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Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE
In Mathematics B (4MB1)
Paper 02

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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
  - 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.

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- **With working**

  If the final answer is wrong 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, then award the lowest mark, unless the subsequent working makes clear the method that has been used.

  If there is no answer achieved then check the working for any marks appropriate from the mark scheme.

- **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.

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Question	Working	Answer	Mark		Notes
1(a)		2.48×10^{8}	1	B1	cao
(b)		0.000256	1	B1	cao
(c)	Numerator of 2.37×10^{60} or 23.7×10^{107} oe or an answer in the form 1.58×10^{n} or $m\times10^{108}$		3	M1	Allow eg 23.7×10^{59} or $(25-1.3)\times10^{59}$ Implied by a correct single value in any form
	15.8×10^{107} or 158×10^{106} oe			A1	A correct single value seen in their working but need not be in standard form.
		1.58×10^{108}		A1	
					Total 5 marks

Question	Working	Answer		Mark	Notes
2(a)	$\frac{9+8+7+6+10+a+7}{7}=8$ or $\frac{a+47}{7}=8$		2	M1	Correct method to find the mean no errors.
		9		A1	
(b)	6, 7, 7, 8, 9, "9", 10		2	M1	For ordering allow correct ordering using their value for *a*. This is often seen in the text of the question
		8		A1ft	Answer must follow their value for part (a) If $a \geqslant 8$ the median is 8 If $a \leqslant 7$ the median is 7 If there is no value of *a* found in part(a) the median is 7.5 Check that a median of 8 does not come from calculating the mean
(c)	$34\times49-11\times72 \quad [=1666-792=874]$		3	M1	A correct method to find the total age of the passengers who are not pensioners.
	$\frac{"874"}{34-11}$ or $\frac{"874"}{23}$			M1dep	Dep on previous M being awarded. A correct method to find the mean age of the passengers who are not pensioners.
		38		A1	
					Total 7 marks

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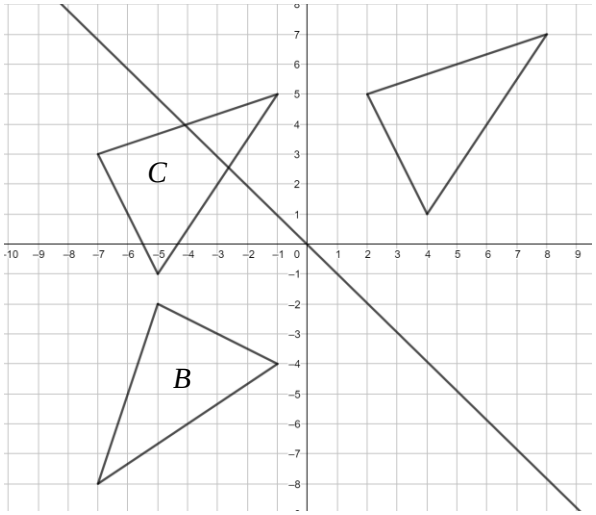
Question	Working	Answer	Mark		Notes
3 (a)	$y = -x$ drawn or 2 points correct		2	M1	
		Correct triangle		A1	(–1, –4) (–5, –2) (–7, –8)
(b)	2 points correct or 3 x coordinates correct or 3 y coordinates correct		2	M1	
		Correct triangle		A1	(–7, 3) (–5, –1) (–1, 5)
(c)		enlargement	3	B1	
		SF – 0.5		B1	
		Centre (6, –1)		B1	
					Total 7 marks



