

Mark Scheme

Edexcel Higher Mock Set B Paper 3

For Pearson Edexcel GCSE Mathematics (1MA1)

Higher tier • Paper 3 (Calculator)

Total 80 marks

Key to the marks

M	Method mark: for a correct method or a correct part of a method.
P	Process mark: for a correct step in the process of solving a problem.
A	Accuracy mark: for a correct answer or value after a correct method or process.
B	Unconditional accuracy mark: no method needs to be seen.
C	Communication mark: for a fully correct statement or conclusion with no contradiction.
()	A mark in brackets, e.g. (B1), is an alternative partial mark when full marks are not given.
oe	Or equivalent.
cao	Correct answer only.
ft	Follow through from an earlier answer.
isw	Ignore subsequent working once the correct answer is seen.
awrt	Answer which rounds to.
sc	Special case.
dep	Dependent on the mark before it.
“ ”	A value in quotation marks, e.g. “12” $\times$ 5, must come from a correct method, but may contain an arithmetic slip.

Give credit for any correct method, including ones not listed here. A correct answer with no working scores full marks unless the question asks for working (for example “show that” or “you must show your working”). If a correct answer is followed by further work that does not change it, ignore the further work. Probabilities must be written as fractions, decimals or percentages.

Indicative grade boundaries

Grade	9	8	7	6	5	4	3
Whole set: Papers 1, 2 and 3 (out of 240)	210	180	150	118	85	53	37
This paper alone, rough guide (out of 80)	70	60	50	39	28	18	12

Indicative only. Based on the real Pearson Edexcel boundaries for June 2023 to June 2026 (median), adjusted for how this set compares in difficulty with the real papers. Grades are awarded on the total for all three papers; the single-paper guide is about one third of the set boundaries.

These are estimates to help you judge performance on a practice paper; real boundaries change every year.

Marking guidance

Q	Answer	Marks	Guidance
1	No. The LCM of 42 and 54 is 378 seconds = 6 min 18 s, so they next flash together at 9.06 pm and 18 seconds, which is after 9.05 pm.	P1 A1 C1	for a correct method to find the LCM, eg $42 = 2 \times 3 \times 7$ and $54 = 2 \times 3^3$, or at least 3 multiples of each of 42 and 54 listed for 378 (seconds) or 6 minutes 18 seconds for 'No' with a correct comparison, eg next time is 9.06 pm (and 18 seconds), or $378 > 300$, or 6 min 18 s is more than 5 min <i>Additional guidance:</i> Alternative: listing the multiples of 54 up to 300 (54, 108, 162, 216, 270) and showing that none is a multiple of 42, with 'No', scores P1A1C1. $42 \times 54 = 2268$ (a common multiple but not the LCM) scores P0A0C0. 378 seconds written as 3.78 minutes, giving 'Yes', scores P1A1C0.
2(a)	t^8	B1	cao
2(b)	$10p^3 - 15p^2q$	B1	cao
2(c)	$7cd(3c + 5d^2)$	B2 (B1)	for $7cd(3c + 5d^2)$ for a correct partial factorisation with at least two of 7, c , d taken out, eg $7c(3cd + 5d^3)$, $7d(3c^2 + 5cd^2)$ or $cd(21c + 35d^2)$, or for $7cd(\dots)$ with one error in the bracket
Total for Question 2: 4 marks			
3	$26.8 \leq w < 26.9$	B1 B1	for 26.8 in the correct position for 26.9 in the correct position <i>Additional guidance:</i> $26.75 \leq w < 26.85$ (rounding) scores B0B0. Do not accept 26.89 or 26.89 for the upper bound.
4	Region below the bisector of angle DAB and inside the arc of radius 5 cm, centre C , shaded and labelled R	M1 M1 A1	for a correct angle bisector of angle DAB drawn with relevant construction arcs (within 2° of the true bisector) for an arc, or part of a circle, with centre C and radius 5 cm (± 2 mm) for the correct region shaded or clearly identified

