Pearson

Mark Scheme (Results)

November 2025

Pearson Edexcel International GCSE in Mathematics B

4MB1/02

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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

- cas – correct answer scores full marks (unless from obvious incorrect working)
- wr – working required

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.

With working

If there is a wrong answer indicated on the answer line 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. e.g., 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 on the answer line then check the working for an obvious answer.

Ignoring subsequent work

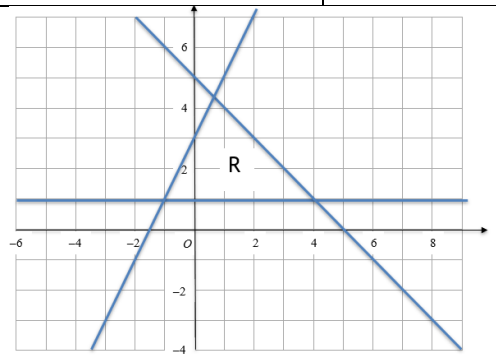
It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
It is not appropriate to ignore subsequent work when the additional work essentially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

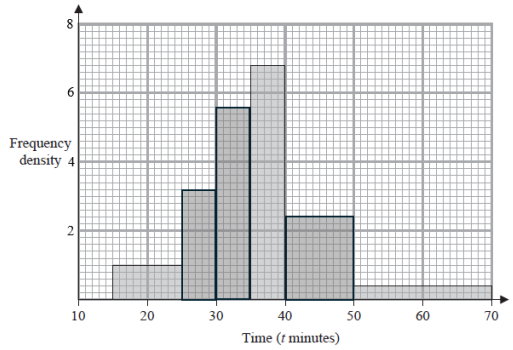
Question		Working	Answer	Mark	Notes
1	(a)		25 100	1	B1 cao
	(b)		6.37×10^{-6}	1	B1 cao
	(c)	35×10^{199} or 3.5×10^{n} or $k\times10^{200}$		2	M1 n is any integer or $1 \le k < 10$ or for a correct answer in any form
			3.5×10^{200}		A1 cao
	(d)	$\left(5\times10^{100}\right)-\left(0.7\times10^{100}\right)$ or $\left(50\times10^{99}\right)-\left(7\times10^{99}\right)$ or 43×10^{99} or 4.3×10^{n} or $k\times10^{100}$		2	M1 n is any integer or $1 \le k < 10$ or for a correct answer in any form
			4.3×10^{100}		A1 cao
		cas			***Total 6 marks***

Question		Working	Answer	Mark	Notes
2	(a)	$\pi \times 5^2 \left[= 25\pi = 78.53981634\right]$		3	M1 For area of circle May be implied by 50π May be embedded in an attempt at the total surface area Do not allow if seen in a calculation of the volume
		$2\pi \times 5 \times 8 \left[= 80\pi = 251.3274123\right]$			M1 For curved surface area May be embedded in an attempt at the total surface
			408		A1 for awrt 408 Accept 130π Ignore an answer of 409 (incorrect rounding) after a correct answer is seen
	(b)	$\sqrt{\left(\frac{5424}{3051}\right)^3} \left[= \frac{64}{27} = 2.\dot{3}7\dot{0}\right]$ **or** 64 : 27 **or** $\sqrt{\left(\frac{3051}{5424}\right)^3} \left[= \frac{27}{64} = 0.421875\right]$ **or** 27 : 64		4	M2 For a correct SF or ratio (If not M2 then M1 for $\sqrt{\frac{5424}{3051}} \left[= \sqrt{\frac{16}{9}} = \frac{4}{3} = 1.333...\right]$ or $\left(\frac{5424}{3051}\right)^3 \left[= \frac{4096}{729} = 5.6186...\right]$ or $\sqrt{\frac{3051}{5424}} \left[= \sqrt{\frac{9}{16}} = \frac{3}{4} = 0.75\right]$ or $\left(\frac{3051}{5424}\right)^3 \left[= \frac{729}{4096} = 1.7797...\right]$ or $\sqrt{5424} : \sqrt{3051}$ or 16 : 9 or 9 : 16 or $5424^3 : 3051^3$)
		Vol of **A** + $\sqrt{\left(\frac{5424}{3051}\right)^3} \times$ Vol of **A** = 2548 **or** $a + \frac{64}{27}a = 2548$ oe **or** Vol of **B** + $\sqrt{\left(\frac{3051}{5424}\right)^3} \times$ Vol of **B** = 2548 **or** $b + \frac{27}{64}b = 2548$ oe			M1 dep on M2 for a correct equation or ratio Equivalent equations are acceptable e.g. $\sqrt{\left(\frac{5424}{3051}\right)^3} = \frac{2548 - \text{Vol of } \mathbf{A}}{\text{Vol of } \mathbf{A}}$ Allow $\frac{64}{27+64} \times 2548$ or $\frac{27}{27+64} \times 2548$ or Vol of **A** =756
		cas	1792		A1
					Total 7 marks

