

Mark Scheme

Summer 2027 (Predicted)

GCSE Mathematics (Edexcel-style 1MA1)

Higher (Calculator) Paper 3

This is an original mark scheme written for a predicted practice paper. It is NOT an official Edexcel mark scheme and is NOT endorsed by or affiliated with Pearson Edexcel.

For use with the Predicted Practice Paper 3 question paper.

General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

1 All candidates must receive the same treatment.

Mark the last script in exactly the same way as the first.

2 Mark positively.

The mark scheme is designed so that every mark can be awarded. Give credit for what is correct, and award zero only when a response deserves no credit. If the answer line is wrong or blank, always check the working and any diagrams first.

3 Working not required / working required.

Where working is not required, a correct answer alone earns full marks. Where a question specifically requires working (for example “show that” or a proof), a candidate who shows no working earns no marks.

4 Crossed-out work.

Mark crossed-out work unless the candidate has replaced it with a new response.

5 Choice of method.

Where several methods are shown, mark the method that leads to the answer given on the answer line. If there is no answer on the line, mark every method shown and award the lower total.

6 Incorrect method.

If the working clearly produces a “correct” answer by an incorrect method, award no marks.

7 Follow-through marks.

A follow-through mark involving a single calculation step can be awarded from the answer alone. One involving more than one step can only be awarded if the relevant working is seen, even when there seems to be only one possible route to the answer.

8 Ignoring subsequent work.

Ignore extra work that does not spoil a correct answer (for example an incorrectly cancelled fraction where the uncanceled form would earn full marks). Do not ignore extra work that makes the answer incorrect.

9 Probability.

Give probabilities as a fraction, percentage or decimal. A decimal equivalent should have at least 2 decimal places. Penalise poor notation on the accuracy mark only, keeping any method marks.

10 Linear equations.

Full marks can be given for the solution alone on the answer line (or clearly shown in working). If the solution is only shown substituted back into the equation, the accuracy mark is lost but method marks can still be awarded.

11 Range of answers.

A range such as 3.5 – 4.2 includes both end points and every value between them.

12 Number in brackets after a calculation.

Where a bracketed value follows a calculation, for example $2 \times 6 (= 12)$, the mark can be given either for the correct method or for the correct bracketed answer.

13 Word in square brackets.

Where a word appears in square brackets, for example $[\text{area}] \times 1.5$, the value used for $[\text{area}]$ does not need to come from correct working — use the candidate's value, subject to any limits stated in the mark scheme.

14 Misread.

If a candidate misreads a number from the question (for example 252 for 255), method marks can still be awarded provided the question has not been made easier.

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	£36	B1	36	AO1. Accept 36 or £36.
2	£360	M1 A1	$306 \div 0.85$ (or $306 \div (1 - 0.15)$) seen; 360	AO1. M1 for a complete reverse-percentage method.
3	30 km/h	M1 A1	$45 \div 1.5$ (1 hour 30 minutes = 1.5 hours); 30	AO1. Accept 30.
4	8 g/cm ³	M1 A1	$2.4 \times 1000 \div 300$ (or $2400 \div 300$); 8	AO1. M1 for converting kg to g and dividing by volume. Accept 8.
5	$x > 4$	M1 A1	$3x > 12$ (collecting x terms correctly); $x > 4$	AO1. A1 for $x > 4$ (strict inequality required).
6	648	M1 M1 A1	$72 \div (5 - 4)$ [= 72, value of one part]; 72×9 ; 648	AO2.
7	£7680	M1 M1 A1	0.8 (or $1 - 0.2$) seen; 12000×0.8^2 ; 7680	AO1. M1 for the multiplier; M1 for applying it twice.
8	125 cm ²	M1 M1 A1	$(10 \div 4)^2$ [= 6.25, area scale factor]; $20 \times (10 \div 4)^2$; 125	AO2. M1 for squaring the length scale factor.
9	198.5	M1 A1	235 and 36.5 identified (lower bound of p, upper bound of q); 198.5	AO2.
10	6.88 cm	M1 M1 A1	$\sin 35^\circ = AC \div 12$; $AC = 12 \times \sin 35^\circ$; 6.88	AO2. Accept 6.88–6.89.
11	503 cm ³	M1 A1	$\pi \times 4^2 \times 10$ [= 502.65...]; 503	AO1. Accept 502.7 or 503.
12(a)	–1 and 1	B1 B1	–1 (for $x = 1$); 1 (for $x = 3$)	AO1. One mark per correct value.
12(b)	Correct curve	B1 B1	Curve through all 7 points; smooth parabola	AO2. B1 for at least 5 points plotted correctly and joined.
13	Correct sketch	B1 B1	Parabola of correct shape with vertex at (3, 0); correct position (through (0, 9), (1, 4), (5, 4))	AO2. B1 for a translated parabola of the right shape.
14(a)	73	B1	73	AO1.
14(b)	Yes, $n = 32$	M1 A1	$4n - 7 = 121$ leading to $n = 32$; yes, since 32 is a positive integer	AO2.
15(a)	29	M1 A1	28 and 30 identified as the 7th and 8th values; $(28 + 30) \div 2 = 29$	AO1.
15(b)	25	B1	25	AO1.
16(a)	Correct Venn	B1 B1	Regions correct: A only {3, 9}, B only {2, 4, 8, 10}, both {6, 12}, outside {1, 5, 7, 11}; all four regions correct	AO1. B1 for two or three regions correct.
16(b)	1/6	B1	1/6	AO1. Accept 2/12. Follow through their Venn diagram.

