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Mark Scheme (Results)

Summer 2024

Pearson Edexcel International GCSE In Mathematics A (4MA1) Paper 1HR

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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

- **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, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.

  If there is no answer on the answer line then check the working for an obvious answer.

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- **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.

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International GCSE Maths

Apart from questions 4, 12, 17b, 19, 21, 23 the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method

Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.

Q	Working	Answer	Mark	Notes
1	11×6 (= 66) **or** $\frac{16+15+3+2+9+x}{6}=11$		3	M1 for a correct calculation for the total **or** a correct equation for the last card eg using 'x'
	16 + 15 + 3 + 2 + 9 + x = "66" oe eg 45 + x = "66" **or** "66" **– (**16 + 15 + 3 + 2 + 9)			M1 for a correct equation for 'x' with no fraction **or** a correct calculation for the number on the last card
	Correct answer scores full marks (unless from obvious incorrect working)	21		A1 if the answer line is blank, check the card
				Total 3 marks

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2	$1 - (0.27 + 0.04 + 0.12)$ $(= 0.57)$ oe **or** $2x + 0.27 + 0.04 + x + 0.12 = 1$ oe **or** 0.27×400 $(= 108)$ and 0.04×400 $(= 16)$ and 0.12×400 $(= 48)$		4	M1	for showing a clear understanding that the total of probabilities is 1 **or** for finding estimates for the number of times the spinner will land on 2 and 3 and 5
	$(x =)$ "0.57" $\div 3$ $(= 0.19)$ **or** $(2x =)$ "0.57" $\div 3 \times 2$ $(= 0.38)$ **or** $\frac{400 - \text{"108"} - \text{"16"} - 48\text{"}}{3} (= 76)$ oe **or** $\frac{400 - \text{"108"} - \text{"16"} - 48\text{"}}{3} \times 2 (= 152)$ oe			M1	for a method to find the value of x **or** $2x$ **or** an estimate for the number of times the spinner will land on 4 **or** 1
	$(2 \times$ "0.19" $+ 0.04 + 0.12) \times 400$ **or** $2 \times$ "76" + "16" + "48"			M1	for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	216		A1	for an answer of 216 answer of $\frac{216}{400}$ oe scores M3A0
					Total 4 marks

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3	eg 200 ÷ (3 + 2) (= 40)		5	M1	for a method to find one 'share' of the ratio
	eg 3 × "40" (= 120) **and** 2 × "40"(= 80)			M1	for a method to find the number of white loaves **and** the number of brown loaves
	eg "120" × 1.50 (= 180) oe **and** "80" × 1.75 (= 140) oe **or** "120" × 0.4 (= 48) oe **and** "80" × 0.6 (= 48) oe **or** 0.4 × 1.50 (= 0.6) oe **and** 0.6 × 1.75 (= 1.05) oe			M1	for a method to find income from white loaves **and** brown loaves **or** number of white loaves **and** brown loaves that are entirely profit **or** profit from a single white loaf or a single brown loaf
	eg 0.4 × "180" (= 72) oe **and** 0.6 × "140"(= 84) oe **or** "48" × 1.50 (= 72) oe **and** "48" × 1.75 (= 84) oe **or** "0.6" × "120"(= 72) oe **and** "1.05" × "80"(= 84) oe			M1	for a complete method to find the total profit for the white loaves **and** the total profit for the brown loaves
	Correct answer scores full marks (unless from obvious incorrect working)	156		A1	cao award SCB4 for an answer of 164 or 174
					Total 5 marks