Question		Working	Answer	Mark	Notes
3	(a)	$3p > 4 + 2$		2	M1 for adding 2 to both sides or dividing throughout by 3 (in an equality or equation) as a first step or for showing 2 as the critical value May be implied by $p = 2$ or $p < 2$
			$p > 2$		A1 isw e.g. $p = 2$
	(b)	$10 - 5q < 30$ or $2 - q < 6$		2	M1 for a correct start by either expanding the brackets or dividing throughout by 5 May be implied by $q = -4$ or $q < -4$
			$q > -4$		A1 do not isw e.g. $q = -4$
	(c)			4	B1 for horizontal line drawn through 1 on y axis Allow solid or dotted
					B1 for $x + y = 5$ drawn Allow solid or dotted Tolerance ± ¼ square on the intercepts
					B1 for $y = 2x + 3$ drawn Allow solid or dotted Tolerance ± ¼ square on the intercepts
					B1 cao Correct region indicated with either this region shaded or labelled as **R** or the outside of the region shaded. We can ignore shading inside and outside of the required region if the required region is clearly labelled **R**
		cas			***Total 8 marks***

Question		Working	Answer	Mark	Notes
4	(a)	$[ED =]\dfrac{21.7}{\tan 56}$ (=14.63683...) or $[ED =]21.7\tan 34$ **or** $[CD =]\dfrac{21.7}{\sin 56}$ (= 26.17492...) or $[CD =]\dfrac{21.7}{\cos 34}$		4	M1 for a correct method to find length *CD* or *ED* (*E* is the point on line *AD* from where a vertical line is drawn downwards from point *C*)May be seen on the diagram NB. Sine rule may be used
		$[ED =]\dfrac{21.7}{\tan 56}$ (=14.63683...) **and** $[CD =]\dfrac{21.7}{\sin 56}$ (= 26.17492...)			M1 for a correct method to find both *CD* **and** *ED* May be seen on the diagram Allow $[ED =]\sqrt{'26.17....'^2 - 21.7^2}$ or $[ED =]\dfrac{21.7\sin 34}{\sin 56}$ or $[ED =]\sqrt{\left(21.7^2 + '26.17492...'^2 - 2\times 21.7\times '26.17492...'\times\cos 34\right)}$ or $[ED =]'26.17492...'\times\cos 56$ or $[ED =]'26.17492...'\times\sin 34$ and $[CD =]\sqrt{21.7^2 + '14.63....'^2}$ or $[CD =]\dfrac{'14.63683...'}{\sin 34}$ or $[CD =]\dfrac{'14.63683...'}{\cos 56}$
		34.9 + 21.7 + 34.9 – '14.6' + '26.1' (= 103.038…)			M1 (dep on M2) complete method with no extra sides
			103		A1 awrt 103
	(b)	$\dfrac{72}{360}\times 2\times\pi\times r$		5	M1 for a correct expression for the arc length. May be seen embedded in an expression for the perimeter of the sector
		$\left(\dfrac{72}{360}\times 2\times\pi\times r\right)+2r$			M1 for a correct expression for the perimeter of the sector
		$[r =]\dfrac{"103.038..."}{\left(\dfrac{72}{360}\times 2\times\pi\right)+2}$			M1 for a correct method to find *r* using their (a) A value of *r* = 31.6 implies this mark
		$\dfrac{72}{360}\times\pi\times"31.6"^2$			M1 for correct method to find the area of the sector using their *r* value
			629		A1 627 – 629
		cas			***Total 9 marks***

