Pearson
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Mark Scheme (Results)

November 2021

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

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November 2021
Question Paper Log Number P66022RA
Publications Code 4MB1_02_2111_MS

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.

- **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**

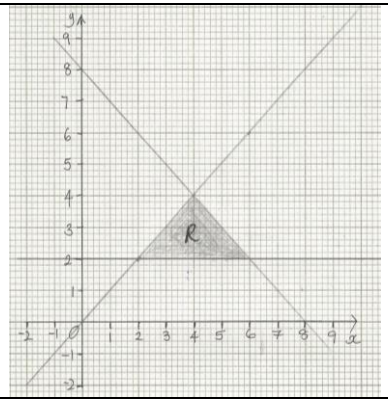
  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.

  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.

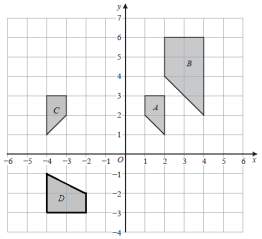
Ques	Working	Answer	Mark	Notes
1 (a)			3	M1 for line $x + y = 8$ correct (between $x = 4$ and $x = 6$ at least) Condone dashed line
				M1 for lines $x = y$ (between $x = 2$ and $x = 4$ at least) **and** $y = 2$ (between $x = 2$ and $x = 6$ at least) drawn correctly. Condone dashed line
		Correct region indicated		A1 both method marks must be awarded. Mark the area labelled *R*. If no area is labelled allow if the area required is shaded in or out.
(b)			2	M1 for line $2y - x = 2$ drawn (between $x = 2$ and $x = 4$ at least) or for one correct pair of coordinates if all the given co-ordinates are on the line $y = \frac{x+2}{2}$ eg (3, 2.5) or (5, 3.5) or (6, 4) or $\left(\frac{14}{3}, \frac{10}{3}\right)$
		(2, 2), (4, 3)		A1 both coordinates and no extras. Condone missing brackets Allow written as $x = 2$, $y = 2$ and $x = 4$, $y = 3$ if pairing is clear.
				Total 5 marks

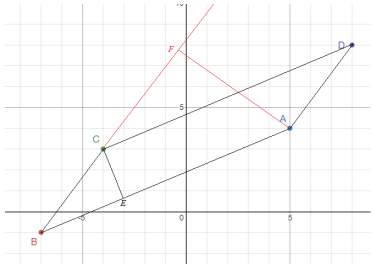
Ques	Working	Answer	Mark	Notes
2 (a)	$\sqrt{12^2-5^2}$ [= $\sqrt{119}$ =10.9] **or** $\sqrt{12^2-4^2}$ [= $\sqrt{128}=8\sqrt{2}$ = 11.3] **or** $[\angle AEB=]\cos^{-1}\left(\frac{12^2+12^2-8^2}{2\times12\times12}\right)[=38.9^\circ]$ **or** $[\angle AEB=]2\times\sin^{-1}\left(\frac{4}{12}\right)$ **or** $[\angle BEC=]\cos^{-1}\left(\frac{12^2+12^2-10^2}{2\times12\times12}\right)[49.2^\circ]$ **or** $[\angle BEC=]2\times\sin^{-1}\left(\frac{5}{12}\right)$		4	M1 for correct method to find height of a triangular side or angle *BEC* or angle *AEB* or angle *ECB* or angle *EBC* or angle *EBA* or angle *EAB* oe This may be implied by a correct expression or area for triangle *AEB* or *ECB.* ALT $[\angle ECB=\angle EBC=]\cos^{-1}\left(\frac{12^2+10^2-12^2}{2\times12\times10}\right)[=65.4...^\circ]$ $[\angle EBA=\angle EAB=]\cos^{-1}\left(\frac{12^2+8^2-12^2}{2\times12\times8}\right)[=70.5...^\circ]$ Allow all written in form cos … = eg $\cos...=\left(\frac{12^2+10^2-12^2}{2\times12\times10}\right)$
	0.5 × 10 ×"10.9" **or** 0.5 × 12 × 12 × sin"49.2"°**or** 0.5 × 8 × "11.3" **or** 0.5 × 12 × 12 × sin"38.9"°			M1 ft their height of the triangles. For area of triangle *AEB* [= 45.2…] **NB** 12sin"65.4..." = 10.9 or triangle *BEC* [= 54.5…] **NB** 12sin"70.5..." = 11.3... This may be embedded in an expression for total area
	M1 for 8 × 10 + 2 × "54.5" + 2 × "45.2"			M1 indep For 8 × 10 + 2 × *z* + 2 × *y* where $z \neq y$
		280 (cm²)		A1 279 – 280 (inclusive)
(b)	[*PQ* =] $\sqrt{4^2+5^2}$ [= $\sqrt{41}$]		4	M1 a correct method to find *PQ* Allow $\sqrt{41}$ or awrt 6.40 seen - ignore labelling
	$\left("\sqrt{41}"\right)^2="10.9"^2+"11.3"^2-2\times"10.9"\times"11.3"\times\cos E$ oe			M1 a correct equation to find $\angle PEQ$. Allow use of their values for *EP* and *EQ* either from part (a) or from this part . ft their *PQ.*
	$\cos\angle PEQ=\left(\frac{"10.9"^2+"11.3"^2-\left(\sqrt{41}\right)^2}{2\times"10.9"\times"11.3"}\right)$			M1 dep on previous method mark being awarded. A correct method to find $\angle PEQ$. Allow use of their values for *EP* and *EQ* either from part (a) or from this part if they are clearly labelled. Allow other letters for *P* and *Q* if clear on diagram