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4	$\frac{7}{3}$ and $\frac{21}{4}$		3	M1	may have $\frac{4}{21}$ rather than $\frac{21}{4}$
	$\frac{7}{3}\times\frac{4}{21}$ oe eg $\frac{49}{21}\times\frac{4}{21}$ **or** $\frac{28}{12}\div\frac{63}{12}$ oe			M1	for intention to multiply correct improper fraction and inverted fraction **or** writing the 2 fractions over the same common denominator
	eg $\frac{7}{3}\times\frac{4}{21}=\frac{28}{63}=\frac{4}{9}$ oe eg $\frac{49}{21}\times\frac{4}{21}=\frac{196}{441}=\frac{4}{9}$ **or** $\frac{\cancel{7}^{1}}{3}\times\frac{4}{\cancel{21}^{3}}=\frac{4}{9}$ oe **or** $\frac{28}{12}\div\frac{63}{12}=\frac{28}{63}=\frac{4}{9}$ *Working required*	Correctly shown		A1	for correctly completing to reach the required answer Ignore any decimals used as checking.
					Total 3 marks

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5	5200 × 1.025 (= 5330) oe **or** 5200 × 0.025 (= 130) oe		3	M1	for a method to find 2.5% **or** 102.5% of 5200	M2 for 5200×1.025^4 oe **or** for 5200×1.025^5 (= 5883…) oe
	for "5330" × 1.025 (= 5463...) oe **and** "5463.25" × 1.025 (= 5599...) oe **and** "5599.83..." × 1.025 (= 5739...) oe			M1	for a complete method	
	Correct answer scores full marks (unless from obvious incorrect working)	5740		A1	5739 – 5740 **SC:** If no other marks awarded, award B1 for 5200 × 0.1 (= 520) oe 5200 × 1.1 (= 5720) oe 5200 × 0.9 (= 4680) oe 5200 × 0.975 (= 5070) oe 5200×0.975^4 (= 4699...) oe (accept (1 + 0.025) as equivalent to 1.025 throughout but not (1 + 2.5%))	
						Total 3 marks

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6	(a)	$\pi \times 8^2 \times h = 1208$ oe **or** $\frac{1208}{\pi \times 8^2}$ oe		2	M1	for setting up an equation in *h* using the volume of the cylinder **or** a correct calculation for *h* (may be seen in stages)
		Correct answer scores full marks (unless from obvious incorrect working)	6		A1	accept 6 – 6.02
	(b)	$\frac{m}{1208} = 1.25$ oe **or** (*m* =) 1208 × 1.25 (= 1510)		2	M1	for setting up an equation using *D* = *M* / *V* **or** for a calculation to find the mass (may convert mass to kg first)
		Correct answer scores full marks (unless from obvious incorrect working)	1.51		A1	
						Total 4 marks

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7	(a)		g^7	1	B1	
	(b)		$5k^5 + 20k^2$	2	B2	for $5k^5 + 20k^2$
					(B1	for $5k^5$ or $20k^2$)
	(c) (i)	$(x \pm 7)(x \pm 9)$		2	M1	for $(x \pm 7)(x \pm 9)$ **or** for $(x + a)(x + b)$ where $ab = -63$ **or** $a + b = -2$ where a and b are integers
		Correct answer scores full marks (unless from obvious incorrect working)	$(x + 7)(x - 9)$		A1	for correct factors
	(ii)		$-7, 9$	1	B1	must ft from (c)(i) dep on factorising in the form $(x + p)(x + q)$ where p and q are integers
	(d)	$-2y - 3y < -12 - 7$ **or** $7 + 12 < 3y + 2y$ **or** $7 < 5y - 12$ **or** $7 - 5y < -12$ **or** $-2y < 3y - 19$ **or** $19 - 2y < 3y$		3	M1	for rearrangement with y terms on one side and numerical terms on the other in a correct inequality **or** the correct simplification of y terms or numbers on one side in a correct inequality sign can be = or the incorrect inequality sign
		$-5y < -19$ **or** $19 < 5y$ **or** $-y < \frac{-19}{5}$ **or** $y < \frac{19}{5}$ **or** $y = \frac{19}{5}$ oe			M1	for the correct simplification of y terms on one side and numbers on the other side in a correct inequality **or** a correct inequality with the wrong sign sign can be = or the incorrect inequality sign
		Correct answer scores full marks (unless from obvious incorrect working)	$y > \frac{19}{5}$		A1	oe eg $y > 3.8$ or $3.8 < y$ Must be given as the correct inequality on the answer line
						Total 9 marks