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Que	Working	Ans	Mark		Notes
4	$x^2+\left(\frac{40-3x}{4}\right)^2=64$ or $\left(\frac{40-4y}{3}\right)^2+y^2=64$ oe $\left(\frac{40-3x}{4}\right)=\sqrt{64-x^2}$ or $\left(\frac{40-4y}{3}\right)=\sqrt{64-y^2}$		6	M1	For substituting a correct expression for x or y into th quadratic equation to form an (un-simplified) quadratic equation in either x or y. Implied by the 2nd M1
	$x^2+\left(\frac{1600}{16}-\frac{240}{16}x+\frac{9}{16}x^2\right)=64$ or $\left(\frac{1600}{9}-\frac{320}{9}y+\frac{16}{9}y^2\right)+y^2=64$ oe			M1	For a correct method to expand $\left(\frac{40-3x}{4}\right)^2$ or $\left(\frac{40-4y}{3}\right)^2$ resulting with 3 or 4 terms. Condone 1 error in total (numerical or sign). NB $-3x^2$ and $-4y^2$ will count as 1 error. This must then be subst into the correct equation.
	$25/16\,x^2-15x+36=0$ **or** $25x^2-240x+576=0$ **or** $25/9\,y^2-320/9\,y+1024/9=0$ **or** $25y^2-320y+1024=0$ oe			M1	For correct 3 term quadratic dep on M1 (one of the 2 above) being awarded.
	$\left(\frac{5}{4}x-6\right)\left(\frac{5}{4}x-6\right)$ **or** $(5x-24)(5x-24)$ **or** $\left(5/3\,y-32/3\right)\left(5/3\,y-32/3\right)$ **or** $(5y-32)(5y-32)$ **or** $(-320)^2-4(25\times1024)$ **or** $(-240)^2-4(25\times576)$			M1	Solving their 3 term quadratic equation using any correct method - if factorising, allow brackets which expanded give 2 out of 3 terms correct. If using formula or completing the square allow one sign error. Working must be seen. By completing the square must see eg $\frac{25}{16}\left(x-\frac{24}{5}\right)^2[\pm...]=0$ Allow calculation of the discriminant for their quadratic
	$x=4.8$ or $y=6.4$ or using discriminant $(-320)^2-4(25\times1024)=0$ **or** $\left(-320/9\right)^2-4\left(25/9\times1024/9\right)=0$ $(-240)^2-4(25\times576)=0$ **or** $(-15)^2-4\left(25/16\times36\right)=0$			A1	correct single value for x or y. Award A0 if more than one value of x or more than one value of y is given For discriminant the calculation must be correct and = 0
		Only one solution. [therefore line intersects the C only once.]		A1dep	Dep on all previous method marks awarded and only 1 value of x and/or y given. For a correct conclusion stating only one solution
					Total 6 marks

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Question	Working	Answer	Mark		Notes
For this question Marks for part(b) may be awarded if seen in part(a)					
5(a)		$-\mathbf{a}+\mathbf{b}$	1	B1	
(b)	$\left[\overrightarrow{AE}=\right]\pm k\left("-\mathbf{a}+\mathbf{b}"\right)$		6	M1	correct vector for $\overrightarrow{AE}$ or This may be seen embedded in an equation
	$\left[\overrightarrow{CD}=\right]-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}$ **or** $\left[\overrightarrow{DC}=\right]\frac{1}{3}\mathbf{a}-\frac{2}{5}\mathbf{b}$			M1	A correct vector for $\overrightarrow{CD}$ seen. This may be seen embedded in $\overrightarrow{AE}$ or in an equation
	$\left[\overrightarrow{AE}=\right]-\frac{2}{3}\mathbf{a}\pm m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$ **or** $-\frac{2}{3}\mathbf{a}\pm m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)=\pm k\left("-\mathbf{a}+\mathbf{b}"\right)$ or $\left[\overrightarrow{AE}=\right]-\mathbf{a}+\frac{2}{5}\mathbf{b}\pm t\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$ **or** $-\mathbf{a}+\frac{2}{5}\mathbf{b}\pm t\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)=\pm k\left("-\mathbf{a}+\mathbf{b}"\right)$			M1	A second correct vector for $\overrightarrow{AE}$ These may be seen embedded in an equation or 2 different vectors for another side. They should include $\pm\alpha\overrightarrow{AE}$ and $\pm\beta\overrightarrow{CD}$ somewhere but these may be embedded (see next page)
	$k=\frac{2}{3}+\frac{1}{3}m$ or $k=1+\frac{1}{3}t$ or $k=\frac{2}{5}m$ or $k=\frac{2}{5}+\frac{2}{5}t$			M1dep	Dep on the 1st and 3rd method marks being awarded. Equating the coefficients of **a** or the coefficient of **b** to form a linear equation in two unknowns
	$0=\frac{2}{3}-\frac{1}{15}m$ or $0=\frac{3}{5}-\frac{1}{15}t$			M1dep	Dep on the previous method mark being awarded. Eliminating either m or k or implied by $m=10$ or $k=4$ or $t=9$
		$4\left(-\mathbf{a}+\mathbf{b}\right)$		A1	oe Correct answer gets 6/6
					Total 7 marks

