

Mark Scheme

Edexcel Higher Mock Set A 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)	209	179	149	116	84	52	36
This paper alone, rough guide (out of 80)	70	60	50	39	28	17	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(a)	He worked out $(-4)^2$ as -16 . It should be $+16$.	B1	for identifying the error, eg $(-4)^2$ is 16 not -16 , or he squared 4 and then made it negative, or $-4 \times -4 = 16$ <i>Additional guidance:</i> Do not accept “he got the wrong answer” or “the answer should be 52” with no reason given. Ignore any reference to the -5×-4 step, which Joel did correctly.
1(b)	$V = 52$	B1	cao
Total for Question 1: 2 marks			
2	304°	M1	for $124 + 180$ or $360 - 56$ or for 56° (co-interior angles) shown correctly on a diagram
		A1	cao
3	48.7 km/h	P1	for finding the ferry time, eg $51 \div 34 (= 1.5)$, or the coach distance, eg $57 \times 2\frac{40}{60} (= 152)$
		P1	for a complete process, eg $(51 + “152”) \div (“1.5” + 2\frac{40}{60})$
		A1	48.7 to 48.72 <i>Additional guidance:</i> 2 hours 40 minutes used as 2.4 hours or 2.40 hours: P1 can still be awarded for $51 \div 34$. $(34 + 57) \div 2 = 45.5$ scores P0POAO.
4	62.9%	P1	for finding the total income, eg $128 \times 3.75 + (150 - 128) \times 1.5 (= 513)$
		P1	for $\frac{“513” - 315}{315} \times 100$ or $\frac{“513”}{315} \times 100 (= 162.8 \dots)$
		A1	62.8 to 62.9 <i>Additional guidance:</i> $\frac{198}{513} \times 100 = 38.6$ scores P1POAO.
5	£15 000	P1	for $\frac{5}{8} \times 640 (= 400)$ or $640 - \frac{5}{8} \times 640 (= 240)$
		P1	for $\frac{3}{4} \times (640 - “400”) (= 180)$
		P1	for $0.75 \times (“240” - “180”) (= 45)$ or a complete process for the income from two of the three groups
		A1	cao <i>Additional guidance:</i> Process marks can be awarded for income values, eg $400 \times 28.5 (= 11\,400)$ implies the first P1. An answer of 15 180 (free seats charged) scores P1P1POAO.

(continued)

Q	Answer	Marks	Guidance
6(a)	4200 cm ²	B1	cao
6(b)	Esme's drone (19 m/s = 68.4 km/h, which is more than 65 km/h)	M1	for converting one speed to the units of the other, eg $19 \times 3600 \div 1000$ (= 68.4) or $65 \times 1000 \div 3600$ (= 18.05 ...)
		C1	for Esme's drone with correct comparable figures, eg 68.4 km/h and 65 km/h, or 19 m/s and 18.0(5 ...) m/s <i>Additional guidance:</i> Accept other comparable units, eg 1140 m per minute and 1083.3 ... m per minute. "Esme" with no correct working scores MOC0.
Total for Question 6: 3 marks			
7	29 years	P1	for expressions for two of the ages in terms of one variable, eg x , $2x + 5$, $2x + 1$
		P1	for a correct equation, eg $x + 2x + 5 + 2x + 1 + 12 = 78$ oe or $5x + 6 = 66$
		P1	for solving to find Amira's age, $x = 12$
		A1	cao <i>Additional guidance:</i> Trial and improvement leading to 29 scores full marks. $5x + 6 + 4 = 78$ leading to $x = 13.6$, then 32.2: P1POP0A0. An answer of 33 (Josh's age in 4 years' time) with correct working scores P1P1P1A0.
8	6.08 cm	P1	for a correct method to find PR , eg $\frac{9.4}{\cos 38}$ (= 11.92 ...)
		P1	for a complete method to find RS , eg "11.92 ..." $\times \tan 27$
		A1	6.07 to 6.08 <i>Additional guidance:</i> Calculator in radians gives $PR = 9.84 \dots$ and $RS = -32.2 \dots$: P1P1A0 if the method is clear. Use of the sine or cosine rule is acceptable for the process marks.
9	60 840	M1	for $26 \times 26 \times 10 \times 9$ or $26 \times 26 \times 10 \times 10$ (= 67 600) or $26 \times 25 \times 10 \times 9$ (= 58 500)
		A1	cao
10(a)	9, 30, 56, 70, 77, 80	B1	cao