				Allow $\cos^{-1}\left(\frac{"10.9"^2+"11.3"^2-\left("\sqrt{41}"\right)^2}{2\times"10.9"\times"11.3"}\right)$
		33.4		A1 33.4 – 33.5 **Total 8 marks**
3 (a)	(200 + 1) ÷ 2 (=100.5) or 100th		2	M1 Allow 101 May be implied by correct answer
		$5 < t \leqslant 15$		A1 Condone $\leqslant$ for $<$ and vice versa
(b)	2.5×28 + 10×74 + 25×42 + 42.5×36 + 62.5×20 (= 70 + 740 + 1050 + 1530 + 1250 = 4640)		4	M2 for at least 3 correct products added (need not be evaluated) (M1 for consistent use of a value within interval (incl end points) for at least 3 products which must be added **OR** correct mid-points used for at least 3 products but not added)
	"4640" ÷ 200			M1 dep on at least M1 previously scored. For dividing their sum by 200
		23.2		A1 (allow 23 from correct working) Allow $\frac{116}{5}$ oe
(c)	FDs: 28÷5 (=5.6), 74÷10 (=7.4), 42÷20 (=2.1), 36÷15 (=2.4), 20÷25 (=0.8)		3	M2 for correct methods to find at least 4 of the FD which may be on graph (M1 for at least 2 FDs which may be on graph) If there is not a scale on the *y*-axis we will allow if the bars are drawn at the correct height, in relation to the bar for $5 < t \leqslant 15$
				A1 completely correct histogram. A correct scale with at least one correct value on the *y*-axis
				Total 9 marks

4 (a)	0.55 × 320 (=176) **or** 0.45 × 320 (=144) oe		4	M1 Correct method to find the number of jars of jam or (honey + chutney) sold. Allow 176 or 144 seen	
	(320 – "176") ÷ (5 + 3) [=18] oe or (320 – "176") × 3 [= 432]oe			M1 ft "their 176" or "their 144" rather than 320 – "176"	M2 for $\frac{3}{8}\times(320-\text{"176"})$
	"18" × 3 or $\frac{\text{"432"}}{8}$			M1 ft "their 18" or "their 432"	or $\frac{3}{8}\times(\text{"144"})$
		54		A1	
(b)	$99\times\frac{20}{9}(=220)$ oe		3	M1 A correct method to find the total number of jars of jam sold on Friday	
	("220" – "176") ÷ "176"			M1 ft "their 176" or "220" – (320 – "their 144") from part(a) Allow $\text{"176"}\div(\text{"220"}-\text{"176"})$ or $\text{"220"}-\text{"176"}=\frac{1}{n}\times\text{"176"}$	
		4		A1	
(c)	$\frac{3.50-3.20}{3.20}\times100$ oe		2	M1 allow $\frac{3.50}{3.20}$ [=1.09…] or $\frac{3.50}{3.20}\times100$ allow 9.4% Allow awrt 0.094	
		9.375		A1 Allow 9.38 ISW	
(d)	5.10 ÷ 1.0625		3	M2 for 5.10 ÷ 1.0625 oe Allow $x+0.0625x=5.10$ (M1 for 106.25% = 5.10 oe Allow $x+6.25\%x=5.10$)	
		4.8(0) (euros)		A1 Must not come from incorrect working.	
					Total 12 marks