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There may be other combinations used. If there is another method use that merits marks send to review
$\overrightarrow{AC} = -\frac{2}{3}\mathbf{a}$ **and** $\overrightarrow{AC} = \pm k\left("-\mathbf{a}+\mathbf{b}"\right) \pm m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$ **or** $-\frac{2}{3}\mathbf{a} = \pm k\left("-\mathbf{a}+\mathbf{b}"\right) \pm m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$
$\overrightarrow{OE} = \mathbf{a} \pm k\left("-\mathbf{a}+\mathbf{b}"\right)$ **and** $\overrightarrow{OE} = \frac{1}{3}\mathbf{a} \pm m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$ **or** $\mathbf{a} \pm k\left("-\mathbf{a}+\mathbf{b}"\right) = \frac{1}{3}\mathbf{a} \pm m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$
$\overrightarrow{CE} = \frac{2}{3}\mathbf{a} \pm k\left("-\mathbf{a}+\mathbf{b}"\right)$ **and** $\overrightarrow{CE} = m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$ **or** $\frac{2}{3}\mathbf{a} \pm k\left("-\mathbf{a}+\mathbf{b}"\right) = m\left("-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}"\right)$
$\overrightarrow{AO} = -\mathbf{a}$ **and** $\overrightarrow{AO} = \pm k\left("-\mathbf{a}+\mathbf{b}"\right) \pm q\left(-\frac{1}{3}\mathbf{a}+\frac{2}{5}\mathbf{b}\right) - \frac{2}{5}\mathbf{b}$ **or** $\mathbf{a} = \pm k\left("-\mathbf{a}+\mathbf{b}"\right) \pm m\left("\frac{1}{3}\mathbf{a}-\frac{2}{5}\mathbf{b}"\right) - \frac{2}{5}\mathbf{b}$

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Question	Working	Answer	Mark		Notes
6	$[\mathbf{A}^{-1}=]\ -\frac{1}{(4\times-2)-(3\times-2)}\begin{pmatrix}4&3\\-2&-2\end{pmatrix}\left[=-\frac{1}{2}\begin{pmatrix}4&3\\-2&-2\end{pmatrix}\right]$		7	M1	oe allow correct un-simplified
	$[\mathbf{B}=]\ \mathbf{B}\ \mathbf{AA}^{-1}$ or $\left[\mathbf{B}=\right]\begin{pmatrix}4x&-14\\x&-1\end{pmatrix}\left[\text{"}-\frac{1}{2}\begin{pmatrix}4&3\\-2&-2\end{pmatrix}\text{"}\right]$			M1	For writing or using $\mathbf{B}\ \mathbf{AA}^{-1}$ ft their inverse of $\mathbf{A}$
	$\left[\mathbf{B}=\right]-\frac{1}{2}\begin{pmatrix}16x+28&12x+28\\4x+2&3x+2\end{pmatrix}$ or $\begin{pmatrix}-8x-14&-6x-14\\-2x-1&-\frac{3}{2}x-1\end{pmatrix}$			M1dep	Dep on previous M mark being awarded. Correct method for multiplying out $\mathbf{B}\ \mathbf{AA}^{-1}$ to find a single matrix for **B in** terms of x (determinant and 2 terms correct)
	$10=\text{"}\frac{1}{4}\text{"}\left(\text{("}16x+28\text{")}\text{("}3x+2\text{")}-\text{("}4x+2\text{")}\text{("}12x+28\text{")}\right)$ or $10=\text{("}-8x-14\text{")}\left(\text{"}-\frac{3}{2}x-1\text{"}\right)-\text{("}-2x-1\text{")}\text{("}-6x-14\text{")}$			M1	Correct method for finding the determinant in terms of x and equating to 10. If full working shown then ft their matrix for **B** if it is in terms of x Allow $\left(12x^2+29x+14\right)-\left(12x^2+34x+14\right)$
	$10=-5x$ oe or $10x=10\times-2$			M1dep	Dep on all previous M marks being awarded. Obtaining a correct linear equation which need not be fully simplified.
	$x=-2$			A1	Correct value for x
		$\mathbf{B}=\begin{pmatrix}2&-2\\3&2\end{pmatrix}$		A1	
ALT	$\left[\begin{pmatrix}a&b\\c&d\end{pmatrix}\begin{pmatrix}-2&-3\\2&4\end{pmatrix}=\right]\begin{pmatrix}-2a+2b&-3a+4b\\-2c+2d&-3c+4d\end{pmatrix}$			M1	Correct matrix – letters may be different.
	$\text{"}-2a+2b\text{"}=4x$ $\text{"}-3a+4b\text{"}=-14$ $\text{"}-2c+2d\text{"}=x$ $\text{"}-3c+4d\text{"}=-1$			M1	Forming the 4 equations ft their matrix
	$a=-8x-14$ and $b=-6x-14$ $c=-2x-1$ and $d=-\frac{3}{2}x-1$			M1dep	Dep on previous M mark being awarded. Solving to get a, b, c and d in terms of x (2 correct)
	$10=\text{("}-8x-14\text{")}\left(\text{"}-\frac{3}{2}x-1\text{"}\right)-\text{("}-2x-1\text{")}\text{("}-6x-14\text{")}$			M1	Correct method for finding the determinant in terms of x and equating to 10. Ft their matrix only if working seen
	$10=-5x$ oe or $10x=10\times-2$			M1dep	Dep on all previous M marks being awarded. Obtaining a correct linear equation which need not be fully simplified
	$x=-2$			A1	Correct value for x
		$\mathbf{B}=\begin{pmatrix}2&-2\\3&2\end{pmatrix}$		A1	
					Total 7 marks

