Pearson Edexcel

Mark Scheme (Results)

Summer 2025

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 – can only be awarded when relevant M marks have been gained
  - B marks: unconditional accuracy marks (independent of M marks)

- **Abbreviations**
  - cao – correct answer only
  - cso – correct solution 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 may score full marks
  If no working is shown, then incorrect (even though nearly correct) answers score no marks.

- **With working**
  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: e.g. uses 252 instead of 255; follow through their working and deduct 2A marks from any gained provided the work has not been simplified. (Do not deduct any M marks gained.)

  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

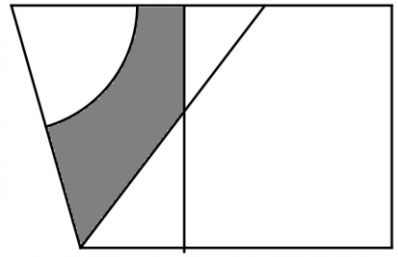
  Examiners should send any instance of a suspected misread to review (but see above for simple misreads).

- **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: e.g. 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 e.g. algebra.

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

Question		Working	Answer	Mark	Notes
1		84 (±2) seen or 276 (±2)		3	B1 may be seen in a calculation. May be implied by $\frac{7}{30}$ oe
		$\frac{84}{360}\times 30$ oe e.g. $\frac{360-276}{360}\times 30$			M1 a correct calculation for the number of students who preferred chocolate ice cream - allow use of any angle (even if outside range) for chocolate (but must be a value and not *x*) May be seen in stages e.g. $\frac{360}{30}\left[=12\right]$ and $\frac{84}{12}$
			7		A1 cao
					Note: an answer with no working and in the range 6.8 – 7.17 implies B1M1 **Note**: B0M1A1 is possible
					Total 3 marks

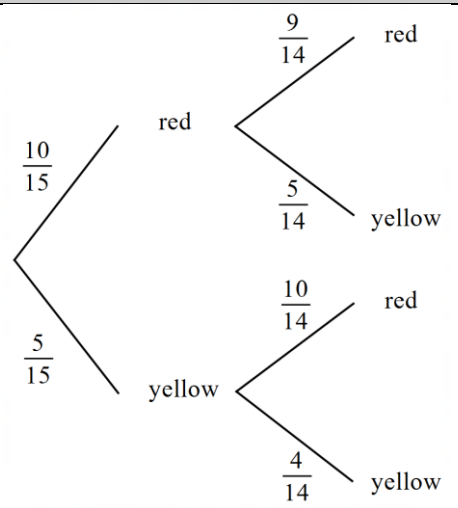
Question		Working	Answer	Mark	Notes
2	(a)		an arc centre *P* with radius 3 cm	1	B1 for a correct arc **NB** The arc does not have to touch/cross *PQ* and *PS*
	(b)		a line parallel to *QR* drawn 6 cm from *QR*	1	B1 for a correct line **NB** The line does not have to touch/cross *PQ* and *SR*
	(c)		a correct bisector with arcs shown	2	B2 for a correct bisector with arcs that have been drawn from a point on *SP* (*x*) and a point on *SR* (*y*) such that *Sx* = *Sy* **NB** The bisector does not have to touch/cross *PQ* but must remain within the tolerance if extended to *PQ* (B1 for a bisector without arcs or correct arcs that cross or would cross if tolerance lines were extended) **NB** the intersection of the arcs and the point *S* must be two distinct points which allow for a straight line to be drawn for either B2 or B1
	(d)		correct region indicated	1	B1ft only follow through if they have an arc centre *P* and a line parallel to *QR* and at least B1 for part (c) with the 3 loci being a boundary of the area **NB** The arc must touch/cross *PQ* and *PS*, the line must touch/cross *PQ* and the bisector and the bisector must touch/cross the parallel line i.e. it must be a fully bounded area
					Total 5 marks

Question		Working	Answer	Mark	Notes
3	(a)		3.47×10^{7}	1	B1 cao
	(b)		0.0098	1	B1 cao
	(c) (i)	108×10^{240} or 10.8×10^{241} or 1.08×10^{n} or $k\times10^{242}$		2	M1 where n is any integer or $1 \leq k < 10$ or for a correct answer in any form
			1.08×10^{242}		A1 cao
	(ii)	$\left(54\times10^{120}\right)+\left(2\times10^{120}\right)$ or $\left(5.4\times10^{121}\right)+\left(0.2\times10^{121}\right)$ or 56×10^{120} or 5.6×10^{n} or $k\times10^{121}$		2	M1 where n is any integer or $1 \leq k < 10$ or for a correct answer in any form
			5.6×10^{121}		A1 cao
					Total 6 marks

