

INTERNATIONAL GCSE MATHEMATICS

9260/2E

Extension Tier Paper 2E

Mark scheme

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2 4 B Y 9 2 6 0 / 2 E / M S

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Key to mark types and abbreviations

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq \text{value} < b$
3.14 ...	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Q	Answer	Mark	Comments
1	Sector	B1	

Q	Answer	Mark	Comments
2	100 000	B1	oe eg 10^5

Q	Answer	Mark	Comments
3	(-1, 7)	B1	

Q	Answer	Mark	Comments
4	(-3, 6)	B1	

Q	Answer	Mark	Comments
5	$\frac{8}{3}$ or $2\frac{2}{3}$	B2	B1 equivalent fraction or mixed number or same units eg 200 (and 75) or 0.075 (and 0.2)

Q	Answer	Mark	Comments
6(a)	Alternative method 1		
	$\cos 37 = \frac{x}{19}$ or $(x =) 19 \times \cos 37$	M1	oe eg $\sin(90 - 37) = \frac{x}{19}$ or $\sin 53 = \frac{x}{19}$ or $19 \times \sin 53$ or $\frac{\sin 90}{19} = \frac{\sin 53}{x}$ accept [0.79, 0.8] for $\cos 37$ or $\sin 53$
	15.17... or 15.2	A1	allow 15 with M1 awarded
	Alternative method 2		
	$x^2 + (19 \times \sin 37)^2 = 19^2$ or $(x =) \sqrt{19^2 - (19 \times \sin 37)^2}$	M1	oe
	15.17... or 15.2	A1	allow 15 with M1 awarded

Q	Answer	Mark	Comments
6(b)	$\tan y = \frac{14}{11}$ or $\tan^{-1} 1.27... \text{ or } \tan^{-1} 1.3$	M1	oe eg $\sin y = \frac{14}{\sqrt{14^2 + 11^2}}$ $\cos y = \frac{11}{\sqrt{14^2 + 11^2}}$
	51.8...	A1	allow 52 with M1 awarded

Q	Answer	Mark	Comments
7	Alternative method 1		
	$544 \div (10 + 7)$ or 32	M1	implied by 320 or 224
	$10 \times \text{their } 32 - 7 \times \text{their } 32$ or 96	M1dep	oe implied by eg $32 \times \frac{3}{2}$
	48	A1	
	Alternative method 2		
	$544 \div (10 + 7)$ or 32	M1	implied by 320 or 224
	$10 \times \text{their } 32$ or 320 and $544 \div 2$ or 272	M1dep	
	48	A1	
	Alternative method 3		
	$544 \div (10 + 7)$ or 32	M1	implied by 320 or 224
	$7 \times \text{their } 32$ or 224 and $544 \div 2$ or 272	M1dep	
	48	A1	
	Additional Guidance		
	M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
8(a)	Gradient of $y = 5x + 3$ is 5	M1	may come from using points on line
	$y = 5x + 4$ or correctly using points on line, eg using (1, 9) and (2, 14) $\frac{14-9}{2-1}$	M1	oe eg $y = \frac{10x+8}{2}$
	Both gradients are 5 with M2 scored or The coefficients of x are the same with $y = 5x + 4$ seen	A1	may come from using points on line
	Additional Guidance		
	Accept eg slope or m or k for gradient		

Q	Answer	Mark	Comments
8(b)	$(y =) 5 \times -1 + 3$ or -2 or $(x =) (-8 - 3) \div 5$ or -2.2 or $y = 5x - 3$	M1	oe
	Below and $(y =) -2$ or Below and $(x =) -2.2$ or Below and $y = 5x - 3$	A1	oe

Q	Answer	Mark	Comments
9	$-2, -1, 0, 1, 2, 3, 4$ or $-1 \leq x < 6$ or $-1, 0, 1, 2, 3, 4, 5$	M1	
	$-2, -1, 0, 1, 2, 3, 4$ and $-1 \leq x < 6$ or $-2, -1, 0, 1, 2, 3, 4$ and $-1, 0, 1, 2, 3, 4, 5$	M1dep	implied by $-1 \leq x \leq 4$
	$-1, 0, 1, 2, 3, 4$	A1	SC2 $-1, 1, 2, 3, 4$

Q	Answer	Mark	Comments
10(a)	0.25 and 10^5 or 25 000 or 1 500 000 000 000 000 or 60 000 000 000	M1	oe correct value not in standard form eg 25×10^3
	2.5×10^4	A1	
	Additional Guidance		
	Condone $2.5 \cdot 10^4$		M1A1