Question	Answer	Mark	Mark scheme	Additional guidance
17(a)	11	M1 A1	$g(2) = 3; f(3) = 11$	AO1.
17(b)	$4x^2 + 20x + 24$	M1 A1	$(2x + 5)^2 - 1; 4x^2 + 20x + 24$	AO1.
18(a)	14	M1 A1	$4^2 - (\sqrt{2})^2$ (difference of two squares); 14	AO1.
18(b)	$12 - 6\sqrt{3}$	M1 A1	Multiply top and bottom by $(2 - \sqrt{3})$: $6(2 - \sqrt{3}) \div 1; 12 - 6\sqrt{3}$	AO1.
19	Correct construction	B1 B1 B1	Pair of intersecting arcs drawn from A; pair of intersecting arcs drawn from B (same radius); straight bisector drawn through the intersections	AO1. Construction lines must be visible.
20	182.25 cm^3	M1 M1 A1	$(9 \div 6)^3 [= 3.375, \text{ volume scale factor}]; 54 \times (9 \div 6)^3; 182.25$	AO2. Accept 182.
21(a)	4.64 m	M1 A1	$5 \times \sin 68^\circ; 4.64$	AO2. Accept 4.63–4.64.
21(b)	1.87 m	B1	1.87	AO2. Accept 1.87–1.88. Follow through their angle work.
22(a)	400	M1 M1 A1	$60 \div 12 \times 80$ (or equivalent proportion); complete method; 400	AO3.
22(b)	Valid assumption	B1	e.g. the tagged fish mix evenly through the lake; no fish die, are born or leave between catches; the second catch is random	AO3. Accept any one sensible assumption.
23(a)	Conclusion shown	B1 B1	$3^3 - 4 \times 3 = 15 < 20$, so $x = 3$ gives too small a value; $4^3 - 4 \times 4 = 48 > 20$, so $x = 4$ gives too big a value	AO2. Both values with a sign-change conclusion.
23(b)	3.2	M1 A1	Trial between 3 and 4, e.g. $x = 3.2$ gives 19.968 (< 20) and $x = 3.3$ gives 22.737 (> 20); 3.2	AO2. A1 for 3.2 with trials shown on both sides.
24	Proof complete	M1 M1 A1	$2n$ and $2n + 2$ (two consecutive even numbers); product = $4n(n + 1)$; since $n(n + 1)$ is always even, the product is a multiple of 8, with concluding statement	AO2.
25(a)	67.0 cm^2	M1 A1	$(120 \div 360) \times \pi \times 8^2; 67.0$	AO1. Accept 67.02.
25(b)	32.8 cm	M1 A1	$(120 \div 360) \times 2 \times \pi \times 8 + 16$ (arc length plus two radii); 32.8	AO2. Accept 32.76.
26(a)	21 cm	M1 M1 A1	Midpoints $\times$ frequencies, e.g. $5 \times 4 + 15 \times 9 + 25 \times 12 + 35 \times 5 [= 630]; 630 \div 30; 21$	AO1. M1 for at least three correct products.
26(b)	$20 < h \leq 30$	B1	$20 < h \leq 30$	AO1.

