Mark Scheme (Results)

Summer 2025

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

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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).

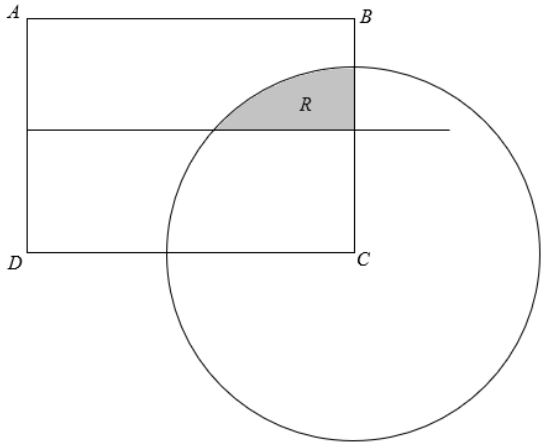
- **Ignoring subsequent work**
  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct.

  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.

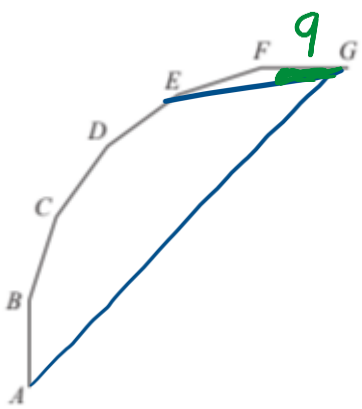
Question		Working	Answer	Mark	Notes
1		$12x-16y=12$ $\quad 21x-28y=21$ $12x-21y=6$ **or** $16x-28y=8$ **or** $y=\frac{4x-2}{7}$ **or** $y=\frac{3x-3}{4}$ **or** $x=\frac{2+7y}{4}$ **or** $x=\frac{3+4y}{3}$		4	M1 for preparing to eliminate a variable either by multiplying so the coefficients of x (or y) are the same or rearranging to get x in terms of y or y in terms of x Allow one arithmetic or sign slip in total for both M marks [Allow eg, $x=\frac{5+11y}{7}$ **or** $x=3y-1$ **or** $y=\frac{7x-5}{11}$ **or** $y=\frac{x+1}{3}$]
		$5y=6$ **or** $5x=13$ **or** $3x-4\left(\frac{4x-2}{7}\right)=3$ **or** $4x-7\left(\frac{3x-3}{4}\right)=2$ **or** $3\left(\frac{2+7y}{4}\right)-4y=3$ **or** $4\left(\frac{3+4y}{3}\right)-7y=2$			M1 dependent on previous mark For a correct method to eliminate either variable by adding/subtracting equations or substituting to obtain an equation in one variable NB the alternative forms of x and y listed in the notes above can be substituted into either of the correct original equations Allow one arithmetic or sign slip in total for both M marks A correct equation in one variable implies the previous mark
			$x=2.6$ **and** $y=1.2$		A2 wr dependent both method marks being awarded and having a correct equation in terms of x or y only Accept exact fractions eg $x=\frac{13}{5}$ and $y=\frac{6}{5}$ or simplified mixed numbers eg $x=2\frac{3}{5}$ and $y=1\frac{1}{5}$ isw if correct form is seen NB we will **not** accept decimals within a fraction eg $\frac{7.8}{3}$ May be seen within a coordinate pair (A1 for just one value correct)
					Total 4 marks

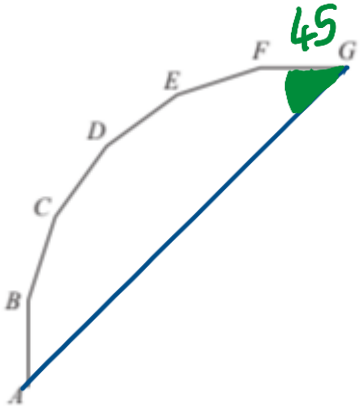
Question		Working	Answer	Mark	Notes
2					**Use the overlay when marking this question**

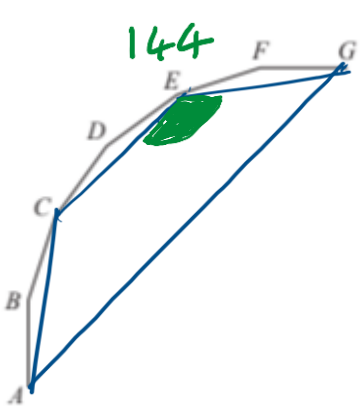
	(a)			1	B1 full Circle centre *C* radius 4 cm – within guidelines Allow faint lines and short breaks in the line as long as the intention to draw a **full** circle is clear
	(b)			2	B2 for a line within the guidelines **and** 2 pairs of suitable intersecting arcs which intersect within the guidelines (if extended) (B1 for a line within the guidelines **or** 2 pairs of suitable intersecting arcs) NB The line can be any length - does not need to cross *BC* but should remain within the guidelines if it were to be extended to *BC*
	(c)			1	B1 must have a partial circle **and** at least B1 in (b). Correct region shaded.
					Total 4 marks

