

Mark Scheme

Summer 2027 (Predicted)

GCSE Mathematics 8300/2H

Higher Tier Paper 2 (Calculator)

This is an original mark scheme written for a predicted practice paper. PREDICTED PRACTICE PAPER — not an official AQA paper, not a past paper, and not endorsed by or affiliated with AQA. All questions are original.

For use with the Predicted Practice Paper 2 (Calculator) question paper.

General marking guidance

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

1 How this mark scheme works.

This mark scheme is written for a predicted practice paper. It awards M marks for a correct method or process, A marks for accuracy following a correct method, and B marks for a correct answer where no method is needed. The notes for each individual question take precedence over these general notes.

2 Mark positively.

All the marks on the mark scheme are designed to be awarded. Award zero only when the response is not worthy of credit. If the answer line is wrong or blank, always check the working in the body of the script and on any diagrams, and award any marks the working earns.

3 Working must be shown.

Questions that say “You must show your working”, “Show that...” or “Prove that...” earn no marks from the answer alone. In general, a correct answer with no working shown earns full marks only where the question does not require working.

4 Crossed out work.

Mark crossed out work unless the candidate has replaced it with an alternative response.

5 Choice of method.

If more than one method is shown, mark the method that leads to the answer on the answer line. If no answer appears on the answer line, mark each method and award the lower number of marks.

6 Incorrect method.

If it is clear from the working that a “correct” answer came from incorrect working, award 0 marks.

7 Follow through (ft).

Follow through marks let a candidate earn credit for a correct later step that uses their own earlier wrong value. Single-stage follow through can be awarded from the answer alone; multi-stage follow through needs the relevant working to be seen.

8 Ignoring subsequent work.

Ignore extra work that does not change a correct answer into an incorrect one (for example, an incorrectly cancelled fraction). Do not ignore extra work that makes the answer wrong (for example, incorrect algebraic simplification).

9 Probability.

Give probability answers as a fraction, percentage or decimal. A decimal equivalent should be written to at least 2 decimal places unless the question asks otherwise. Incorrect notation loses the accuracy mark but keeps any implied method marks.

10 Misread numbers.

If a candidate misreads a number from the question (for example, uses 252 instead of 255),

method marks may still be awarded provided the question has not been made easier.

11 Range of answers.

Where an answer is given as a range (for example, 54–57), the end points are inclusive.

12 Numbers in brackets.

Where the mark scheme shows a calculation followed by a number in brackets, for example $2 \times 6 (= 12)$, the mark can be awarded for the correct method implied by the calculation or for the correct answer to it.

13 Alternative methods.

Valid alternative methods not mentioned in the mark scheme should be given equivalent credit, following the same M/A/B principles.

14 Diagrams.

Diagrams are not drawn accurately unless the question says otherwise. Measurements taken from a diagram do not earn method marks unless the question asks for them.

Guidance on the use of abbreviations within this mark scheme

M	method mark awarded for a correct method or partial method
P	process mark awarded for a correct process as part of a problem solving question
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
C	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	$2^2 \times 3^2 \times 5$	M1 A1	for a complete factor tree or division ladder for 180 with at most one arithmetic error, or for 2, 2, 3, 3, 5 seen; for $2^2 \times 3^2 \times 5$	cao; accept $2 \times 2 \times 3 \times 3 \times 5$ for the M1 only

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
2	4 5/12	M1 A1	for a common denominator of 12, eg $32/12 + 21/12 (= 53/12)$; for 4 5/12	cao; accept 53/12 for the M1 only

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
3	(a) 5.2×10^{-4}	B1	5.2×10^{-4}	cao
	(b) 1×10^4	M1 A1	for 10×10^3 or $(4 \times 2.5) \times 10^{6+(-3)}$; for 1×10^4	cao; accept 10000 for the M1 only

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	£120	M1 M1 A1	for $96 \div 0.8$ or $96 \div 80 \times 100$; for a complete method; for £120	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	(a) $12.45 \leq l < 12.55$	B1	$12.45 \leq l < 12.55$ (l = length in cm)	Accept $12.45 < l \leq 12.55$ or $l = 12.5 \pm 0.05$
	(b) 106.0475 cm ²	M1 A1	for 12.55×8.45 ; for 106.0475	cao; ft their upper bounds from (a) for the M1