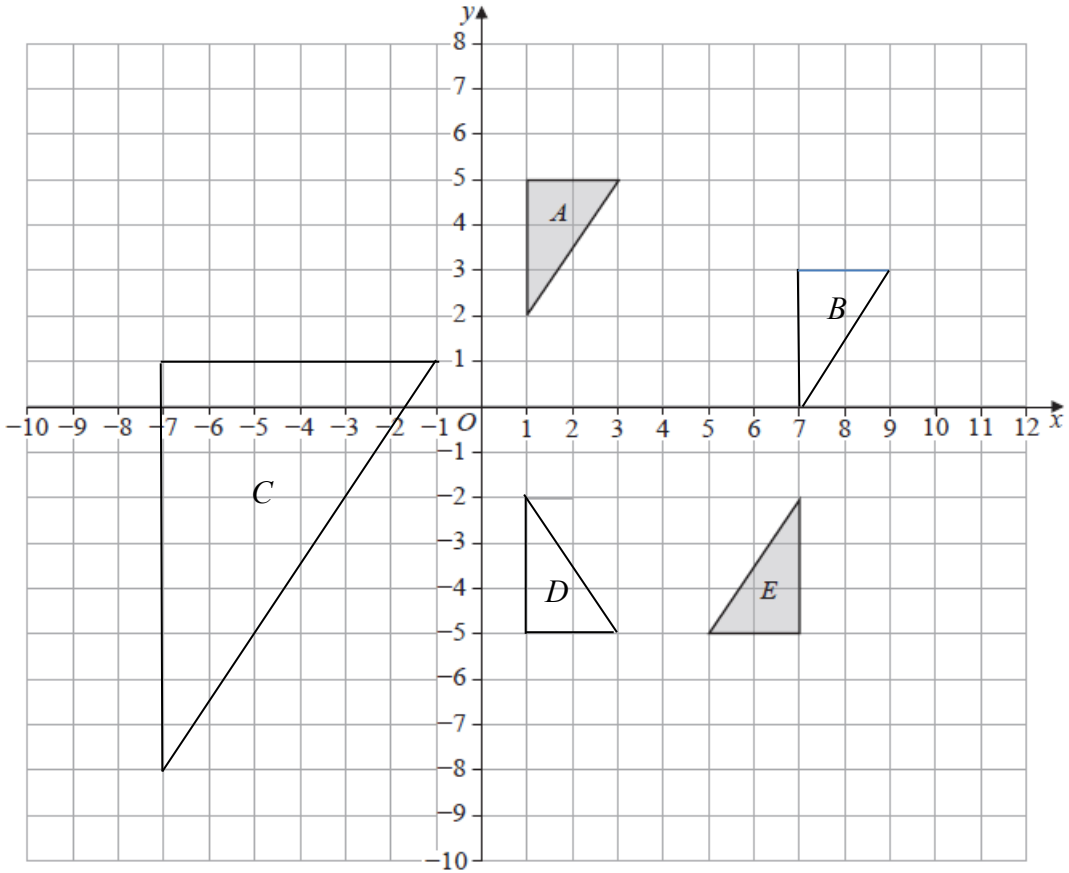
Question		Working	Answer	Mark	Notes
5		$x = 3 - 2y \Rightarrow 4(3-2y)^2 - y^2 = 27$ or $y = \frac{3-x}{2} \Rightarrow 4x^2 - \left(\frac{3-x}{2}\right)^2 = 27$		6	M1 for correct substitution of the linear equation $x + 2y = 3$ into the quadratic equation $4x^2 - y^2 = 9$ to form an (unsimplified) quadratic equation in either x or y. This mark can be implied by the second method mark.
		$4(9 - 12y + 4y^2) - y^2 = 27$ or $4x^2 - \left(\frac{9}{4} - \frac{3x}{2} + \frac{x^2}{4}\right) = 27$			M1 for correct expansion of either **their** $(3-2y)^2$ or $\left(\frac{3-x}{2}\right)^2$ This mark can be implied by the third method mark
		$15y^2 - 48y + 9[= 0]$ $\frac{15x^2}{4} + \frac{3x}{2} - \frac{117}{4}[= 0]$			M1 dep on first M1 for multiplying out and collecting terms, forming a 3 term quadratic in any form of $ax^2 + bx + c$ (= 0) with at least 2 coefficients (a or b or c) correct (oe e.g. $5y^2 - 16y + 3[= 0]$, $15x^2 + 6x - 117[= 0]$, $5x^2 + 2x - 39[= 0]$ etc look out for all signs reversed)
		$(5y-1)(y-3)[= 0]$ oe or $(5x-13)(x+3)[= 0]$ oe			M1 correct method for solving **their** 3-term quadratic – either by formula, completing the square or factorising. If the quadratic is incorrect then working must be shown. Allow equivalent factorisations e.g. $(15y-3)(y-3)[= 0]$ By factorising: brackets must expand to give 2 out of 3 correct terms By formula: correct substitution into fully correct formula (allow 1 sign error). By completing the square: must see e.g., $5\left(y - \frac{8}{5}\right)^2 \pm ...[= 0]$ May be implied by $x = 2.6$ and $x = -3$ or $y = 0.2$ and $y = 3$
		$[x =] 3 - 2 \times "0.2"$ and $[x =] 3 - 2 \times "3"$ or $[y =] \frac{3 - "2.6"}{2}$ and $[y =] \frac{3 - "-3"}{2}$			M1substituting their **two** x values into either equation leading to values for y or vice versa (not dependent on any previous M marks) e.g. $4x^2 - "0.2"^2 = 27$ leading to $x =$… and $4x^2 - "3"^2 = 27$ leading to $x =$ … or $4("2.6")^2 - y^2 = -27$ leading to $y =$ … and $4("-3")^2 - y^2 = -27$ leading to $y =$ … This mark can be implied by correct values (if no working seen). This mark can be implied by both correct pairs of values. If values are incorrect then working must be seen
			(2.6, 0.2) (–3, 3)		A1 dep on 3 M marks for both correct pairs of x and y values (oe e.g., $x = \frac{13}{5}, y = \frac{1}{5}$ and $x = -3, y = 3$) **NB** These do not need to be written as coordinates
		wr			***Total 6 marks***