Q	Answer	Mark	Comments
10(b)	$(c =) 3$	B1	
	$(d =) -2$	B1	

Q	Answer	Mark	Comments
11(a)	Positive	B1	
	Additional Guidance		
	Ignore any reference to the strength of the correlation		

Q	Answer	Mark	Comments
11(b)	Suitable line of best fit that does or would pass through (150, [504, 512]) and (180, [548, 558])	B1	
	Correct reading for their line of best fit	B1ft	ft straight line with positive gradient $\pm \frac{1}{2}$ square
	Additional Guidance		
	No line		B0B0

Q	Answer	Mark	Comments
12	Alternative method 1		
	$(168 + 140 + 95 + 117) \div 4$ or $520 \div 4$ or 130	M1	oe may be embedded
	their $130 \div 5 \times 7$ or 182	M1dep	oe may be embedded
	their 182×6 or 1092	M1dep	oe may be embedded
	174	A1	
	Alternative method 2		
	$(168 + 140 + 95 + 117) \div 4$ or $520 \div 4$ or 130	M1	oe may be embedded
	$(250 + 180 + 223 + 110 + 155$ or 918 and) their $130 \div \frac{\text{their } 918 + x}{6} = 5 \div 7$	M1dep	oe equation
	$\frac{x}{6} = 29$	M1dep	oe equation of the form $ax = b$ eg $5x = 870$
	174	A1	
	Additional Guidance		
	Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Missing brackets not recovered can score a maximum of M1		

Q	Answer	Mark	Comments
13	J density = 7.2	B1	oe accept alternative values with correct units eg 7 200 000 g/m ³
	K volume = 12.5	B1ft	oe correct or ft their density for J and K accept alternative values with correct units eg 12 500 mm ³
	K volume in cm ³ and both densities in g/cm ³	B1	accept alternative correct units for their values eg 7200 g/dm ³
	Additional Guidance		
	Accept alternative correct unit representations eg g per cm ³ or g per cubic centimetre or g cm ⁻³ or kg/dm ³		
	Max B2 if the two density cells are contradictory		

Q	Answer	Mark	Comments
14	$0.25\pi^2 (35 + 26) (35 - 26)^2$	M1	oe
	[12 179, 12 195]	A1	implied by correct answer
	12 200	B1ft	ft their [12 179, 12 195] correct to 3sf
	Additional Guidance		
	$0.25\pi^2 (35 + 26) (35 - 26)^2$ 12 200		M1 A1B1
	Rounding should only be on the final value		

Q	Answer	Mark	Comments	
15	$\frac{a^4c}{bd}$ or $\frac{a^4cd^{-1}}{b}$ or $\frac{a^4b^{-1}c}{d}$ or $a^4b^{-1}cd^{-1}$	B3	B2 three correct indices eg $\frac{a^3c}{db}$ or $\frac{c^2a^4d^{-1}}{b}$ or $\frac{a^4c^1}{d}$ or $da^4b^{-1}c$ B1 two correct indices eg $\frac{a^4c^2}{d}$ or $\frac{a^3cd^{-1}}{b^3}$ or $\frac{b^{-1}}{a^4d^1}$ or $a^4c b^2$	
	Additional Guidance			
	Award max B2 for index 1 included eg d^1 in place of d			
	Award max B2 if multiplication or division signs included			
	Letters can be in any order			
	Mark the answer only			

Q	Answer	Mark	Comments
16	39.75 or 40.25 or 2.55 or 2.65	M1	oe
	their 40.25 – their 2.55	M1	oe their 40.25 must be (40, 40.5] their 2.55 must be [2.5, 2.6)
	37.7	A1	oe

Q	Answer	Mark	Comments
17	$4x^2 - 20x - 7 (= 0)$	B1	oe in the form $px^2 + qx + r (= 0)$ implied by a correct root
	Obtains at least one correct root for their $px^2 + qx + r (= 0)$ or $px^2 + qx = r$	M1	may be unsimplified eg $\frac{- -20 \pm \sqrt{(-20)^2 - 4 \times 4 \times -7}}{2 \times 4}$ or $-0.3(28\dots)$ or -0.33 or $5.3(28\dots)$ or 5.33
	$\frac{20 \pm \sqrt{512}}{8}$ or $\frac{5}{2} \pm 2\sqrt{2}$ or $-0.3(28\dots)$ or -0.33 and $5.3(28\dots)$ or 5.33	A1ft	oe in processed surd form correct or ft their 3-term quadratic
	Additional Guidance		
	Correct values with no incorrect working		B1M1A1