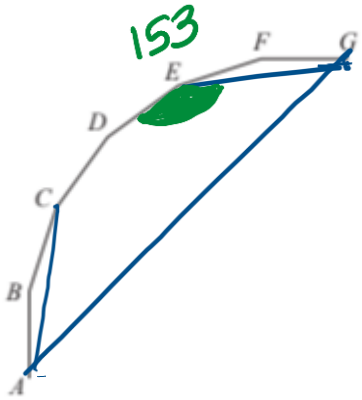
Question		Working	Answer	Mark	Notes
3	(a)	$\frac{360}{20}[=18]$ **or** $(20-2)\times 180[=3240]$ **or** $(2\times 20-4)\times 90[=3240]$		2	M1 Finding the sum of the interior angles or the exterior angle of the polygon. May be seen as part of calculation eg $\left(180-\frac{360}{20}\right)$ or $\left(\frac{(20-2)\times 180}{20}\right)$ or $\frac{(2\times 20-4)\times 90}{20}$
			162		A1 cas May be seen on diagram.
	(b)	$(2\times 7-4)\times 90[=900]$ **or** $(2\times 6-4)\times 90[=720]$ **or** $(2\times 5-4)\times 90[=540]$ **or** $(2\times 4-4)\times 90[=360]$ **or** $(2\times 10-4)\times 90[=1440]$ $[\angle FGE=]\frac{180-"162"}{2}[=9]$		4	M1 for a start to the process, **either** a correct method to find the sum of the interior angles of a 7, 6, 5, 4 or 10 sided polygon. Allow for $(n-2)\times 180$ where $n=7,6,5,4,10$ **or** $\angle FGE$. Allow $180="162"+2x$ oe NB, if found, the 9 could be seen on the diagram or labelled as $\angle FEG, \angle FGE, \angle DEC, \angle DCE, \angle BCA, \angle BAC$
		$[\angle FGA \text{ or } \angle BAG=]\frac{"900"-5\times"162"}{2}[=45]$ $[\angle DEG \text{ or } \angle ACD=]"162"-"9"[=153]$ $[\angle ACE \text{ or } \angle CEG=]\frac{"1440"}{10}[=144]$ or $[\angle ACE \text{ or } \angle CEG=]"162"-2\times"9"[=144]$ $[\angle DEA \text{ or } \angle BAE=]\frac{"540"-3\times"162"}{2}[=27]$			M1 ft a correct method to find an angle within the polygon eg $\angle FGA$ or $\angle BAG$ or $\angle DEG$ or $\angle ACD$ or $\angle ACE$ Allow the angles, represented by any variable, to be seen within an equation eg $900=5\times"162"+2x$ ft their part (a), their sum of angles and their $\angle FGE$ if clearly labelled, seen on the diagram or from correct working
		eg $[\angle EGA=]"\angle FGA"-"\angle FGE"$ or $[\angle EGA=]"720"-"\angle BAG"-"\angle DEG"-3\times"162"$ or $[\angle EGA=]\frac{"360"-2\times"\angle CEG"}{2}$ or $[\angle EGA=]180-"144"$ or $[\angle EGA=]\frac{"540"-"162"-2\times"\angle DEG"}{2}$			M1 ft a complete method to find $\angle EGA$ ft their part (a), their sum of angles and their calculated angles if clearly labelled, seen on the diagram or from correct working There are alternative approaches, for example $[\angle EGA=]180-\angle AEG-\angle EAG=180-("162"-"27"-"9")-("45"-"27")$
			36		A1 cas
					Total 6 marks

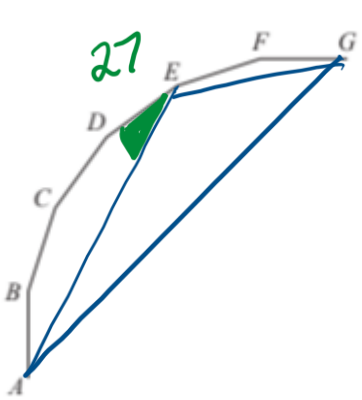
Commonly found angles that could be used to work towards finding $\angle EGA$
(due to the symmetry of the shape, these may not always be found in these positions)