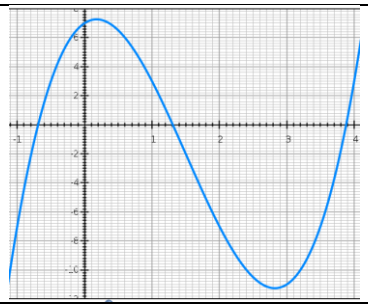
Question		Working	Answer	Mark	Notes
6	(a)	126 (±2) seen		3	B1 may be seen in a calculation or on the diagram
		$\frac{"126"}{360}\times 120$			M1 a correct calculation for the number of participants aged 25-34 allow use of their angle (even if outside range) for 25-34 (but must be a value and not x) Allow equivalent expressions e.g. $"126"\times\frac{1}{3}$ Condone an any angle between 0 and 360 if angle is not explicitly stated
			42		A1 cao Note: an answer in the range 41.3(3…) – 42.6(6…) implies B1M1
	(b)	$\frac{d}{t}$ where $2950 \leqslant d \leqslant 3050$ and $17.5 \leqslant t \leqslant 18.5$		4	M1 for a correct method to find the speed d and t must be within the limits given
		$[d_{LB} =]2950, [d_{UB} =]3050, [t_{LB} =]17.5, [t_{UB} =]18.5$			B1 for one correct LB or UB stated or used
		$\text{speed} = \frac{2950 \leqslant d < 3000}{18 < t \leqslant 18.5}$ $\left[\text{speed} = \frac{2950}{18.5}\right]$			M1 for recognising to be LB/UB ie $\text{speed} = \frac{2950 \leqslant d < 3000}{18 < t \leqslant 18.5}$
			159		A1 dep on $\frac{2950}{18.5}$ Allow awrt 159
	(c)	For a correct frequency density on the FD axis or by table or One 1cm square height = FD of 1 or 1 person = 5 small squares or 5 people = 1 large square etc		3	M1 for use of area to work out frequency density. May be implied by one correct value in the table or at least two correct bars drawn
			34 and 8		A1 for both values correct
			Height 3.2 (25-30) Height 5.6 (30-35) Height 2.4 (40-50)		A1 for all three bars correct Allow bars plotted at correct height even if there is no scale given on the FD axis
		(a) cas (b) wr (c) cas			***Total 10 marks***