Q	Answer	Mark	Comments
18	Bag H has a smaller proportion of blue discs than bag G	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
19	Alternative method 1		
	$x + 5 = 3x$ and $x = 2.5$	B1	oe
	Alternative method 2		
	$2.5 + 5 = 7.5$ and $3 \times 2.5 = 7.5$	B1	oe
	Alternative method 3		
	$\tan y = 1$ and $\frac{7.5}{7.5} = 1$	B1	oe any letter other than x
	Additional Guidance		
	$\tan 45 = \frac{2.5 + 5}{3 \times 2.5}$ and $\tan 45 = 1$	B1	
	$\tan 45 = 1$ with no further working	B0	

Q	Answer	Mark	Comments
20	One of $7 \div 5$ or 1.4 or $33 \div 15$ or 2.2 or $34 \div 20$ or 1.7 or $12 \div 15$ or 0.8	M1	implied by a correct height
	1.4 and 2.2 and 1.7 and 0.8	M1dep	implied by four correct heights
	Fully correct histogram	A1	
	Additional Guidance		
	Ages of people at a concert Frequency density Age, x (years)		M1M1A1
	Ignore other graph types eg frequency polygon		
	Allow $\pm \frac{1}{2}$ small square		

Q	Answer	Mark	Comments
21	Alternative method 1		
	Rotation	B1	
	Turn 180°	B1	oe
	Turn (about) (0, 0)	B1	oe
	Alternative method 2		
	Enlargement, scale factor –1, (centre) (0, 0)	B3	
	Alternative method 3		
	Reflected through the origin	B3	
	Alternative method 4		
	$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ or $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$	M1	
	$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ or $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$	M1dep	condone $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
	Rotation 180° about (0, 0) or Enlargement scale factor –1, centre (0, 0)	A1	
	Additional Guidance		
	Accept origin or <i>O</i> for (0, 0)		
	Accept half turn or 180 for 180°		
	Accept centre for about and vice versa		
	Accept sf for scale factor		
	Accept eg rotate for rotation		
	Accept eg revolve for turn		
	Combined transformation		Zero

Q	Answer	Mark	Comments
22	Alternative method 1		
	$x^2 + 5x - 6x - 30$ with at least three terms correct or $x^2 - x + k$ where k is a non-zero constant	M1	oe no omissions or extra terms
	$x^3 + 5x^2 - 6x^2 - 30x$ or $x^3 - x^2 - 30x$ or $2x^2 + 10x - 12x - 60$ or $2x^2 - 2x - 60$	M1dep	oe attempt at full expansion with correct multiplication of their 3 or 4 terms by one of the terms in the remaining bracket
	$x^3 - x^2 + 2x^2 - 30x - 2x - 60$	A1	oe implied by correct final answer
	$x^3 + x^2 - 32x - 60$	A1	
	Alternative method 2		
	$x^2 + 5x + 2x + 10$ with at least three terms correct or $x^2 + 7x + k$ where k is a non-zero constant	M1	oe no omissions or extra terms
	$x^3 + 5x^2 + 2x^2 + 10x$ or $x^3 + 7x^2 + 10x$ or $-6x^2 - 30x - 12x - 60$ or $-6x^2 - 42x - 60$	M1dep	oe attempt at full expansion with correct multiplication of their 3 or 4 terms by one of the terms in the remaining bracket
	$x^3 + 7x^2 - 6x^2 + 10x - 42x - 60$	A1	oe implied by correct final answer
	$x^3 + x^2 - 32x - 60$	A1	

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22 cont.	Alternative method 3		
	$x^2 - 6x + 2x - 12$ with at least three terms correct or $x^2 - 4x + k$ where k is a non-zero constant	M1	oe no omissions or extra terms
	$x^3 - 6x^2 + 2x^2 - 12x$ or $x^3 - 4x^2 - 12x$ or $5x^2 - 30x + 10x - 60$ or $5x^2 - 20x - 60$	M1dep	oe attempt at full expansion with correct multiplication of their 3 or 4 terms by one of the terms in the remaining bracket
	$x^3 - 4x^2 + 5x^2 - 12x - 20x - 60$	A1	oe implied by correct final answer
	$x^3 + x^2 - 32x - 60$	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	For the first three marks terms may be seen in a grid		
	If an attempt at the expansion of all three brackets is made in one go it must be fully correct to gain M2A1, otherwise M0		
	Ignore equating to zero or attempt to solve an equation		
	Do not ignore further incorrect work after correct answer seen eg incorrect factorising		M1M1A1A0
	Terms may be written in any order		