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> The region is bounded by the bisector from (5.1, 5.1) to where it meets <i>DC</i>, by <i>DC</i> and <i>CB</i>, and by the arc from <i>CB</i> back to the bisector. A correct bisector drawn with no construction arcs scores M0, but the A1 can still be awarded for the correct region. Ignore any shading outside the rectangle.
5	119 g	P1	for a process to find the volume of a mass of tin or of lead, eg $3 \div 7.3$ ($= 0.410 \dots$) or $2 \div 11.3$ ($= 0.176 \dots$), or $\frac{3k}{7.3}$ or $\frac{2k}{11.3}$
		P1	for a process to find the density of the solder, eg $5 \div ("0.410 \dots" + "0.176 \dots")$ ($= 8.50 \dots$), or for a correct equation, eg $\frac{3k}{7.3} + \frac{2k}{11.3} = 14$
		P1	for a complete process to find the mass, eg $"8.50 \dots" \times 14$ or $5 \times "23.81 \dots"$
		A1	119 (accept 119.0 to 119.1)
			<i>Additional guidance:</i> Using a weighted mean of the densities, $(3 \times 7.3 + 2 \times 11.3) \div 5 = 8.9$, giving 124.6, scores POPPOA0. Using the mean $(7.3 + 11.3) \div 2 = 9.3$, giving 130.2, scores POPPOA0. With the equation method, $k = 23.81 \dots$, so the masses are 71.4 ... g of tin and 47.6 ... g of lead.
6	The supplier in England: £188.40, compared with €230.40 = £195.25 from the supplier in Ireland.	P1	for finding the total cost from one supplier, eg $8 \times 27.30 + 12$ ($= 230.40$) or 6×31.40 ($= 188.40$)
		P1	for a correct conversion of a cost between currencies, eg $"230.40" \div 1.18$ or $"188.40" \times 1.18$
		A1	for £195.25 (accept 195.2 to 195.3) and £188.40, or €230.40 and €222.31 (accept 222.3), or comparable costs for one case, eg £4.07 and £3.925
		C1	(dep on P2) for England, supported by correct figures

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Ignoring the delivery charge gives €218.40 = £185.08 and the conclusion Ireland: P1P1A0C0. Multiplying by 1.18 to change euros to pounds ($230.40 \times 1.18 = 271.87$): P1P0A0C0.
7(a)	0.22 on the first throw; 0.78, 0.22, 0.78, 0.22 on the second throw	B1	for 0.22 on the first-throw ‘misses’ branch
		B1	for 0.78, 0.22, 0.78, 0.22 on the second-throw branches
7(b)	No. She has missed the case ‘miss then score’. The probability is $2 \times 0.1716 = 0.3432$	M1	for $0.78 \times 0.22 + 0.22 \times 0.78$ oe or 2×0.1716 (ft their tree)
		C1	for ‘No’ with 0.3432 oe, or for ‘No’ with a correct reason, eg she has not included miss then score <i>Additional guidance:</i> ‘No’ with no reason or an incorrect reason scores M0C0. Accept a correct explanation in words, eg “she should have doubled it”, for M1C1.
Total for Question 7: 4 marks			
8	42.8 cm	P1	for an expression for the area of the triangle, eg $\frac{1}{2} \times 8 \times (5x - 3)$ or $20x - 12$
		P1	for an equation equating their area of the triangle to the area of the rectangle, eg $20x - 12 = 5(2x + 7)$
		P1	for solving their linear equation, eg $x = 4.7$
		A1	42.8 cao <i>Additional guidance:</i> Missing the $\frac{1}{2}$ gives $40x - 24 = 10x + 35$, $x = 1.96 \dots$, perimeter 31.9: P0P1P1A0. An answer of 16.4 (the length) or 4.7 scores P1P1P1A0.
9	He worked out -3×2 as +6. It should be -6 (so the answer should be $x^2 + 11x - 18$).	C1	for identifying the mistake, eg -3×2 should be -6 not +6, or the last term in the bracket should be -6, or he did not change the sign of the 2

