



Mark Scheme (Results)

Summer 2026

Pearson Edexcel International GCSE

In Mathematics B (4MB1) Paper 02

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2026

Question Paper Log Number P81333A

Publications Code 4MB1_02_2606_MS

All the material in this publication is copyright

© Pearson

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. 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 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 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.

Question		Working		Answer	Mark	Notes
1	(a)			$T = 8a + 5p$	2	B2 fully correct (B1 for $8a + 5p$ or $T = 8a \pm \dots p$ or $T = \dots a + 5p$)
	(b)	$4a + 5p = 35$ $4a + 30p = 140$ or $25p = 105$ $2\left(\frac{35-5p}{4}\right) + 15p = 70$ or $4\left(\frac{70-15p}{2}\right) + 5p = 35$	$12a + 15p = 105$ $2a + 15p = 70$ or $10a = 35$ $2a + 15\left(\frac{35-4a}{5}\right) = 70$ or $4a + 5\left(\frac{70-2a}{15}\right) = 35$		4	M1 for coefficient of a or p the same in both equations and correct operation to eliminate selected variable (condone one arithmetic error) or for one correct rearrangement of one equation followed by correct substitution into the other must gain an equation in one variable
		$p = 4.2$	$a = 3.5$			A1 either value correct
		$4a + 5 \times "4.2" = 35 \Rightarrow a = \dots$ or $2a + 15 \times "4.2" = 70 \Rightarrow a = \dots$ or $4 \times 3.5 + 5 \times p = 35 \Rightarrow p = \dots$ or $2 \times 3.5 + 15 \times p = 70 \Rightarrow p = \dots$				M1 for substituting their value of p or a into a correct equation or starting again to gain an equation in the 2 nd variable (condone one arithmetic or sign error) Implied by $a = 3.5$ or $\frac{7}{2}$ and $p = 4.2$ or $\frac{21}{5}$ oe Working must be shown if a or p is incorrect
				(\$) 49		A1 dep on M2
		<i>wr</i>				Total 6 marks

Question		Working	Answer	Mark	Notes
2	(a)		7, 9, 11	1	B1 cao allow brackets. Do not isw
	(b)	1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15 or 2, 4, 14		2	M1 for a list of numbers in $A \cup B$ or $(A \cup B)'$ allow $n(A \cup B) = 12$
		<i>cas</i>	3		A1 cao
	(c)	$B \cap C$ or 1, 2, 3, 5, 6, 10, 15 or 1, 3, 5, 15		2	M1 for realising they need to find $B \cap C$ if writing the list allow one omission
		<i>cas</i>	4		A1
					Total 5 marks

Question		Working	Answer	Mark	Notes
3	(a)		$\begin{pmatrix} 5 & 24 \\ -1 & 2 \end{pmatrix}$	2	B2 fully correct matrix (B1 for a 2×2 matrix with 2 or 3 terms correct.
	(b)	$\mathbf{BC} = \begin{pmatrix} -20-6x & -5x+9 \\ 8+12x & 2x-18 \end{pmatrix}$		4	M1 For a 2×2 matrix with 2 or 3 terms correct.
		$(-20-6x)(2x-18) - (8+12x)(-5x+9) = 588$			M1 dep on previous method mark being awarded. For finding the determinant and equating to 588 ft their matrix if un-simplified working shown
		$(-12x^2 + 360 + 68x) - (-60x^2 + 72 + 68x) = 588$ oe			M1 dep on previous method mark being awarded. For multiplying out the brackets to gain the correct equation eg $48x^2 + 288 = 588$ or +/- 2.5 oe
		<i>wr</i>	2.5		A1 oe if other root shown it must be rejected
	Alt (b)	Det C = $4 \times -3 - x \times 2x$ [= - 12 - $2x^2$] Det B = $-5 \times 6 - (-3) \times 2$ [= - 24]			M1 for a correct method for the determinants of B and C
		$(-24) \times (-12 - 2x^2) = 588$			M1 dep on previous mark being awarded. For multiplying detB and detC and equating to 588
		$288 + 48x^2 = 588$			M1 dep on previous method mark being awarded. For multiplying out the bracket to gain the correct equation
		<i>wr</i>	2.5		A1 oe if other root shown it must be rejected
					Total 6 marks