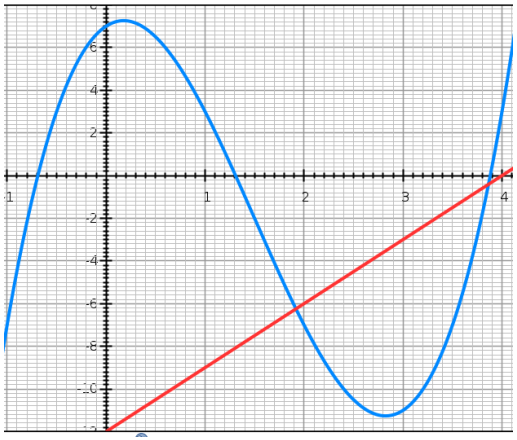
Question		Working	Answer	Mark	Notes
7	(a)	$\frac{31000}{35350}[\times 100]$		2	M1 for method to find the percentage (can be one step away ie without the × 100). May be implied by 0.8769…
			87.7[%]		A1 awrt 87.7
Way 1		**Total cost in £'s (1st 3 Marks)**			
	(b)	$0.6\times 80000(=48000)$		4	M1 for selling price of all 80 000 cans
		35350 ÷ 1.15 (=30739.13043)			M1 for converting costs from euros to pounds
		$\frac{"48000"-"30739.13043"}{"30739.13043"}[\times 100]$			M1 method to find percentage profit (can be one step away ie without the ×100)
Way 2		**Total cost in €'s (1st 3 Marks)**			
		$0.6\times 80000(=48000)$ or $0.6\times 1.15(=0.69)$			M1 for selling price of all 80 000 cans or converting selling price from pounds to euros
		$"48000"\times 1.15=55200$ or $"0.69"\times 80000(=55200)$			M1 for converting selling price from euros to pounds or for selling price of all 80 000 cans
		$\frac{"55200"-35350}{35350}[\times 100]$			M1 method to find percentage profit (can be one step away ie without the ×100)
Way 3		**Cost per can in £'s (1st 3 Marks)**			
		$\frac{35350}{1.15\times 80000}(=0.384239...)$			M2 for a fully correct method to find price per can in pounds (if not M2 then M1 for $\frac{35350}{1.15}(=30739.130...)$ or $\frac{35350}{80000}(=0.441875)$
		$\frac{0.6-"0.3842391"}{"0.3842391"}[\times 100]$			M1 method to find percentage profit (can be one step away ie without the ×100)
Way 4		**Cost per can in €'s (1st 3 Marks)**			
		35350 ÷ 80000 (= 0.441875)			M1 for cost per can
		$0.6\times 1.15(=0.69)$			M1 converting selling price from pounds to euros
		$\frac{"0.69"-"0.441875"}{"0.441875"}[\times 100]$			M1 method to find percentage profit (can be one step away ie without the ×100)
		This answer is for all 4 ways	56.2[%]		A1 awrt 56.1 or 56.2

	(c)	20000×1.084^2		2	M1 for 20000×1.084^n where n = 1 or 2 Allow 108.4% or 1 + 8.4% for 1.084 May be implied by 21680 or 20000 + 1680 or 20000 +1680 + 1821.12 or 1821.12 or 23500 or 23501 or 23501.1
			[£]23501.12		A1 cao
	(d)	$0.90\div1.2$ oe or $\frac{0.9}{120}\times100$ oe		2	M1 for a correct method to find the selling price. Allow 120% or 1 + 20% for 1.2
			0.75		A1
		cas			***Total 10 marks***

Question		Working	Answer	Mark	Notes
8	(a)		Rotation	3	B1 allow rotate, rotated, rotation do not accept turn B0 if multiple transformations stated. Multiple transformations are when more than one of reflection (mirrored), rotation (turn), translation (move), enlargement (stretch / squash) is stated eg a vector or SF or equation of a line do not imply multiple transformations
			180^o		B1 for 180^o — These two marks can still be awarded if multiple transformations are stated
			(4, 0)		B1 must be a coordinate and not a vector. Do not allow if another coordinate is given as well
ALT					
			Enlargement		B1 allow enlarge B0 if multiple transformations stated. Multiple transformations are when more than one of reflection (mirrored), rotation (turn), translation (move), enlargement (stretch / squash) is stated eg a vector or an angle or equation of a line do not imply multiple transformations
			SF = – 1		B1 for SF = – 1 — These two marks can still be awarded if multiple transformations are stated
			(4, 0)		B1 must be a coordinate and not a vector. Do not allow if another coordinate is given as well
	(b)		Correct triangle B at (7, 0), (7, 3) (9, 3)	2	B2 for a fully correct triangle (If not B2 then B1 for a triangle translated either 6 units to the right or 2 units down)
	(c)		Correct triangle C at (–1, 1), (–7, 1) (–7, –8)	2	B2 for a fully correct triangle (If not B2 then B1 for a triangle enlarged by SF3 but in the incorrect position or for 2 of the 3 points correct and joined to make a triangle or for 3 correct points stated or plotted correctly but not joined to make a triangle)
	(d)	$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 1 & 1 & 3 \\ 2 & 5 & 5 \end{pmatrix}$ oe		3	M1 for intention to multiply the correct way, can be implied by writing in the correct order or one correct point stated or plotted Points can be in any order
		Points can be in any order $\begin{pmatrix} 1 & 1 & 3 \\ -2 & -5 & -5 \end{pmatrix}$ oe			M1 for at least two correct columns or correctly stating or plotting two points.
			Correct triangle D at (1, –2), (1, –5) (3, –5)		A1 Fully correct triangle Award 3 marks for a correct triangle drawn, irrespective of working in the working space.
		cas			***Total 10 marks***