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Question	Working	Answer		Mark	Notes
7(a)	$\angle ODC = 90 - 38$ [= 52] Or $\angle CAD = 38$ or $\angle DBC = 38$ Or $\angle ADE = 180 - (180 - 86 + 38)\left[= 48\right]$		6	M1	Correct method to find $\angle ODC$ or correct e for $\angle CAD$ May be seen on diagram. If it is n on the diagram it must be clearly labelled
	$\angle ODA$ or $\angle OAD$ = 180 – 86 – "52" [= 42] **or** 90 – 48 [= 42] **or** $\angle COD = 76$ **or** $\angle ABD = 86 - 38\left[= 48\right]$			M1	Correct method to find $\angle ODA$, $\angle OAD$ or $\angle COD$ May be seen on diagram, If it is not on the diagram it must be clearly labelled
	$\angle AOD = 180 - 2 \times "42"$ [= 96] **or** $\angle AOD = 86 \times 2 - "76"$ [= 96] **or** $\angle AOD = 48 \times 2$ [= 96]			M1	Correct method to find $\angle AOD$ May be seen on diagram If it is not on the diagram it must be clearly labelled Allow $\angle O$ for $\angle AOD$
	$\frac{"96"}{360} \times 2\pi r = 0.8\pi$ oe **or** $\frac{"96"}{360} \times 2 \times \pi \times 1.5$			M1	Allow without π Must use "their $\angle AOD$ "from diagram or clearly labelled
	$r = \frac{0.8\pi \times 360}{"96" \times 2\pi}$ oe **or** $\frac{"96"}{360} \times 2 \times \pi \times 1.5 = 0.8\pi$			M1	Allow without π in. Must use "their $\angle AOD$ "from diagram or clearly labelled
	Angle between tangent and radius (diameter) is 90° Alternate segment theorem Opposite angles of a cyclic quadrilateral Angle at the centre is 2 × (double) angle at circumference / angle at circumference is ½ angle at centre Base angles in an isosceles triangle Angles in a triangle add to 180° Angles on a straight line add to 180°	1.5		A1 shown	Need all of the previous method marks and a fully correct solution with at least two relevant reasons for their working. Minimum needed is the words underlined (allow abbreviations if clear). If verifying then must state the radius is therefore 1.5 e.g. r = 1.5 rather than just 1.5
(b)	[Area =] $\pi \times 1.5^2$		2	M1	
		7.07		A1	Awrt 7.07
					Total 8 marks