Question		Working	Answer	Mark	Notes
4	(a)	$\frac{50}{360}\times\pi\times5^2[=\frac{125}{36}\pi=10.908...]$		2	M1 a correct method to find the area of the sector. May be implied by awrt 10.9
			$10.9m^2$		A1 awrt 10.9 (Allow $\frac{125}{36}\pi$ or 11 if from correct working)
	(b)	$BC=5\sin 40$ or $BC=5\cos 50$ [=3.213938048] $CD=5\cos 40$ or $CD=5\sin 50$ [=3.830222216]		4	M1 for a correct method to find *BC* or *CD* May be implied by awrt 3.2 or awrt 3.8 Allow equivalent equations e.g. $\frac{\sin 40}{x}=\frac{\sin 90}{5}$
		$\frac{1}{2}\times5\times\sin 40\times5\times\cos 40$ or $\frac{1}{2}\times5\times\sin 40\times5\times\sin 50$ or $\frac{1}{2}\times5\times\cos 50\times5\times\cos 40$ or $\frac{1}{2}\times5\times\cos 50\times5\times\sin 50$ or $\frac{1}{2}\times5\times\sin 40\times\sqrt{5^2-(5\sin 40)^2}$ or $\frac{1}{2}\times5\times\cos 50\times\sqrt{5^2-(5\cos 50)^2}$ or $\frac{1}{2}\times5\times\cos 40\times\sqrt{5^2-(5\cos 40)^2}$ or $\frac{1}{2}\times5\times\sin 50\times\sqrt{5^2-(5\sin 50)^2}$ [=6.155048456]			M1 for a correct method to find the area of the triangle ft their *BC* and/or their *CD* May be implied by awrt 6.2
		("10.9"+"6.15...")×35 [17.06...×35 = 597.217...]			M1 for correct method ft their answer to part (a) and their triangle *BCD*. Either the area must be labelled triangle *BCD* or it must be clear that they are finding the area of triangle *BCD*. It must be 2 areas added together and multiplied by 35
			597		A1 awrt 597
		Cas			***Total 6 marks***

Question		Working	Answer	Mark	Notes
5	(a)	$\frac{3850}{11}\times 2$		2	M1 for $\frac{3850}{11}\times n$ where n = 2 or 3 or 6
			700		A1 cao
	(b)	$\frac{15.95}{116}\times 100$		2	M1 for $x\times 1.16 = 15.95$ or $x\times 116 = 15.95$ or $\frac{15.95}{116}$
			[£] 13.75		A1 cao
	(c)	$1500\times 7 + 600\times 11 (= 10500 + 6600 = 17100)$		4	M1 for a correct method to find the total cost of the towels. May be seen as two separate calculations and added at any stage
		$\frac{3}{5}\times 1500\times 15 + \frac{95}{100}\times 600\times 18 [= 13500 + 10260 = 23760]$ or $\left(\frac{3}{5}\times 1500\times 15 - 10500\right) + \left(\frac{95}{100}\times 600\times 18 - 6600\right)$ $[= 3000 + 3600 = 6660]$			M1 for a correct method to find the income from selling items or a correct method to find the total profit. May be seen as two separate calculations and added at any stage (Condone 95% for $\frac{95}{100}$)
		$\frac{"23760" - "17100"}{"17100"}\times 100$ or $\frac{"6660"}{"17100"}\times 100$			M1 for a correct method to find the percentage profit ft their total cost and their income from selling items/total profit Allow equivalent calculations e.g. $\frac{23760}{17100}\times 100 - 100$
			38.9[%]		A1 awrt 39
	(d)		7691	1	B1 awrt 7691
		Cas			***Total 9 marks***

Question		Working	Answer	Mark	Notes
6	(a)	$21+x+37=2(10+21)$		2	M1 for a correct equation May be implied a correct answer on its own
			4		A1 cao
	(b)		50	1	B1 cao
	(c)		21	1	B1 cao
	(d)		71	1	B1 cao
	(e)	$80\times1.125\times1.3$		2	M1 correct method to find no of students Condone $80\times112.5\%\times130\%$ May be seen as separate calculations
			117		A1 cao
		Cas			***Total 7 marks***