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8	$\frac{14+AB}{2}\times 15 = 360$ oe **or** $360-14\times 15 (=150)$ oe		6	M1	for setting up an equation using the area of the trapezium **or** method to find the area of the triangle
	AB = 34 **or** *MB* = 20 (where *M* is point on *AB* such that *MC* is perpendicular to *AB*)			A1	could be seen on diagram
	$(CB^2 =) 15^2 + 20^2 (= 625)$ **or** $(CB^2 =) 15^2 + MB^2$			M1	allow use of their *MB*
	$(CB =) \sqrt{15^2 + 20^2} (= 25)$ **or** $(CB =) \sqrt{15^2 + MB^2}$			M1	allow use of their *MB*
	14 + 15 + "34" + "25" oe **or** 14 + 15 + 14 + *MB* + *CB* oe			M1ft	(dep on previous two M marks) for a method to find the perimeter of the trapezium, allow use of their *MB* and *CB*
	Correct answer scores full marks (unless from obvious incorrect working)	88		A1	cao
					Total 6 marks

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9		$y = -\frac{1}{2}x + 1$	3	B3 for $y = -\frac{1}{2}x + 1$ oe but must be in form $y = mx + c$ eg $y = -0.5x + 1$ (B2 for (L =) $-\frac{1}{2}x + 1$ **or** for $y = -\frac{1}{2}x + c$ **or** for $y = mx + 1$ where $m \neq 0$ **or** for a correct equation in the incorrect form eg $2y + x = 2$) (B1 for (L =) $-\frac{1}{2}x + c$ **or** (L =) $mx + 1$ where $m \neq 0$ **or** $m = -\frac{1}{2}$ **or** gradient = $-\frac{1}{2}$ oe eg $\frac{3-(-1)}{-4-4}$)
				Total 3 marks

10	2 **and** 7 correctly identified		2	M1 may also identify median (4)
	Correct answer scores full marks (unless from obvious incorrect working)	5		A1
				Total 2 marks

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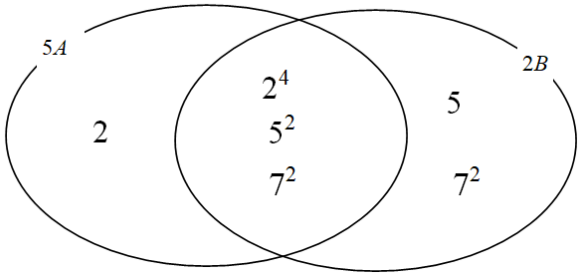
11	(a)		$2^4 \times 5^2 \times 7^2$	2	B2	for $2^4 \times 5^2 \times 7^2$ oe eg $2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7 \times 7$
					(B1	for $2^m \times 5^n \times 7^p$ with 2 of $m = 4$, $n = 2$, $p = 2$ **or** for 19 600 without sight of the correct factorisation **or** a fully correct Venn diagram for 5*A* and 2*B* **or** an answer of $2^3 \times 5 \times 7^2$ oe)
	(b)	$(AB =) 2^8 \times 5^4 \times 7^6$ **or** $(A^2 =) 2^{10} \times 5^2 \times 7^4$ **or** $(B^2) = 2^6 \times 5^6 \times 7^8$ **or** $\left((AB)^2 =\right) 3.5... \times 10^{20}$ oe		2	M1	for a correct product of prime factors for AB **or** A^2 **or** B^2 **or** for $(AB)^2$ evaluated
		Correct answer scores full marks (unless from obvious incorrect working)	$2^{16} \times 5^8 \times 7^{12}$		A1	for $2^{16} \times 5^8 \times 7^{12}$ oe if no other marks are awarded, award SCB1 for $2^c \times 5^d \times 7^f$ with 2 of $c = 16$, $d = 8$, $f = 12$)
						Total 4 marks