5 (a)		Enlargement Scale factor 2 Centre (0, 0)	3	B1 Allow enlarge(d) B1 allow alternatives eg Allow 2 times larger but not 2 times smaller B1 Allow around the origin. oe
(b)		Correct reflection	2	B2 for a fully correct reflection. (B1 for a reflection in any vertical line)
(c)	$\begin{pmatrix}-2 & 0\\ 0 & -1\end{pmatrix}\begin{pmatrix}1 & 1 & 2 & 2\\ 2 & 3 & 3 & 1\end{pmatrix}$ oe		3	M1 for setting up correct matrix and for intention to multiply matrices in the correct order with at least 2 correct entries in answer. Implied by trapezium *D* drawn correctly. Implied by 2 correct points plotted
	$\begin{pmatrix}-2 & -2 & -4 & -4\\ -2 & -3 & -3 & -1\end{pmatrix}$			A1 correct matrix. Pairs can be in any order. Implied by trapezium *D* drawn correctly
		trapezium *D*		A1 trapezium *D* drawn correctly
(d)	$\frac{1}{2}\begin{pmatrix}-1 & 0\\ 0 & -2\end{pmatrix}$ **or** $\begin{pmatrix}a & b\\ c & d\end{pmatrix}\begin{pmatrix}-2 & -2 & -4 & -4\\ -2 & -3 & -3 & -1\end{pmatrix}=\begin{pmatrix}2 & 2 & 4 & 4\\ 4 & 6 & 6 & 2\end{pmatrix}$		3	M1 for the inverse of matrix **M** or for one correct row or column in the answer
	$\begin{pmatrix}2 & 0\\ 0 & 2\end{pmatrix}\left[\frac{1}{2}\begin{pmatrix}-1 & 0\\ 0 & -2\end{pmatrix}\right]$ **or** 2 of $\begin{matrix}-2a-2b=2\\ -2a-3b=2\\ -4a-3b=4\\ -4a-b=4\end{matrix}$ **and** 2 of $\begin{matrix}-2c-2d=4\\ -2c-3d=6\\ -4c-3d=6\\ -4c-d=2\end{matrix}$			M1 for fully correct calculations shown or for 3 correct entries in the answer or Allow $\left[\frac{1}{2}\begin{pmatrix}-1 & 0\\ 0 & -2\end{pmatrix}\begin{pmatrix}2 & 0\\ 0 & 2\end{pmatrix}\right]$ or Different letters may be used
		$\begin{pmatrix}-1 & 0\\ 0 & -2\end{pmatrix}$		A1 fully correct
				Total 11 marks





6 (a)		(−4, 3)	2	B2 (B1 for one correct coordinate or for (3, −4)or for $\begin{pmatrix}-4\\3\end{pmatrix}$) Allow $x = -4$ $y = 3$
(b)	[*AB*/*CD* =] $\sqrt{(5--7)^2+(4--1)^2}\ /\ \sqrt{("8"-"-4")^2+("8"-"3")^2}\ (=13)$ $[AC =]\sqrt{("-4"-5)^2+("3"-4)^2}\ (=\sqrt{82}=9.05...)$ [*BD*=] $\sqrt{("8"--7)^2+("8"--1)^2}\ (=\sqrt{306}=3\sqrt{34}=17.49...)$		5	M2 for 2 of these oe Correct method seen (ft through their coordinates of *C* and *D* ("−4" + 12, "3"+ 5))or correct answer. Ignore working if they have [*AB*/*CD* =]13 (M1 for correct method to find one side) Condone if not labelled Alternative: **N.B.** Alt using coordinate geometry M2 for 2 of: rectangle = 12 × 5 (= 60), 0.5 × 9 × 1 (=4.5), 0.5 × (5 + 1) × 3(=9), 0.5 × 12 × 5(=30) (Allow M1 for finding one of the areas)
	Eg $\cos\angle BCA = \left(\frac{"82"+5^2-"13^2"}{2\times"\sqrt{82}"\times5}\right)\left[=\frac{-62}{10\sqrt{82}}\right]$ oe **or** $\cos\angle ABC = \left(\frac{"13"^2+5^2-"82"}{2\times"13"\times5}\right)\left[=\frac{112}{130}\right]$ oe **or** $\cos\angle BAC = \left(\frac{"82"+"13"^2-5^2}{2\times"13"\times\sqrt{82}}\right)\left[=\frac{226}{26\sqrt{82}}\right]$ oe			M1 For a correct statement, ft their lengths if clearly labelled (allow on a diagram), to enable either angle *BCA* or angle *ABC* or angle *BAC* to be found or area of all 4 shapes needed to find area of shaded shape. $\angle BCA = 133.2$ $\angle ABC = 30.5$ $\angle BAC = 16.27$ Allow use of right angled triangles eg $A = 90-\tan^{-1}\frac{12}{5}-\tan^{-1}\frac{1}{9}$ [=16.27…]
	Area of half parallelogram = 0.5 × 5 × "13" × sin("30.5") or 0.5 × 5 × "13" × sin("149.5") (=16.5)			M1 correct area formula for half parallelogram, ft their angle and sides if clearly labelled(allow on a diagram), or "60" – "30" – "9" – "4.5" (=16.5)
		33 (cm²)		A1 32.9 – 33