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Do not accept “his answer is wrong” or “it should be $x^2 + 11x - 18$ ” without the mistake being identified. Ignore any comment on the other terms, which are correct.
10	9	P1	for a complete process, eg $7 \times 6 \div 4 \frac{50}{60}$ (= 8.68 ...) or $7 \times 360 \div 290$
		A1	9 cao <i>Additional guidance:</i> 8.68 ... or 8 as the final answer scores P1A0. Using 4.5 hours for 4 hours 50 minutes ($42 \div 4.5 = 9.33 \dots$, giving 10) scores POA0.
11	96.4°	P1	for finding the arc length, eg $81 - 2 \times 22$ (= 37)
		P1	for a complete process to find the angle, eg $\frac{“37”}{2 \times \pi \times 22} \times 360$ or $\frac{\theta}{360} \times 2\pi \times 22 = “37”$
		A1	96.3 to 96.4 <i>Additional guidance:</i> Using 81 as the arc length (210.9°) scores POP1A0. Subtracting only one radius (59, giving 153.6°) scores POP1A0.
12	$x = 3.5, y = -2$	M1	for a correct method to eliminate x or y (condone one arithmetic error), eg $20x - 15y = 100$ and $18x + 15y = 33$ added, or $12x - 9y = 60$ and $12x + 10y = 22$ subtracted
		M1	(dep) for substituting their found value into one of the equations, or for a correct method to eliminate the other variable
		A1	for $x = 3.5$ and $y = -2$ <i>Additional guidance:</i> Correct answers with no working, or from trial and improvement, score MOM0A0. $x = \frac{7}{2}$ is acceptable.
13	-1, 1, 3	M1	for $-2 < x < 6$ oe, or for at least one correct pair of values, eg $x = 1, y = 6$
		A1	for -1, 1, 3 and no other values <i>Additional guidance:</i> -1, 1, 3, 5 (including $y = 4$) scores M1A0. 1, 3 only (missing -1) scores M1A0. Values of y given instead of x (7, 6, 5) score M1A0.

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Q	Answer	Marks	Guidance
14	$1000x - 100x = 536.\dot{6} - 53.\dot{6}$, so $900x = 483$ and $x = \frac{483}{900} = \frac{161}{300}$	M1	for two recurring decimals that, when subtracted, eliminate the recurring part, eg $100x = 53.66 \dots$ and $1000x = 536.66 \dots$
		M1	for a correct subtraction leading to a fraction, eg $900x = 483$ or $\frac{483}{900}$
		A1	for completing the proof, eg $\frac{483}{900} = \frac{161}{300}$ <i>Additional guidance:</i> Alternative: $0.53\dot{6} = 0.5 + 0.03\dot{6} = \frac{1}{2} + \frac{11}{300}$ with $0.03\dot{6}$ proved algebraically scores full marks. Recurring decimals must be shown as recurring (dots or ...) for the first M1. $\frac{161}{300} = 0.536666 \dots$ by division alone is not an algebraic proof: MOMOAO.
15	$y = \frac{2}{3}x + \frac{11}{3}$ (or $3y = 2x + 11$)	M1	for a method to find the gradient, eg $\frac{5-1}{2-(-4)}$, or for $\frac{2}{3}$ oe
		M1	for $y = \frac{2}{3}x + c$ with a point on L substituted, eg $5 = \frac{2}{3} \times 2 + c$, or for $y - 5 = \frac{2}{3}(x - 2)$
		A1	for $y = \frac{2}{3}x + \frac{11}{3}$ oe, eg $3y = 2x + 11$ <i>Additional guidance:</i> Reading c from the graph as 3.7 or $3\frac{2}{3}$: accept $y = \frac{2}{3}x + 3\frac{2}{3}$; $y = \frac{2}{3}x + 3.7$ scores M1MOAO. $y = \frac{3}{2}x + c$ (gradient inverted) scores M0, but the second M1 can still be awarded.
16	$p = \left(\frac{3m+5}{2m-1}\right)^2$	M1	for multiplying both sides by $2\sqrt{p} - 3$, eg $m(2\sqrt{p} - 3) = \sqrt{p} + 5$
		M1	for isolating the terms in $\sqrt{p}$ on one side, eg $2m\sqrt{p} - \sqrt{p} = 3m + 5$
		M1	for factorising, eg $\sqrt{p}(2m - 1) = 3m + 5$
		A1	for $p = \left(\frac{3m+5}{2m-1}\right)^2$ oe <i>Additional guidance:</i> Accept equivalent forms, eg $p = \frac{(3m+5)^2}{(2m-1)^2}$ or $p = \left(\frac{-3m-5}{1-2m}\right)^2$. $\sqrt{p} = \frac{3m+5}{2m-1}$ as the final answer scores M1M1M1AO.

