \sin 72$ (= 10.9(56…) or 11) oe or $\frac{1}{2} \times 5.6(4...) \times 3.8(8...)$ oe			M1 for finding the area of the triangle (Allow use of cosine rule/sine rule/SOHCAHTOA/Pythagoras to find *AC* (5.6(427.8…)) and *OM* (3.8(8328…)) where *M* is the midpoint of *AC*)
	"14.4(76…)" – "10.9(56…)" (= 3.520…)			M1 for finding the shaded area with all figures from correct working
	"3.5(20…)" × 14 × 3 × 60 "3.5(20…)" × 2520			M1
	Award marks within the range from correct working	8870		A1 accept 8820 – 8950 from correct working
				Total 5 marks

23 $ABCD$ is a kite.

$AB = AD$ and $CB = CD$

The point B has coordinates $(k, 1)$ where k is a negative constant.
The point D has coordinates $(8, 7)$

The straight line **L** passes through the points B and D

The straight line **L** is parallel to the line with equation $5y - 3x = 6$

Find an equation of AC
Give your answer in the form $px + qy = r$ where p, q and r are integers.
Show your working clearly.

(Total for Question 23 is 6 marks)

23	$y=\frac{3}{5}x\left(+\frac{6}{5}\right)$ or $y=0.6x(+1.2)$ **or** (gradient =) $\frac{3}{5}$ or 0.6 oe		6	M1 for correct gradient which may be seen in an equation. Condone $\frac{3}{5}x$ or $0.6x$
	$k=-2$			B1 for $k=-2$
	$\left(\frac{"-2"+8}{2},\frac{1+7}{2}\right)$ oe or (3, 4)			M1 for finding the midpoint (use of their k where $k<0$)
	$"\frac{3}{5}"m=-1$ **or** $(m=)"-\frac{5}{3}"$			M1ft their gradient for use of $m_1\times m_2=-1$ Allow $-\frac{5}{3}=-1.67$ or better
	$"4"="-\frac{5}{3}"\times"3"+c$ or $c=9$ or $y-"4"="-\frac{5}{3}"(x-"3")$			M1 dep on M3
	Working required	$5x+3y=27$		A1 allow equation in any form where p, q and r are integers
				Total 6 marks

1 Show that $3\frac{5}{7} \div 1\frac{5}{8} = 2\frac{2}{7}$

(Total for Question 1 is 3 marks)

Question	Working	Answer	Mark	Notes
1	$\frac{26}{7}, \frac{13}{8}$ oe		3	M1 both fractions expressed as improper fractions, no need for ÷ or × may be equivalent to those given eg $\frac{52}{14}, \frac{26}{16}$ etc. A student could invert $\frac{13}{8}$ and show multiplication - as shown in the 2nd M1, this mark is then implied.
	$\frac{26}{7}\times\frac{8}{13}$ oe or eg $\frac{208}{56}\div\frac{91}{56}$			M1 **or** for both fractions expressed as equivalent fractions with denominators that are a common multiple of 7 and 8 eg $\frac{208}{56}\div\frac{91}{56}$
	eg $\frac{26}{7}\times\frac{8}{13}=\frac{208}{91}=\frac{16}{7}=2\frac{2}{7}$ **or** $\frac{26}{7}\times\frac{8}{13}=\frac{208}{91}=2\frac{26}{91}=2\frac{2}{7}$ **or** $\frac{\cancel{26}^{2}}{7}\times\frac{8}{\cancel{13}^{1}}=\frac{16}{7}=2\frac{2}{7}$ **or** $\frac{208}{56}\div\frac{91}{56}=\frac{208}{91}=\frac{16}{7}=2\frac{2}{7}$ **or** correct working to $\frac{16}{7}$ **and** writing $2\frac{2}{7}=\frac{16}{7}$ (usually on the first line of working) *working required*	shown		A1 dep on M2 **NB: use of decimals scores no marks (unless used as a check)**
				Total 3 marks