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Q	Answer	Marks	Guidance
10(b)	Points plotted at (2, 9), (4, 30), (6, 56), (8, 70), (10, 77), (12, 80), joined with a curve or straight lines	C2	for a fully correct cumulative frequency graph: points plotted at the ends of the intervals and joined with a curve or line segments
		(C1	for 5 or 6 points plotted correctly at the ends of the intervals, not joined, or for 5 or 6 points plotted consistently within each interval at the correct heights and joined) <i>Additional guidance:</i> ft their table if one error in (a). Ignore any part of the graph to the left of (0, 0) or to the right of (12, 80). Accept a curve not starting at (0, 0).
10(c)	No. About 16 bags weigh more than 7 kg, which is fewer than 20 (a quarter of 80).	M1	for reading from the graph at $m = 7$ (accept 62 to 66) or at a cumulative frequency of 60 (accept 6.2 to 6.7 kg)
		C1	for 'No' with a correct comparison, eg $80 - 64 = 16$ and $16 < 20$, or the upper quartile (6.4 kg) is less than 7 kg <i>Additional guidance:</i> ft their graph for both marks. 'No' with no supporting working scores MOCO.
Total for Question 10: 5 marks			
11	62 minutes 50 seconds	P1	for a process to find the volume of the tank or of the water, eg $\pi \times 60^2 \times 150$ (= 1 696 460 ...) or $\pi \times 0.6^2 \times 1.5$ (= 1.696 ...) or $\pi \times 60^2 \times 100$
		P1	for using $\frac{2}{3}$ and converting to litres, eg $\frac{2}{3} \times "1\,696\,460" \div 1000$ (= 1130.97 ...)
		P1	for [volume in litres] $\div 18$, eg $"1130.97 \dots" \div 18$ (= 62.83 ...)
		A1	62 minutes 50 seconds (accept 62 min 49 s to 62 min 51 s) <i>Additional guidance:</i> 62.8 minutes or 62.83 minutes scores P1P1P1A0. 62 min 83 s scores P1P1P1A0.
12	$3x^3 - 10x^2 - 27x + 10$	M1	for expanding two of the brackets with at least 3 out of 4 terms correct, eg $x^2 - 5x + 2x - 10$ or $3x^2 + 6x - x - 2$

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Q	Answer	Marks	Guidance
		M1	for a complete method to find all terms of the cubic, at least half of them correct (ft their first expansion)
		A1	for $3x^3 - 10x^2 - 27x + 10$ <i>Additional guidance:</i> Accept terms in any order.
13(a)	3 hours 36 minutes	M1	for $135 \times 8 (= 1080)$ or $2.25 \times 8 (= 18)$ or $\frac{8}{5} \times 135$ oe
		A1	3 hours 36 minutes <i>Additional guidance:</i> 3.6 hours or 216 minutes scores M1A0. $135 \times 5 \div 8$ scores M0A0.
13(b)	All the volunteers work at the same rate.	C1	for a valid assumption, eg all the volunteers work at the same rate, or the volunteers work without a break, or there is the same amount of litter <i>Additional guidance:</i> Accept eg “they all pick up litter at the same speed”. Do not accept “the beach is the same” (given in the question).
Total for Question 13: 3 marks			
14	Nisha is not correct: the upper bound of the height is 46.18 ... cm, which is more than 46 cm, so the height could be more than 46 cm.	B1	for one correct bound, eg 89.5, 90.5, 37.5, 38.5, 145 or 155 (or 145 000 or 155 000)
		P1	for $\frac{\text{UB volume}}{\text{LB length} \times \text{LB width}}$ with litres converted to cm^3 , eg $\frac{155\,000}{89.5 \times 37.5}$, where $150\,000 < \text{UB} \leq 155\,000$, $89.5 \leq \text{LB} < 90$ and $37.5 \leq \text{LB} < 38$
		A1	for 46.1 to 46.2
		C1	(dep on P1) for a correct conclusion from their upper bound, eg Nisha is not correct as $46.18 \dots > 46$ <i>Additional guidance:</i> $\frac{150\,000}{90 \times 38} = 43.85 \dots$ followed by “Nisha is correct” scores B0POAOC0. $\frac{155}{89.5 \times 37.5} = 0.0461 \dots$ (litres not converted) scores B1POAOC0. The lower bound (41.6 ...) may also be seen; it does not affect the marks.