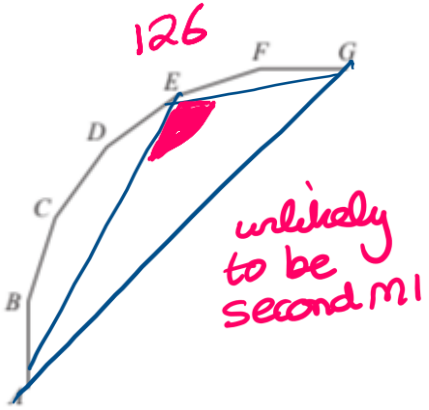






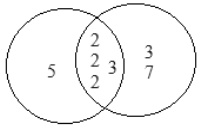


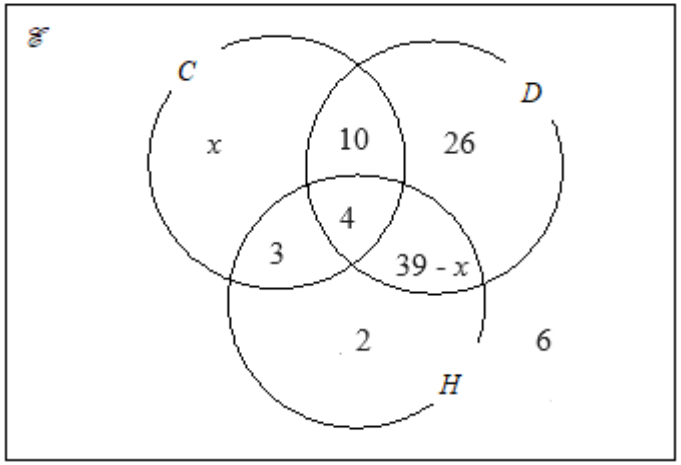




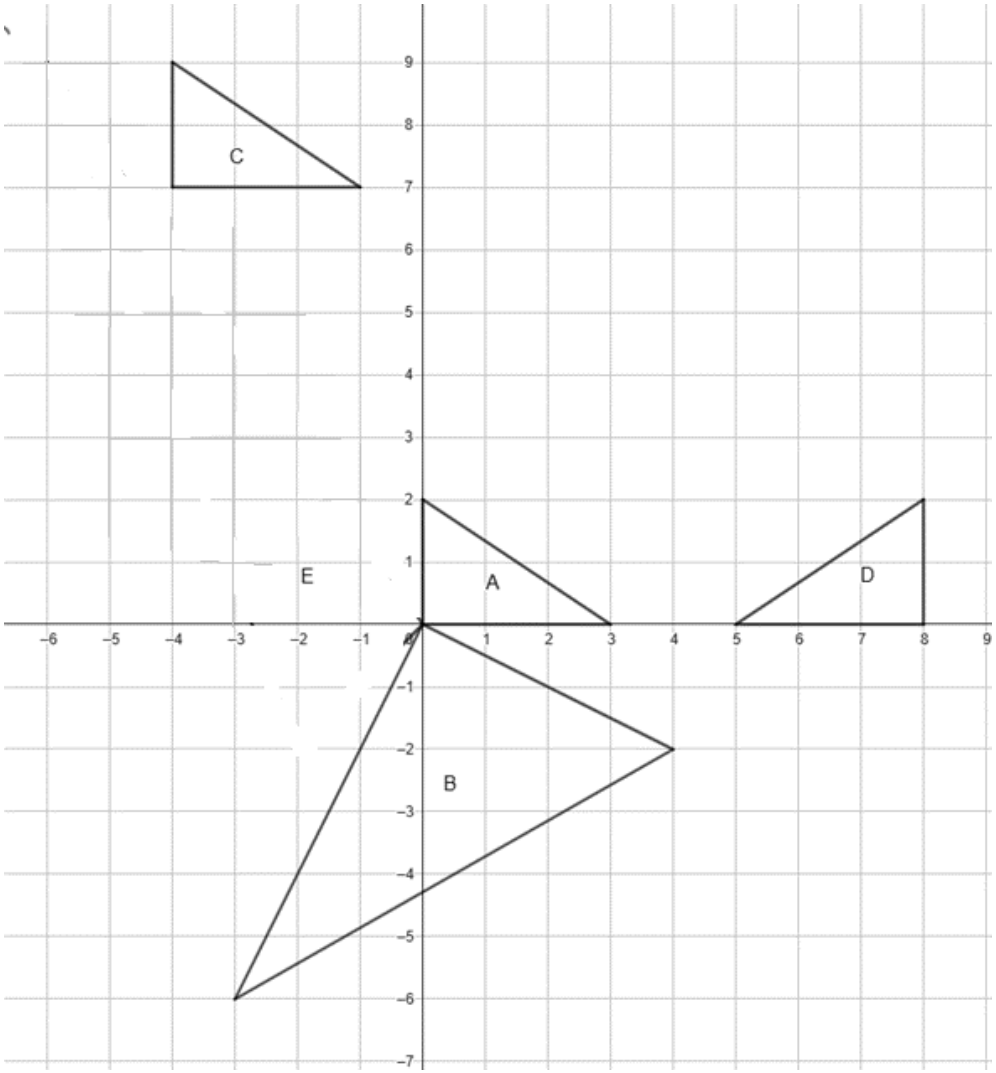
Question		Working	Ans	Mark	Notes
4	(a)	$2\times7^2-5\left[=93\right]$ **and** $2\times3^2-5\left[=13\right]$**or** $2\times7^2\left[=98\right]$**and** $2\times3^2\left[=18\right]$		2	M1 for a correct method to find the 3rd and 7th term or the 3rd and 7th term minus 5 Allow for 93 and 13 **or** 98 and 18
			80		A1 cas Allow –80
	(b)	$d\left(2x-1\right)+2=4x+9$ **and** $d\left(4x+9\right)+2=20x-11$ **or** $d\left(d\left(2x-1\right)+2\right)+2=20x-11$ oe **AND** $\left[d=\right]\frac{4x+7}{2x-1}$ **or** $\left[d=\right]\frac{20x-13}{4x+9}$ **or** $\left[d=\right]\frac{4x+9}{2x-1}$ **or** $\left[d=\right]\frac{20x-13}{4x+7}$ **or** $\left[d=\right]\frac{56x+50}{22x}$ **or** $\left[d=\right]\frac{48}{6x-14}$ **or** $\left[d=\right]\frac{16x-20}{2x+10}$ **or** $\left[d=\right]\frac{12x-27}{11}$ **or** $\left[x=\right]\frac{13+9d}{d+7}$ **or** $\left[x=\right]\frac{d+7}{2d-4}$ **or** $\left[x=\right]\frac{13+9d}{20-4d}$ **or** $\left[x=\right]\frac{20-4d}{2d-4}$ **or** $\left[x=\right]\frac{11d+27}{12}$ **or** $\left[x=\right]\frac{48+14d}{6d}$ **or** $\left[x=\right]\frac{11d+20}{16-2d}$ **or** $\left[x=\right]\frac{50}{22d-56}$ **or** $\left[x=\right]\frac{d^2-2d-13}{2d^2-20}$		5	M1 for • forming two recurrence relationships (allow one sign error). Allow equivalences eg $2xd^2-d^2+2d+2=20x-11$ **AND** • rearranging at least one of their equations to isolate either *d* or *x* Any two expressions for *d* (or for *x*) imply the correct recurrence relationships This mark can be implied by the correct 3-term quadratic
		$\pm\left(24x^2-110x-50\right)\left[=0\right]$ **or** $\pm\left(12x^2-55x-25\right)\left[=0\right]$ **or** $\pm\left(22d^2-2d-192\right)\left[=0\right]$ **or** $\pm\left(11d^2-d-96\right)\left[=0\right]$			M2 for a correct 3-term quadratic (allow multiples) no need for = 0 (M1 for a 3-term quadratic with 2 correct coefficients)
		$\left(12x+5\right)\left(x-5\right)$ oe **or** $\left(11d+32\right)\left(d-3\right)$ oe			M1 dependent on the 1st M1 being awarded. For an attempt at solving their 3-term quadratic. If factorising it must multiply out to gain at least 2 correct terms. If using the quadratic formula it must be correct. Can be implied by $x=-\frac{5}{12}$ or 5 or $d=3$ or $d=-\frac{32}{11}$
			3		A1 wr dependent on 3 method marks awarded $d=3$ must be clearly selected
					Total 7 marks

