

Mark Scheme

Summer 2027 (Predicted)

GCSE Mathematics (AQA-style 8300)

Higher (Calculator) Paper 3

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

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.

Examiners must mark the last candidate in exactly the same way as they mark the first. Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review. Questions where working is not required: in general, the correct answer should be given full marks. Questions that specifically require working: in general, candidates who do not show working on this type of question will get no marks — full details will be given in the mark scheme for each individual question.

2 All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively.

Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no 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.

3 Crossed out work.

This should be marked unless the candidate has replaced it with an alternative response.

4 Choice of method.

If there is a choice of methods shown, mark the method that leads to the answer given on the answer line. If no answer appears on the answer line, mark both methods then award the lower number of marks.

5 Incorrect method.

If it is clear from the working that the “correct” answer has been obtained from incorrect working, award 0 marks.

6 Follow through marks.

Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award. Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 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 or its context. (eg. an incorrectly cancelled fraction when the unsimplified fraction would gain full marks). It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

8 Probability.

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives

a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths). Incorrect notation should lose the accuracy marks, but be awarded any implied method marks. If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

9 Linear equations.

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

10 Range of answers.

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and all numbers within the range.

11 Number in brackets after a calculation.

Where there is a number in brackets after a calculation E.g. $2 \times 6 (=12)$ then the mark can be awarded either for the correct method, implied by the calculation or for the correct answer to the calculation.

12 Use of inverted commas.

Some numbers in the mark scheme will appear inside inverted commas E.g. “12” $\times$ 50; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

13 Word in square brackets.

Where a word is used in square brackets E.g. [area] $\times$ 1.5 : the value used for [area] does not have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

14 Misread.

If a candidate misreads a number from the question. Eg. uses 252 instead of 255; method or process marks may be awarded provided the question has not been simplified.

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: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	(a) $2^3 \times 3^2$	M1 A1	for a complete factor tree or ladder for 72 with no more than one arithmetic error, or for the prime factors of 72 (2, 2, 2, 3, 3); for $2^3 \times 3^2$	cao; accept $2 \times 2 \times 2 \times 3 \times 3$
	(b) 24	B1	24	cao

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
2	£27	M1 A1	for 25×1.08 oe, eg 8% of 25 (= 2) seen; for £27	cao; accept 27

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
3	40°	M1 A1	for $360 \div 9$; for 40°	cao; accept 40

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	£80, £100	M1 A1	for $180 \div (4 + 5)$ (= 20); for £80 and £100	cao; order not required

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	(a) completed Venn diagram	M1 A1	for at least 8 of the 12 numbers placed correctly; for all 12 placed correctly (A only: 1, 3; both: 2, 4, 6, 12; B only: 8, 10; outside: 5, 7, 9, 11)	allow clear labelling
	(b) $1/3$	B1	$1/3$ oe	cao; accept $4/12$

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6	(a) 4.5×10^{-5}	B1	4.5×10^{-5}	cao
	(b) 1.2×10^8	M1 A1	for $(3 \times 4) \times 10^{5+2}$ (= 12×10^7) or 1.2×10^8 seen; for 1.2×10^8	cao; accept 120000000

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
7	$5n + 2$	M1 A1	for $5n$ seen (common difference 5); for $5n + 2$	cao

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
8	(a) 3	B1	3	cao
	(b) $y = 3x + 5$	B1	$y = 3x + 5$ oe	cao; accept $3x - y + 5 = 0$ oe

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
9	2 11/12	M1 M1 A1	for 7/3 or 35/12 seen; for $7/3 \times 5/4$ oe; for 2 11/12	cao

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
10	(a) 2.45 m	B1	2.45	cao; accept 2.45 m
	(b) 19.6 m	M1 A1	for their (a) $\times 8$; for 19.6	ft their (a) for the M1; cao for the A1

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
11	£4307.56	M1 M1 A1	for a multiplier of 1.025; for 4000×1.025^3 ; for £4307.56	cao; accept 4307.5625 rounded