Q	Answer	Mark	Comments
23	$x^5 - 5x^2 (+ x^3)$	M1	
	$5x^4$ or $-10x$ or $3x^2$	M1	oe eg $5 \times x^4$ or $2 \times -5x$ or $3 \times x^2$
	$5x^4 - 10x + 3x^2$	A1	oe eg $x(5x^3 - 10 + 3x)$

Q	Answer	Mark	Comments
24(a)	$\frac{1}{2} \times 8.8 \times 4.2 \times \sin 68$ or 17.13... or 17.1	M1	oe may be embedded implied by [34.2, 34.3]
	their 17.13... $\times 4 \div 7.5$ or [9.12, 9.14] or 9.1	M1dep	oe
	[9.12, 9.14] or 9.1 and 10	A1	SC2 [4.56, 4.57] or 4.6 and 5
	Additional Guidance		
	10 with no working		M0M0A0
	$0.5 \times 8.8 \times 4.2$ and 10		M0M0A0

Q	Answer	Mark	Comments
24(b)	$8.8^2 + 4.2^2 - 2 \times 8.8 \times 4.2 \times \cos 68$ or $77.44 + 17.64 - 73.92 \cos 68$ or 67.38... or 67.39 or 67.4	M1	oe
	$\sqrt{\text{their } 67.38\ldots}$	M1dep	
	8.2...	A1	implied by correct value of x
	$\frac{\sin x}{\text{their } 8.2\ldots} = \frac{\sin 44}{7.3}$ or $\sin^{-1}[0.78, 0.782]$	M1	oe their 8.2... must be their length of the vertical line
	[51.26, 51.45]	A1ft	ft their 8.2... accept answer 51 with full method seen
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	If incorrect their 8.2... must follow M1M1 or be identified in working or on the diagram as the length of the vertical line		

Q	Answer	Mark	Comments
25	Alternative method 1: making 5 litres of paint		
	390 ÷ 50 or 7.8(0) or 160 ÷ 20 or 8(.00)	M1	oe blue paint cost per litre or yellow paint cost per litre
	390 ÷ 50 or 7.8(0) and 160 ÷ 20 or 8(.00)	M1dep	oe blue paint cost per litre and yellow paint cost per litre
	their 7.8(0) × 3 + their 8(.00) × 2 or 39.4(0)	M1dep	oe eg 23.4(0) + 16(.00) green paint cost per 5 litres
	their 39.4(0) × 1.3 or 51.22 or their 39.4(0) ÷ 2 × 1.3	M1dep	oe selling price per 5 litres of green paint selling price per 2.5 litres of green paint
	25.61	A1	
	Alternative method 2: making 2.5 litres of paint		
	2.5 ÷ (3 + 2) or 0.5	M1	oe
	their 0.5 × 3 or 1.5 and their 0.5 × 2 or 1	M1dep	oe 2.5 litres in the ratio 3 : 2
	$\frac{\text{their } 1.5}{50} \times 390$ or 11.7(0) and $\frac{\text{their } 1}{20} \times 160$ or 8	M1dep	oe blue paint cost per 1.5 litres yellow paint cost per 1 litre implied by 19.7(0)
	(their 11.7(0) + their 8) × 1.3	M1dep	oe selling price per 2.5 litres of green paint 19.7(0) × 1.3 or 15.21 + 10.4(0)
	25.61	A1	