2 Change a speed of 90 kilometres per hour to a speed in metres per second.
Show your working clearly.

..... m/s

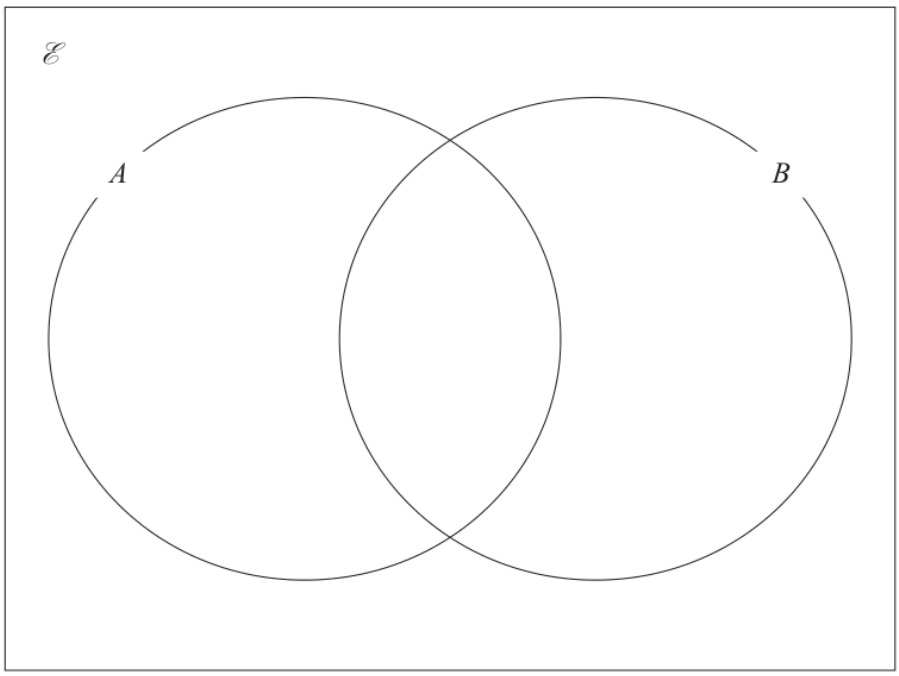
(Total for Question 2 is 3 marks)

Question	Working	Answer	Mark	Notes	
2	90 × 1000 (=90 000) or $\frac{90}{60\times60}(=0.025 \text{ or } \frac{1}{40})$ **or** $\frac{1000}{60\times60}(=\frac{5}{18}=0.277...)$ **or** sight of 1500		3	M1 For one of ×1000 (eg sight of 90 000) or (÷60 ÷ 60) or ÷3600 oe ie correct conversion of distance units or of time units	M2 for 90 ÷ 3.6 **or** $90\times\frac{5}{18}$
	$\frac{90\times1000}{60\times60}$ oe eg$(1.5\times1000)\div60$			M1 For a fully correct method with correct use of brackets eg 90 000 ÷ 60 × 60 is M1 only if not recovered	
	Working required	25		A1 dep on M1	
					Total 3 marks

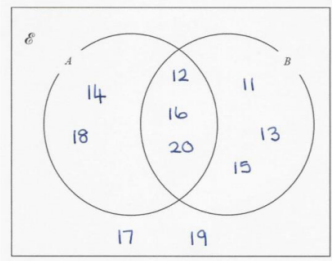
3 $\mathscr{E} = \{11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$A = \{\text{even numbers}\}$
$A \cap B = \{12, 16, 20\}$
$(A \cup B)' = \{17, 19\}$

Complete the Venn diagram for the sets $\mathscr{E}$, A and B



(Total for Question 3 is 3 marks)

Question	Working	Answer	Mark	Notes
3			3	B3 Fully correct (B2 for 2 or 3 'regions' correct, B1 for one 'region' correct)
				Total 3 marks

4 The diagram shows rectangle $ABCD$

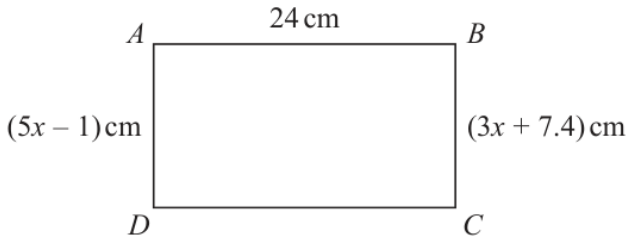


Diagram **NOT** accurately drawn

Work out the perimeter of the rectangle.
Show your working clearly.