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
12	Amara	M1 M1 A1	for a process to find one speed, eg $18 \div 0.75 (= 24)$ or $24 \div (70/60)$; for both speeds 24 and 20.6 (km/h); for Amara with correct supporting working	A correct answer with no supportive working gets 0 marks

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	13.0 cm	M1 M1 A1	for $\cos 52^\circ = 8/AB$ oe; for $AB = 8 \div \cos 52^\circ$; for 13.0	awrt 13.0; accept 12.99–13.0

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
14	(a) completed histogram	M1 A1	for one correct frequency density, eg $40 \div 10 = 4.0$; for all three missing bars correct (4.0, 1.8, 0.2)	condone small inaccuracies in bar heights
	(b) 13	B1	13	cao; ft their frequency density for the 30–50 class

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	$x = 5, y = 2$	M1 A1 A1	for a correct process to eliminate one variable, eg adding the equations ($4x = 20$); for $x = 5$; for $y = 2$	cao

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	(a) 35	B1	35	cao
	(b) 8	M1 A1	for $z = k/w^2$ with $k = 72$, eg $18 = k/4$; for 8	cao

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	$8 \frac{1}{9}$	M1 M1 A1	for $16^{(3/4)} = 8$ or $27^{(-2/3)} = 1/9$; for both 8 and $1/9$ seen; for $8 \frac{1}{9}$	cao; accept $73/9$

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	(a) $3\sqrt{5}$	M1 A1	for $\sqrt{20} = 2\sqrt{5}$ and $\sqrt{45} = 3\sqrt{5}$; for $3\sqrt{5}$	cao
	(b) $2\sqrt{3}$	M1	for multiplying top and bottom by $\sqrt{3}$, eg $6\sqrt{3}/3$	cao

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	12.8 cm	M1 M1 A1	for $DF/\sin 75^\circ = 12/\sin 65^\circ$ oe; for $DF = 12 \times \sin 75^\circ \div \sin 65^\circ$; for 12.8	awrt 12.8; accept 12.78–12.80

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	(a) 90° , angle in a semicircle	M1 A1	for identifying the angle in a semicircle; for 90° with the reason stated	The reason must be stated for the A1
	(b) 58°	B1	58°	cao

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

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	(a) $x^2 + 4x - 53 = 0$	M1 A1	for $(x + 5)(x - 1) = 48$; for $x^2 + 4x - 53 = 0$ with no errors	A correct answer with no working gets 0 marks
	(b) 5.55 and -9.55	M1 A1	for a correct substitution into the quadratic formula, eg $(-4 \pm \sqrt{(16 + 212)})/2$; for both answers correct to 3 s.f.	awrt; accept 5.549-5.550 and -9.549--9.550

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
23	(a) $(x + 4)^2 - 13$	M1 A1	for $(x + 4)^2$ seen; for $(x + 4)^2 - 13$	cao
	(b) $(-4, -13)$	B1	$(-4, -13)$	cao; ft their (a)

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
24	(a) 6, 20, 42, 54, 60	B1	6, 20, 42, 54, 60	cao
	(b) cumulative frequency graph	M1 A1	for at least 4 points plotted correctly at class boundaries (10, 6), (20, 20), (30, 42), (40, 54), (50, 60); for a smooth curve or line segments through all 5 points	condone a curve drawn through the points
	(c) 24-25 cm	B1	an estimate in the range 24-25 cm	ft their graph

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
25	(a) $\frac{1}{2}a$	B1	$\frac{1}{2}a$ oe	cao
	(b) $\frac{1}{2}(b - a)$	M1 A1	for $CD = OD - OC$ oe; for $\frac{1}{2}(b - a)$ oe	cao; accept $\frac{1}{2}b - \frac{1}{2}a$
	(c) $CD = \frac{1}{2}AB$	B1	$CD = \frac{1}{2}AB$ (so CD is parallel to AB)	ft their (b); the conclusion of parallelism must be stated

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
26	proof	M1 M1 A1	for $2n$ and $2n + 2$ (or $2n - 2$ and $2n$); for a product of $4n(n + 1)$ oe; for $8k$ with a concluding statement that $n(n + 1)$ is always even	The final A1 is dep on a correct concluding statement