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	$3\sqrt{5}$	M1 A1	for $6\sqrt{5}$ or $3\sqrt{5}$ seen (correct simplification of at least one term); for $3\sqrt{5}$	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
7	£165	M1 M1 A1	for $7 - 4 = 3$ parts = £45; for $£45 \div 3 \times 11$; for £165	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
8	(a) 2	M1 A1	for $y = k/x^2$ and $k = 8 \times 3^2 (= 72)$; for 2	cao
	(b) 63	M1 A1	for $y = kx$ and $k = 35 \div 5 (= 7)$; for 63	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
9	$x = 6$	M1 M1 A1	for $2(3x + 2) + 2(x + 1) = 54$ or $8x + 6 = 54$; for a correct step to solve, eg $8x = 48$; for $x = 6$	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	$y = 3x + 1$	M1 M1 A1	for $(19 - 7) \div (6 - 2) (= 3)$; for substituting one point, eg $7 = 3 \times 2 + c$; for $y = 3x + 1$	cao; accept $3x - y + 1 = 0$

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
11	£6461.34	M1 A1	for 6000×1.025^3 ; for £6461.34	cao; the final answer must be correct to the nearest penny

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
12	72.8%	M1 M1 A1	for a multiplier of 1.2; for $1.2^3 (= 1.728)$; for 72.8%	cao; accept 72.8 with the % sign implied by the question

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	(a) 1.8	B1	1.8	cao (read from the histogram)
	(b) 2150 minutes	M1 A1	for using midpoints, eg $5 \times 8 + 15 \times 22 + 30 \times 36 + 50 \times 14$; for 2150	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
14	(a) 55.5 minutes	B1	awrt 55.5	Accept 54-57
	(b) 15	M1 A1	for reading the cumulative frequency at 45 minutes from the graph; for 15	Accept 13-17

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	$x = 2.91$ and $x = -0.57$	M1 A1 A1	for correct substitution into the quadratic formula, eg $(7 \pm \sqrt{(49 + 60)}) / 6$; for one correct value to 2 dp; for both correct to 2 dp	Accept 2.9067... and $-0.5733...$ unrounded for the first A1

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	(a) $2/15$	B1	$2/15$	Accept $4/30$ or $0.133...$
	(b) $8/15$	B1	$8/15$	Accept $0.533...$

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	45.1°	M1 M1 A1	for $\sin(\text{angle ABC}) = 8.5/12$; for angle $\text{ABC} = \sin^{-1}(8.5/12)$; for 45.1°	awrt 45.1° ; accept $45.09...$ unrounded

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	55° , angle at the centre is twice the angle at the circumference	M1 A1	for $110 \div 2$; for 55° with a correct reason stated	The reason must be stated for the A1; accept 'the angle subtended by the same chord at the centre is twice the angle at the circumference'

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	$x = 4, y = 7$ and $x = -7, y = -4$	M1 M1 A1 A1	for substituting $y = x + 3$ into $x^2 + y^2 = 65$; for $2x^2 + 6x - 56 = 0$ oe; for $x = 4$ and $x = -7$; for $y = 7$ and $y = -4$ (each y matched to its x)	Each correct (x, y) pair may earn one of the A marks if clearly matched

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	0.7	M1 A1 A1	for attempting the iteration, eg $x_1 = 0.75$; for $x_3 = 0.6639$ (awrt); for 0.7	The final A1 is dep on a correct x_3

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
21	$x = (4y + 1)/(y - 3)$	M1 M1 A1	for $y(x - 4) = 3x + 1$; for collecting the x terms, eg $xy - 3x = 4y + 1$; for $x = (4y + 1)/(y - 3)$	cao; accept equivalent forms, eg $x = (1 + 4y)/(y - 3)$

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	$2n^2 + n + 2$	M1 M1 A1	for a second difference of 4 (so a $2n^2$ term); for comparing with $2n^2$ to find the linear and constant parts; for $2n^2 + n + 2$	cao

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
23	(a) $4/3$	B1	$4/3$	Accept 1.333...
	(b) $3x + 4y = 25$ oe	M1 A1	for a gradient of $-3/4$ (negative reciprocal of $4/3$); for $3x + 4y = 25$ oe	Accept $y = -3/4 x + 25/4$

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
24	(a) $(2/3)b - a$	B1	$(2/3)b - a$	Accept $-a + (2/3)b$
	(b) $(1/4)a + (1/2)b$ oe	M1 M1 M1 A1	for $OP = a + t((2/3)b - a)$ oe (parameter on AN); for $OP = b + s((1/2)a - b)$ oe (parameter on BM); for equating coefficients and solving, eg $s = 1/2$, $t = 3/4$; for $(1/4)a + (1/2)b$ oe	Accept $(a + 2b)/4$