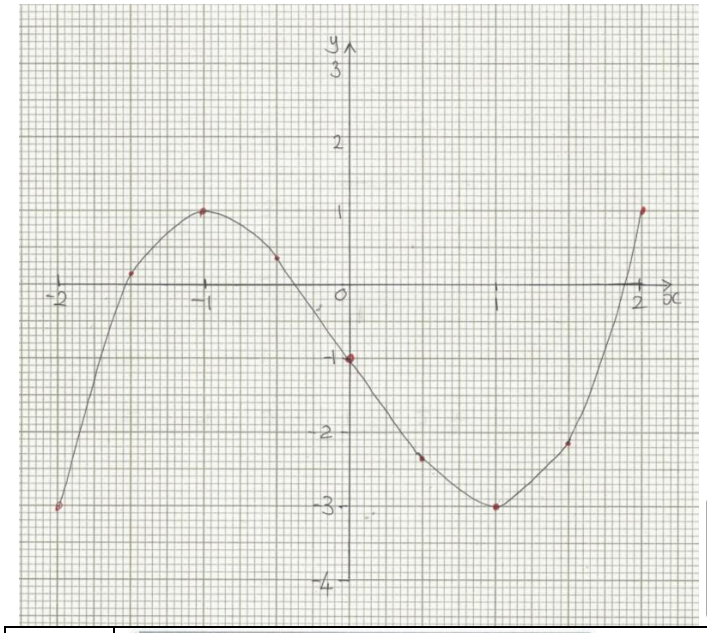
				NB: A correct answer within the given range with no obvious incorrect working gains full marks.
				Total 7 marks

part (b) There are other ways see next page for most common

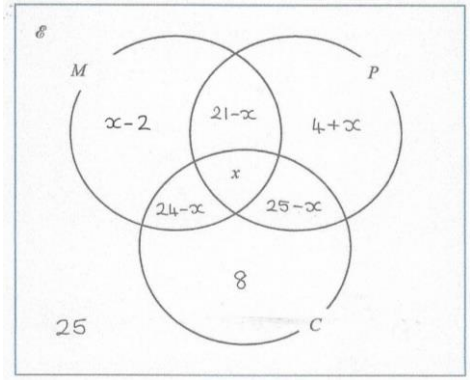
Alt 1 (b)	[*AB*/*CD* =] $\sqrt{(5--7)^2+(4--1)^2}\ (=13)$			M1 Condone not labelled
	[Line *AB*] $y-4=\frac{4--1}{5--7}(x-5)$ oe $\left[\Rightarrow y=\frac{5}{12}x+\frac{23}{12}\right]$			M1 Correct method to find the equation of the line. Allow use of point *B*
	[Line *CE*] $y-"3"=-"\frac{12}{5}"(x-"-4")$ oe $\left[\Rightarrow y=-\frac{12}{5}x-\frac{33}{5}\right]$			M1 Correct method to find the equation of the line.
	Solving gives $x=-\frac{511}{169}\quad y=\frac{111}{169}$ $CE=\sqrt{\left("3"-"111/169"\right)^2+\left("-4"-"-511/169"\right)^2}$ [=2.538…]			M1 Correct method to find the length of *CE* using their values for *x* and *y* which must be stated. If *x* and *y* are incorrect working must be seen
	Area = $13\times 2.538...$	33 (cm²)		A1