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12	eg $\begin{array}{r} 12x+9y=28.8 \\ -\ 12x+10y=33.6 \end{array}$ or $\begin{array}{r} 20x+15y=48 \\ -\ 18x+15y=50.4 \end{array}$ **or** eg $4x+3\left(\frac{16.8-6x}{5}\right)=9.6$ **or** $6\left(\frac{9.6-3y}{4}\right)+5y=16.8$		4	M1	for multiplication of one or both equation(s) with correct operation selected (allow one arithmetic error) (if + or – is not shown then assume it is the operation that at least 2 of the 3 terms have been calculated for) **or** correct rearrangement of one equation with substitution into the second
		$x = –1.2$ oe **or** $y = 4.8$ oe		A1	dep on M1
				M1	(dep on M1) for substitution of found variable **or** repeating the steps in first M1 for the second variable
	Working required	$x = –1.2$ oe **and** $y = 4.8$ oe		A1	dep on M1
					Total 4 marks

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13	*BAD* = 180 – 128 (= 52) **or** (reflex) *BOD* = 2 × 128 (= 256)		5	M1	angles to be identified either by notation or correctly positioned on the diagram.
	(obtuse) *BOD* = 2 × "52" (= 104) **or** (obtuse) *BOD* = 360 – "256" (= 104)			M1	(dep on M1) angles to be identified either by notation or correctly positioned on the diagram.
	Correct answer of 38 scores 3 marks (unless from obvious incorrect working)	38		A1	
				B2	dep on a fully correct method to find *OBD* for correct reasons for method used.
				(B1	dep on M1 for a correct circle theorem for their method)
					Opposite angles of a cyclic quadrilateral sum to 180° Angle at the centre is 2 × (double) angle at circumference / angle at circumference is ½ angle at centre
					Angles around a point add up to 360° Isosceles triangle Angles in a triangle add to 180° Angles in a triangle add to 180°
					Total 5 marks

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14 (a)	$(3x + 1)(2 – x) = 6x – 3x^2 + 2 – x$ $(= –3x^2 + 5x + 2)$ **or** $(2 – x)(4 + x) = 8 + 2x – 4x – x^2$ $(= –x^2 – 2x + 8)$ **or** $(3x + 1)(4 + x) = 12x + 3x^2 + 4 + x$ $(= 3x^2 + 13x + 4)$		3	M1	for a correct method to expand two brackets with at least 3 terms correct out of 4 terms (or 2 terms correct out of 3 terms). Do not award this mark for eg $6x – 3x^2 + 2 – x + 8 + 2x – 4x – x^2$ or $6x – 3x^2 + 2 – x + 4 + x$
	$(–3x^2 + 5x + 2)(4 + x) = –12x^2 – 3x^3 + 20x + 5x^2 + 8 + 2x$ **or** $(–x^2 – 2x + 8)(3x + 1) = –3x^3 – x^2 – 6x^2 – 2x + 24x + 8$ **or** $(3x^2 + 13x + 4)(2 – x) = 6x^2 – 3x^3 + 26x – 13x^2 + 8 – 4x$			M1	ft dep on M1 **and** a quadratic for a correct method to multiply by the 3rd bracket – allow one further error
	Correct answer scores full marks (unless from obvious incorrect working)	$–3x^3 – 7x^2 + 22x + 8$		A1	oe but must be simplified eg $22x – 3x^3 – 7x^2 + 8$ if no working shown then award B2 for 3 out of a maximum of 4 terms correct
	ALTERNATIVE				
ALT (a)	$24x + 6x^2 – 12x^2 – 3x^3 + 8 + 2x – 4x – x^2$ oe		3	M2 (M1	for a complete expansion with 8 terms present of which at least 4 are correct for at least 4 correct terms from any number of terms)
		$–3x^3 – 7x^2 + 22x + 8$		A1	oe but must be simplified eg $22x – 3x^3 – 7x^2 + 8$ if no working shown then award B2 for 3 out of a maximum of 4 terms correct