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Q	Answer	Marks	Guidance
15(a)	36	B1	cao
15(b)	Bars drawn for $10 < t \leq 15$ at height 8 and for $25 < t \leq 45$ at height 1 (on the scale from the $0 < t \leq 4$ bar)	B2 (B1	for both bars correct: $10 < t \leq 15$ at frequency density 8 and $25 < t \leq 45$ at frequency density 1 for one correct bar, or for frequency densities 8 and 1 seen) <i>Additional guidance:</i> The scale is fixed by the $0 < t \leq 4$ bar (16 customers, frequency density 4): each small square is 0.2.
15(c)	71	M1 A1	for $\frac{2}{6} \times "36"$ (= 12) or 2×6 or $\frac{5}{10} \times 38$ (= 19) or 5×3.8 71 (ft their answer to (a))
Total for Question 15: 5 marks			
16(a)	$k = 0.925$	M1 A1	for $3200 \times k^2 = 2738$ oe or $\frac{2738}{3200}$ (= 0.855625) 0.925 oe <i>Additional guidance:</i> 0.855625 as the final answer scores M1A0. Trial and improvement with k values leading to 0.925 scores M1A1.
16(b)	The number of birds decreases by 7.5% each year.	C1	for a correct statement, eg the number of birds decreases by 7.5% each year (ft their k) <i>Additional guidance:</i> Accept "the number of birds goes down by 7.5% a year" or "each year there are 92.5% of the birds of the year before". Do not accept "the number of birds is decreasing" without a percentage.
Total for Question 16: 3 marks			
17(a)	$f(2) = -5 < 0$ and $f(3) = 9 > 0$: there is a change of sign, so there is a solution between 2 and 3.	M1 A1	for substituting $x = 2$ and $x = 3$ into $x^3 - 5x - 3$ for -5 and 9 and a correct conclusion, eg there is a change of sign so there is a solution <i>Additional guidance:</i> Accept a comparison of x^3 with $5x + 3$: $8 < 13$ and $27 > 18$, with a conclusion.