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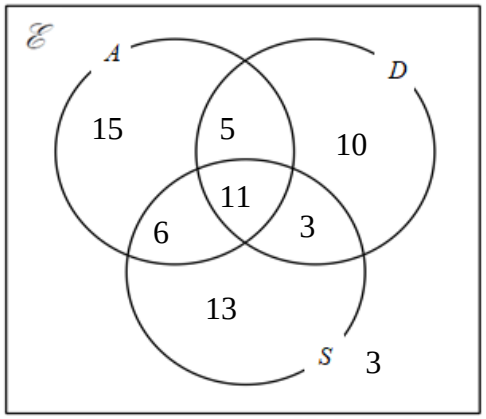
Question	Working	Answer	Mark		Notes
8(a)		3	3	B3 B2 B1	All 8 correct 6 or 7 correct 4 or 5 correct
We do not ft if they have blanks for a region needed for that part of the question but correct answers gain the marks					
(b)(i)		3	3	B1	Correct answer or Ft their Venn diagram ie the number outside of the circles.
(ii)	"15" + "6" + "11" + "3" + "13" or 33 + "15"	48		B1	Correct answer or Ft their Venn diagram.
(iii)	66 – "5" or "3"+"3"+"13"+"11"+"6"+"15"+"10"	61		B1	Correct answer or Ft their Venn diagram.
(c)(i)		0	1	B1	Mark the final answer, ignore working. We will allow 0 or $\frac{0}{29}$ as the final answer
(ii)	$\frac{"11"+"3"}{29}$ or $\frac{"11"+"3"}{"10"+"11"+"3"+"5"}$		2	M1	Correct answer or Ft their Venn diagram but the numerator must be less than the denominator
		$\frac{14}{29}$		A1	
					Total 9 marks

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Quest	Working	Ans	Mark		Notes
9	$[AB=]\dfrac{30}{\tan 32}[=48.01]$ **or** $[AB=]\sqrt{\left(\dfrac{30}{\sin 32}\right)^2-30^2}[=48.01]$ oe		8	M1	A correct method to find the length *AB.* Allow awrt 48 May be seen on diagram
	$[CB=]\dfrac{30}{\tan 25}[=64.3...]$ **or** $[CB=]\sqrt{\left(\dfrac{30}{\sin 25}\right)^2-30^2}[=64.3...]$ oe			M1	A correct method to find the length *CB.* Allow awrt 64.3 May be seen on diagram
	$[\angle CBA=]280-195$ [=85]			M1	A correct method to find $\angle CBA$ May be seen on diagram
The next 3 method marks can only be awarded if using their $\angle CBA$ or a correct value					
	$[AC^2=]"48.01"^2+"64.335"^2-2\times"48.01"\times"64.335"\cos"85"$ [=5905] **or** $[AC=]\sqrt{"48.01"^2+"64.335"^2-2\times"48.01"\times"64.335"\cos"85"}$ [= 76.8…]			M1	A correct method to find the length *AC* Allow awrt 5910 or 76.8 May be seen on diagram Ft through their *AB*, *AC* and $\angle CBA$ if they are labelled clearly(allow on diagram) or it must come from correct working
	$\dfrac{\sin\angle CAB}{"64.335"}=\dfrac{\sin"85"}{"76.85"}$ **or** $\dfrac{\sin\angle ACB}{"48.01"}=\dfrac{\sin"85"}{"76.85"}$ or $"64.3"^2="48.01"^2+"76.8"^2-2\times"48.01"\times"76.8"\cos\angle CAB$ or $"48.01"^2="64.3"^2+"76.8"^2-2\times"64.3"\times"76.8"\cos\angle ACB$			M1	A fully correct method to find $\angle CAB$ or $\angle ACB$. Ft through their *CB*(or *AB*), *AC* and $\angle CBA$ if they are labelled clearly (allow on diagram) or come from correct working. May use cosine rule.
	$\sin\angle CAB=\dfrac{\sin"85"}{"76.85"}\times"64.335"\rightarrow\angle CAB$ =56.5… **or** $\cos\angle CAB=\dfrac{"48.01"^2+"76.8"^2-"64.3"^2}{2\times"48.01"\times"76.8"}\rightarrow\angle CAB=56.5\ldots$ $\sin\angle ACB=\dfrac{\sin"85"}{"76.85"}\times"48.01"\rightarrow\angle ACB=38.487..$ or $\cos\angle ACB=\dfrac{"64.3"^2+"76.8"^2-"48.01"^2}{2\times"64.3"\times"76.8"}\rightarrow\angle ACB=38.487\ldots$			M1	Rearranging and using inverse sine leading to an angle for $\angle CAB$ or $\angle ACB$ does not need to be correct) This implies the 5th M1
	$360+15-"56.5..."$ **or** $360-(180-(100+"38.487\ldots"))$ oe			M1	A correct method to find required bearing. eg 180 + 100 + "38.487…"
		318		A1	awrt 318 or awrt 319 Condone degree sign.
					Total 8 marks