Question		Working	Answer	Mark	Notes
5	(a)	$1000+7\times400\left[=3800\right]$ **or** $1000+0.8\times500\left[=1400\right]$ **or** $7\times400+0.8\times500\left[=3200\right]$		5	M1 for calculating the combined cost of any two components These may be seen within a calculation for multiple minibuses eg for 3 minibuses $3\times\left(1000+7\times400\right)\left[=3000+8400=11400\right]$ or $3\times\left(1000+0.8\times500\right)\left[=3000+1200=4200\right]$ or $3\times\left(7\times400+0.8\times500\right)\left[=8400+1200=9600\right]$
		$1000+7\times400+0.8\times500\left[=4200\right]$			M1 fully correct method for the total cost. This may be seen within a calculation for multiple minibuses, eg, $3\times\left(1000+7\times400+0.8\times500\right)\left[=12600\right]$ 4200 implies M1M1 unless contradictory working is seen
		$\frac{10584}{3}\left[=3528\right]$ **or** $"4200"\times3\left[=12600\right]$ **or** $\left("4200"\times m \text{ and } \frac{10584\times m}{3}\left[=3528m\right]\right)$			M1 finding value(s) that can be compared either the cost of hiring 1 discounted minibus (hybrid) **or** 3 full-price minibuses **or** (m full-price minibuses **and** m discounted minibuses) ft their values if they come from correct method 12600 implies M1M1M1 unless contradictory working is seen
		$\pm\frac{"3528"}{"4200"}\left[=0.84\right]$ **or** $\pm\frac{"3528"}{"4200"}\times100\left[=84\right]$ **or** $\pm\frac{"4200"-"3528"}{"4200"}\left[=0.16\right]$ **or** $"4200"\times\frac{100-n}{100}\left[="3528"\right]$ **or** $"4200"-\frac{n}{100}\times4200\left[="3528"\right]$			M1 ft their values if they all use the same value of *m* and come from correct working Allow calculation for m minibuses eg for 3 minibuses $\pm\frac{10584}{"12600"}$ or $\pm\frac{"12600"-10584}{"12600"}$
			16		A1 cas
	(b)		4500	1	B1 oe eg $2^2\times3^2\times5^3$ isw