..... cm

(Total for Question 4 is 4 marks)

Question	Working	Answer	Mark	Notes
4	eg $5x-1=3x+7.4$ oe **or** eg $10x-2+48$ **or** $6x+14.8+48$ **or** $24+24+5x-1+3x+7.4$ oe		4	M1 a correct equation to find x **or** a correct expression for the perimeter in terms of x
	$x=4.2$			A1 the correct value of x (implies previous mark)
	$2\times24+2(5\times$ "4.2" $-1)$ oe **or** $2\times24+2(3\times$ "4.2" $+7.4)$ oe **or** $2\times24+(5\times4.2-1)+(3\times4.2+7.4)$ oe eg $24+24+20+20$ oe			M1dep on a correct method to find the perimeter – use of positive x from correct working (1st M1 awarded for an equation) **and** only if used the same measurement for AD and BC
	working required	88		A1 cao dep on either M1 or $x=4.2$
				Total 4 marks

5 The weight of a cake is 2.75 kg, correct to 2 decimal places.

(a) Write down the lower bound of the weight of the cake.

..... kg

(1)

(b) Write down the upper bound of the weight of the cake.

..... kg

(1)

Penny has worked out $\frac{81.3 \times 59.2}{1.9^2}$ on her calculator.

Her answer is 13 332.299 17

Penny's answer is not sensible.

(c) By rounding each number to one significant figure, work out a suitable estimate to show that her answer is not sensible.
Show your working clearly.

(2)

(Total for Question 5 is 4 marks)

Question		Working	Answer	Mark	Notes
5	(a)		2.745	1	B1
	(b)		2.755	1	B1 allow $2.754\dot{9}$
	(c)	$(80 \times 60) \div 2^2$		2	M1 For two of 80, 60, 2 or 4 rather than 2^2 oe
		eg $(80 \times 60) \div 2^2 = 1200$ oe *working with rounded values seen required*	1200		A1 dep on M1 for answer coming from use of the 3 rounded numbers – if 1200 seen then ignore any other working and comments
					Total 4 marks

6 The points A and B are on a coordinate grid.

The coordinates of A are $(6, 4)$
The coordinates of B are $(17, j)$ where j is a constant.

The midpoint of AB has coordinates $(k, 15)$ where k is a constant.

Find the value of j and the value of k

$j =$ .....

$k =$ .....

(Total for Question 6 is 3 marks)

Question	Working	Answer	Mark	Notes
6	$[k =] \frac{6+17}{2}$ **or** $[k =] 6+\frac{17-6}{2}$ oe **or** $[j =] 4+2(15-4)$ **or** $[j =] 15+(15-4)$ **or** $\frac{4+j}{2}=15$ oe		3	M1
	Correct answers score full marks (unless from obvious incorrect working) *1 correct answer will score M1A1 and both will score M1A1A1*	26		A1
		11.5		A1 oe eg $\frac{23}{2}$ both answers the wrong way round scores M1A1 unless the correct answers are clearly labelled in working space
				Total 3 marks

9 (a) Write down the value of $(m + 2)^0$ where m is a positive integer.

.....

(1)

(b) Simplify $(3a^2b^4)^3$

.....

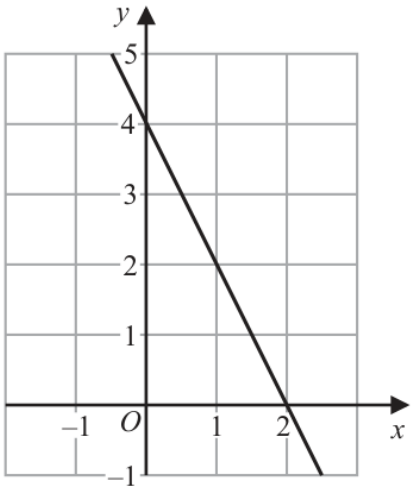
(2)

(c) Factorise fully $14x^2y^4 + 21x^3y^2$

.....