Question		Working	Answer	Mark	Notes
7	(a)			2	B2 for LH branch $\frac{5}{15}$ oe and RH branches $\frac{9}{14}$ $\frac{5}{14}$ $\frac{10}{14}$ $\frac{4}{14}$ oe (B1 for any two correct pairs of branches e.g. $\frac{5}{15}$ with $\frac{9}{14}$ $\frac{5}{14}$ or $\frac{5}{15}$ with $\frac{10}{14}$ $\frac{4}{14}$ or $\frac{9}{14}$ $\frac{5}{14}$ with $\frac{10}{14}$ $\frac{4}{14}$)
	(b)	$\frac{10}{15}\times"\frac{9}{14}"+"\frac{5}{15}"\times"\frac{4}{14}"$ or $1-\left(\frac{10}{15}\times"\frac{5}{14}"+"\frac{5}{15}"\times"\frac{10}{14}"\right)$		2	M1 fully correct method ft their tree diagram Do not ft any probability greater than 1
			$\frac{11}{21}$		A1 oe Allow awrt 0.52
	(c)	$\left(\frac{10}{15}\times"\frac{9}{14}"\times\frac{6}{9}\right)+\left("\frac{5}{15}"\times"\frac{4}{14}"\times\frac{5}{9}\right)$ oe $\left[=\frac{2}{7}+\frac{10}{189}=\frac{64}{189}\right]$		3	M2 probability of all the same colour ft their tree diagram. Do not ft any probability greater than 1 (M1 probability of all being red e.g. $\frac{10}{15}\times"\frac{9}{14}"\times\frac{6}{9}\left[=\frac{2}{7}\right]$ oe ft their tree diagram. Do not ft any probability greater than 1)
			$\frac{27}{32}$		A1 oe Allow awrt 0.84
					SC award M1M0A0 for $\frac{a}{a+b}$ oe where a and b are the product of three probabilities and $a \neq b$
		Cas			***Total 7 marks***

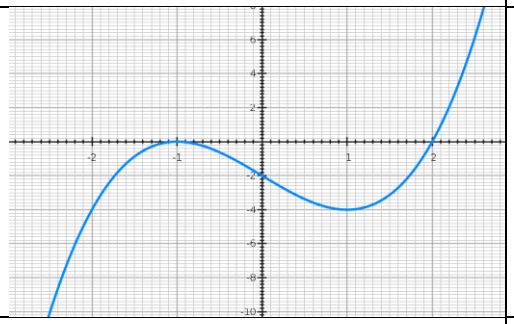
Question		Working	Answer	Mark	Notes
8	(a)	$2x^2y = a$ oe		4	M1 for a correct expression for the volume of the cuboid
		$[S =]2\times 2x^2 + 2\times xy + 2\times 2xy [= 4x^2 + 6xy]$			M1 for a correct expression for the surface area of the cuboid. Need not be simplified.
		$y = \frac{a}{2x^2}$ oe or $xy = \frac{a}{2x}$ oe or $2xy = \frac{a}{x}$ oe or $\frac{2x^2y}{x} = \frac{a}{x}$			M1 for a correct rearrangement of the volume expression May be implied by an embedded expression in *S*
		$[S =]4x^2 + 6x\times\frac{a}{2x^2}$ or $[S =]4x^2 + 6\times\frac{a}{2x}$ or $[S =]4x^2 + 3\times\frac{a}{x}$ or $[S =]4x^2 + 3\times\frac{2x^2y}{x}$ Leading to the given answer			A1 dep on M3 with no errors seen We condone S = omitted from the final answer
	(b)	$S = 4x^2 + 3ax^{-1}$		5	M1 for writing $\frac{3a}{x}$ as $3ax^{-1}$ May be implied by $3ax^{-2}$ oe seen in $\frac{dS}{dx}$
		$\frac{dS}{dx} = 8x - 3ax^{-2} = 0$ oe			M1 for differentiating one term correctly and putting equal to 0 May be implied by $8x^3 - 3a = 0$
		$4x^2 + \frac{3a}{x} = 400 [\Rightarrow 4x^3 + 3a = 400x]$ Solving simultaneously leading to $12x^3 = 400x$ oe or $4\left(\sqrt[3]{\frac{3a}{8}}\right)^3 + 3a = 400\left(\sqrt[3]{\frac{3a}{8}}\right)$ oe			M1 dependent on a fully correct expression for $\frac{dS}{dx} = 0$ For putting S = 400 and solving simultaneously to get a correct equation in one variable. May be implied by $x = \sqrt{\frac{100}{3}}$ [=5.77…] oe May be implied by a correct equation of the form $a^n = ...$
		$8\left(\sqrt{\frac{100}{3}}\right)^3 - 3a = 0$ oe or $4\left(\sqrt{\frac{100}{3}}\right)^3 + 3a = 400\left(\sqrt{\frac{100}{3}}\right)$ oe or $a^{\frac{2}{3}} = \frac{400}{9}\left(3^{\frac{1}{3}}\right)$ oe			M1 dependent on previous M mark for substitution of $x = \sqrt{\frac{100}{3}}$ oe into an equation to find a value of *a* or reducing to a correct equation with $a^n = ...$ May be implied by awrt 513
			513		A1 awrt 513 Allow $\frac{8000\sqrt{3}}{27}$
		Cas			***Total 9 marks***