Question	Working	Answer	Mark	Notes
4	$\frac{r}{x} = \frac{30}{50} \text{ or } r = \frac{3}{5}x$		5	M1 for a correct method to find the base radius of the small cone
	$\frac{1}{3}\pi \times \left(\frac{3}{5}x\right)^2 \times 30 = \left[\frac{18}{5}\pi x^2 = 11.3097\dots x^2\right]$			M1 dep on M1 for a correct method to find the volume of the small cone. May be seen as part of full equation eg $\frac{1}{3}\pi x^2 \left(50 - \left(\frac{3}{5}\right)^2 \times 30\right)$ Allow $\frac{1}{3}\pi x^2 \times 50 \times \left(\frac{3}{5}\right)^3$ or awrt $11.3x^2$
	$\frac{1}{3}\pi x^2 \times 50 - \frac{18}{5}\pi x^2 = \left[\frac{196}{15}\pi x^2 \text{ or } 41.050\dots x^2\right]$			M1 for finding the volume of the frustrum. ft their volume of small cone if comes from correct working or is clearly labelled. (This may imply the 1 st and 2 nd M1)
	$2000 = 80x^2 - \frac{196}{15}\pi x^2 \text{ or } 2000 = 38.94\dots x^2$			M1 For setting up a correct equation to find x ft their volume of the frustrum. Condone 2 rather than 2000 and ft, if working shown, their volume of cone providing of the form $\dots x^2$
	wr	7.2		A1 answers in the range awrt 7.0 to 7.2
				Total 5 marks

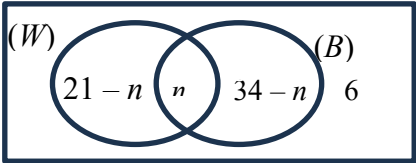
Question		Working	Answer	Mark	Notes
5	(a)	$\frac{360}{15} [= 24]$ or $(15-2) \times 180 [= 2340]$ or $(2 \times 15 - 4) \times 90 [= 2340]$		2	M1 Finding the sum of the interior angles or the exterior angle of the polygon. May be seen as part of calculation eg $\left(180 - \frac{360}{15}\right)$ or $\left(\frac{(15-2) \times 180}{15}\right)$ or $\frac{(2 \times 15 - 4) \times 90}{15}$
		<i>wr</i>	$180 - 24 = 156$ or $\frac{2340}{15} = 156$		A1 dependent on M1
	(b)	$\angle EGD$ or $\angle FEG = \frac{180-156}{2} [= 12]$		5	M1 for a correct method to find $\angle EGD$ or $\angle FEG$ May be seen on diagram
		$\angle DEG = 156 - "12" [= 144]$			M1 for a correct method to find $\angle DEG$ May be seen on diagram
		$\frac{DE}{5} = \frac{\sin "12"}{\sin "144"}$ or $DE = \frac{5 \sin "12"}{\sin "144"} [= 1.7686...]$			M1 for a correct method to find DE
		$15 \times "1.7686..."$			M1 for a correct method to find the perimeter
		<i>cas</i>	26.5[cm]		A1 awrt 26.5
		PTO for Alt1 and Alt2			Total 7 marks

	Alt 1 (b)	[Let M be the point on DG such that EM is perpendicular to DG] $[\angle DEM =] "156" - 90 [= 66]$ or $[\angle EDG =] \frac{360 - 2 \times "156"}{2} [= 24]$		5	M1 for a correct method to find $\angle DEM$ or $\angle EDG$ ft their answer to (a) if it comes from correct working or is clearly labelled (may be on diagram) ft their $\angle EDG$ if it comes from correct working or is clearly labelled or is their final answer (may be on diagram)
		[Let x be the length of DE] $DM = x \cos "24"$ or $DM = x \sin "66"$			M1 for finding the length DM . ft their angle if it is clearly labelled or comes from correct working
		$2x \cos "24" + x = 5$ or $2x \sin "66" + x = 5$			M1 setting up an equation to find the length of one side of the polygon. ft their DM if from correct working. If correct this implies the previous 2 method marks
		[Perimeter =] $15 \times \frac{5}{2 \cos "24" + 1}$ or $15 \times \frac{5}{2 \sin "66" + 1}$			M1 for a correct Method to find the perimeter ft their $\angle EDG$ if it comes from correct working or is clearly labelled (may be on diagram) If correct this implies the previous 3 method marks
		<i>cas</i>		26.5 [cm]	A1 awrt 26.5
					Total 7 marks