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(b)	$\left(\frac{1}{a^6b^4}\right)^{-\frac{1}{2}}$ **or** $\left(a^{-6}b^{-4}\right)^{-\frac{1}{2}}$ **or** $\left(\frac{a^{1.5}b^{0.5}}{a^{4.5}b^{2.5}}\right)^{-1}$ **or** $\left(\frac{a^9b^5}{a^3b}\right)^{\frac{1}{2}}$ **or** $\left(\frac{a^{-3}b^{-1}}{a^{-9}b^{-5}}\right)^{\frac{1}{2}}$ oe		3	M1	for simplifying the a and the b term in the fraction **or** for applying the power ½ to at least 3 out of 4 of a^3, b, a^9, b^5 **or** for applying the negative power to at least 3 out of 4 of a^3, b, a^9, b^5
	$\left(\frac{1}{a^3b^2}\right)^{-1}$ **or** $\left(a^{-3}b^{-2}\right)^{-1}$ **or** $\frac{a^{4.5}b^{2.5}}{a^{1.5}b^{0.5}}$ **or** $\left(a^6b^4\right)^{\frac{1}{2}}$ **or** $\left(\frac{a^{-1.5}b^{-0.5}}{a^{-4.5}b^{-2.5}}\right)$ oe			M1	for two of simplifying the a and the b term in the fraction **or** for applying the power ½ to at least 3 out of 4 of a^3, b, a^9, b^5 **or** for applying the negative power to at least 3 out of 4 of a^3, b, a^9, b^5
	Correct answer scores full marks (unless from obvious incorrect working)	a^3b^2		A1	accept $\frac{1}{a^{-3}b^{-2}}$
					Total 6 marks

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15	eg $0.5 \times EF \times FG \times \sin 130 = 74$ oe **or** eg $EF \times FG \times \sin 130 = 2 \times 74$ oe		3	M1	for setting up an equation using the area of a triangle formula
	$\left(EF^2 =\right)\frac{2\times 74}{\sin 130}$ (= 193.2...) oe **or** (EF =) $\sqrt{\frac{2\times 74}{\sin 130}}$ $\left(=\sqrt{193.2...}\right)$ oe			M1	for a complete method to find EF^2 **or** EF
	Correct answer scores full marks (unless from obvious incorrect working)	13.9		A1	awrt 13.9
					Total 3 marks

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16	5 ÷ 2 (= 2.5) oe 12 ÷ 3 (= 4) 18 ÷ 5 (= 3.6) oe 14 ÷ 10 (= 1.4) oe 9 ÷ 15 (= 0.6) oe		3	M1	for 3 correct frequency densities or 3 correct bars
				M1	for 4 correct frequency densities or 4 correct bars
	Correct answer scores full marks (unless from obvious incorrect working)	completely correct histogram		A1	completely correct histogram use overlay **SC**: award B2 for all 5 bars of correct width with heights in the correct ratio (eg drawn at 1.25, 2, 1.8, 0.7, 0.3)
					Total 3 marks

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17	(a)		15	1	B1	accept k^{15}
	(b)	eg $\frac{7(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}$ **or** $\frac{7(-2-\sqrt{3})}{(2-\sqrt{3})(-2-\sqrt{3})}$		3	M1	for multiplying the numerator and denominator of the fraction by $2+\sqrt{3}$ or $-2-\sqrt{3}$
		eg $\frac{14+7\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}-3}$ **or** $\frac{14+7\sqrt{3}}{4-3}$ **or** $\frac{14+7\sqrt{3}}{1}$ **or** $\frac{-14-7\sqrt{3}}{-4-2\sqrt{3}+2\sqrt{3}+3}$ **or** $\frac{-14-7\sqrt{3}}{-4+3}$ **or** $\frac{-14-7\sqrt{3}}{-1}$			M1	dep on previous M1
		Working required	$\sqrt{147}+14$		A1	dep on M2 SCB1 for $\sqrt{147}+14$ gained with no method marks awarded SCB2 for $\sqrt{147}+14$ gained with 1st M1 awarded
						Total 4 marks