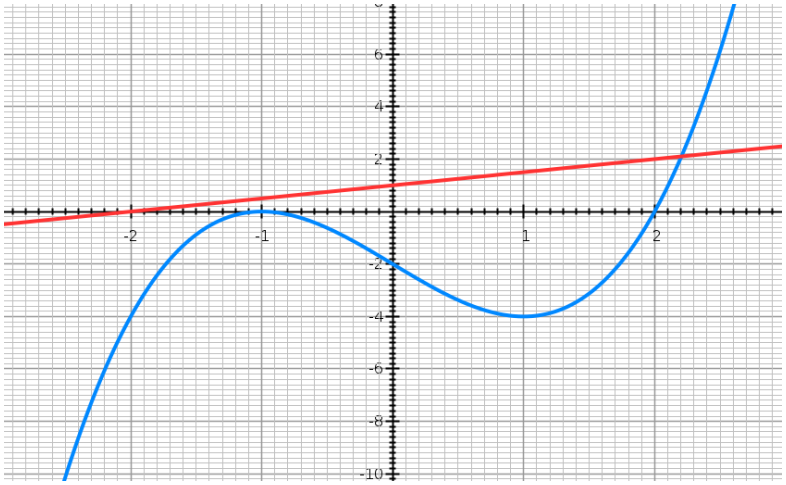
Question	Working	Ans	Mark	Notes
9 (a)	60° or 120° or 30°		3	M1 for seeing any of these angles. May be seen in the diagram or embedded in a calculation
	Area of equilateral triangle $\frac{1}{2}\times 3\times 3\times \sin 60\times 6$ or $\frac{1}{2}\times 3\times 3\times \sin 120\times 6$ or $\frac{1}{2}\times 3\times 3\times \cos 30\times 6$ or $\frac{1}{2}\times 3\times 1.5\times \tan 60\times 6$ or $\frac{1}{2}\times 3\times \frac{1.5}{\tan 30}\times 6$ or $\frac{1}{2}\times 3\times \sqrt{3^2-1.5^2}\times 6$ or $\frac{1}{2}\times 3\times \frac{1.5\sin 60}{\sin 30}\times 6$ or $\frac{1}{2}\times 3\times \sqrt{1.5^2+3^2-2\times 1.5\times 3\cos 60}\times 6$ or $\sqrt{4.5(4.5-3)(4.5-3)(4.5-3)}\times 6$ **Area of trapezium** $\left(\frac{(6+3)}{2}\times 3\sin 60\right)\times 2$ or $\left(\frac{(6+3)}{2}\times 3\cos 30\right)\times 2$ or $\left(\frac{(6+3)}{2}\times 1.5\tan 60\right)\times 2$ or $\left(\frac{(6+3)}{2}\times \frac{1.5}{\tan 30}\right)\times 2$ or $\left(\frac{(6+3)}{2}\times \sqrt{3^2-1.5^2}\right)\times 2$ or $\left(\frac{(6+3)}{2}\times \frac{1.5\sin 60}{\sin 30}\right)\times 2$ or $\left(\frac{(6+3)}{2}\times \sqrt{1.5^2+3^2-2\times 1.5\times 3\cos 60}\right)\times 2$ **Area of 2 triangles + rectangle or Area of 4 triangles + 2 rectangles** $\frac{1}{2}\times 2\times 3\sin 60\times 1.5\times 2+3\times 2\times 3\sin 60$ or $\frac{1}{2}\times 2\times 3\cos 30\times 1.5\times 2+3\times 2\times 3\cos 30$ or $\frac{1}{2}\times 2\times 1.5\tan 60\times 1.5\times 2+3\times 2\times 1.5\tan 60$ or $\frac{1}{2}\times 2\times \frac{1.5}{\tan 30}\times 1.5\times 2+3\times 2\times \frac{1.5}{\tan 30}$ or $\frac{1}{2}\times 2\times \sqrt{3^2-1.5^2}\times 1.5\times 2+3\times 2\times \sqrt{3^2-1.5^2}$ or $\frac{1}{2}\times 2\times \frac{1.5\sin 60}{\sin 30}\times 1.5\times 2+3\times 2\times \frac{1.5\sin 60}{\sin 30}$ or $\frac{1}{2}\times \frac{3\sin 120}{\sin 30}\times 1.5\times 2+3\times \frac{3\sin 120}{\sin 30}$ or $\frac{1}{2}\times 2\times \sqrt{1.5^2+3^2-2\times 1.5\times 3\cos 60}\times 1.5\times 2+3\times 2\times \sqrt{1.5^2+3^2-2\times 1.5\times 3\cos 60}$ or $\frac{1}{2}\sqrt{3^2+3^2-2\times 3\times 3\cos 120}\times 1.5\times 2+3\times \sqrt{3^2+3^2-2\times 3\times 3\cos 120}$ or $\sqrt{\frac{6+3\sqrt{3}}{2}\left(\frac{6+3\sqrt{3}}{2}-3\right)\left(\frac{6+3\sqrt{3}}{2}-3\right)\left(\frac{6+3\sqrt{3}}{2}-3\sqrt{3}\right)}\times 2+3\times 3\sqrt{3}$ or $\sqrt{\frac{9+3\sqrt{3}}{4}\left(\frac{9+3\sqrt{3}}{4}-3\right)\left(\frac{9+3\sqrt{3}}{4}-1.5\right)\left(\frac{9+3\sqrt{3}}{4}-\frac{3\sqrt{3}}{2}\right)}\times 4+2\times 3\times \frac{3\sqrt{3}}{2}$			M1 for splitting hexagon into six triangles and finding the area **or** for splitting hexagon into two trapezia and finding the area **or** for splitting hexagon into two triangles and a rectangle/four triangles and two rectangles and finding the area May be seen in stages May be implied by awrt 23.4