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Q	Answer	Marks	Guidance
17	No. The bond started at £4800, so the interest was £568.26, which is less than £575	P1	for 1.038^3 (= 1.118 ...) or a first step in a year-by-year method, eg $5368.26 \div 1.038$ (= 5171.73 ...)
		P1	for a complete process to find the original amount, eg $5368.26 \div 1.038^3$
		A1	for 4800 or 568.26 (accept 568.2 to 568.3)
		C1	for 'No' with correct figures, eg $568.26 < 575$ <i>Additional guidance:</i> $5368.26 \times 0.962^3 = 4779.24$, interest 589.02, 'Yes': POP0A0C0. Simple interest ($5368.26 \div 1.114 = 4818.90$, interest 549.36): POP0A0C0. Trial of an original amount with the compound interest worked forwards to 5368.26 is a complete process.
18	13.4 m ²	P1	for finding BC , eg $16.9 - 5.2 - 6.3$ (= 5.4)
		P1	for a correct use of the cosine rule to find any angle, eg $\cos B = \frac{5.2^2 + 5.4^2 - 6.3^2}{2 \times 5.2 \times 5.4}$ ($B = 72.9 \dots$), or $A = 55.0 \dots$ or $C = 52.1 \dots$
		P1	for a complete process to find the area, eg $\frac{1}{2} \times 5.2 \times 5.4 \times \sin "72.9 \dots"$
		A1	13.4 to 13.42 <i>Additional guidance:</i> Use of Heron's formula with $BC = 5.4$ is a complete method: award full marks for 13.4. $\frac{1}{2} \times 5.2 \times 6.3 \times \sin 72.9$ (angle not between the two sides) scores P1P1P0A0.
19	66°	M1	for angle $BAD = 64^\circ$ or angle $BCD = 116^\circ$ (may be on the diagram)
		M1	for angle $CAD = 24^\circ$ or angle $BAC = 40^\circ$
		A1	for 66°
		C1	for all reasons given, eg angles on a straight line add up to 180°; opposite angles of a cyclic quadrilateral add up to 180° (or the exterior angle of a cyclic quadrilateral equals the interior opposite angle); the angle in a semicircle is 90°; angles in a triangle add up to 180°

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> C1 can be awarded only if the A1 is awarded, or the reasons are all correct and relevant for the method shown. Splitting 116° in the ratio 5:3 (giving 43.5°) scores M1MOAOC0. Alternative: angle $ACB = 90 - 40 = 50$ (angle in a semicircle), angle $ACD = 116 - 50 = 66$.
20(a)	252 m	M1 M1 A1	for a method to find the area of one strip, eg $\frac{1}{2} \times 6 \times 11 (= 33)$ or $\frac{1}{2} \times (11 + 19) \times 6 (= 90)$ or $\frac{1}{2} \times (19 + 24) \times 6 (= 129)$ for a complete method for the total area of the three strips 244 to 260 <i>Additional guidance:</i> Readings from the graph: accept $v = 10.5$ to 11.5 , 18.5 to 19.5 and 23.5 to 24.5 . Using rectangles (eg $6 \times 11 + 6 \times 19 + 6 \times 24 = 324$) scores MOMOA0. $24 \times 18 = 432$ scores MOMOA0.
20(b)	Underestimate, because the straight tops of the strips are below the curve, so the strips miss some of the area under it.	C1	for underestimate with a correct reason, eg the strips are below the curve, or the area under the curve is greater than the area of the strips <i>Additional guidance:</i> Do not accept “underestimate” with no reason, or with a reason about the speed or the jet ski.
Total for Question 20: 4 marks			
21(a)	The curve translated 3 units to the right: maximum at (1, 3), minimum at (4, -3), through (-1, 1) and (6, 1)	B1	for a correct translation of the curve 3 units to the right, eg through (-1, 1), (1, 3), (4, -3) and (6, 1) <i>Additional guidance:</i> Accept a curve within half a square of the correct points, with the correct shape.
21(b)	$y = f(-x)$	B1	for $y = f(-x)$ oe <i>Additional guidance:</i> Do not accept $y = -f(x)$ or $f(-x)$ without “ $y =$ ”. Accept $B = f(-x)$.
Total for Question 21: 2 marks			