(2)

The diagram shows a straight line drawn on a grid.



(d) Write down an equation of the line.

.....

(2)

(Total for Question 9 is 7 marks)

Question	Working	Answer	Mark	Notes
9 (a)		1	1	B1
(b)		$27a^6b^{12}$	2	B2 (B1 for 2 of 3 parts in a product)
(c)		$7x^2y^2(2y^2+3x)$	2	B2 B1 for a correct factorisation with at least 2 factors outside (eg $7x$, x^2, xy, etc) eg $7x(2xy^4+3x^2y^2)$ eg $x^2y^2(14y^2+21x)$ or for the correct common factor with just one mistake inside the bracket eg $7x^2y^2(2y+3x)$ which is missing the squared on the y term
(d)	$y = mx + 4$ where $m \neq 0$ oe (eg $y = 2x + 4$) **or** $y = -2x + c$ or $y + 2x = c$ oe **or** $-2x + 4$ or $f(x) = -2x + 4$ oe		2	M1
	Correct answer scores full marks (unless from obvious incorrect working)	$y = -2x + 4$		A1 oe eg $y + 2x = 4$
				Total 7 marks

10 The diagram shows an isosceles triangle, with base length 24 cm.

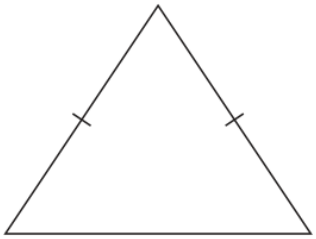


Diagram **NOT** accurately drawn

The perimeter of the triangle is 54 cm.

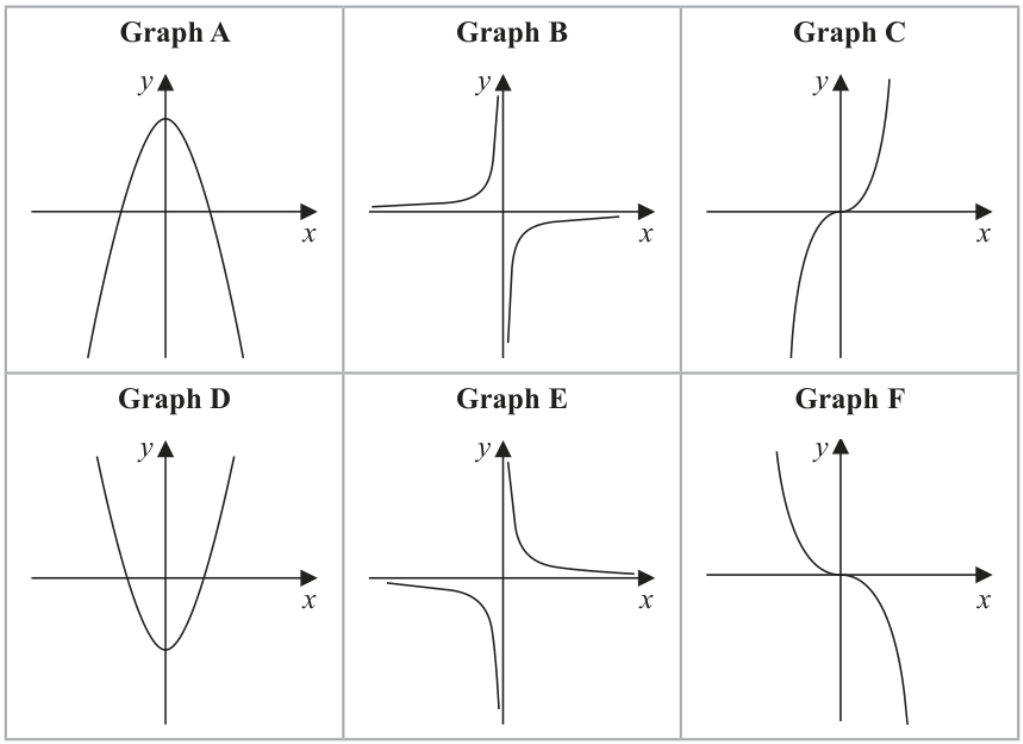
Work out the area of the triangle.