			23.4		A1 awrt 23.4 or exact value of $\frac{27\sqrt{3}}{2}$ oe

	(b)	$[XA = XD =]\sqrt{5^2+3^2}\left[=\sqrt{34}=5.830...\right]$		6	M1 for correct use of Pythagoras to find *XA* or *XD* May be implied by $\sqrt{34}$ = awrt 5.8 or $\frac{\sqrt{34}}{2}$
		$[XM = MD]\frac{1}{2}\sqrt{5^2+3^2}\left[=\frac{\sqrt{34}}{2}=2.915...\right]$			M1 for correct use of midpoint to find *XM* May be implied by $\frac{\sqrt{34}}{2}$ = awrt 2.9
		$[AM =]\sqrt{\left(3+\frac{3}{2}\right)^2+\left(\frac{5}{2}\right)^2}\left[=\frac{\sqrt{106}}{2}=5.1478...\right]$ or $[AM =]\sqrt{6^2+\left(\frac{\sqrt{34}}{2}\right)^2-2\times6\times\frac{\sqrt{34}}{2}\cos(59.036..)}\left[=\frac{\sqrt{106}}{2}=5.1478...\right]$ or $[AM =]\sqrt{\sqrt{34}^2+\left(\frac{\sqrt{34}}{2}\right)^2-2\times\sqrt{34}\times\frac{\sqrt{34}}{2}\cos(61.927...)}\left[=\frac{\sqrt{106}}{2}=5.1478...\right]$			M1 for a correct method to find *AM* May be implied by $\frac{\sqrt{106}}{2}$ or awrt 5.15 Allow 5.14 May be seen in stages You may find these expressions useful $\cos^{-1}\frac{3}{\sqrt{34}}=\sin^{-1}\frac{5}{\sqrt{34}}=\tan^{-1}\frac{5}{3}=59.036...$ $\cos^{-1}\left(\frac{\sqrt{34}^2+\sqrt{34}^2-6^2}{2\sqrt{34}\sqrt{34}}\right)=61.927$ Allow decimal equivalents
		$\sqrt{34}^2=\left(\frac{\sqrt{34}}{2}\right)^2+\left(\frac{\sqrt{106}}{2}\right)^2-2\times\frac{\sqrt{34}}{2}\times\frac{\sqrt{106}}{2}\times\cos AMX$ or $6^2=\left(\frac{\sqrt{34}}{2}\right)^2+\left(\frac{\sqrt{106}}{2}\right)^2-2\times\frac{\sqrt{34}}{2}\times\frac{\sqrt{106}}{2}\times\cos AMD$ or $\left(\frac{\sqrt{34}}{2}\right)^2=6^2+\left(\frac{\sqrt{106}}{2}\right)^2-2\times6\times\frac{\sqrt{106}}{2}\times\cos MAD$ or $\frac{\sin\angle AMX}{\sqrt{34}}=\frac{\sin(61.927...)}{\frac{\sqrt{106}}{2}}$ or $\frac{\sin\angle MAD}{\frac{\sqrt{34}}{2}}=\frac{\sin 59.036...}{\frac{\sqrt{106}}{2}}$			M1 dependent on 3rd M mark for correct substitution into Cosine Rule or correct substitution into the Sine Rule Allow decimal equivalents Allow $\frac{\sin\angle AMD}{6}=\frac{\sin 59.036...}{\frac{\sqrt{106}}{2}}$ may be implied by 5th M mark