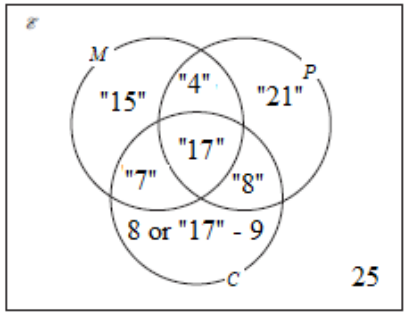
Alt 2 (b)	[Line *BC*] $y--1=\frac{3--1}{-4--7}(x--7)$ oe $\left[\Rightarrow y=\frac{4}{3}x+\frac{25}{3}\right]$			M1 Correct method to find the equation of the line. Allow use of point *C*
	[Line *AF*] $y-4=-"\frac{3}{4}"(x-"5")$ oe $\left[\Rightarrow y=-\frac{3}{4}x+\frac{31}{4}\right]$			M2 Correct method to find the equation of the line. Allow use of point *D* ("−4" + 12, "3"+ 5)) $\left[\Rightarrow y=-3/4\,x+14\right]$
	Solving gives $x=-\frac{7}{25}\quad y=\frac{199}{25}$ $AF=\sqrt{\left(5--"7/25"\right)^2+\left(4-"199/25"\right)^2}$ [= 6.6 …]			M1 Correct method to find the length of *AF* using their values for *x* and *y* which must be stated. If *x* and *y* are incorrect working must be seen Use of *D* gives *x* = 68/25 and *y* = 299/25 $\sqrt{(8-"68/25")^2+(8-"299/25")^2}$
	Area = 5×6.6	33 (cm²)		A1
Alt 3	$[2\times 0.5]\times\left\lvert 5(-1-"3")-"4"(-7+4)-(-7\times"3"-4)\right\rvert$			M4 ft their coordinates from part(a)

				$\pm\left[-5-15+28-16-21-4\right]$ (M1 2 correct values, M2 3 correct values, M3 4 correct values)
Alt 3	$0.5\left\|(5\times-1+-7\times"3"+"-4"\times"8"+"8"\times4)-\right.$ $\left.(4\times-7+-1\times"-4"+"3"\times"8"+"8"\times5)\right\|$			M4 ft their coordinates from part(a) and D ("−4" + 12, "3"+ 5) $\pm\left[(-5-21-32+32)-(-28+4+24+40)\right]$ (M1 2 correct values, M2 3 correct values, M3 4 correct values)
			33	A1
7 (a)	−3, 1, −1, −2.38 (allow −2.375)		3	B3 for all 4 correct values, B2 for 3 correct, B1 for 2 correct
(b)		Correct curve drawn	3	M1 Attempts to plot at least 7 of their points with at least 5 correct ±1 small square. (Allow if curve goes through the points) M1 drawing a smooth curve through at least 5of the plotted points. Do not allow if they use straight lines. Allow ±1square from their point. A1 A fully correct curve. All Points plotted correctly, $\pm$ 1square, (allow their point (0.5, a)) provided $-2 < a < -2.5$ with a smooth curve through all the points.
(c)		−1.4, −0.6, 1.9	2	M1 for drawing line or showing marks on graph only at $y = 0.5$ A1cao dep on M1 no incorrect extras given.
(d)			2	M1 for a tangent drawn at $x = 0.5$
		−2		A1 dep on M1
				Total 10 marks



x	−2	−1.5	−1	−0.5	0	0.5	1	1.5	2
y	-3	0.13	1	0.38	-1	-2.38	−3	−2.13	1

8 (a)			4	B4 fully correct for all 7 correct. (NB: x given in middle overlap so is not included as a correct region) Allow as numbers (ft their x–value) B3 for 5 or 6 regions correct. B2 for 3 or 4 regions correct. B1 for 2 correct regions. NB Allow correct un-simplified expressions