Paper: 8300/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
27	(a) $gf(x) = 4x^2 - 12x + 10$	M1 A1	for $(2x - 3)^2 + 1$; for $4x^2 - 12x + 10$ with no errors	A correct answer with no working gets 0 marks
	(b) $x = 4$, $x = -1$	M1 A1	for $4x^2 - 12x - 16 = 0$ oe; for $x = 4$ and $x = -1$	cao

Worked solutions

- Q1.** (a) $72 = 8 \times 9 = 2^3 \times 3^2$. (b) Multiples of 8: 8, 16, 24, ...; multiples of 12: 12, 24, ... LCM = 24.
- Q2.** 8% of £25 = £2. New price = £25 + £2 = £27. (Or $25 \times 1.08 = 27$.)
- Q3.** Exterior angles of any polygon sum to 360° . $360 \div 9 = 40^\circ$.
- Q4.** $4 + 5 = 9$ parts. $\text{£}180 \div 9 = \text{£}20$ per part. Priya: $4 \times \text{£}20 = \text{£}80$; Sam: $5 \times \text{£}20 = \text{£}100$.
- Q5.** (a) Factors of 12: 1, 2, 3, 4, 6, 12. Even numbers: 2, 4, 6, 8, 10, 12. Both: 2, 4, 6, 12. A only: 1, 3. B only: 8, 10. Outside: 5, 7, 9, 11. (b) 4 of the 12 numbers are in both A and B: $P = 4/12 = 1/3$.
- Q6.** (a) $0.000045 = 4.5 \times 10^{-5}$. (b) $(3 \times 10^5) \times (4 \times 10^2) = 12 \times 10^7 = 1.2 \times 10^8$.
- Q7.** Differences: 5, 5, 5, 5 — common difference 5, so the n th term starts $5n$. $5n$ gives 5, 10, 15, 20, 25; the sequence is 2 more each time: $5n + 2$.
- Q8.** (a) In $y = mx + c$ the gradient is m , so gradient = 3. (b) Parallel lines share the gradient 3; through (0, 5) the intercept is 5: $y = 3x + 5$.
- Q9.** $2\frac{1}{3} = 7/3$. $7/3 \div 4/5 = 7/3 \times 5/4 = 35/12 = 2\frac{11}{12}$.
- Q10.** (a) 2.4 to the nearest 0.1 $\rightarrow$ upper bound 2.45 m. (b) Greatest total = $8 \times 2.45 = 19.6$ m.
- Q11.** Multiplier = 1.025. After 3 years: $4000 \times 1.025^3 = 4000 \times 1.076890625 = 4307.5625$. Answer: £4307.56.
- Q12.** Amara: 45 min = 0.75 h; $18 \div 0.75 = 24$ km/h. Ben: 70 min = 70/60 h; $24 \div (70/60) = 24 \times 60/70 \approx 20.6$ km/h. $24 > 20.6$, so Amara cycles faster.
- Q13.** $\cos(52^\circ) = \text{adjacent/hypotenuse} = 8/AB$. $AB = 8 \div \cos 52^\circ = 8 \div 0.61566... = 12.994... \approx 13.0$ cm (3 s.f.).
- Q14.** (a) Frequency density = frequency $\div$ class width: $12/10 = 1.2$; $28/10 = 2.8$; $40/10 = 4.0$; $36/20 = 1.8$; $4/20 = 0.2$. Draw bars of these heights. (b) More than 45 min: $(50 - 45) \times 1.8 = 9$ from the 30–50 class, plus 4 from the 50–70 class: 13 students.
- Q15.** Add the equations (the $2y$ terms cancel): $4x = 20 \rightarrow x = 5$. Substitute into $x - 2y = 1$: $5 - 2y = 1 \rightarrow 2y = 4 \rightarrow y = 2$. Check: $3(5) + 2(2) = 19$. Answer: $x = 5$, $y = 2$.
- Q16.** (a) $y = kx$; $20 = 4k \rightarrow k = 5$. When $x = 7$: $y = 5 \times 7 = 35$. (b) $z = k/w^2$; $18 = k/4 \rightarrow k = 72$. When $w = 3$: $z = 72/9 = 8$.
- Q17.** $16^{(3/4)} = (4\sqrt{16})^3 = 2^3 = 8$. $27^{(-2/3)} = 1/(3\sqrt{27})^2 = 1/9$. Sum = $8 + 1/9 = 8\frac{1}{9}$.
- Q18.** (a) $\sqrt{20} = 2\sqrt{5}$ and $\sqrt{45} = 3\sqrt{5}$, so $3\sqrt{20} - \sqrt{45} = 6\sqrt{5} - 3\sqrt{5} = 3\sqrt{5}$. (b) $6/\sqrt{3} = (6\sqrt{3})/(\sqrt{3} \times \sqrt{3}) = 6\sqrt{3}/3 = 2\sqrt{3}$.
- Q19.** Angle F = $180 - 40 - 75 = 65^\circ$. Sine rule: $DF/\sin 75^\circ = 12/\sin 65^\circ$. $DF = 12 \times \sin 75^\circ \div \sin 65^\circ = 12 \times 0.96593 \div 0.90631 = 12.789... \approx 12.8$ cm (3 s.f.).
- Q20.** (a) PQ is a diameter, so angle PRQ is an angle in a semicircle = 90° . (b) Angles in a triangle sum to 180° : angle PQR = $180 - 90 - 32 = 58^\circ$.