y
x
O
A
B
C
D
E

Question		Working	Answer	Mark	Notes
9	(a)		–7, 3, –7, 3	2	B2 All values correct (If not B2, then B1 for 2 or 3 correct values)
	(b)		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 all points plotted correctly ± 1 small square, may be joined by line segments) B1 for at least 5 points plotted ±1 small square with curve (or line segments) going through 5 of their points.)
	(c)			2	M1 for drawing a tangent to the curve at $x = 0.5$ Must be a tangent and not a chord
			-4.5		A1 (dep M1) answer in the range, –5 to –4 Must come from a gradient of a tangent and not gradient of a chord
	(d)		–0.7, 1.3, 3.9	1	B1 ft for all 3 values Allow ± 0.1
	(e)	$4x^3 - 18x^2 + 38 < 0$ or $2x^3 - 9x^2 + 19 < 0$		4	M1 for recognising to multiply by x^2 (may also recognise to divide by 2)
		$2x^3 - 9x^2 + 3x + 7 < 3x - 12$ or $y = 3x - 12$ seen			M1 For a correct equation identified (allow $3x - 12$)
					M1 A correct line drawn that intersects the curve (the correct line drawn implies all 3 M marks)
		Answer dependent on a correct line being drawn	$1.9 < x < 3.9$		A1 (dep on 3rd M mark) values which round to 1.9, 3.9 Do not allow use of ⩽ instead of < NB: if y values given as well then A0
		(c) (e) wr			***Total 12 marks***


6
4
2
1
1
2
3
4
-2
-4
-6
-8
-10

Question		Working	Answer	Mark	Notes
10		$[BC=]\dfrac{15}{\sin 45}\left[=15\sqrt{2}=21.2(1320344)\right]$ or $[BC=]\dfrac{15}{\cos 45}\left[=15\sqrt{2}=21.2(1320344)\right]$ or $[BC=]\sqrt{15^2+15^2}\left[=15\sqrt{2}=21.2(1320344)\right]$		7	M1 for correct method to find BC May be implied by $10\sqrt{2}=14.1(4213563)$ or $5\sqrt{2}=7.07(1067812)$ (May be seen on the diagram)
		$[AB=]\sqrt{12^2+(15-10)^2}\ [=13]$			M1 for correct method to find AB (May be seen on the diagram)
		$[BF=]\dfrac{2}{3}\times"BC"\left[=10\sqrt{2}=14.1(4213563)\right]$ or $[FC=]\dfrac{1}{3}\times"BC"\left[=5\sqrt{2}=7.07(1067812)\right]$			M1 for a correct method to find BF or FC (May be seen on the diagram)
		$"13"^2=20^2+\left("15\sqrt{2}"\right)^2-2\times20\times"15\sqrt{2}"\cos ACB$ or $20^2="13"^2+\left("15\sqrt{2}"\right)^2-2\times"13"\times"15\sqrt{2}"\cos ABC$			M1 for substitution into Cosine Rule to find angle ACB=ACF or angle ABC=ABF Allow any letter to represent angle ACB or angle ABC
		$\cos ACB=\dfrac{20^2+\left("15\sqrt{2}"\right)^2-"13"^2}{2\times20\times"15\sqrt{2}"}\left[\Rightarrow ACB=36.6(2414042)\right]$ or $\cos ABC=\dfrac{"13"^2+\left("15\sqrt{2}"\right)^2-20^2}{2\times"13"\times"15\sqrt{2}"}\left[\Rightarrow ABC=66.6(0500911)\right]$			M1 for correct method to find angle ACB=ACF or angle ABC=ABF Allow any letter to represent angle ACB or angle ABC (This implies 4th M mark) (May be seen in the diagram) May be implied by a correct angle for ACB/ABC If any value is incorrect then working must be shown
		$\left[(AF)^2\right]=20^2+\left("5\sqrt{2}"\right)^2-2\times20\times"5\sqrt{2}"\cos"36.6..."$ or $\left[(AF)^2\right]="13"^2+\left("10\sqrt{2}"\right)^2-2\times"13"\times"10\sqrt{2}"\cos"66.6..."$			M1 for correct method to find AF
			14.9		A1 awrt 14.9
		cas			***Total 7 marks***