	(c)	$2^3\times3\times5$ and $2^3\times3^2\times7$  		3	M1 allow $120=8\times3\times5$ and/or $504=8\times3\times21$ may be reduced further or list of at least 4 multiples for one of the numbers 120, 240, 360, 480, 600, 720, 840, …2016, 2520 or 504, 1008, 1512, 2016, 2520 (allow multiples with 7 added)
		LCM = $2^3\times3^2\times5\times7$ or 2520			A1 correct LCM Correct value implies M1
			2527		A1 cas
					SC award 3 marks for a final answer of 7
	ALT	$120x+7=504y+7$		3	M1 for setting up the correct relationship
		$\frac{x}{y}=\frac{21}{5}$			A1 may be seen embedded eg $120\times21+7$ or $504\times5+7$ Allow $x=21$ and $y=5$
			2527		A1 cas
	(d)	[hybrid vans] $0.4\times\frac{5}{8}\times200[=50]$ oe		4	M1 For a correct method to find the number of hybrid vans Allow 40% as 0.4 or $\frac{4}{10}$ or $\frac{40}{100}$. Implied by 50
		[hybrid minibuses] $\frac{9}{25}\times\frac{3}{8}\times200[=27]$ oe			M1 for a correct method to find the number of hybrid minibuses Implied by 27
		$\frac{"50"+"27"}{200}[\times100]$			M1 ft their values if clearly labelled or if they come from correct method
			38.5		A1 wr dependent on all method marks awarded
	ALT	$0.4\times5[=2]$ or $0.4\times\frac{5}{8}\left[=\frac{1}{4}\right]$		4	M1 for a correct method to find the relative number or proportions of hybrid vans
		$\frac{9}{25}\times3\left[=\frac{27}{25}=1.08\right]$ or $\frac{9}{25}\times\frac{3}{8}\left[=\frac{27}{200}\right]$			M1 for a correct method to find the relative number or proportions of hybrid minibuses
		$\frac{"2"+"1.08"}{8}[\times100]$ or $"\frac{1}{4}"+"\frac{27}{200}"[\times100]$			M1 ft their values if they come from correct method
			38.5		A1 wr dependent on all method marks awarded
					Total 13 marks

Question		Working	Answer	Mark	Notes
6	(a)			3	B3 fully correct (B2 6 or 7 correct) (B1 3, 4 or 5 correct) Allow 34 for x Allow 5 or $x - 29$ for $39 - x$
	(b)	$x+10+3+4-37=4+3+2+"39-x"$ oe		2	M1 ft their Venn diagram if at least one region has x in and no areas are blank (x must not cancel out) We must see the relation between the horses and cats so look for $cats-37=horses$ or $cats=horses+37$ or $cats-horses=37$ May be seen with sections combined eg $x+17=48-x+37$
			34		A1 cas
	(c)		36	1	B1 ft "10 " + "26"
	(d)		8	1	B1 ft "6" + "2" or 90 – "82"
					Total 7 marks

Question		Working	Answer	Mark	Notes
7	(a)	for moving triangle A 4 left **or** moving triangle A 7 up **or** for correctly translating two of the vertices		2	M1 implied by an attempt at the correct translation
			Triangle C		A1 cas for a fully correct triangle (–1, 7) (–4, 7) (–4, 9)
	(b)	correct reflection in the vertical line $x = k$ **or** for correctly reflecting 2 vertices **or** a correct reflection in the horizontal line $y = 4$		2	M1 implied by an attempt at reflection
			Triangle D		A1 cas for a fully correct triangle (5,0) (8, 0) (8, 2)
	(c)	$\tan(x) = \frac{1}{2}$ oe **or** $\sin(x) = \frac{2}{2\sqrt{5}}$ oe **or** $\cos(x) = \frac{4}{2\sqrt{5}}$ oe **or** $\cos(x) = \frac{4^2 + \left(2\sqrt{5}\right)^2 - 2^2}{2 \times 4 \times 2\sqrt{5}}$ oe		3	M1 uses a trigonometric method to calculate an angle. ft their $\sqrt{4^2 + 2^2}$ in place of $\sqrt{5}$ when using sin or cos Allow $\sin(x) = \frac{4}{2\sqrt{5}}$ oe or $\cos(x) = \frac{2}{2\sqrt{5}}$ oe Note that measuring the angle is **not** an acceptable method
		$x = 26.565...$ or $x = 63.434...$			A1 wr awrt 27 or 63 condone 26 (truncation) if an acceptable method was seen
			117		A1ft wr awrt 117° ft their x value if from correct working.
					SC3 for using $\cos^{-1}\left(\frac{-2}{2\sqrt{5}}\right) = 116.56...$
					Total 7 marks