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18	30 : 12 (= 5 : 2) **or** 30 ÷ 12 (= 2.5 oe) **or** 12 : 30 (= 2 : 5) **or** 12 ÷ 30 (= 0.4 oe)		4	M1	for a method to find ratio for the lengths **or** linear scale factor
	eg $5^2x - 2^2x = 178.5$ **or** $"2.5"^2y - y = 178.5$ **or** k – "0.4"^2k = 178.5 oe			M1	for setting up an equation using the surface areas
	$\frac{178.5}{5^2 - 2^2} \times 5^2$ (= 8.5 × 25) oe **or** $\frac{178.5}{"2.5"^2 - 1} \times "2.5"^2$ (= 34 × 6.25) oe **or** $\frac{178.5}{1 - "0.4"^2}\left(= 178.5 \div \frac{21}{25}\right)$ oe			M1	for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	212.5		A1	oe
					Total 4 marks

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19	$\left(\frac{dy}{dx} =\right) 3x^2 - 16x - 12$		5	M1	for differentiation with at least 2 terms correct
	$"3x^2 - 16x - 12" = 0$			M1ft	(dep on previous M1) for their $\frac{dy}{dx} = 0$
	eg $(3x+2)(x-6)(=0)$ **or** $(x =) \frac{-(-16) \pm \sqrt{(-16)^2 - 4\times 3\times(-12)}}{2\times 3}$ **or** $3\left[\left(x - \frac{8}{3}\right)^2 - \frac{64}{9}\right] - 12 (= 0)$			M1ft	(dep on 1st M1) for the correct x value (of 6) – ignore other x value **OR** 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 allow one sign error and some simplification – allow as far as $\frac{16 \pm \sqrt{256+144}}{6}$) (if completing the square then as far as shown on LHS) The award of this mark implies the previous M mark
	eg $6^3 - 8\times 6^2 - 12\times 6 + 5 (= -139)$			M1ft	(dep on 1st M1) for x = 6 substituted into correct equation for curve C **OR** (dep on 1st M1 and 2 values for x) for ***their*** greatest x value substituted into correct equation for curve C (ignore any attempt to substitute their least x value)
	Working required	(6, –139)		A1	(dep on M2) cao
					Total 5 marks

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20	(a)	$2\left(x^2-\frac{11}{2}x\right)+...$ **or** $2\left(x^2-\frac{11}{2}x+...\right)$ oe		3	M1	for taking out a factor of 2
		$2\left[\left(x-\frac{11}{4}\right)^2-\frac{11^2}{4^2}\right]+...$ **or** $2\left[\left(x-\frac{11}{4}\right)^2-\frac{11^2}{4^2}+...\right]$ oe			M1	for correctly completing square
		Correct answer scores full marks (unless from obvious incorrect working)	$2\left(x-\frac{11}{4}\right)^2-\frac{49}{8}$		A1	oe, eg $2(x-2.75)^2-6.125$ allow $a = 2$, $b = \frac{11}{4}$ oe, $c = \frac{49}{8}$ oe if no other marks awarded, award SCB1 for $2\left(x-\frac{11}{4}\right)^2+...$
		ALTERNATIVE				
ALT	(a)	$ax^2 - 2bax + b^2a - c$		3	M1	for correctly expanding $a(x - b)^2 - c$ to give $ax^2 - 2bax + b^2a - c$
		$-2ba = -11$ or $2ba = 11$ and $b^2a - c = 9$			M1	for setting up 2 equations using the coefficient of x and the numerical term
		Correct answer scores full marks (unless from obvious incorrect working)	$2\left(x-\frac{11}{4}\right)^2-\frac{49}{8}$		A1	oe, eg $2(x-2.75)^2-6.125$ allow $a = 2$, $b = \frac{11}{4}$ oe, $c = \frac{49}{8}$ oe if no other marks awarded, award SCB1 for $2\left(x-\frac{11}{4}\right)^2+...$
	(b)		$\left(\frac{23}{4}, -\frac{49}{8}\right)$	2	B2ft	oe, eg (5.75, −6.125)
					(B1ft	for one correct coordinate)
						Total 5 marks