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25 cont.	Alternative method 3: making 5 litres of paint when profit is added at the start		
	390 × 1.3 or 507 and 160 × 1.3 or 208	M1	oe blue paint container cost plus 30% yellow paint container cost plus 30%
	their 507 ÷ 50 or 10.14 or their 208 ÷ 20 or 10.4(0)	M1dep	oe blue paint cost per litre plus 30% or yellow paint cost per litre plus 30%
	their 507 ÷ 50 or 10.14 and their 208 ÷ 20 or 10.4(0)	M1dep	oe blue paint cost per litre plus 30% and yellow paint cost per litre plus 30%
	their 10.14 × 3 + their 10.4(0) × 2 or 51.22	M1dep	oe 30.42 + 20.8(0) green paint price per 5 litres
	25.61	A1	
	Alternative method 4: making n litres of paint		
	390 ÷ 50 × 0.6 n or 4.68 n or 160 ÷ 20 × 0.4 n or 3.2 n	M1	oe cost of blue and yellow paint per n litres of green paint
	390 ÷ 50 × 0.6 n or 4.68 n and 160 ÷ 20 × 0.4 n or 3.2 n	M1dep	oe cost of blue and yellow paint per n litres of green paint
	their 4.68 n + their 3.2 n or 7.88 n	M1dep	oe cost of n litres of green paint
	their 7.88 n × 1.3 or 10.244 n or 10.24 n	M1dep	oe price of n litres of green paint
	25.61	A1	
	Additional Guidance		
	Up to M4 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Alt 4 value of n must be clear eg 100 litres total or 300 : 200 (500 litres implied)		
	Alt 4 their 7.88 n ÷ k × 1.3 implies their 7.88 n × 1.3 where ÷ k is their attempt to scale to the cost of a 2.5-litre tin		M1M1M1M1

Q	Answer	Mark	Comments
26	Alternative method 1		
	$\frac{x}{x+20} = \frac{7}{12}$	M1	oe
	$12x - 7x = 140$ or $x - \frac{7}{12}x = \frac{140}{12}$ or $(x =) 28$	M1dep	oe linear equation with collected terms 28 may be seen in intersection on Venn diagram
	$120 - 32 - 20 - \text{their } 28$ or 40	M1dep	oe 40 may be seen on the outside of the circles within the Venn diagram may be embedded eg $\frac{120 - 32 - 20 - \text{their } 28}{120}$
	$\frac{40}{120}$	A1	oe fraction, decimal or percentage
	Alternative method 2		
	$\left(1 - \frac{7}{12}\right) \times P = 20$	M1	oe P can be any letter
	$20 \div \left(1 - \frac{7}{12}\right)$ or (Physics =) 48	M1dep	oe
	$120 - 32 - \text{their } 48$ or 40	M1dep	oe
	$\frac{40}{120}$	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
27	Alternative method 1		
	$(\sqrt{24} =) 2\sqrt{6}$	M1	
	$9\sqrt{6} - 2\sqrt{6} = 7\sqrt{6}$	A1	allow $9\sqrt{6} - 2\sqrt{6} = \sqrt{294}$
	294 with M1A1 seen or Explanation that $7\sqrt{6}$ squared is an integer so an integer answer with M1A1 seen	A1	
	Alternative method 2		
	$81\sqrt{6}\sqrt{6} - 9\sqrt{6}\sqrt{24} - 9\sqrt{6}\sqrt{24}$ $+ \sqrt{24}\sqrt{24}$ or $81\sqrt{6}\sqrt{6} - 18\sqrt{6}\sqrt{24} + \sqrt{24}\sqrt{24}$ or $(81\sqrt{6}\sqrt{6} =) 486$ or $(9\sqrt{6}\sqrt{24} =) 108$ or 216 or $(\sqrt{24}\sqrt{24} =) 24$	M1	oe expansion eg $\sqrt{486}\sqrt{486} - \sqrt{486}\sqrt{24} - \sqrt{486}\sqrt{24}$ $+ \sqrt{24}\sqrt{24}$ eg $\sqrt{486}\sqrt{486} - \sqrt{11664} - \sqrt{11664}$ $+ \sqrt{24}\sqrt{24}$
	$486 + 24 - 108 - 108$ or $486 + 24 - 216$	A1	
	294 with M1A1 seen or Explanation that each term is an integer so an integer answer with M1A1 seen	A1	
	Additional Guidance		
	Accept $\sqrt{3}\sqrt{2}$ for $\sqrt{6}$ throughout		