	Alt 2 (b)	Let $EF = x [= FG = DE]$ $EG^2 = x^2 + x^2 - 2x(x) \cos 156$ $EG^2 = 2x^2 - 2x^2 \cos 156$ $EG = \sqrt{2x^2 - 2x^2 \cos 156}$		5	M1 for a correct method to find EG or EG^2 in terms of x eg $EG = \frac{x}{\sin 12} \times \sin 156 (= 1.956x)$
		$\angle DEG = 156 - "12" [= 144]$			M1 for a correct method to find $\angle DEG$ May be seen on diagram
		$5^2 = x^2 + 2x^2 - 2x^2 \cos 156$ $- 2x \cos 144 \sqrt{2x^2 - 2x^2 \cos 156}$ $25 = 7.99x^2$ $x = 1.7686$			M1 for finding the length DG . ft their angle if it is clearly labelled or comes from correct working
		$15 \times "1.7686..."$			M1 for a correct method to find the perimeter
		<i>cas</i>		26.5 [cm]	A1 awrt 26.5
					Total 7 marks

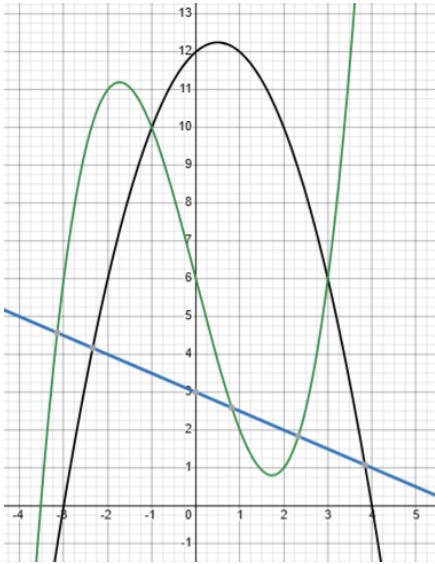
Question	Working	Answer	Mark	Notes
6	$v = \frac{dx}{dt} = -3t^2 + 20t$		7	M1 Attempt to differentiate $t^n \rightarrow t^{n-1}$ for at least one term
	$a = \frac{dv}{dt} = -6t + 20$			M1 (dependent on previous mark) Attempt to differentiate $t^n \rightarrow t^{n-1}$ for at least one term correct
	$-3t^2 + 20t - 9.25 [> 0]$ oe			M1 for a correct 3 term quadratic expression (all three terms on same side)
	$\frac{-20 \pm \sqrt{20^2 - 4 \times (-3) \times (-9.25)}}{2 \times (-3)}$			<p>M1 a correct method to solve their 3 term quadratic. If factorising, allow brackets which when expanded give 2 out of 3 terms correct If using formula must use a fully correct formula allow one sign error when substituting in</p> <p>If completing the square need to see $-3\left(t - \frac{10}{3}\right)^2 + c$ or where c is a numerical expression that does not equal -9.25 or to see $t^2 - \frac{20}{3}t - \frac{37}{12}$ leading to $\left(t - \frac{10}{3}\right)^2 + k$ oe where k does not equal $-\frac{10}{3}$</p> <p>May be implied by 0.5 or $\frac{37}{6}$ (allow 6.2 or 6.17 or better) or Full working must be shown if it is incorrect.</p>
	$"0.5" < t < "\frac{37}{6}"$			M1 for selecting the correct range – may be implied by the correct range using a
	$-6 \times "0.5" + 20 [= 17]$ or $-6 \times "\frac{37}{6}" + 20 [= -17]$			M1 for substitution of their “0.5” or their “37/6” into their expression for a
	<i>cas</i>	$-17 < a < 17$		A1 <i>cao</i>
				Total 7 marks