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21	eg $\frac{x}{25}\times\frac{25-(x+6)}{24}$ **or** $\frac{x}{25}\times\frac{19-x}{24}$ oe		5	M1 for a correct product for P(orange , pink)
	eg $2\times\left(\frac{x}{25}\times\frac{19-x}{24}\right)=\frac{22}{75}$ oe			M1 for setting up a correct equation in x
	eg $2x^2-38x+176(=0)$ oe eg $x^2-19x+88(=0)$			M1 for dealing with the fractions to set up a correct quadratic equation
	x = 11 or pink = 25 – 6 – 11 (= 8)			M1 (dep on M1) for x = 11 or pink = 25 – 6 – 11 (= 8)
	Working required	$\frac{7}{75}$		A1 (dep on M2) oe eg 0.093... or 9.3...%
				Total 5 marks

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22	eg $MP = \sqrt{8^2 + 6^2}\ (=10)$		6	M1	for a method to find *MP* may be seen in subsequent working eg in the correct place in the cosine rule 10 seen without a correct method or without being identified as *MP* scores M0
	eg $BM = \sqrt{\left(\sqrt{10^2 + 6^2}\right)^2 + 8^2}\ \left(=\sqrt{200} = 10\sqrt{2} = 14.1...\right)$			M1	for a method to find *BM*
	eg $BP = \sqrt{12^2 + 10^2}\ \left(=\sqrt{244} = 2\sqrt{61} = 15.6...\right)$			M1	for a method to find *BP*
	eg $"244" = "10"^2 + "200" - 2 \times "10" \times "\sqrt{200}" \cos BMP$ **or** $\cos BMP = \dfrac{"10"^2 + "200" - "244"}{2 \times "10" \times "\sqrt{200}"}$ oe			M1	for correct substitution into the cosine rule
	angle $BMP = \cos^{-1}\left(\dfrac{"10"^2 + "200" - "244"}{2 \times "10" \times "\sqrt{200}"}\right)$ oe			M1	for a complete correct method to find angle *BMP*
	Correct answer scores full marks (unless from obvious incorrect working)	78.6		A1	accept 78.5 − 78.7
					Total 6 marks

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23	$(7x – 9) – (x + 2) = (x + 2) – (4x – 14)$ oe eg $6x – 11 = 16 – 3x$ **OR** $x + 2 = 4x – 14 + d$ and $7x – 9 = 4x – 14 + 2d$ oe eg $-3x + 16 = d$ and $3x + 5 = 2d$		4	M1	for setting up an equation in x **OR** two simultaneous equations in x and d
	$x = 3$ **and** $a = –2$ **and** $d = 7$ **OR** $x = 3$ **and** eg $(S_{40} =)\frac{40}{2}\left[2(4x-14)+39(-3x+16)\right]$ **or** $x = 3$ **and** eg $(S_{40} =)\frac{40}{2}\left[2(4x-14)+39(6x-11)\right]$			M1	correct values or values from correct substitution **OR** $x = 3$ **and** S_{40} expressed in terms of x allow (40 – 1) for 39
	$(S_{40} =)\frac{40}{2}(2\times"-2"+39\times"7")$ **or** eg $(S_{40} =)\frac{40}{2}\left[2(4\times"3"-14)+39(-3\times"3"+16)\right]$ **or** $(S_{40} =)\frac{40}{2}\left[2(4\times"3"-14)+39(6\times"3"-11)\right]$			M1	allow use of their a **and** their d **or** their x as long as clearly stated allow (40 – 1) for 39
	Working required	5380		A1	(dep on M1)
					Total 4 marks

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