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Question	Working	Answer	Mark		Notes
10(a)	$\frac{2}{5+3+2}\times 120\,000$		2	M1	
		24 000		A1	Ignore any units eg condone \$24 000
(b)	$5\times 1.1+3\times 1.05+2\times 0.96\left[=5.5+3.15+1.92=10.57\right]$ or $60\,000\times 1.1+36\,000\times 1.05+"24\,000"\times 0.96$ [= 66000 + 37800 + 23040 = 126840]		3	M1	Allow any multiple.
	$\frac{"10.57"}{"5+3+2"}\left[=1.057\right]$ or $\frac{"126840"-120000}{120\,000}\left[=\frac{"6840"}{120\,000}\times 100\right]$ or $\frac{"126840"}{120000}$ oe			M1	Ft their total from the step before. Allow multiples eg is a multiply of $\frac{"10.57"}{"5+3+2"}$
		5.7[%]		A1	
(c)	$\frac{360\,000}{0.75}$ or $\frac{360\,000}{3}\times 4$		2	M1	
		[\$]480 000		A1	
(d)	$\frac{360\,000}{1.35}\left[=266\,666.6.\right]$		3	M1	A correct first step for example $360\,000\times 388.5=[139\,860\,000]$ or $\frac{1.35}{388.5}\left[=0.00347...\right]$ or $\frac{388.5}{1.35}\left[=287.7...\right]$
	$\frac{360\,000}{1.35}\times 388.5$			M1	A fully correct method.
		103 600 000		A1	oe awrt 103600000
					Total 10 marks

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Quest	Working	Answer	Mark		Notes
11(a) (i)	A correct straight line drawn between at least 2 integer values of x		2	M1	Allow ± 1 small square for all points.
		Correct line		A1	A straight line through (−2, 0) and (2, 3) Allow ± 1 small square for all points. Must cover at least –2 to 3
(ii)	A correct straight line drawn between at least 2 integer values of x		2	M1	Allow ± 1 small square for all points.
		Correct line		A1	A straight line through (0,5) and (3, 3) Allow ± 1 small square for all points. Must cover at least – 2 to 3
(b)		$x = 2.5$ $y = 3.4$	1	B1ft	Allow $2.4 \leqslant x \leqslant 2.6$ and $3.3 \leqslant y \leqslant 3.5$ or ft their graph where their two lines cross. If lines don't cross or none drawn B0
(c)		$x < 2.5$ or $x < \frac{42}{17}$	1	B1ft	ft their "2.5" value .Allow $x < \frac{42}{17}$ (awrt 2.5) allow $-3 \leqslant x < \frac{42}{17}$ or $(-\infty, "2.5")$ or $[-\infty, "2.5")$ or $[-3, "2.5")$ $]-\infty, "2.5")$ $]-\infty, "2.5"[$
(d)	x | – 2 | – 1 | 0 | 1 | 2 | 3 | 4 y | **7** | **2** | −1 | **– 2** | **–1** | 2 | 7	7, 2, −2, −1	2	B2	B2 for 4 correct. B1 for 3 correct.
(e)	At least 5 points plotted correctly		2	M1	Ft their points.
		Correct curve		A1	Fully correct curve drawn. Allow ± 1 small square
(f)	$x^2 - 2x - 1 < \frac{6+3x}{4}$ oe		3	M1	Rearranging to use the graph. eg $x^2 - 2x - 1 - \frac{6+3x}{4}$ This must be seen
		–0.7 or 3.5		A1ft	M1 must be awarded. If parts(a) (i) and (e) are correct we will allow -0.7 ± 0.1 or 3.5 ± 0.1 Otherwise the numbers must match their graphs Allow ± 1 small square Must give values to 1dp
		$"-0.7" < x < "3.5"$		B1ft	Allow awrt −0.7 and awrt 3.5 or ft their 2 values accept other notation eg $(-0.7, 3.5)$ or $]-0.7, 3.5[$ This mark does **not** imply M1A1
					Total 13 marks