Question	Answer	Mark	Mark scheme	Additional guidance
27	2.59 and -0.26	M1 M1 A1 A1	$x = [7 \pm \sqrt{49 + 24}] \div 6$ (quadratic formula); correct substitution $a = 3$, $b = -7$, $c = -2$; 2.59; -0.26	AO1. Award A1A1 for both correct to 2 dp; A1 for one correct.

Worked solutions

- Q1.** 10% of £240 = £24, so 5% = £12. 15% = £24 + £12 = £36. Answer: £36
- Q2.** After a 15% discount the price is 85% of the original. Original = $306 \div 0.85 = 360$. Answer: £360
- Q3.** 1 hour 30 minutes = 1.5 hours. Speed = $45 \div 1.5 = 30$. Answer: 30 km/h
- Q4.** 2.4 kg = 2400 g. Density = mass $\div$ volume = $2400 \div 300 = 8$. Answer: 8 g/cm³
- Q5.** $5x - 3 > 2x + 9 \rightarrow 5x - 2x > 9 + 3 \rightarrow 3x > 12 \rightarrow x > 4$. Answer: $x > 4$
- Q6.** The difference in the ratio is $5 - 4 = 1$ part, worth 72. Total parts = $5 + 4 = 9$. Total students = $9 \times 72 = 648$. Answer: 648
- Q7.** Multiplier for a 20% decrease = 0.8. After 2 years: $12000 \times 0.8^2 = 12000 \times 0.64 = 7680$. Answer: £7680
- Q8.** Length scale factor = $10 \div 4 = 2.5$. Area scale factor = $2.5^2 = 6.25$. Area of B = $20 \times 6.25 = 125$. Answer: 125 cm²
- Q9.** $p = 240$ to 2 sf $\rightarrow$ lower bound 235. $q = 36$ to 2 sf $\rightarrow$ upper bound 36.5 (we subtract, so use the upper bound of q). Lower bound of $p - q = 235 - 36.5 = 198.5$. Answer: 198.5
- Q10.** $\sin(35^\circ) = \text{opposite} \div \text{hypotenuse} = AC \div 12$. $AC = 12 \times \sin(35^\circ) = 12 \times 0.573576... = 6.8829...$ Answer: 6.88 cm
- Q11.** Volume = $\pi r^2 h = \pi \times 4^2 \times 10 = 160\pi = 502.654...$ Answer: 503 cm³
- Q12.** (a) $y = x^2 - 3x + 1$. When $x = 1$: $1 - 3 + 1 = -1$. When $x = 3$: $9 - 9 + 1 = 1$. (b) Plot $(-2, 11)$, $(-1, 5)$, $(0, 1)$, $(1, -1)$, $(2, -1)$, $(3, 1)$, $(4, 5)$ and join with a smooth curve.
- Q13.** $y = (x - 3)^2$ is the graph of $y = x^2$ translated 3 units to the right. Vertex moves from $(0, 0)$ to $(3, 0)$; the curve passes through $(0, 9)$, $(1, 4)$, $(2, 1)$, $(4, 1)$, $(5, 4)$.
- Q14.** (a) $4 \times 20 - 7 = 80 - 7 = 73$. (b) $4n - 7 = 121 \rightarrow 4n = 128 \rightarrow n = 32$. Since 32 is a positive integer, 121 is the 32nd term. Answer: yes.
- Q15.** In order: 18, 19, 21, 24, 24, 27, 28, 30, 32, 35, 35, 39, 41, 43 (14 values). (a) Median = mean of 7th and 8th values = $(28 + 30) \div 2 = 29$. Answer: 29 years. (b) Range = $43 - 18 = 25$. Answer: 25 years.
- Q16.** (a) A (multiples of 3): 3, 6, 9, 12. B (even): 2, 4, 6, 8, 10, 12. A only: {3, 9}; B only: {2, 4, 8, 10}; both: {6, 12}; outside both: {1, 5, 7, 11}. (b) $A \cap B' = \{3, 9\}$, so $P = 2/12 = 1/6$. Answer: 1/6
- Q17.** (a) $g(2) = 2^2 - 1 = 3$. $fg(2) = f(3) = 2 \times 3 + 5 = 11$. Answer: 11. (b) $gf(x) = g(f(x)) = (2x + 5)^2 - 1 = 4x^2 + 20x + 25 - 1 = 4x^2 + 20x + 24$. Answer: $4x^2 + 20x + 24$
- Q18.** (a) $(4 + \sqrt{2})(4 - \sqrt{2}) = 16 - 4\sqrt{2} + 4\sqrt{2} - 2 = 14$. Answer: 14. (b) $6/(2 + \sqrt{3}) = 6(2 - \sqrt{3})/((2 + \sqrt{3})(2 - \sqrt{3})) = 6(2 - \sqrt{3})/(4 - 3) = 6(2 - \sqrt{3}) = 12 - 6\sqrt{3}$. Answer: $12 - 6\sqrt{3}$