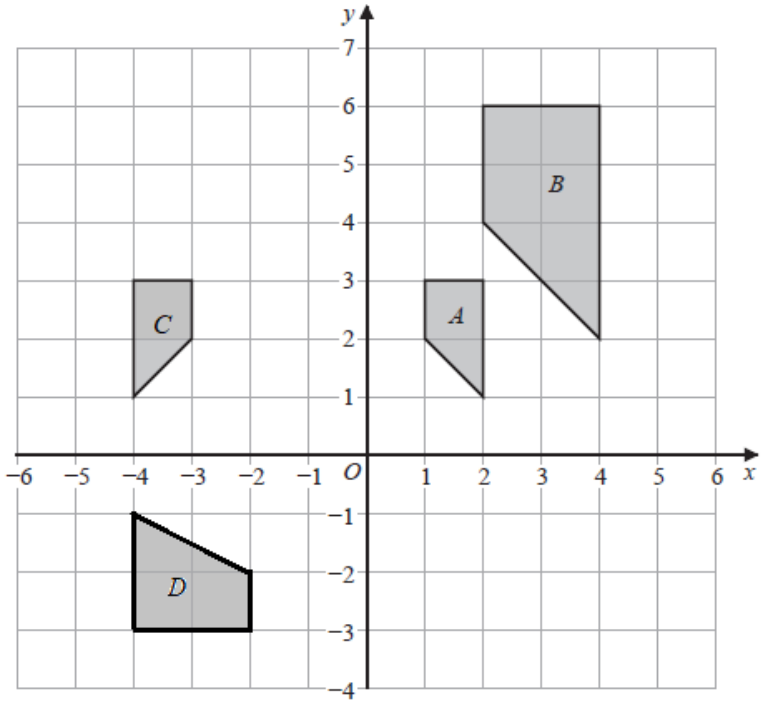
				SC If using x =" their 17" the max they can get is B3 B3 for 5 or 6 regions correct. B2 for 3 or 4 regions correct. B1 for 2 correct regions. 
(b)	$24 - x + x + 25 - x + 8 = 40$ oe		4	M1 a correct equation for number of elements in set C ft their Venn diagram, if there are no blanks, providing working is shown and the equation contains x
	$x = 17$	17		A1
	("17" – 2) +(21 – "17") +(4 + "17") + (24 – "17") +("17")+ (25 – "17") + 8 + 25 oe			M1 dep on M1 a correct equation using their value of x ft their Venn diagram if working is shown eg 15 + 4 + 21 + 40 + 25 or 15+ 4 + 21 + 7 + 17 +8 +8 +25
		105		A1 answer of 105 gets full marks
	SC M1M1 for adding all the areas in their Venn diagram providing the x's cancel out. Eg $(x - 2) + (21 - x) + (4 + x) + (25 - x) + (24 - x) + 8 + 25$ oe eg – 2+ 21 + 4 + 25 + 24 + 8 + 25 A2 for 105			
(c)		$\frac{25}{40}$	2	B2 oe Allow 0.625 (B1 for $\frac{n}{40}$ where $n < 40$ or $\frac{25}{m}$ where $m > 25$)
				Total 10 marks

9	$2r+\frac{120}{360}\times 2\pi r=5(3+\pi)$		6	M1 correct equation for perimeter of sector *AOD* Allow 30.7 or better for $5(3+\pi)$
	$r=\frac{5(3+\pi)}{2+\frac{2}{3}\pi}$ [= 7.5]			A1 correct value for *r* – need not be simplified. Allow 30.7 or better for $5(3+\pi)$
	$\angle BOD=180-2(60-18)$ (=96)			M1 a correct method to find angle *BOD* eg 360 – 120 – (180 – 2 × 18) **NB** radians $\frac{8}{15}\pi$
	Area of sector *OBCD* = $\frac{"96"}{360}\times\pi\times"7.5"^2$ $(=15\pi=47.12...)$			M1 a correct method to find Area of sector *OBCD*. Ft their value of *r* and their $\angle BOD$ eg $\pi"7.5"^2-\left(\frac{360-96}{360}\right)\times\pi"7.5"^2$ **NB** radians $\frac{1}{2}"7.5"^2\times\frac{8}{15}\pi$
	Area of triangle *OBD* = 0.5 × 7.5² × sin"96" $(=27.97...)$			M1 a correct method to find the area of the triangle *OBD* Ft their value of *r* and their $\angle BOD$. May use trig to find lengths and use area = 0.5bh
		19.2 (cm²)		A1 19.1 – 19.2
				Total 6 marks