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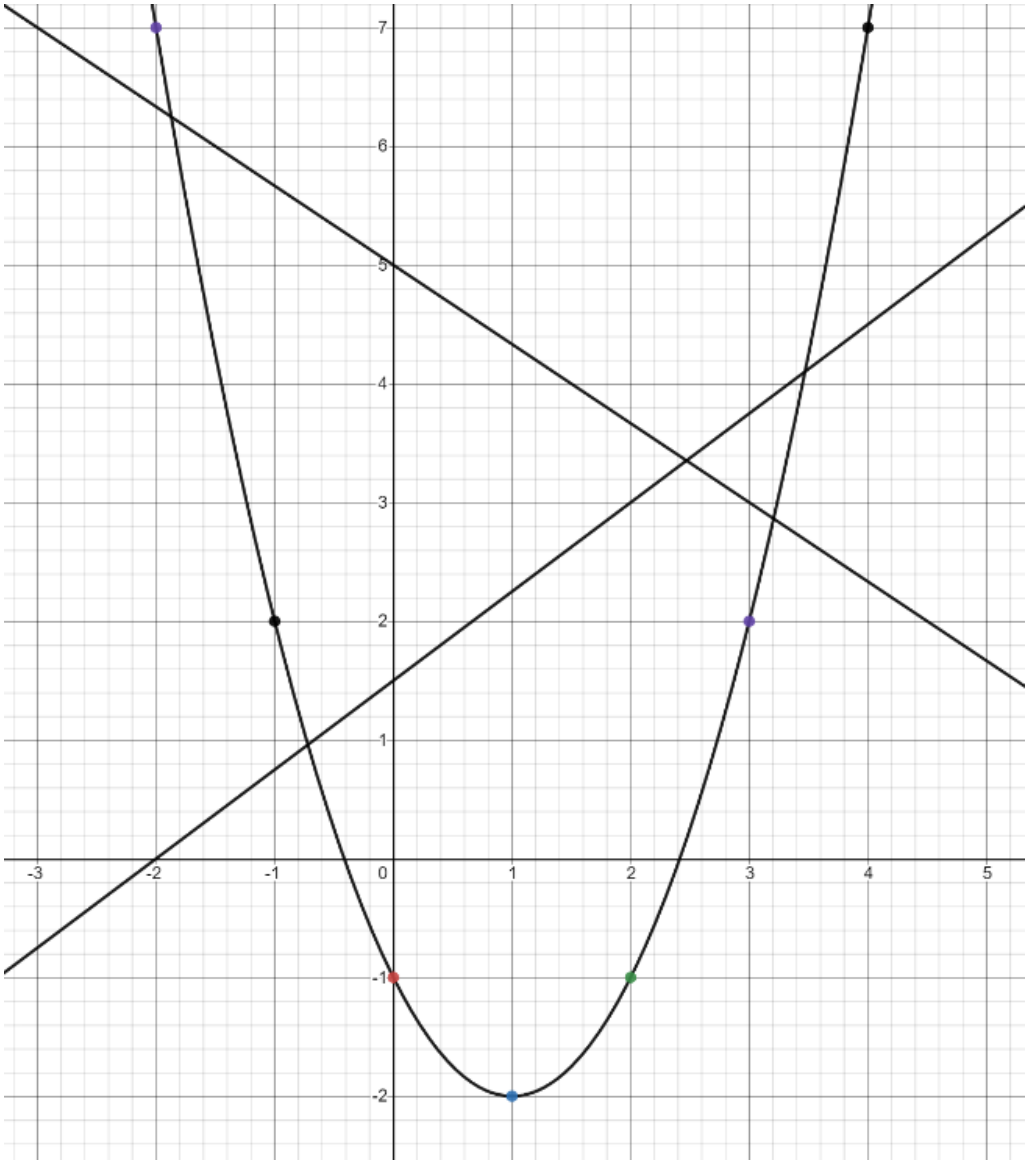