C
E
A
D
B

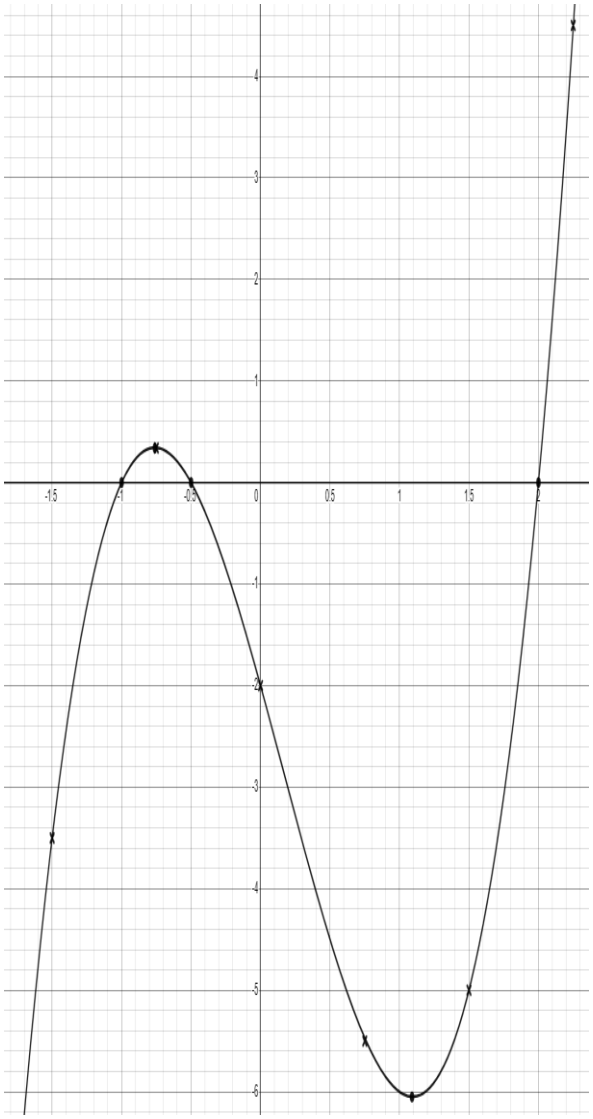
Question		Working	Answer	Mark	Notes
8	(a)(i)		0.35	1	B1 oe
	(ii)		0.85	1	B1 oe
	(iii)	$0.1+0.15+0.2+2x+2x+0.1+x=1$		3	M1 using sum of probabilities = 1 May be seen in any form for example as $[P(\text{less than } 8)=]0.1+0.15+0.2+2x=1-(2x+0.1+x)$ $[P(\text{odd})=]0.1+0.2+2x+2x+0.1+x=0.85$ This may be seen earlier in (a) or by the table.
		$2x+2x+x=1-0.1-0.2-0.15-0.1$ oe **or** $5x=0.45$ oe **or** $x=0.09$			M1 dependent on previous M1 Correctly isolating terms in x (condone one arithmetic/sign error) This may be seen earlier in (a) or by the table.
			0.63		A1 cas oe
	(b)	$[2\times]0.15\times0.2$		2	M1 for the probability of the red dice landing on 2 then 5 or the probability of the red dice landing on 5 then 2 May be seen as $0.15\times0.2+0.2\times0.15$
			0.06		A1 cas oe
	(c)	$80\times(0.15+0.1)$		2	M1 for $80\times p$ where $0 < p < 1$
			20		A1 cas
	(d)	$0.1\times0.24+0.15\times0.24+0.1\times0.12[=0.072]$		3	M1 for finding the probability that the score is < 6 This may be seen embedded within another calculation
		$\frac{0.15\times0.24}{"0.072"}[=0.5]$			M1 for $\frac{0.15\times0.24}{p}$ where $0.036 < p < 1$
			0.5		A1 cas oe
					Total 12 marks