Question		Working	Answer	Mark	Notes
7	(a)		correct triangle drawn (-2, 0) (-4, -6) (0, -4)	2	B2 correct triangle drawn (B1 for 2 correct points or for a reflection in the x-axis)
	(b)		correct triangle drawn (-2, 3) (-1, 6) (-3, 5)	3	B3 correct triangle drawn B2 for 2 correct points B1 for an enlargement SF -0.5
	(c)	Rotation		4	B1 for rotation and no other transformations given
		$\tan \theta = \frac{1}{2}$ oe or $\tan \theta = \frac{2}{6}$ oe or $\theta = 26.56505\dots$ $\theta = 18.4349\dots$			M1 allow awrt 3sf or 2 sf if working shown
		$90 + 2 \times "26.565\dots"$ $180 - 2 \times "18.4349\dots"$			M1 ft their angle
		wr	143° anticlockwise or 217° clockwise about (2, 0)		A1 dep on at least 1 M1 awrt 143 with anticlockwise or awrt 217 with clockwise or - 217 (Fully correct answer of 143 anticlockwise or 217 clockwise about (2,0) with no working shown award SC B1) Allow counter clockwise to imply anticlockwise
	Alt(c)	Rotation		4	B1 for rotation and no other transformations given
		$(6\sqrt{2})^2 = (2\sqrt{5})^2 + (2\sqrt{5})^2 - 2(2\sqrt{5})(2\sqrt{5}) \cos \theta$ $12^2 = (2\sqrt{10})^2 + (2\sqrt{10})^2 - 2(2\sqrt{10})(2\sqrt{10}) \cos \theta$ or			M1 correct use of cosine rule (may see 98.1 and 45 calculated to get 143.1)
		$\cos \theta = -0.8$ $\theta = 143.1$			M1 awrt 143 calculated
		wr	143° anticlockwise or 217° clockwise about (2, 0)		A1 dep on at least 1 M1 awrt 143 with anticlockwise or awrt 217 with clockwise or - 217
					Total 9 marks

Question	Working	Answer	Mark	Notes
8	(a)	$21 \times 4 + 23.5 \times 6 + 27.5 \times 23 + 32.5 \times 12 + 47.5 \times 5 [= 1485]$	4	M2 for at least 3 correct products using midpoints with intention to add. Allow $84 + 141 + 632.5 + 390 + 237.5$ or 1485 (M1 for at least 3 products using frequency and a value within the interval with the intention to add. (condone use of lower class bound) or for at least 3 correct products using midpoints without adding)
		$\frac{"1485"}{50}$		M1 dep on at least M1 previously scored. For dividing their sum by 50
		29.7		A1 must have 29.7 as their final answer. However, if 29.7 seen condone further rounding to 30
	(b)	 <p>or $21 - n + n + 34 - n + 6 = 50$ oe</p>	5	M1 Venn diagram (no need for labels) or for setting up equation in terms of n May be implied by $n = 11$
		$n = 11$		A1 allow 'number of people' to imply n
		$\frac{"11"}{21} \times \frac{21 - "11"}{20}$ or $\frac{21 - "11"}{21} \times \frac{20 - "11"}{20} + \frac{"11"}{21} \times \frac{21 - "11"}{20} \left[= \frac{10}{21} \right]$		M1 May be embedded. Allow numerators and denominators in any order $\frac{"n"}{21} \times \frac{21 - "n"}{20}$ with any consistent value for n used
		$2 \times \frac{"11"}{21} \times \frac{21 - "11"}{20}$ or $1 - \frac{10}{21}$		M1 Allow numerators and denominators in any order $2 \times \frac{"n"}{21} \times \frac{21 - "n"}{20}$ with any consistent value for n used
		$\frac{11}{21}$		A1oe (0.52(3809...))
				Total 9 marks