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Question	Working	Answer	Mark		Notes
12 (a)		-11	1	B1	
(b)		$g(x) \leqslant 5$	1	B1	Allow g or y. Allow $(-\infty, 5]$ or $[-\infty, 5]$ or $]-\infty, 5]$ **DO NOT** allow $x \leqslant 5$
(c)	g(2) = 1 or f(1) or fg(x) = $\dfrac{4}{2(5-x^2)-11}$ oe		2	M1	
		$-\dfrac{4}{9}$		A1	Allow equivalent exact answer
(d)	$2xy - 11y = 4$ or $y(2x-11) = 4$		3	M1	Different letters may be used.
	$2xy = 4 + 11y$ or $2x = \dfrac{4}{y} + 11$ or $x = \dfrac{4}{2y} + \dfrac{11}{2}$ oe			M1	Isolating term in x. Allow 1 sign error
		$\left[f^{-1} : x \mapsto\right] \dfrac{4+11x}{2x}$		A1	oe Must be in terms of x.
(e)		0	1	B1	Allow $x \neq 0$ but **DO NOT** allow $x > 0$ or $x < 0$
(f)	$\dfrac{4}{2\left(\dfrac{4}{2x-11}\right)-11}$ oe		3	M1	
	$\dfrac{4}{\dfrac{8-11(2x-11)}{2x-11}}$			M1	Reducing the denominator to a single fraction. Allow $\dfrac{5(2x-11)^2-16}{2x-11}$
		$\dfrac{8x-44}{129-22x}$		A1	Must be in simplest form
(g)	$\text{hm}(x) = (3x+3)(3x+2)$ or $(ax+b)(ax+b+1)$ or $a^2x^2 + 2abx + b^2 + ax + b$		2	M1	Rewriting hm(x) in the form $y(y+1)$ where y is a function of x. ISW
		$a = 3$ $b = 2$		A1	Allow $3x+2$
					Total 13 marks

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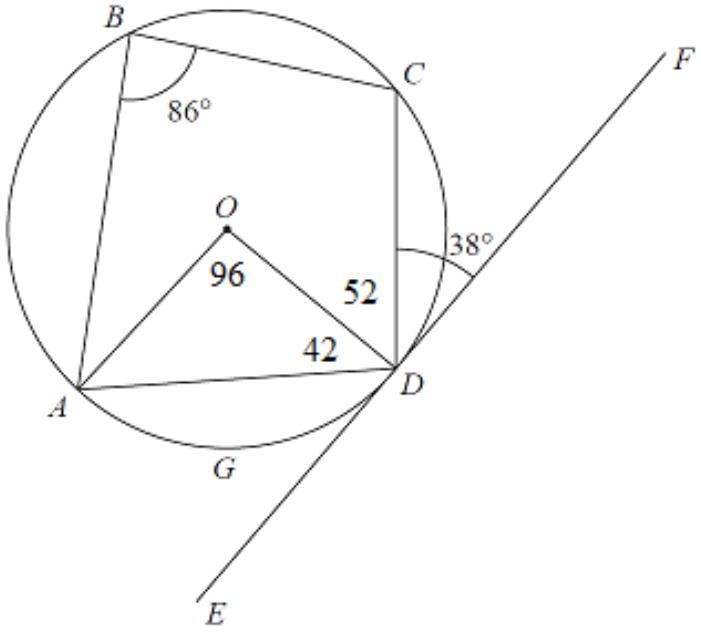

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