- Q21.** $y = (3x + 1)/(x - 2) \rightarrow y(x - 2) = 3x + 1 \rightarrow xy - 2y = 3x + 1 \rightarrow xy - 3x = 2y + 1 \rightarrow x(y - 3) = 2y + 1 \rightarrow x = (2y + 1)/(y - 3)$.
- Q22.** (a) Area = $(x + 5)(x - 1) = 48$. Expanding: $x^2 - x + 5x - 5 = 48 \rightarrow x^2 + 4x - 5 = 48 \rightarrow x^2 + 4x - 53 = 0$. (b) $x = [-4 \pm \sqrt{(16 + 212)}]/2 = -2 \pm \sqrt{57}$. $\sqrt{57} \approx 7.5498$, so $x \approx 5.55$ or $x \approx -9.55$ (3 s.f.).
- Q23.** (a) $x^2 + 8x + 3 = (x + 4)^2 - 16 + 3 = (x + 4)^2 - 13$. (b) The turning point is at $(-4, -13)$.
- Q24.** (a) Cumulative frequencies: 6, $6 + 14 = 20$, $20 + 22 = 42$, $42 + 12 = 54$, $54 + 6 = 60$. (b) Plot (10, 6), (20, 20), (30, 42), (40, 54), (50, 60) and join with a smooth curve. (c) Median = 30th value $\rightarrow$ read across at cumulative frequency 30 $\rightarrow \approx 24.5$ cm (accept 24-25).
- Q25.** (a) C is the midpoint of OA, so $OC = \frac{1}{2}a$. (b) $CD = OD - OC = \frac{1}{2}b - \frac{1}{2}a = \frac{1}{2}(b - a)$. (c) $AB = OB - OA = b - a$, so $CD = \frac{1}{2}AB$ — CD is parallel to AB and half its length.
- Q26.** Let the even numbers be $2n$ and $2n + 2$. Their product = $2n(2n + 2) = 4n^2 + 4n = 4n(n + 1)$. Now $n(n + 1)$ is the product of two consecutive integers, so one of them is even — write $n(n + 1) = 2k$ for some integer k . Then the product = $4 \times 2k = 8k$, which is a multiple of 8. QED.
- Q27.** (a) $gf(x) = g(f(x)) = (2x - 3)^2 + 1 = 4x^2 - 12x + 9 + 1 = 4x^2 - 12x + 10$. (b) $4x^2 - 12x + 10 = 26 \rightarrow 4x^2 - 12x - 16 = 0 \rightarrow x^2 - 3x - 4 = 0 \rightarrow (x - 4)(x + 1) = 0 \rightarrow x = 4$ or $x = -1$.