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
25	$12n$ with concluding statement	M1 M1 A1	for expanding $(n + 3)^2 = n^2 + 6n + 9$; for expanding $(n - 3)^2$ and subtracting to get $12n$; for $12n = 12 \times n$ with a concluding statement that it is a multiple of 12	The final A1 is dep on a correct concluding statement

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
26	88.3°	M1 M1 A1	for the cosine rule, eg $\cos(XYZ) = (9^2 + 11^2 - 14^2)/(2 \times 9 \times 11)$; for substituting the values; for 88.3°	awrt 88.3° ; accept $88.26...^\circ$ unrounded

Paper: 8300/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
27	9	M1 M1 M1 A1	for $(4/n) \times (3/(n - 1))$; for equating to $1/6$; for $n^2 - n - 72 = 0$ oe and solving; for $n = 9$ (reject $n = -8$)	The final A1 requires rejecting the negative root or stating $n = 9$ only

Worked solutions

- Q1.** $180 = 18 \times 10 = (2 \times 3^2) \times (2 \times 5) = 2^2 \times 3^2 \times 5$. Answer: $2^2 \times 3^2 \times 5$
- Q2.** $2 \frac{2}{3} = \frac{8}{3} = \frac{32}{12}$; $1 \frac{3}{4} = \frac{7}{4} = \frac{21}{12}$. Sum = $\frac{53}{12} = 4 \frac{5}{12}$. Answer: $4 \frac{5}{12}$
- Q3.** (a) $0.00052 = 5.2 \times 10^{-4}$. (b) $(4 \times 2.5) \times 10^{6+(-3)} = 10 \times 10^3 = 1 \times 10^4$.
- Q4.** 80% of the original price = £96. Original = $96 \div 0.8 = \text{£}120$. Check: 20% of £120 = £24; $\text{£}120 - \text{£}24 = \text{£}96$. Answer: £120
- Q5.** (a) 12.5 cm to the nearest 0.1 cm: $12.45 \leq \text{length} < 12.55$. (b) Greatest area = $12.55 \times 8.45 = 106.0475 \text{ cm}^2$.
- Q6.** $\sqrt{20} = \sqrt{(4 \times 5)} = 2\sqrt{5}$, so $3\sqrt{20} = 6\sqrt{5}$. $\sqrt{45} = \sqrt{(9 \times 5)} = 3\sqrt{5}$. $6\sqrt{5} - 3\sqrt{5} = 3\sqrt{5}$. Answer: $3\sqrt{5}$
- Q7.** Ratio 4 : 7, difference = 3 parts = £45, so 1 part = £15. Total = $11 \times \text{£}15 = \text{£}165$. Answer: £165
- Q8.** (a) $y = k/x^2$; $8 = k/9$ gives $k = 72$. When $x = 6$: $y = 72/36 = 2$. (b) $y = kx$; $35 = 5k$ gives $k = 7$. When $x = 9$: $y = 63$.
- Q9.** Perimeter = $2(3x + 2) + 2(x + 1) = 54 \rightarrow 8x + 6 = 54 \rightarrow 8x = 48 \rightarrow x = 6$. Answer: $x = 6$
- Q10.** Gradient = $(19 - 7)/(6 - 2) = 12/4 = 3$. Using (2, 7): $7 = 3 \times 2 + c \rightarrow c = 1$. Answer: $y = 3x + 1$
- Q11.** $6000 \times 1.025^3 = 6000 \times 1.076890625 = 6461.34375 \rightarrow \text{£}6461.34$. Answer: £6461.34
- Q12.** $y = kx^3$. New $x = 1.2x$, so new $y = k(1.2x)^3 = 1.728kx^3 = 1.728y$. Increase = 72.8%. Answer: 72.8%
- Q13.** (a) The bar for $20 < t \leq 40$ has height 1.8 on the frequency-density axis. (b) Midpoints 5, 15, 30, 50: $5 \times 8 + 15 \times 22 + 30 \times 36 + 50 \times 14 = 40 + 330 + 1080 + 700 = 2150$ minutes.
- Q14.** (a) Cumulative frequency of 40 (half of 80) corresponds to about 55.5 minutes. (b) At 45 minutes the cumulative frequency is about 15.
- Q15.** $x = [7 \pm \sqrt{(49 + 60)}]/6 = (7 \pm \sqrt{109})/6$. $\sqrt{109} \approx 10.4403$. $x = (7 + 10.4403)/6 \approx 2.9067 \rightarrow 2.91$; $x = (7 - 10.4403)/6 \approx -0.5734 \rightarrow -0.57$. Answers: $x = 2.91$ and $x = -0.57$
- Q16.** (a) Football only = 4 students; $P = 4/30 = 2/15$. (b) 15 students play tennis, of whom 8 also play football; $P = 8/15$.
- Q17.** $\sin(\text{angle } ABC) = \text{opposite/hypotenuse} = 8.5/12 = 0.70833\dots$ angle $ABC = \sin^{-1}(0.70833\dots) = 45.0996\dots^\circ \rightarrow 45.1^\circ$. Answer: 45.1°
- Q18.** The angle at the centre is twice the angle at the circumference (same chord AB). angle $ACB = 110^\circ \div 2 = 55^\circ$. Answer: 55°
- Q19.** Substitute $y = x + 3$: $x^2 + (x + 3)^2 = 65 \rightarrow 2x^2 + 6x + 9 = 65 \rightarrow 2x^2 + 6x - 56 = 0 \rightarrow x^2 + 3x - 28 = 0 \rightarrow (x + 7)(x - 4) = 0$. $x = 4$ gives $y = 7$; $x = -7$ gives $y = -4$. Check: $16 + 49 = 65$; $49 + 16 = 65$. Answers: $x = 4, y = 7$ and $x = -7, y = -4$