..... cm^2

(Total for Question 10 is 5 marks)

Question	Working	Answer	Mark	Notes
10	(54 – 24) ÷ 2 (=15) [may be marked on diagram]		5	M1
	"15"^{2} – (24 ÷ 2)^2 (= 81)			M1 ft their "15" (if > 12)
	[height =] $\sqrt{\text{"15"}^2-(24\div 2)^2}$ (= 9)			M1 ft their "15" (if > 12)
	(24 × "9") ÷ 2 oe			M1 figures must be from correct working
	Correct answer scores full marks (unless from obvious incorrect working)	108		A1 allow 107.9 – 108.1
	ALTERNATIVES BELOW			**Total 5 marks**
10	(54 – 24) ÷ 2 (=15) [may be marked on diagram]		5	M1
	or $x=\cos^{-1}\left(\frac{\text{"12"}}{\text{"15"}}\right)(=36.86...)$ **or** $y=\sin^{-1}\left(\frac{24\div 2}{\text{"15"}}\right)(=53.13...)$ **or** $A=\cos^{-1}\left(\frac{15^2+15^2-24^2}{2\times 15\times 15}\right)(=106.2...)$ **or** $B=\cos^{-1}\left(\frac{15^2+24^2-15^2}{2\times 15\times 24}\right)(=36.8....)$			M1 ft their "15" (if > 12) [using Hero's formula S = 0.5 × 54 (= 27) and] 27 × (27 – 24) × (27 – "15") × (27 – "15")
	or "12"tan"36.86…" (= 9) (allow 8.9… for these) "12" ÷ tan"53.13…" (= 9) **or** "15" × sin "36.86…" (= 9) **or** "15" × cos "53.13…" (= 9)			M1 ft their "15" (if > 12) — M2 for 0.5 × 24 × "15" × sin"36.86…" or 0.5 × "15" × "15" × sin(2 × "53.13…") or 0.5×"15"×"15"×sin("106.2...") **or** $\sqrt{\text{"27"}(\text{"27"}-24)(\text{"27"}-\text{"15"})(\text{"27"}-\text{"15"})}$
	(24 × "9") ÷ 2 oe			M1
	Correct answer scores full marks (unless from obvious incorrect working)	108		A1 allow 107.9 – 108.1
				Total 5 marks

11 Here are six graphs.



Complete the table below with the letter of the graph that could represent each given equation.
Write your answers on the dotted lines.

Equation	Graph
$y = -\frac{2}{x}$	.....
$y = 5 - x^2$	.....
$y = -2x^3$	.....

(Total for Question 11 is 3 marks)

Question	Working	Answer	Mark	Notes
11		**B**	3	B1
		A		B1
		F		B1
				Total 3 marks

13 Solve $\frac{x+3}{4} - \frac{7-x}{5} = 4.3$

Show clear algebraic working.

$x =$ .....

(Total for Question 13 is 3 marks)

Question	Working	Answer	Mark	Notes
13	eg $20\times\frac{x+3}{4}-20\times\frac{7-x}{5}=20\times4.3$ or eg $5(x+3)-4(7-x)=20\times4.3$ or eg $\frac{5(x+3)}{20}-\frac{4(7-x)}{20}(=4.3)$ or eg $\frac{5(x+3)-4(7-x)}{20}(=4.3)$		3	M1 For clear intention to multiply all terms by 20 (or 4 × 5) or a multiple of 20 oe or to express LHS as two fractions over 20 (or 4 × 5) or a multiple of 20 oe or as a single fraction with a denominator of 20 (or 4 × 5) or a multiple of 20 oe if expanded numerator, allow one error
	eg $5x + 15 - 28 + 4x = 4.3 \times 20$ oe eg $9x - 13 = 86$ eg $9x = 99$			M1 Expanding brackets and multiplying by denominator with no more than one error in total from multiplying out brackets [we must see 4.3 × 20 or 86 accurately]
	Working required	11		A1 dep on M1
				Total 3 marks