Question		Working	Answer	Mark	Notes
9	(a)	$\frac{315}{250} - 100$ oe or $\frac{315 - 250}{250}$ oe		2	M1 for a correct method
			26 [%]		A1
	(b)	$2 + \frac{54}{60} [= 2.9]$ or $120 + 54 [= 174]$		3	M1 changing time to a single unit
		$640 \times "2.9"$ or $640 \times "174" \div 60$			M1 correct method to find distance. Condone 640×2.54 or an answer of 1625.6
			1856		A1 Accept 1850 or 1860 if from correct working
	(c)	$\frac{612}{680} [= 0.9]$ or $\frac{680}{612} [= \frac{10}{9} = 1.111\dots]$		3	M1 correct method to find the exchange rate
		$200 \times "0.9"$ or $\frac{200}{"1.111\dots"}$			M1 correct method to find how much she pays. If working shown allow for $200 \times "n"$ where $0 < n < 1$ seen or $\frac{200}{m}$ where $1 < m < 2$ seen
			180		A1 awrt 180
	(d)	$560 + \frac{2}{5}c + \frac{28}{100}c = c$ oe or $\frac{17}{25} [= 0.68]$ or 68% or $\frac{2}{5} + 28\% = 40 + 28 (\%)$		4	M1 to work out what fraction of the total the 2nd and 3rd payment are or making a correct equation for the total cost Allow 0.28 or 28% or equivalent fractions
		$c = \frac{560}{1 - \frac{17}{25}} [= 1750]$ or $\frac{560y}{1 - \frac{17}{25}}$ or $\frac{560y}{32}$ oe			M1 for finding the total cost or for finding y% (accept $560 = 32\%$ followed by a correct method to find either 100% or 28%)
		"1750" $\times 0.28$ or $\frac{560}{1 - \frac{17}{25}} \times \frac{0.28}{y}$ or $\frac{560}{32} \times \frac{28}{y}$ or			M1 $\frac{560}{1 - \frac{17}{25}} \times 0.28$ Allow 28% or equivalent fractions of 'their' total cost
			490		A1 cao
cas					Total 12 marks

Question		Working	Answer	Mark	Notes
10	(a)	$y = 3 - 0.5x$ or Straight line passing through at least 2 of $(-2, 4)$ $(0, 3)$ $(2, 2)$		3	M1 equation of correct line seen. Implied by correct line drawn
					M1 correct line drawn that crosses the curve twice
		<i>wr</i>	-2.3 and 3.8		A1 dep on both previous M marks awarded allow -2.2 to -2.4 and 3.7 to 3.9 Do not accept co-ordinates
	(b)		$6, 11.2, 2, 0.8$	3	B3 4 correct allow 11.2 or better (11.1935) and allow 0.8 or better (0.8065) B2 3 correct B1 1 or 2 correct
	(c)		Correct curve drawn	3	B3 fully correct graph B2 At least 5 points plotted correctly and joined by a smooth curve, or all points plotted correctly and joined by straight lines. B1 At least 4 points plotted correctly or any curve through 4 correct points Do not fit any incorrect values
	(d)(i)		$(-1, 10)$ and $(3, 6)$	1	B1 both correct (condone missing brackets) Allow values between -1 and -1.1 for x co-ordinate and 10 and 10.1 for y co-ordinate MUST be seen in d(i)
	(ii)	$\frac{"10" - "6"}{"-1" - "3"} [= -1]$		3	M1 ft their coordinates in (i) For a correct method to find the gradient. If co-ordinates incorrect, working must be shown.
		$y = mx + 9$ or $y = "-1"x + c$ or $L = "-1"x + 9$ or $"-1"x + 9$ or $y - "6" = "-1"(x - "3")$ or $y - "10" = "-1"(x - "-1")$			M1 allow $-x$ instead of $-1x$ ft their gradient oe $\frac{y - "6"}{x - "3"} = \frac{"10" - "6"}{"-1" - "3"}$
		<i>cas</i>	$y = -x + 9$		A1 oe must be $y = ..$
					Total 13 marks