Question		Working	Answer	Mark	Notes
9	(a)	**Allow 3, 3.1, 3.14 etc or $\frac{22}{7}$ for π**			
		$17\times 20\left[=340\right]$ **or** $26\times 20\left[=520\right]$		5	M1 correct method to find area of one of the rectangular sides Allow $2\times 17\times 20\left[=680\right]$
		$2\pi\times 5\times 20\left[=200\pi=628.318...\right]$ **or** $\pi\times 5\times 20\left[=100\pi=314.159...\right]$ **and** $\pi\times 5^2\left[=25\pi=78.539...\right]$ **or** $0.5\times\pi\times 5^2\left[=\frac{25}{2}\pi=39.269...\right]$			M1 for a method to find the surface area of the cylinder or half-cylinder. Allow $\pi\times 5\times 20+\pi\times 5^2\left[=125\pi=392.699...\right]$
		$\frac{1}{2}(26+10)\times 15\left[=270\right]$			M1 Correct method for area of the trapezium. Allow $\left[2\times\frac{1}{2}\right](26+10)\times 15\left[=540\right]$
		$2\times"270"+"314.159"+"78.539"+2\times"340"+"520"\left[=2132.699...\right]$oe $"540"+"(100+25)\pi"+"680"+"520"\left[=125\pi+1740\right]$			M1 dep on previous 3 method marks awarded. For a fully correct method to find the surface area.
			2100		A1 cas awrt 2100 ignore units
	(b)			3	*X* is the midpoint of *HG*
		$AX=\sqrt{13^2+20^2}\left[=\sqrt{569}=23.85...\right]$ **or** $AO^2=13^2+20^2+15^2\left[=794\right]$ **or** $AN^2=13^2+20^2+20^2\left[=969\right]$			M1 for a correct method to find *AX*, *AO* or *AN* ignoring labelling
		$\tan\angle AOX=\frac{"\sqrt{569}"}{15}$ **or** $\cos\angle AOX=\frac{15}{"\sqrt{794}"}$ **or** $\sin\angle AOX=\frac{"\sqrt{569}"}{"\sqrt{794}"}$ $"969"="794"+5^2-2\times 5\times"\sqrt{794}"\cos\angle AON$ **or** $\cos\angle AON=\frac{"794"+5^2-"969"}{2\times 5\times"\sqrt{794}"}$ **or** $\tan\angle ANX=\frac{"\sqrt{569}"}{20}$ **and** $\frac{\sin\angle AON}{\sqrt{"969"}}=\frac{\sin"ANX"}{\sqrt{"794"}}$			M1 dependent on 1st M1 ft using trigonometry to find $\angle AOX$ **or** $\angle AON$ allow any notation for the angle ft their values provided that they come from a correct method Note that $\left[\angle AOX=57.83... \text{ and } \angle ANX=50.022...\right]$
			122°		A1 cas awrt 122 or 123
					Total 8 marks

Question		Working	Answer	Mark	Notes
10	(a)	$\overrightarrow{AB} = 5\mathbf{b} - 10\mathbf{a}$ **or** $\overrightarrow{BA} = 10\mathbf{a} - 5\mathbf{b}$ **or** $\overrightarrow{AN} = \frac{2}{5}(5\mathbf{b} - 10\mathbf{a})\left[= 2\mathbf{b} - 4\mathbf{a}\right]$ **or** $\overrightarrow{BN} = \frac{3}{5}(10\mathbf{a} - 5\mathbf{b})\left[= 6\mathbf{a} - 3\mathbf{b}\right]$		3	M1 for finding $\overrightarrow{AB}$ or $\overrightarrow{BA}$ May be seen within $\overrightarrow{AN}$ or $\overrightarrow{BN}$
		$\overrightarrow{ON} = 10\mathbf{a} + \frac{2}{5}("5\mathbf{b} - 10\mathbf{a}")$ **or** $\overrightarrow{ON} = 5\mathbf{b} + \frac{3}{5}("10\mathbf{a} - 5\mathbf{b}")$			M1 condone invisible brackets
			$6\mathbf{a} + 2\mathbf{b}$		A1 cas do **not** isw but accept $2(3\mathbf{a} + \mathbf{b})$
	(b)	$\frac{1}{2} \times 10 \times 10 \sin \angle BOM = 45$ **or** $\angle BOM = 64.158...$		4	M1 allow awrt 64.2
		$BM = 2 \times 10 \sin\left(\frac{"64.158..."}{2}\right)$ **or** $BM^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos"64.158..."$ **or** $\frac{10}{\sin\left(\frac{180 - "64.158..."}{2}\right)} = \frac{BM}{\sin("64.158...")}$			M1 Allow for $BM = 10.62\ldots$ or $BM^2 = 112.8\ldots$ ft their $\angle BOM$
		$OC^2 = 10^2 + \left(\frac{3}{4} \times "BM"\right)^2 - 2 \times 10 \times \left(\frac{3}{4} \times "BM"\right) \times \cos("\angle OBM")$ **or** $OC^2 = 10^2 + ("7.96...")^2 - 2 \times 10 \times ("7.96...") \times \cos("57.92...")$ **or** $OC^2 = 10^2 + \left(\frac{1}{4} \times "BM"\right)^2 - 2 \times 10 \times \left(\frac{1}{4} \times "BM"\right) \times \cos("\angle OMB")$ **or** $OC^2 = 10^2 + ("2.65...")^2 - 2 \times 10 \times ("2.65...") \times \cos("57.92...")$ **or** $OC^2 = 10^2 - \left(\frac{1}{2} \times "10.62..."\right)^2 + \left(\frac{1}{4} \times "10.62..."\right)^2$			M1 for finding length OC awrt 78.8 ft their values for *BM* and angles provided correctly labelled or from correct working Note $\angle OMB = \angle OBM = \frac{180 - "64.15..."}{2} = 57.92...$ or $\angle OMB = \angle OBM = \sin^{-1}\left(\frac{10 \times \sin("64.15...")}{BM}\right) = 57.92...$ but the angle $\angle OMB$ alone does **not** imply the mark
			8.88		A1 wr accept answer in the range 8.87 - 8.90
					Total 7 marks