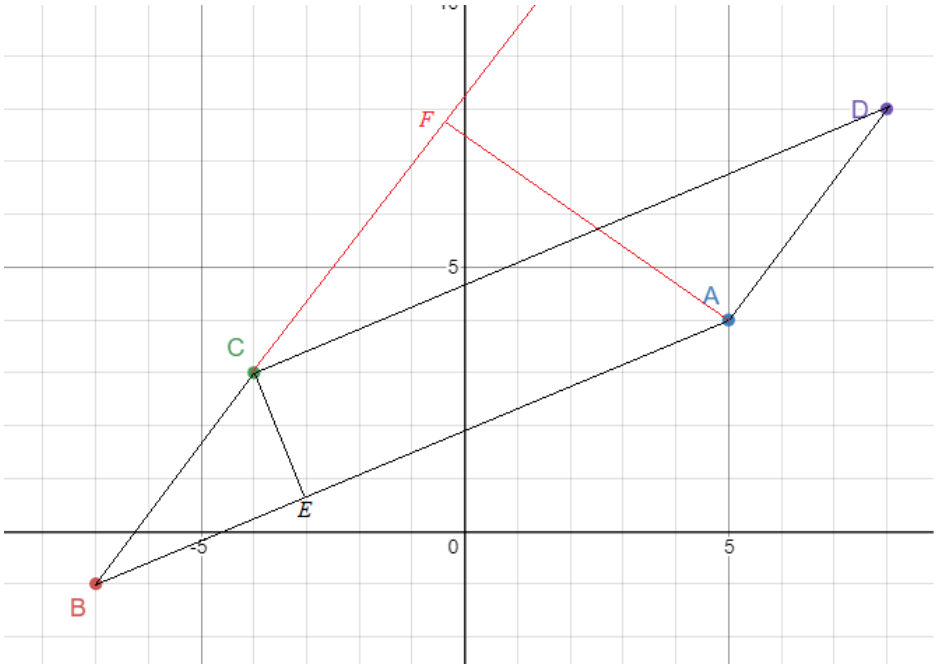
10 (a)	$\overrightarrow{AB} = 6\mathbf{b} - 4\mathbf{a}$ oe or $\overrightarrow{BA} = 4\mathbf{a} - 6\mathbf{b}$ oe		3	M1 correct vector for $\overrightarrow{AB}$ or $\overrightarrow{BA}$ May be embedded in an expression for $\overrightarrow{OC}$
	$\overrightarrow{OC} = 4\mathbf{a} + \frac{3}{4}("6\mathbf{b} - 4\mathbf{a}")$ or $\overrightarrow{OC} = 6\mathbf{b} + \frac{1}{4}("4\mathbf{a} - 6\mathbf{b}")$			M1 Allow $\overrightarrow{OC} = 4\mathbf{a} + \frac{3}{4}("\text{their } \overrightarrow{AB}")$ or $\overrightarrow{OC} = 6\mathbf{b} + \frac{1}{4}("\text{their } \overrightarrow{BA}")$ if $\overrightarrow{AB} / \overrightarrow{BA}$ is clearly labelled.
		a + 4.5**b**		A1 oe
(b)	$\overrightarrow{PT} = \mathbf{a} + \frac{3}{2}("6\mathbf{b} - 4\mathbf{a}")(= -5\mathbf{a} + 9\mathbf{b})$		4	M1 Implied by $\frac{9}{\lambda} = \frac{-5}{-3}$ ft their $\overrightarrow{AB}$
	$\overrightarrow{PQ} = -3\mathbf{a} + \lambda\mathbf{b}$ or $\overrightarrow{OQ} = \lambda\mathbf{b}$ oe			M1 One correct vector. Allow $\frac{6n}{n+1}$ or 6λ for λ Implied by $\frac{9}{\lambda} = \frac{-5}{-3}$
	$\overrightarrow{PQ} = \frac{3}{5}("-5\mathbf{a} + 9\mathbf{b}")(= 5.4\mathbf{b} - 3\mathbf{a})$ or $\overrightarrow{OQ} = 3\mathbf{a} + \delta("-5\mathbf{a} + 9\mathbf{b}")$			M1 A 2nd correct vector for *PQ* or a 2nd correct vector for *OQ* ft their $\overrightarrow{PT}$ or 5.4 : 0.6 or $\frac{9}{\lambda} = \frac{-5}{-3}$ oe $\lambda = \frac{27}{5}$
		9		A1 Allow 9 : 1
				Total 7 marks