	$\cos\angle AMX = \dfrac{\left(\frac{\sqrt{34}}{2}\right)^2 + \left(\frac{\sqrt{106}}{2}\right)^2 - \sqrt{34}^2}{2\times\frac{\sqrt{34}}{2}\times\frac{\sqrt{106}}{2}}$ or $\cos\angle AMD = \dfrac{\left(\frac{\sqrt{34}}{2}\right)^2 + \left(\frac{\sqrt{106}}{2}\right)^2 - 6^2}{2\times\frac{\sqrt{34}}{2}\times\frac{\sqrt{106}}{2}}$ or $\cos\angle MAD = \dfrac{6^2 + \left(\frac{\sqrt{106}}{2}\right)^2 - \left(\frac{\sqrt{34}}{2}\right)^2}{2\times 6\times\frac{\sqrt{106}}{2}}$ or $\sin\angle AXM = \dfrac{\sin(61.927)}{\frac{\sqrt{106}}{2}}\times\sqrt{34}$ or $\sin\angle MAD = \dfrac{\sin 59.036...}{\frac{\sqrt{106}}{2}}\times\dfrac{\sqrt{34}}{2}$			M1 dependent on 4th M mark for a correct rearrangement of the cosine rule or the sine rule Allow decimal equivalents May be implied by answers in the range 87.9 – 88.3 Allow $\sin\angle AMD = \dfrac{\sin 59.036...}{\left(\frac{\sqrt{106}}{2}\right)}\times 6$
			88.1		A1 87.9 – 88.3 Do not ISW e.g. 180 – 88.1 = 91.9 would score A0 Do not accept answers in the range that have come from incorrect methods
	Wr				***Total 9 marks***

Question		Working	Answer	Mark	Notes
10	(a)	$(2)^3-3(2)-2$		2	M1 Attempt to find f (±2) (M0 if long division used)
			$(2)^3-3(2)-2=0$		A1 Find f(2) must see working including the " = 0" Allow 8 – 6 – 2 = 0 as a minimum
	(b)	$[(x-2)](x^2+2x+1)$ 2 | 1 0 –3 –2 2 4 2 1 2 1 0		3	M1 (For any two terms of the quadratic factor). May be seen as part of long division of synthetic long division (in which case look for two correct non-zero terms on the bottom row).
		$[(x-2)](x^2+2x+1)$			A1 fully correct quadratic factor
			$(x-2)(x+1)^2$		A1 fully correct solution with no incorrect working seen gains full marks, may be awarded from part (a). Allow $(x-2)(x+1)(x+1)$ ISW
	(c)		0, −0.6, −3.1	2	B2 All values correct to 1 dp or better (actual values are 0, −0.625, −3.125) (B1 for 2 values correct to at least 1dp)
	(d)		Curve drawn	3	B3 Fully correct smooth curve ±1 small square. Allow if curve goes through points, even if the points are not plotted. (B2 for at least 7 points plotted correctly ±1 small square or a curve/line segments that goes through at least 7 correct points ±1 small square . (B1 For at least 5 points plotted correctly ±1 small square or a curve/line segments that goes through at least 5 correct points ±1 small square.
	(e)	$x^3-3x-2=0.5x+1$ **or** $y=0.5x+1$		3	M1 for identifying the required line` (allow $0.5x+1$ or $f(x)=0.5x+1$) May be seen on the diagram Allow a straight line drawn through (0, 1) with a positive gradient.
					M1 a correct line that intersects the curve (a correct line drawn implies M2)
			(x=) 2.2		A1 dependent on a correct line being drawn Allow answers in the range 2.1 to 2.3 inclusive (dep on M2) **NB**: if y values given as well then A0
					Total 13 marks