- Q20.** $x_0 = 1$. $x_1 = (1^3 + 5)/8 = 6/8 = 0.75$. $x_2 = (0.75^3 + 5)/8 = (0.421875 + 5)/8 = 0.677734375$. $x_3 = (0.677734375^3 + 5)/8 = 0.6639124... \rightarrow 0.7$ (1 dp). Answer: 0.7
- Q21.** $y = (3x + 1)/(x - 4) \rightarrow y(x - 4) = 3x + 1 \rightarrow xy - 4y = 3x + 1 \rightarrow xy - 3x = 4y + 1 \rightarrow x(y - 3) = 4y + 1 \rightarrow x = (4y + 1)/(y - 3)$. Answer: $x = (4y + 1)/(y - 3)$
- Q22.** Differences: 7, 11, 15; second difference 4, so the n th term begins $2n^2$. $2n^2$ gives 2, 8, 18, 32; subtracting from the sequence leaves 3, 4, 5, 6 = $n + 2$. Answer: $2n^2 + n + 2$
- Q23.** (a) Gradient of OP = $(4 - 0)/(3 - 0) = 4/3$. (b) The tangent is perpendicular to the radius, so its gradient is $-3/4$. $y - 4 = -3/4(x - 3) \rightarrow 4y - 16 = -3x + 9 \rightarrow 3x + 4y = 25$.
- Q24.** (a) N is at $(2/3)b$ (since ON:NB = 2:1). AN = ON - OA = $(2/3)b - a$. (b) Let P divide AN with $OP = a + t \cdot AN = (1 - t)a + (2t/3)b$, and divide BM with $OP = b + s \cdot BM = (s/2)a + (1 - s)b$. Equating coefficients of a and b: $1 - t = s/2$ and $2t/3 = 1 - s$. Solving: $s = 1/2$, $t = 3/4$. Hence $OP = (1/4)a + (1/2)b = (a + 2b)/4$.
- Q25.** $(n + 3)^2 = n^2 + 6n + 9$. $(n - 3)^2 = n^2 - 6n + 9$. Difference = $(n^2 + 6n + 9) - (n^2 - 6n + 9) = 12n = 12 \times n$, which is a multiple of 12 for every integer n .
- Q26.** $\cos(\text{angle XYZ}) = (9^2 + 11^2 - 14^2)/(2 \times 9 \times 11) = (81 + 121 - 196)/198 = 6/198 = 1/33$. $\text{angle XYZ} = \cos^{-1}(1/33) = 88.2639...^\circ \rightarrow 88.3^\circ$. Answer: 88.3°
- Q27.** Let there be n counters in total. $P(\text{both red}) = (4/n) \times (3/(n - 1)) = 12/(n(n - 1)) = 1/6$. So $n(n - 1) = 72 \rightarrow n^2 - n - 72 = 0 \rightarrow (n - 9)(n + 8) = 0 \rightarrow n = 9$ ($n = -8$ impossible). Check: $(4/9) \times (3/8) = 12/72 = 1/6$. Answer: 9 counters