		Alternative using the diagram below		7	
		$[DC =]\sqrt{20^2 - 10^2}[= 10\sqrt{3} = 17.32050808]$			M1 for correct method to find *DC* May be implied by $10\sqrt{3} = 17.3(2050808)$ (May be seen on the diagram)
		$[AN =]10 - \frac{1}{3} \times 15[= 5]$			M1 for correct method to find *AN* (May be seen on the diagram)
		$"(10\sqrt{3})"^2 = 12^2 + 15^2 - 2 \times 12 \times 15 \cos DEC$ or $12^2 = 15^2 + \left("10\sqrt{3}"\right)^2 - 2 \times "15" \times "10\sqrt{3}" \cos ECD$			M1 for substitution into Cosine Rule to find angle *DEC* or angle *ECD* Allow any letter to represent angle *DEC* or angle *ECD* Allow other correct expressions e.g. If *DEM* then use of 10 rather than 15 is correct or if *MCD* then use of 5 rather than 15 is correct
		$\cos DEC = \frac{12^2 + 15^2 - "(10\sqrt{3})"^2}{2 \times 12 \times 15}\left[\Rightarrow DEC = 78.9(4993504)\right]$ or $\cos ECD = \frac{15^2 + \left("10\sqrt{3}"\right)^2 - 12^2}{2 \times 15 \times "10\sqrt{3}"}\left[\Rightarrow ECD = 42.8(4172776)\right]$			M1 for correct method to find angle *DEC* or angle *ECD* Allow any letter to represent angle *DEC* or angle *ECD* Allow other correct expressions e.g. If *DEM* then use of 10 rather than 15 is correct or if *MCD* then use of 5 rather than 15 is correct (This implies 4th M mark) (May be seen in the diagram) May be implied by a correct angle for *DEC/ECD* If any value is incorrect then working must be shown
		$\left[\left(DM\right)^2\right] = 12^2 + 10^2 - 2 \times 12 \times 10 \cos "78.9..."$ or $\left[\left(DM\right)^2\right] = 5^2 + \left("10\sqrt{3}"\right)^2 - 2 \times 5 \times "10\sqrt{3}" \cos "42.8..."$			M1 for correct method to find *DM*
		$AF = \sqrt{5^2 + "14.07..."^2}$			M1 for a correct method to find *AF*
			14.9		A1 awrt 14.9

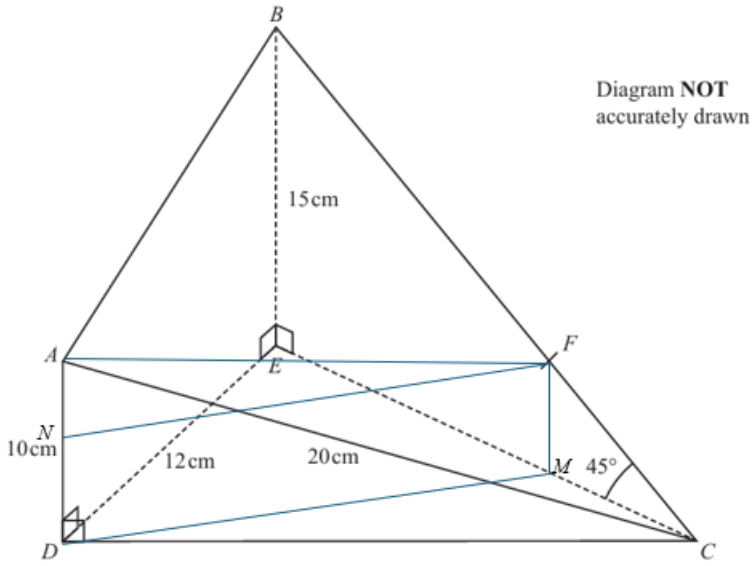


Diagram **NOT** accurately drawn

Question		Working		Answer	Mark	Notes
11	(a)			$\{y : 0 \leqslant y \leqslant 9\}$	2	B2 for $\{y : 0 \leqslant y \leqslant 9\}$ or $[0, 9]$ condone $0 \leqslant y \leqslant 9$ but not $0 \leqslant x \leqslant 9$ (If not B2 then B1 for $0 < y < 9$ or $0 \leqslant y$ ... or ... $y \leqslant 9$) Allow f or f(x) for y
	(b)			-1	1	B1 Allow $x \neq -1$ but not $y \neq -1$
	(c)	f(0) = 3			2	M1 for f(0) = 3
				2		A1 cao
	(d)	$xy + y = 3x - 1$ or $xy + x = 3y - 1$			4	M1 For a correct expression.
		$y + 1 = 3x - xy$ or $-y - 1 = -3x + xy$	$x + 1 = 3y - xy$ or $-x - 1 = -3y + xy$			M1 Collect all their x (or y) terms on one side (must be more than one) Allow 1 sign error. Condone both sides being over x or y eg $\frac{y+1}{x} = \frac{3x-xy}{x}$
		$y + 1 = x(3 - y)$ or $-y - 1 = x(y - 3)$	$x + 1 = y(3 - x)$ or $-x - 1 = y(x - 3)$			M1 Isolating term in x (or y) ie taking x (or y) out as common factor so it only appears once in the equation
				$[g^{-1}(x) =] \frac{x+1}{3-x}$		A1 oe e.g. $\frac{-x-1}{x-3}$ Must be in terms of x. No label required
		cas				***Total 9 marks***