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Q	Answer	Marks	Guidance
22	$\overrightarrow{MN} = \frac{2}{3}(\mathbf{a} + \mathbf{b})$ and $\overrightarrow{OB} = 2(\mathbf{a} + \mathbf{b})$, so $\overrightarrow{MN} = \frac{1}{3}\overrightarrow{OB}$ and MN is parallel to OB .	P1	for $\overrightarrow{AB} = -\mathbf{a} + 2\mathbf{b}$ oe, or $\overrightarrow{OB} = 2\mathbf{a} + 2\mathbf{b}$
		P1	for $\overrightarrow{AN} = \frac{1}{3}(-\mathbf{a} + 2\mathbf{b})$ oe or $\overrightarrow{NB} = \frac{2}{3}(-\mathbf{a} + 2\mathbf{b})$ oe
		P1	for a correct route for $\overrightarrow{MN}$ with vectors, eg $\mathbf{a} + \frac{1}{3}(-\mathbf{a} + 2\mathbf{b})$ or $-2\mathbf{a} + 2\mathbf{b} + 2\mathbf{a} - \frac{2}{3}(-\mathbf{a} + 2\mathbf{b})$
		A1	for $\overrightarrow{MN} = \frac{2}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe
		C1	for $\overrightarrow{OB} = 2\mathbf{a} + 2\mathbf{b}$ and a correct conclusion, eg $\overrightarrow{MN} = \frac{1}{3}\overrightarrow{OB}$ so MN is parallel to OB <i>Additional guidance:</i> Any correct route may be used, eg $\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{OC} + \overrightarrow{CB} + \overrightarrow{BN}$. For C1 the vectors must be shown to be multiples, eg $\frac{2}{3}(\mathbf{a} + \mathbf{b})$ and $2(\mathbf{a} + \mathbf{b})$, with a statement. $\overrightarrow{AB} = \mathbf{a} - 2\mathbf{b}$ (direction reversed) scores P0 but further P marks can be awarded for correct work with it.
23	$2n(2n + 2) = 4n^2 + 4n = (2n + 1)^2 - 1$, and $2n + 1$ is odd, so the product is 1 less than an odd square number.	M1	for two consecutive even numbers in algebraic form, eg $2n$ and $2n + 2$, or $2n - 2$ and $2n$
		M1	for a correct expanded product, eg $4n^2 + 4n$ or $4n^2 - 4n$
		C1	for a complete proof, eg $4n^2 + 4n = (2n + 1)^2 - 1$ with a statement that $2n + 1$ is odd <i>Additional guidance:</i> Numerical examples only score MOMOCO. Using n and $n + 2$ (not necessarily even) scores M0, but can score M1 for $n^2 + 2n$ and C0.
24	8	P1	for an expression for P(both red) or P(both yellow), eg $\frac{n}{n+7} \times \frac{n-1}{n+6}$ or $\frac{7}{n+7} \times \frac{6}{n+6}$
		P1	for a correct equation for P(same colour), eg $\frac{n(n-1)}{(n+7)(n+6)} + \frac{42}{(n+7)(n+6)} = \frac{7}{15}$
		P1	for reducing to a 3-term quadratic, eg $8n^2 - 106n + 336 = 0$ or $4n^2 - 53n + 168 = 0$
		P1	for a correct method to solve their quadratic, eg $(4n - 21)(n - 8)$ or correct use of the formula
		A1	8 cao (and 5.25 rejected or ignored)

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Treating the selection as with replacement ($\frac{n^2+49}{(n+7)^2} = \frac{7}{15}$) scores P0P0P0P0A0. An answer of 15 (the total number of tulips) with correct working scores P1P1P1P1A0. A correct answer of 8 found by trial (eg checking $\frac{98}{210} = \frac{7}{15}$), with no algebra, scores P1P1P0P0A0.