16 Use algebra to show that $0.4\dot{3}\dot{8} = \frac{217}{495}$

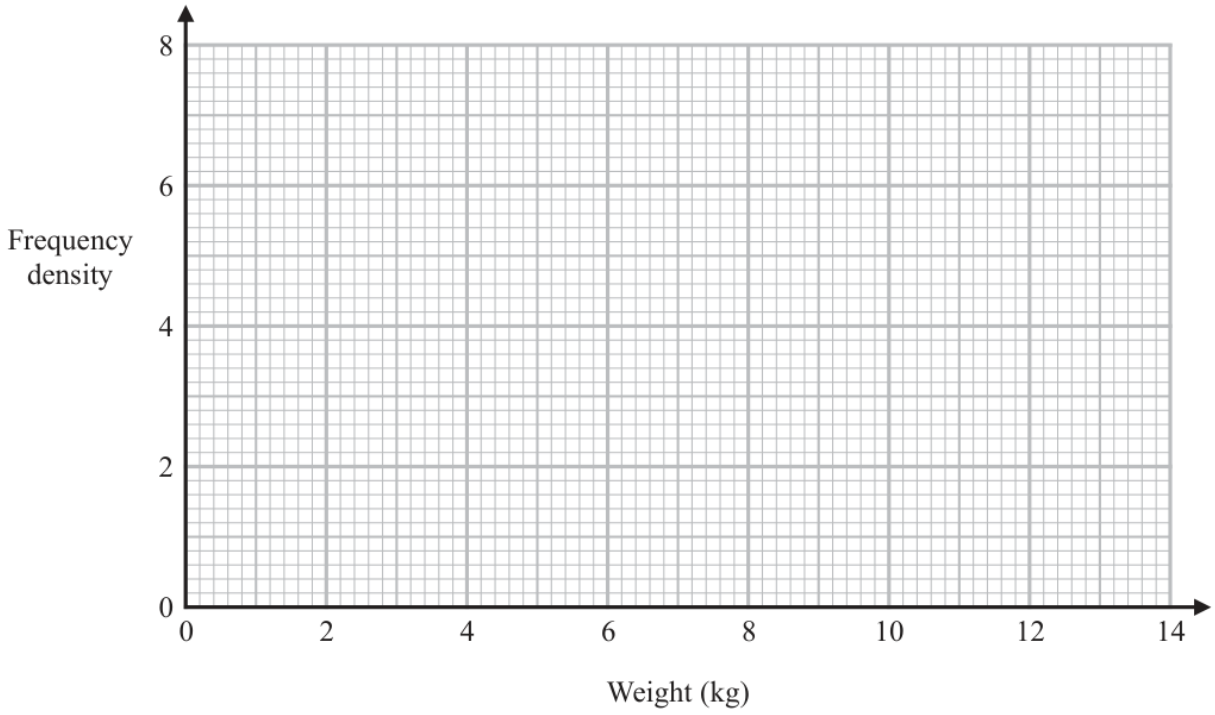
(Total for Question 16 is 2 marks)