Question		Working	Answer	Mark	Notes
11	(a)		$-\frac{3}{2}$	1	B1 allow -1.5 or $x = -1.5$ or $x \neq -1.5$
	(b)		$g(x) > -2$	1	B1 allow use of y and g for $g(x)$ but do not allow x
	(c)		7	1	B1 cao (accept ' <i>undefined</i> ' as $x > 0$ in question)
	(d)	$f(4) = 2$ or $hf(x) = 10\left(\frac{5x+2}{2x+3}\right)^3 + 29\left(\frac{5x+2}{2x+3}\right)^2 - 5\left(\frac{5x+2}{2x+3}\right) - 6$		2	M1 for finding $f(4)=2$ or substituting $f(x)$ into $h(x)$
		<i>cas</i>	180		A1
	(e)(i)	$10\left(-\frac{2}{5}\right)^3 + 29\left(-\frac{2}{5}\right)^2 - 5\left(-\frac{2}{5}\right) - 6$ oe		2	M1 substituting $\left(-\frac{2}{5}\right)$ or $\left(\frac{2}{5}\right)$ into $h(x)$ consistently. M0 if long division used
		$10\left(-\frac{2}{5}\right)^3 + 29\left(-\frac{2}{5}\right)^2 - 5\left(-\frac{2}{5}\right) - 6 = 0$			A1 oe dep on M1 must have $= 0$
	(ii)	$(2x^2 \dots\dots\dots)$		4	M1 for a start to find the quadratic factor - may be seen in part (e)(i)
		$(2x^2 + 5x - 3)$			A1 for a fully correct quadratic factor may be seen in part (e)(i)
		$(2x-1)(x+3)$			M1(dep on previous M1) A correct method to solve their 3 term quadratic. If factorising, allow brackets which when expanded give 2 out of 3 terms correct If using formula must use a fully correct formula allow one sign error when substituting in If completing the square need to see $2\left(x + \frac{5}{4}\right)^2 + c$ or where c is a numerical expression that does not equal -3 or $\left(x + \frac{5}{4}\right)^2 + k$ oe where k does not equal $-\frac{3}{2}$
		<i>wr</i>	0.5, -3, -0.4		A1 (dep on all 3 previous marks) all 3 values correct oe
					Total 11 marks

Question	Working	Answer	Mark	Notes
12	(a)	$-3\mathbf{a} + 3\mathbf{b}$	1	B1 oe
	(b)	$\vec{MN} = -2\mathbf{a} + \frac{6}{5}\mathbf{b}$ or $\vec{OP} = \frac{9}{5}\mathbf{b}$ oe	4	M1 for finding $\vec{MN}$ or $\vec{NM}$ or $\vec{OP}$ or $\vec{PO}$ May be seen as part of working. MUST be seen in (b)
		$\vec{AP} = \frac{3}{2} \left(-2\mathbf{a} + \frac{6}{5}\mathbf{b} \right) = -3\mathbf{a} + \frac{9}{5}\mathbf{b}$ $\vec{AQ} = -3\mathbf{a} - 12\mathbf{a} + 9\mathbf{b} = -15\mathbf{a} + 9\mathbf{b}$ $\vec{PQ} = -\frac{9}{5}\mathbf{b} - 12\mathbf{a} + 9\mathbf{b} = -12\mathbf{a} + \frac{36}{5}\mathbf{b}$		<p>M2 for a correct method to find 2 of these vectors (M1 for a correct method to find 1 of these vectors)</p> <p>ft their $\vec{MN}$ or/and $\vec{OP}$ oe if from correct working or clearly labelled</p> <p>Note: Accept for M2</p> $\vec{AP} = \lambda \left(-2\mathbf{a} + \frac{6}{5}\mathbf{b} \right) \text{ oe AND}$ $\vec{AQ} = 7.5 \left(-2\mathbf{a} + \frac{6}{5}\mathbf{b} \right) \text{ or } \vec{PQ} = 6 \left(-2\mathbf{a} + \frac{6}{5}\mathbf{b} \right)$
		$\vec{AQ} = 5 \vec{AP}$ or $\vec{PQ} = 4 \vec{AP}$ or $\vec{PQ} = \frac{4}{5} \vec{AQ}$		A1 oe dependent on M3. A correct statement but the relevant vectors for their conclusion must be seen. allow equivalent eg $\frac{1}{5} \vec{AQ} = \vec{AP}$
	(c)	$\vec{OR} = 3\mathbf{b} + \psi ("3\mathbf{a} - 3\mathbf{b}")$ $\text{or } \vec{OR} = 3\mathbf{a} + \phi ("3\mathbf{a} - 3\mathbf{b}")$ $\text{or } \vec{OR} = 3\mathbf{a} + \lambda ("3\mathbf{a} - 3\mathbf{b} ")$ $\text{or } \vec{OR} = 3\mathbf{b} + \beta ("3\mathbf{a} - 3\mathbf{b} ")$	5	<p>M1 For a correct method to find a vector using $\vec{AB}$ from a point to R eg $\vec{AR} (\text{ or } \vec{BR}) = k\vec{AB} (\text{ or } k\vec{BA})$ ft allow $\pm$ (their $\vec{MN}$) from part(b)</p> <p>Note: They may calculate that $\vec{NR} = \frac{9}{5}\mathbf{b} + \delta (3\mathbf{a} - 3\mathbf{b})$ and</p> $\vec{ON} = \frac{6}{5}\mathbf{b}$