Q	Answer	Mark	Comments
28	Alternative method 1		
	$y + 4 = \frac{3x}{7}$	M1	x and y may be transposed
	$7(y + 4) = 3x$ or $\frac{7(y + 4)}{3}$ or $\frac{7(x + 4)}{3}$	M1dep	x and y may be transposed implied by $\frac{7(5 + 4)}{3}$
	21	A1	implied by a correct answer
	$\frac{3 \times -1.4}{7} - 4$ or $-\frac{23}{5}$ or -4.6	M1	oe
	16.4	A1	oe eg $16\frac{2}{5}$ or $\frac{82}{5}$
	Alternative method 2		
	$\frac{3x}{7} = 5 + 4$ or $\frac{3x}{7} = 9$	M1	oe may use y instead of x
	$3x = \text{their } 9 \times 7$	M1dep	may use y instead of x
	21	A1	implied by a correct answer
	$\frac{3 \times -1.4}{7} - 4$ or $-\frac{23}{5}$ or -4.6	M1	oe
	16.4	A1	oe eg $16\frac{2}{5}$ or $\frac{82}{5}$
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	f may be used for y		
	Missing brackets must be recovered		

Q	Answer	Mark	Comments
29	Alternative method 1		
	$2x^2 - 4x + 6 = x + 9$	M1	oe eg $2x^2 - 4x + 6 - (x + 9) = 0$
	$2x^2 - 5x - 3 (= 0)$	M1dep	oe $px^2 + qx + r (= 0)$ or $px^2 + qx = r$
	$(2x + 1)(x - 3) (= 0)$ or $\frac{- -5 \pm \sqrt{(-5)^2 - 4 \times 2 \times -3}}{2 \times 2}$ or $\frac{5}{4} \pm \sqrt{\frac{49}{16}}$	M1	oe ft their 3-term quadratic except $2x^2 - 4x + 6 (= 0)$
	$(x =) -\frac{1}{2}$ and $(x =) 3$	A1	oe implied by correct coordinates
	$\left(-\frac{1}{2}, \frac{17}{2}\right)$ and $(3, 12)$	A1	oe either order

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29 cont	Alternative method 2		
	$y = 2(y - 9)^2 - 4(y - 9) + 6$	M1	oe eg $y = 2y^2 - 36y + 162 - 4y + 36 + 6$
	$2y^2 - 41y + 204 (= 0)$	M1dep	oe $py^2 + qy + r (= 0)$ or $py^2 + qy = r$
	$(2y - 17)(y - 12) (= 0)$ or $\frac{- -41 \pm \sqrt{(-41)^2 - 4 \times 2 \times 204}}{2 \times 2}$ or $\frac{41}{4} \pm \sqrt{\frac{49}{16}}$	M1	oe ft their 3-term quadratic
	$(y =) \frac{17}{2}$ and $(y =) 12$	A1	oe implied by correct coordinates
	$\left(-\frac{1}{2}, \frac{17}{2}\right)$ and $(3, 12)$	A1	oe either order
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	$2x^2 - 4x + 6 = x + 9$ $2x^2 - 5x + 3 (= 0)$ $(2x - 3)(x - 1) (= 0)$	M1M0M1	
	$2x^2 - 5x + 3 (= 0)$ with no working followed by $(2x - 3)(x - 1) (= 0)$	M0M0M1	

Q	Answer	Mark	Comments
30	$4x - 3y (= 3)$ or $-x + 2y (= 8)$	M1	
	$4x - 3y = 3$ and $-x + 2y = 8$	M1dep	oe equations
	correct method to eliminate one unknown	M1dep	eg $(4x + -4x) - 3y + 8y = 3 + 32$ or $5y = 35$ or $8x + -3x (-6y + 6y) = 6 + 24$ or $5x = 30$
	$x = 6$ and $y = 7$ or $(6, 7)$	A1	

Q	Answer	Mark	Comments
31	Alternative method 1: using triangles <i>OMP</i> and <i>ONQ</i>		
	$OM = ON$	M1	oe
	$OP = OQ$	M1	oe
	Angle $MOP =$ angle NOQ	M1	oe
	$OM = ON$ and radii and $OP = OQ$ and radii and angle $MOP =$ angle NOQ and vertically opposite and SAS and $MP = NQ$	A1	oe

Question 31 continues on next page

31 cont	Alternative method 2: using triangles PQM and PQN or triangles MNP and MNQ		
	$OM = ON$	M1	oe
	$OP = OQ$	M1	oe
	angle $NPQ = \text{angle } MQP$ or angle $QMN = \text{angle } PNM$	M1	oe
	$OM = ON$ and radii and $OP = OQ$ and radii and $MQ = NP$ and angle $NPQ = \text{angle } PQM$ or angle $QMN = \text{angle } PNM$ and angles in an isosceles triangle and SAS and $MP = NQ$	A1	
	Additional Guidance		
	Allow any unambiguous labelling of the angles		
	Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		