<table>
<tr><td>11 (a)</td><td colspan="2"></td><td>1.5</td><td>1</td><td>B1 oe</td></tr>
<tr><td>(b)</td><td colspan="2"></td><td>5</td><td>1</td><td>B1</td></tr>
<tr><td rowspan="3">(c)</td><td>$y=\frac{x-7}{3-2x}$ and
$y(3-2x)=x-7$</td><td>$x=\frac{y-7}{3-2y}$ and
$x(3-2y)=y-7$</td><td></td><td rowspan="3">3</td><td>M1 implied by $\frac{3x+7}{1+2x}$ or $\frac{3y+7}{1+2y}$ oe</td></tr>
<tr><td>$3y+7=x+2xy$</td><td>$3x+7=y+2xy$</td><td></td><td>M1 grouping together terms in x or terms in y implied by $\frac{3x+7}{1+2x}$ or $\frac{3y+7}{1+2y}$ oe Allow 1 sign error</td></tr>
<tr><td colspan="2"></td><td>$g^{-1}(x)=\frac{3x+7}{1+2x}$</td><td>A1 oe Do not ISW allow $g^{-1}: x \mapsto \ldots$ Do not allow $y = \ldots$</td></tr>
<tr><td>(d)</td><td colspan="2">$x-7=(3-2x)(2x+1)$ oe</td><td></td><td rowspan="4">4</td><td>M1 for equating functions and removing denominator</td></tr>
<tr><td></td><td colspan="2">$4x^2-3x-10\ (=0)$ oe</td><td></td><td>M1 correct 3 term quadratic equation</td></tr>
<tr><td></td><td colspan="2">$(4x+5)(x-2)\ (=0)$</td><td></td><td>M1 correct method to solve their 3 term quadratic equation.
By factorisation brackets must expand to give 2 out of 3 terms correct or fully correct substitution into fully correct formula.</td></tr>
<tr><td></td><td colspan="2"></td><td>−1.25, 2</td><td>A1 oe A correct answer with no incorrect working gains 4/4</td></tr>
<tr><td>(e)(i)</td><td colspan="2">$4\times(-1.5)^3+4\times(-1.5)^2-5\times-1.5-3$ oe</td><td></td><td rowspan="2">2</td><td>M1</td></tr>
<tr><td></td><td colspan="2">$4\times(-1.5)^3+4\times(-1.5)^2-5\times-1.5-3=0$ oe</td><td></td><td>A1 must show that substitution of −1.5 gives solution of zero</td></tr>
<tr><td>(e)(ii)</td><td colspan="5">The first 3 marks may be awarded for working seen in part(i)</td></tr>
<tr><td rowspan="4"></td><td colspan="2">Division by $(2x+3)$ giving a first term of $2x^2$
$(2x+3)\overline{)\,4x^3+4x^2-5x-3}$ $2x^2$.....</td><td></td><td rowspan="4">4</td><td>M1 for $(2x+3)(2x^2.....)$ or synthetic division
<table><tr><td></td><td>4</td><td>4</td><td>−5</td><td>−3</td></tr><tr><td>-3/2</td><td></td><td>−6</td><td>3</td><td>3</td></tr><tr><td></td><td>4</td><td>−2</td><td>…</td><td>…</td></tr></table></td></tr>
<tr><td colspan="2">Quotient $2x^2-x-1$</td><td></td><td>M1 Allow $4x^2-2x-2$</td></tr>
<tr><td colspan="2">$(2x+1)(x-1)(=0)$ oe</td><td></td><td>M1 Correct factorisation of their quotient. For synthetic division allow $(4x+2)(x-1)(=0)$ or $(2x+1)(2x-2)(=0)$ or $2(2x+1)(x-1)(=0)$ but we will condone missing 2
Allow correct use of quadratic formula for their quadratic but working must be seen. Condone 2^2 for $(-2)^2$</td></tr>
<tr><td colspan="2"></td><td>−1.5, −0.5, 1</td><td>A1 All previous method marks must be awarded</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td></td><td>Total 15 marks</td></tr>
</table>

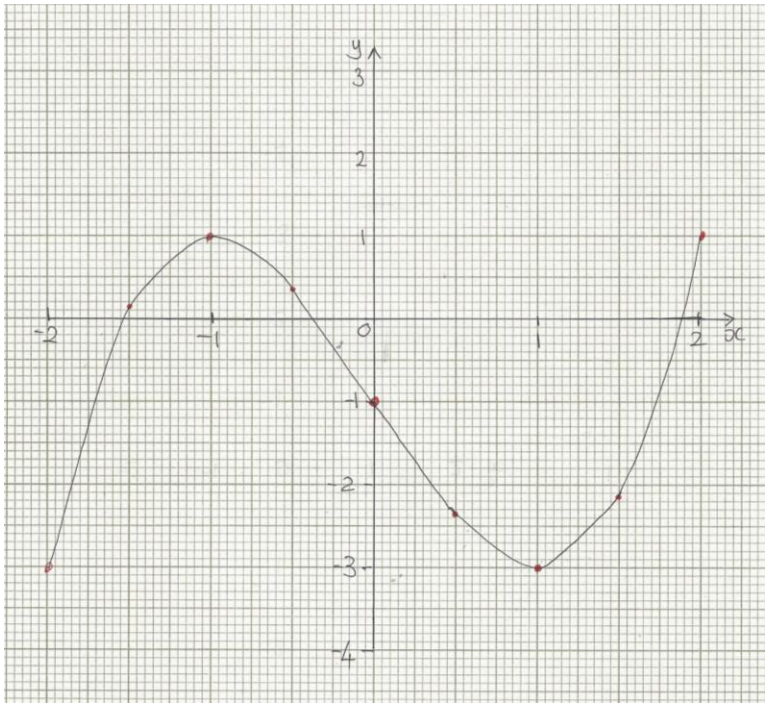
Q5



Q6



Q7



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