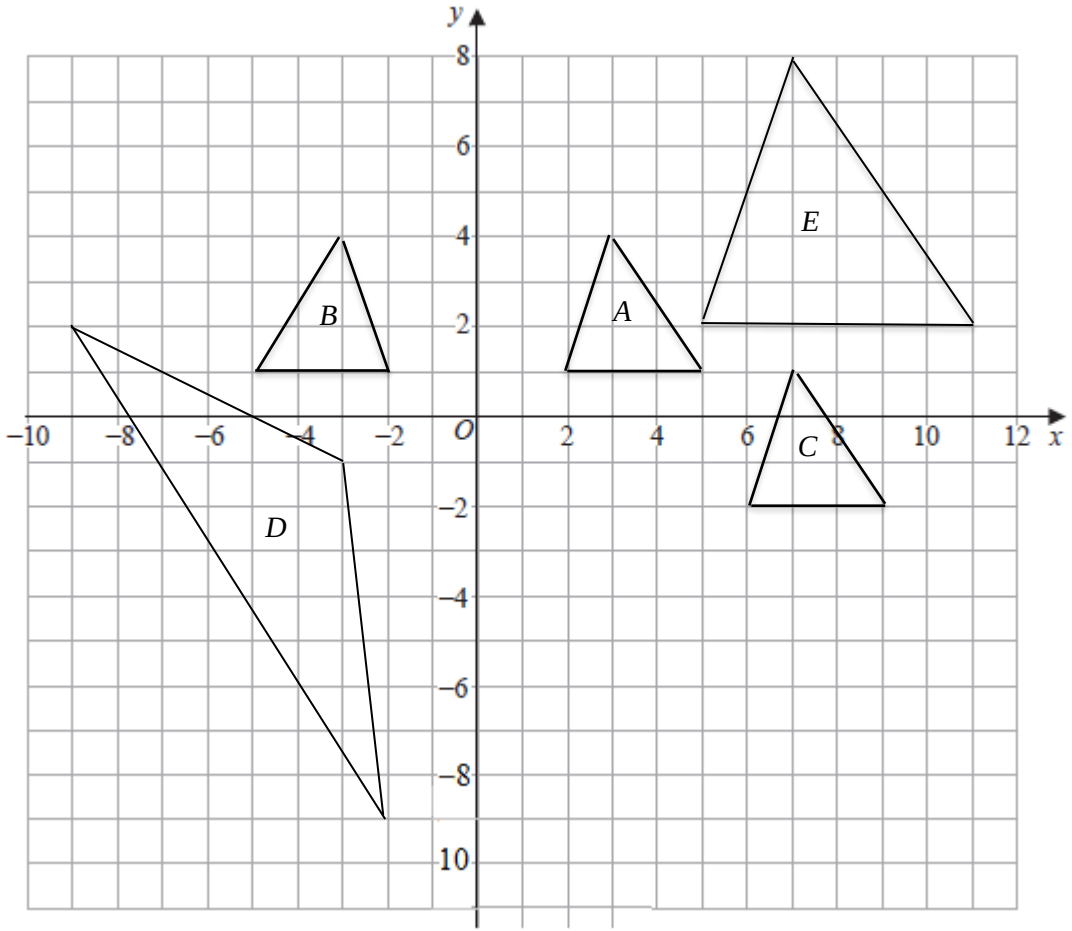

6
4
2
-2
-1
1
2
-2
-4
-6
-8
-10

Question		Working		Answer	Mark	Notes
11	(a)	$\left[x^2+6x+8=\right](x+4)(x+2)$			3	B1 factorising quadratic
		$\frac{x+x+4}{(x+4)(x+2)}\left[=\frac{2x+4}{(x+4)(x+2)}=\frac{2(x+2)}{(x+4)(x+2)}\right]$				M1 for writing both fractions with a common denominator (can be written as two fractions with a common denominator or one single fraction) This step may be done before or without factorising eg $\frac{x(x+2)+x^2+6x+8}{(x^2+6x+8)(x+2)}$ oe
				$\frac{2}{x+4}$		A1 cao dep on M1 Do not ISW
	(b)	$f(2)=4$ or $\frac{6-\frac{1}{2}x^2+5}{2\left(6-\frac{1}{2}x^2\right)+3}$			2	M1 for f(2) = 4 May be seen as a substitution into h(x) e,g. $\frac{4+5}{2(4)+3}$ or substitution of f(x) into h(x)
				$\frac{9}{11}$		A1 Allow awrt 0.82 $\frac{9}{11}=0.8181...$
	(c)	$2xy+3y=x+5$			4	M1 For a correct expression. May use 2 other letters eg $2xy+3x=y+5$ (from interchanging x and y as a first step)
		$2xy-x=5-3y$	$3y-5=x-2xy$			M1 Collect all their x terms on one side (must be more than one) Allow 1 sign error. Condone both sides being over x or y eg $\frac{2xy-x}{x}=\frac{5-3y}{x}$ May use other letters eg $2xy-y=5-3x$
		$x(2y-1)=5-3y$	$3y-5=x(1-2y)$			M1 Isolating term in x ie taking x out as common factor so it only appears once in the equation
				$\frac{5-3x}{2x-1}$		A1 oe eg $\frac{3x-5}{1-2x}$ must be in terms of x
	(d)	$\frac{x+5}{2x+3}=\text{"}\frac{5-3x}{2x-1}\text{"}$ oe			3	M1 for recognising that question can be answered by solving $h(x)=h^{-1}(x)$