Question	Working	Answer	Mark	Notes
16	eg $1000x = 438.38\ldots$ $10x = 4.38\ldots$ **or** $100x = 43.838\ldots$ $x = 0.438\ldots$ oe		2	M1 For **selecting** 2 correct recurring decimals that when subtracted give a whole number or terminating decimal (43.4 or 434 etc) eg $1000x = 438.38...$ and $10x = 4.38....$ **or** $100x = 43.838\ldots$ and $x = 0.438\ldots$ with intention to subtract. (if recurring dots not shown then showing at least **one** of the numbers to at least 5sf) **or** $0.4 + 0.0\dot{3}\dot{8}$ **and** eg $1000x = 38.38...$ & $10x = 0.3838...$, with intention to subtract.
	eg $1000x - 10x = 438.38\ldots - 4.38\ldots = 434$ **and** $\frac{434}{990} = \frac{217}{495}$ **or** eg $100x - x = 43.838\ldots - 0.438\ldots = 43.4$ **and** $\frac{43.4}{99} = \frac{217}{495}$ **or** eg $1000x - 10x = 38.38\ldots - 0.3838 = 38$ and $0.4 + \frac{38}{990} = \frac{4\times99+38}{990} = \frac{434}{990} = \frac{217}{495}$ oe *working required*	Clearly shown		A1 For completion to $\frac{217}{495}$ dep on M1 and use of some algebra
				Total 2 marks

18 The table gives information about the weights, in kg, of the parcels that Pedro delivers on Monday.

Weight (w kg)	Frequency
$0 < w \leqslant 2$	12
$2 < w \leqslant 3$	7
$3 < w \leqslant 6$	15
$6 < w \leqslant 9$	12
$9 < w \leqslant 14$	9

(a) On the grid, draw a histogram for this information.



(3)

One of the parcels that Pedro delivered on Monday is chosen at random.

(b) Using the information in the table, find an estimate for the probability that this parcel weighs more than 7 kg.

.....

(2)

(Total for Question 18 is 5 marks)

		USE OVERLAY PROVIDED				
18	(a)	FD are: 6, 7, 5, 4, 1.8		3	M1	For at least two frequency densities correct or at least two correct bars
					M1	For at least 4 correct frequency densities or 4 correct bars
		A fully correct histogram gains full marks	Correct histogram		A1	Fully correct histogram SCB2 for all five bars of correct width with heights in the correct ratio (eg drawn at 0.6, 0.7, 0.5, 0.4, 0.18) SCB1 for three bars of correct width with heights in the correct ratio
	(b)	$(9+\frac{2}{3}\times 12)$ (= 17) oe eg 9 + 8 (= 17) or $55-(12+7+15+\frac{1}{3}\times 12)$		2	M1	may be seen as numerator of fraction (ft their graph dep on M1 in (a))
		Correct answer scores full marks (unless from obvious incorrect working)	$\frac{17}{55}$		A1cao	Or 0.30909…or 30.909….% (to at least 2 sf) SCB1 for $\frac{38}{55}$ (0.6909…)
						Total 5 marks

23 The diagram shows a solid prism $ABCDEFGHIJ$

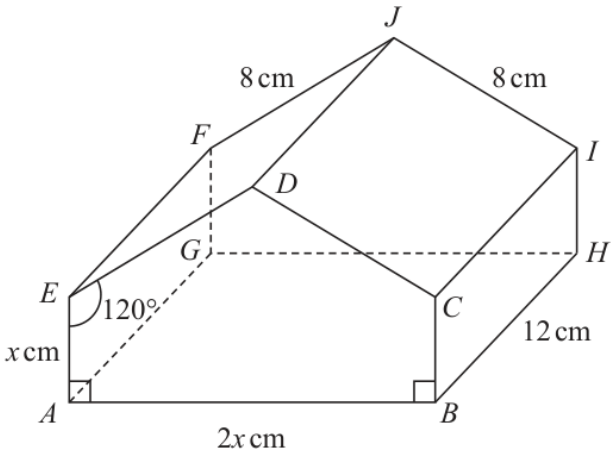


Diagram **NOT** accurately drawn

The prism is such that each cross section is a pentagon where

$AE = BC = x$ cm $\qquad AB = 2x$ cm $\qquad ED = CD = 8$ cm

angle EAB = angle $CBA = 90°$ $\qquad$ angle AED = angle $BCD = 120°$

Given that $AG = BH = EF = DJ = CI = 12$ cm

calculate the angle that AJ makes with the base $ABHG$ of the prism.
Give your answer correct to 3 significant figures.