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Q	Answer	Marks	Guidance
17(b)	$x^3 = 5x + 3$, so $x = \sqrt[3]{5x + 3}$	C1	for $x^3 = 5x + 3$ followed by $x = \sqrt[3]{5x + 3}$ <i>Additional guidance:</i> The intermediate step $x^3 = 5x + 3$ must be seen.
17(c)	$x_3 = 2.491$ (accept 2.491...)	M1 M1 A1	for $x_1 = 2.49(3 \dots)$ for $x_2 = 2.49(1 \dots)$ and x_3 found using x_2 for 2.491(04...) <i>Additional guidance:</i> Accept awrt 2.491 Using $x_0 = 2.5$ in every step scores M1M0A0.
Total for Question 17: 6 marks			
18	9.24 litres	P1 P1 P1 A1	for a process to find the height of the large or the small cone, eg $\frac{H-20}{H} = \frac{9}{15}$ or $20 \div 6 \times 15 (= 50)$ or $20 \div 6 \times 9 (= 30)$ for finding the volume of the large or the small cone using their height, eg $\frac{1}{3} \times \pi \times 15^2 \times "50"$ ($= 11780.9 \dots$) or $\frac{1}{3} \times \pi \times 9^2 \times "30"$ ($= 2544.6 \dots$) for a complete process to find the capacity in litres, eg (" $11780.9 \dots$ " – " $2544.6 \dots$ ") $\div 1000$ 9.23 to 9.24 <i>Additional guidance:</i> Accept use of the frustum formula $\frac{1}{3} \pi h(R^2 + Rr + r^2) = \frac{1}{3} \pi \times 20 \times (225 + 135 + 81)$ for the first three marks if correctly evaluated. An answer of 9236 or 9240 (cm^3 , not changed to litres) scores P1P1P0A0. Using 20 cm as the height of a cone scores P0 for that volume.
19	$CB = CD$, angle $CBP =$ angle $CDQ = 90^\circ$, $BP = DQ$, so the triangles are congruent (SAS).	M1 M1 C1	for one correct statement with a reason, eg $CB = CD$ (sides of a square) or angle $CBP =$ angle $CDQ (= 90^\circ)$, angles in a square for $BP = DQ$ with a reason, eg $AB - AP = AD - AQ$ for a fully correct proof with all reasons given and the conclusion SAS

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> RHS is not a valid condition here (the hypotenuses CP and CQ are not known to be equal). Accept “side, angle, side”.
20	$x = \frac{1}{2}$ or $x = 5$	M1 A1 M1 A1	for multiplying through by the denominators, eg $7(x - 3) + 2(x + 2) = 2(x + 2)(x - 3)$ or $\frac{7(x - 3) + 2(x + 2)}{(x + 2)(x - 3)} = 2$ for $2x^2 - 11x + 5 = 0$ oe for a correct method to solve their 3-term quadratic, eg $(2x - 1)(x - 5)$ or correct substitution into the formula $x = \frac{1}{2}$ and $x = 5$ oe <i>Additional guidance:</i> Working is not required: $x = \frac{1}{2}$ and $x = 5$ with no incorrect working seen scores full marks. One correct solution only, with no working or from trial and improvement, scores no marks.
21	61.0°	P1 P1 P1 A1	for a process to find the vertical height, eg $630 \times 3 \div (14 \times 9) (= 15)$ for a process to find half the diagonal of the base, eg $\frac{1}{2}\sqrt{14^2 + 9^2} (= 8.32 \dots)$ for a correct trig statement for the required angle, eg $\tan x = \frac{15}{8.32 \dots}$ or finding $VA (= 17.15 \dots)$ and using sin or cos 60.9 to 61.0 <i>Additional guidance:</i> Using the full diagonal ($\tan x = \frac{15}{16.64 \dots}$, giving 42.0°) scores P1POPOA0. Using $630 \div 126 = 5$ as the height (no $\frac{1}{3}$) can score POP1P1A0.
22	6.16	M1 A1 M1 A1 P1	for substituting to eliminate one variable, eg $5 - x = 2x^2 - 3x - 4$ $2x^2 - 2x - 9 = 0$ oe for a correct method to solve their 3-term quadratic, eg $\frac{2 \pm \sqrt{(-2)^2 - 4 \times 2 \times (-9)}}{2 \times 2}$ $x = 2.68$ and $x = -1.68$ (awrt), or $\frac{1 \pm \sqrt{19}}{2}$, or the y values 2.32 and 6.68 (awrt) for a process to find AB using their two points, eg $\sqrt{(2.68 - (-1.68))^2 + (2.32 - 6.68)^2}$

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Q	Answer	Marks	Guidance
		A1	6.16 to 6.17 <i>Additional guidance:</i> The answer in surd form, $\sqrt{38}$, scores full marks. Alternative method: eliminating y with $x = 5 - y$ gives $2y^2 - 18y + 31 = 0$, so $y = \frac{9 \pm \sqrt{19}}{2}$; award marks in the same way. Correct coordinates of A and B with no attempt at the length scores M1A1M1A1P0A0.