					May be implied by a correct quadratic ft answer to part (c) for this method mark only May be implied by $(x+5)(2x-1)=(5-3x)(2x+3)$ or $2x^2+9x-5=15+x-6x^2$
		$8x^2+8x-20[=0]$ oe			M1 for a correct three term quadratic
			$\frac{-1+\sqrt{11}}{2}$		A1 oe Allow awrt 1.16 (Condone 1.15) Must reject other root if seen
	ALT	$[\text{hh}(x)=]\dfrac{\frac{x+5}{2x+3}+5}{2\left(\frac{x+5}{2x+3}\right)+3}$ or $\left[\text{h}^2(x)=\right]=\dfrac{x+5+5(2x+3)}{2(x+5)+3(2x+3)}$ or $\left[\text{h}^2(x)=\right]\dfrac{11x+20}{8x+19}$			M1 for a correct expression for $\text{h}^2(x)$ May be implied by a correct quadratic/cubic May be implied by $\frac{11x+20}{8x+19}=x$ or $11x+20=x(8x+19)$
		$8x^2+8x-20[=0]$ oe or $16x^3+40x^2-16x-60[=0]$ oe			M1 for a correct three term quadratic or a correct cubic Allow equivalent expressions e.g $40x^2-16x-60=-16x^3$
			$\frac{-1+\sqrt{11}}{2}$		A1 oe Allow awrt 1.16 (Condone 1.15) Must reject other root/roots if seen
					Total 12 marks

Question		Working	Answer	Mark	Notes
12	(a)		Enlargement	3	B1 Allow enlarge. Do not allow bigger B0 if multiple transformations stated. Multiple transformations are when more than one of reflection (mirrored), rotation (turn), translation (move), is stated eg a vector or SF or equation of a line do not imply multiple transformations
			Centre (–1, 0)		B1 for (–1, 0) Do not accept if written as a column vector These 2 marks can still be awarded if multiple transformations are stated
			SF 2		B1 for 2
	(b)		Correct triangle B drawn	2	B2 correct triangle drawn (–2, 1) (–5, 1) (–3, 4) Award 2 marks for a correct triangle drawn irrespective of working in the working space. (B1 for 2 correct vertices plotted correctly or a triangle of the correct size and orientation, or 3 correct vertices listed)) SC B1 for a correct reflection applied to triangle A in the *x*-axis. [vertices (2, –1) (5, –1) (3, –4)] Ignore triangle B not labelled
	(c)			2	M1 for a triangle translated either 4 units to the right or 3 units down.
			Correct triangle C drawn		A1 correct triangle drawn (6, –2) (9, –2) (7, 1) Ignore triangle C not labelled
	(d) (i)	$\begin{pmatrix}-2 & 1\\ 1 & -3\end{pmatrix}\begin{pmatrix}2 & 3 & 5\\ 1 & 4 & 1\end{pmatrix}$		3	M1 for the intention to multiply the right way. Points can be in any order. May be implied by writing the matrices in the correct order or correctly stating or plotting one point.
		$=\begin{pmatrix}-3 & -2 & -9\\ -1 & -9 & 2\end{pmatrix}$			M1 for at least two correct columns or correctly stating or plotting two correct points
			correct triangle D drawn		A1 correct triangle drawn **NB** Award 3 marks for a correct triangle drawn irrespective of working in the working space. Ignore triangle D not labelled
	(ii)	$\begin{pmatrix}-2 & 1\\ 1 & -3\end{pmatrix}\begin{pmatrix}k & -5\\ 1 & -1\end{pmatrix}$ or $\begin{pmatrix}k & -5\\ 1 & -1\end{pmatrix}\begin{pmatrix}-2 & 1\\ 1 & -3\end{pmatrix}$ or		4	M1 for intention to multiply the two matrices, implied by one correct value once multiplied or finding the determinant of the two matrices

		$\det\begin{pmatrix}-2 & 1\\ 1 & -3\end{pmatrix}=(-2\times-3-1\times1)$ **and** $\det\begin{pmatrix}k & -5\\ 1 & -1\end{pmatrix}=(k\times-1--5\times1)$			
		$\begin{pmatrix}-2k+1 & 9\\ k-3 & -2\end{pmatrix}$ or $\begin{pmatrix}-2k-5 & k+15\\ -3 & 4\end{pmatrix}$ or $(-2\times-3-1\times1)\ (k\times-1--5\times1)=5$			M1 for matrix with 3 or 4 correct elements or for multiplying the two determinants and equating to 5
		$-2(-2k+1)-9(k-3)=5$ or $4(-2k-5)+3(k+15)=5$ or $5(-k+5)=5$			M1 dependent on previous M mark for forming a correct equation for their determinant
			4		A1
					Total 14 marks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