		$\vec{OR} = \frac{6}{5}\mathbf{b} + \gamma\left(2\mathbf{a} - \frac{6}{5}\mathbf{b}\right)$ $\text{or } \vec{OR} = 2\mathbf{a} + \varphi\left(2\mathbf{a} - \frac{6}{5}\mathbf{b}\right)$ $\text{or } \vec{OR} = \frac{6}{5}\mathbf{b} + \mu\left(2\mathbf{a} - \frac{6}{5}\mathbf{b}\right)$ $\text{or } \vec{OR} = 2\mathbf{a} + \kappa\left(2\mathbf{a} - \frac{6}{5}\mathbf{b}\right)$			<p>M1 For a correct method using $\vec{MN}$ to find a different vector from the same point to R eg $\vec{AR} = \vec{AM} \pm \chi \vec{NM}$ ft allow $\pm$ (their $\vec{AB}$) from part(a),</p> <p>Note: They may calculate that</p> $\vec{NR} = \eta\left(\frac{6}{5}\mathbf{b} - 2\mathbf{a}\right)$
		$2\gamma = 3\psi \text{ and } \frac{6}{5} - \gamma\frac{6}{5} = 3 - 3\psi$ $\text{or } 3 + 3\phi = 2 + 2\varphi \text{ and } -3\phi = -\frac{6}{5}\varphi$ $\text{or } 2\mu = 3 + 3\lambda \text{ and } -3\lambda = \frac{6}{5} - \frac{6}{5}\mu$ $\text{or } 2 + 2\kappa = 3\beta \text{ and } -\frac{6}{5}\kappa = 3 - 3\beta$			<p>M1 Equating the coefficients of a and the coefficients of b from two different paths</p> <p>Note: If using</p> $\vec{NR} = \eta\left(\frac{6}{5}\mathbf{b} - 2\mathbf{a}\right)$ <p>they get $\frac{9}{5} - 3\delta = \frac{6}{5}\eta$ and $3\delta = -2\eta$</p> <p>(May be implied by correct parameter)</p>
		$\gamma = \frac{9}{4}, \psi = \frac{3}{2}$ $\phi = \frac{1}{2}, \varphi = \frac{5}{4}$ $\lambda = \frac{1}{2}, \mu = \frac{9}{4} \quad \beta = \frac{3}{2}, \kappa = \frac{5}{4}$			<p>A1 solving to find the value of one of the parameters (may be implied by any correct parameter)</p> <p>Note: if using NR and BR they get</p> $\eta = -\frac{9}{4}, \delta = \frac{3}{2}$
		cas	$\frac{9}{2}\mathbf{a} - \frac{3}{2}\mathbf{b}$		A1 oe
					Total 10 marks