.....°

(Total for Question 23 is 5 marks)

Q	Working	Answer	Mark	Notes
23	$[DN =]8\sin 30$ **or** $8\cos 60$ (= 4) oe [where N is the midpoint of EC] **or** $[x =]8\cos 30$ **or** $8\sin 60 (= 4\sqrt{3} = 6.928...)$ **or** $2x = \sqrt{8^2 + 8^2 - 2\times 8\times 8\times \cos 120} (= \sqrt{192} = 8\sqrt{3} = 13.85....)$		5	M1
	$[DN =]8\sin 30$ **or** $8\cos 60$ (= 4) oe eg $\sqrt{8^2 - (4\sqrt{3})^2} (= 4)$ **And 1 of** $[x =]8\cos 30$ **or** $8\sin 60 (= 4\sqrt{3} = 6.928...)$ oe or $\sqrt{8^2 - "4"^2} (= 4\sqrt{3} = 6.928...)$ **or** $2x = \sqrt{8^2 + 8^2 - 2\times 8\times 8\times \cos 120} (= 8\sqrt{3} = 13.85....)$			M1 [$(JM =)$ 4 + $4\sqrt{3}$ implies M2]
	$[AM =]\sqrt{12^2 + ("4\sqrt{3}")^2}$ $(= \sqrt{192} = 8\sqrt{3} = 13.856\ldots)$ oe [where M is the midpoint of GH]			M1 **Clear intention to be *AM* (not *EC*)**
	$\tan MAJ = \left(\frac{"4"+"4\sqrt{3}"}{"8\sqrt{3}"}\right)$ oe eg $\tan MAJ = \left(\frac{10.928...}{13.856...}\right)$ if student uses sin or cos, then $AJ = 17.647\ldots$ to award marks this must come from a correct method or be correct			M1
	Correct answer scores full marks (unless from obvious incorrect working)	38.3		A1 Accept 38.1 – 38.4 If no marks scored then award SCB2 for $\tan MAJ = \frac{4+x}{\sqrt{x^2+12^2}}$ or SCB1 for $AM = \sqrt{x^2+12^2}$
				Total 5 marks

26 Find the values of n such that

$$\frac{10^{4n} \times 2^{3(n^2-5n)} \times 5^{2(1-2n)}}{20^2} = 1$$

Show clear algebraic working.

(Total for Question 26 is 5 marks)

Q	Working	Answer	Mark	Notes
26	**For one of:** $10^{4n} = (5\times 2)^{4n}$ **or** $5^{4n}\times 2^{4n}$ **or** oe $20^2 = (5\times 2^2)^2$ **or** $5^2\times 2^4$ **or** $5^2\times 2^2\times 2^2$ **or** cancelling 5^2 on numerator with 20^2 to get 16 or 2^4		5	M1 for writing 10^{4n} correctly as a product of 5 and 2 to the power $4n$ oe **or** writing 20^2 correctly as a product of 5 and 2^2 to the power 2 oe **or** cancelling 5^2 on numerator with 20^2 to get 16 or 2^4
	for getting numerator to the stage (this scores M1M1) $2^{4n}\times 2^{3n^2-15n}\times 5^2$ oe eg $2^{3n^2-11n}\times 5^{-4n+4n+2}$ oe **or for two of** $10^{4n} = (5\times 2)^{4n}$ **or** $5^{4n}\times 2^{4n}$ **or** oe $20^2 = (5\times 2^2)^2$ **or** $5^2\times 2^4$ **or** $5^2\times 2^2\times 2^2$ **or** cancelling 5^2 on numerator with 20^2 to get 16 or 2^4 or getting the numerator to the stage			M1
	$\frac{2^{4n}\times 2^{3n^2}\times 2^{-15n}}{2^4}$ [=1 **or** 2^0] *or* $2^{4n}\times 2^{3n^2}\times 2^{-15n} = 2^4$ oe			M1 For writing the equation in powers of 2 only
	$3n^2 - 11n - 4$[= 0]			A1 Correct quadratic equation dep on M1
	working required	$-\frac{1}{3}$, 4		A1 Both answers required dep on M1
				Total 5 marks