Question		Working	Answer	Mark	Notes
11	(a)	$2(2)^3-(2)^2-5(2)-2$		2	M1 Substituting ± 2 in consistently.
			= 0		A1 wr substituted 2 and = 0
	(b)	$2x^2 \pm 3x \pm ...$		4	M1 makes progress to find the quadratic factor with a minimum of $2x^2 \pm 3x \pm ...$ (note that this could be seen in (a))
		$2x^2+3x+1$			M1 correct 3-term quadratic. (note that this could be seen in (a))
		$(2x+1)(x+1)$ or $\frac{-3\pm\sqrt{3^2-4\times 2}}{2\times 2}$			M1ft their 3-term quadratic if working shown. If factorising it must multiply out to gain at least 2 correct terms. If using the quadratic equation it must be a correct equation but allow one error with the substitution
			$-1,\ 2,\ -0.5$		A1 dep on 2nd M1 being awarded
	(c)	$x=\frac{-(-2)\pm\sqrt{(-2)^2-4\times 6\times(-5)}}{2\times 6}$		3	M1 A correct use of the formula. May be implied by correct values to 2 dp
		$y=2("1.09")^3-("1.09")^2-5("1.09")-2$ or $y=2("-0.76")^3-("-0.76")^2-5("-0.76")-2$			M1 ft their *x*-coordinates if full working shown. Implied by 2 correct *y*-coordinates Allow (awrt 1.1, awrt –6) (awrt –0.8, awrt 0.3)
			$(1.09, -6.05)$ and $(-0.76, 0.34)$		A1 dependent on the 2nd M1 being awarded Allow (awrt 1.1, awrt –6) (awrt –0.8, awrt 0.3) Condone missing brackets Allow $x=...$ and $y=...$ if correctly paired, eg working for y value underneath the corresponding x value
					NB can award M0M1A1
	(d)	–3.5, –5		1	B1 Both correct

	(e)				
				4	B4 A fully correct graph going through 9 correct points plus a local maximum between x=-1 and x=-0.5 and between y=0.1 and y=0.5 B3 a smooth curve going through any 5 correct points plus a local maximum between x=-1 and x=-0.5 and between y=0.1 and y=0.5 **or** 9 correct points joined with line segments B2 a smooth curve passing through any 4 correct points **or** a smooth curve going through any 3 correct points plus a local maximum between x=-1 and x=-0.5 **or** any 5 correct points joined with line segments B1 4 points correctly identified Allow for the point plotted at (-0.75, 0.3)
	(f)	$y=-2x-3$		3	M1 correct line identified or a straight line drawn through (0, – 3) with a negative gradient. Line need not intersect the curve
			–1.2, 0.3, 1.3		A2 dependent on correct line drawn allow values ± 0.1 The correct line should go through $(-1.5, 0)$ and $(0, -3)$ (if extended) (A1 dependent on M1, for one correct coordinate ± 0.1)
	(g)	Tangent drawn		2	M1 for a clear tangent drawn
			5.5		A1 dependent on M1 being awarded allow in range 4 – 8 (if not from incorrect working)
					Total 19 marks


4
3
2
1
-1
-2
-3
-4
-5
-6
-1.5
-1
-0.5
0
0.5
1
1.5
2

Question		Working	Answer	Mark	Notes
12		$v=[k](48-3t^2)$		6	M1 Attempt to differentiate with at least one term correct. No need for k Ignore erroneous labelling.
		$48-3t^2=0$			M1 dep on previous M1 for equating their 2-term expression to 0 Note a 2-term expression should have only two terms when all brackets are expanded
		$k\left[\left(48\times"4"-"4"^3\right)-\left(48\times2-2^3\right)\right]=5\Rightarrow k=\left[\frac{1}{8}\right]$			M2 For a correct equation for the difference in x leading to a value for k (M1 For equating the difference in x to 5 leading to a value for k follow through with their value of t for point B (allow if negative))
		$x="\frac{1}{8}"(48\times2-8)$			M1 for substituting their value of k and $t = 2$. This mark can be implied if x and k are correct
			11		A1 dep on two of the previous method marks being awarded Units not required.
					NB The award of 2 method marks and a correct answer of 11 implies the full 6 marks
					Total 6 marks

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