Question		Working	Answer	Mark	Notes
12		$\frac{9}{n}\times\frac{8}{n-1}$ or $\frac{n-9}{n}\times\frac{n-10}{n-1}$ oe **or** $\frac{9}{n}\times\frac{n-9}{n-1}$		6	M1 for orange and orange or purple and purple This may be seen as part of an equation allow eg $n-9-1$ in place of $n-10$ **or** for orange and purple Allow any letter for n
		$\frac{9}{n}\times\frac{8}{n-1}+\frac{n-9}{n}\times\frac{n-10}{n-1}=\frac{46}{91}$ oe **or** $2\times\frac{9}{n}\times\frac{n-9}{n-1}=1-\frac{46}{91}$ oe			M1 Correct equation **or** correct equation using the complementary event. This implies the 1st M1
		$5n^2 - 187n + 1638$ (= 0) oe			A1 For a correct 3 term quadratic. eg $45n^2 - 1683n + 14742$ (= 0) Allow $45n^4 - 1728n^3 + 16425n^2 - 14742n (= 0)$ oe A correct equation will imply both M marks
		$(5n - 117)(n - 14)$ (= 0) or $\frac{--187\pm\sqrt{(-187)^2-4\times5\times1638}}{2\times5}$ oe			M1 For 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 must be correct substitution If completing the square allow one error This mark may be implied by $n = 14$ or $n = 23.4$ If an incorrect 3 term quadratic is given then working must be shown
		$\frac{"14"-9}{"14"}\times\frac{"14"-1-9}{"14"-1}$ or $1-\left(\frac{9}{"14"}\times\frac{8}{"14"-1}+\frac{9}{"14"}\times\frac{"14"-9}{"14"-1}+\frac{"14"-9}{"14"}\times\frac{9}{"14"-1}\right)$			M1 For using their value of n to find purple and purple. Only ft their value of n if n is an integer Allow $1-\left(\frac{"14"-9}{"14"}\times\frac{"14"-1-9}{"14"-1}\right)$ to imply this mark
			$\frac{10}{91}$		A1 oe Do not ISW

ALT		Let x be the number of purple			
		$\frac{9}{9+x}\times\frac{8}{9+x-1}$ or $\frac{x}{9+x}\times\frac{x-1}{9+x-1}$ oe **or** $\frac{9}{9+x}\times\frac{x}{9+x-1}$			M1 for orange and orange or purple and purple **or** for orange and purple Allow any letter for x (except n)
		$\frac{9}{9+x}\times\frac{8}{9+x-1}+\frac{x}{9+x}\times\frac{x-1}{9+x-1}=\frac{46}{91}$ oe **or** $2\times\frac{9}{9+x}\times\frac{x}{9+x-1}=1-\frac{46}{91}$ oe			M1 Correct equation **or** correct equation using the complementary event. This implies the 1st M1
		$5x^2 - 97x + 360$ (= 0) oe			A1 For a correct 3 term quadratic. e.g. $45x^2 - 873x + 3240$ (= 0) oe Allow $45x^4-108x^3-8361x^2-7776x+233280(=0)$ oe A correct equation will imply both M marks
		$(5x - 72)(x - 5)$ (= 0) or $\frac{--97\pm\sqrt{(-97)^2-4\times5\times360}}{2\times5}$ oe			M1 For 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 must be correct substitution If completing the square allow one error This mark may be implied by $x = 5$ or $x = 14.4$ If an incorrect 3 term quadratic is given then working must be shown
		$\frac{"5"}{9+"5"}\times\frac{"5"-1}{9+"5"-1}$ or $1-\left(\frac{9}{9+"5"}\times\frac{8}{9+"5"-1}+\frac{9}{9+"5"}\times\frac{"5"}{9+"5"-1}+\frac{"5"}{9+"5"}\times\frac{9}{9+"5"-1}\right)$			M1 For using their value of x to find purple and purple. Only ft their value of x if x is an integer Allow $1-\left(\frac{"5"}{9+"5"}\times\frac{"5"-1}{9+"5"-1}\right)$ to imply this mark
			$\frac{10}{91}$		A1 oe Do not ISW
		wr			***Total 6 marks***