- Q19.** With compasses centred at A, draw two arcs above and below AB. Keeping the same radius and centring at B, draw two arcs crossing the first pair. Join the two crossing points with a straight line — this is the perpendicular bisector.
- Q20.** Length scale factor = $9 \div 6 = 1.5$. Volume scale factor = $1.5^3 = 3.375$. Volume of B = $54 \times 3.375 = 182.25$. Answer: 182.25 cm³
- Q21.** (a) Height = $5 \times \sin(68^\circ) = 5 \times 0.92718... = 4.6359...$ Answer: 4.64 m. (b) Distance = $5 \times \cos(68^\circ) = 5 \times 0.37460... = 1.8730...$ Answer: 1.87 m.
- Q22.** (a) Estimated total = (tagged in first catch $\times$ total in second catch) $\div$ tagged in second catch = $60 \times 80 \div 12 = 4800 \div 12 = 400$. Answer: 400 fish. (b) Any one sensible assumption, e.g. the tagged fish spread evenly through the lake; or no fish die, are born, or enter/leave between catches.
- Q23.** (a) At $x = 3$: $3^3 - 4 \times 3 = 27 - 12 = 15 < 20$, so the value is too small. At $x = 4$: $4^3 - 4 \times 4 = 64 - 16 = 48 > 20$, so the value is too big. The function is continuous, so there is a solution between 3 and 4. (b) $x = 3.2$: $3.2^3 - 4 \times 3.2 = 32.768 - 12.8 = 19.968 < 20$ (too small). $x = 3.3$: $3.3^3 - 4 \times 3.3 = 35.937 - 13.2 = 22.737 > 20$ (too big). The solution lies between 3.2 and 3.3, so to 1 decimal place $x = 3.2$.
- Q24.** Let the even numbers be $2n$ and $2n + 2$. Their product = $2n(2n + 2) = 4n(n + 1)$. Now n and $n + 1$ are consecutive integers, so one of them is even — write $n(n + 1) = 2k$. Then the product = $4 \times 2k = 8k$, a multiple of 8, as required.
- Q25.** (a) Area = $(120/360) \times \pi \times 8^2 = (1/3) \times 64\pi = 64\pi/3 = 67.0206...$ Answer: 67.0 cm². (b) Arc length = $(120/360) \times 2\pi \times 8 = 16\pi/3 = 16.755...$ Perimeter = $16.755... + 8 + 8 = 32.755...$ Answer: 32.8 cm.
- Q26.** (a) Midpoints: 5, 15, 25, 35. Total = $4 \times 5 + 9 \times 15 + 12 \times 25 + 5 \times 35 = 20 + 135 + 300 + 175 = 630$. Mean = $630 \div 30 = 21$. Answer: 21 cm. (b) The modal class is the one with the highest frequency: $20 < h \leq 30$.
- Q27.** Using the quadratic formula with $a = 3$, $b = -7$, $c = -2$: $x = [7 \pm \sqrt{(49 - 4 \times 3 \times (-2))}] \div 6 = [7 \pm \sqrt{73}] \div 6$. $\sqrt{73} = 8.54400...$ $x = (7 + 8.54400...) \div 6 = 2.59067...$ or $x = (7 - 8.54400...) \div 6 = -0.25733...$ Answers: $x = 2.59$ or $x = -0.26$ (to 2 decimal places).