

Mark Scheme

AQA Higher Mock Set A Paper 2

For AQA GCSE Mathematics (8300)

Higher tier • Paper 2 (Calculator)

Total 80 marks

Key to the marks

M	Method mark: for a correct method that could lead to the correct answer.
A	Accuracy mark: for a correct value or answer that follows from a correct method. The method may be implied.
B	Independent mark: for a correct answer or statement; no method needs to be seen.
Q	Quality mark: for a clear, complete and correct explanation or conclusion.
ft	Follow through: credit correct work that uses a wrong value from an earlier step.
dep	Dependent: can only be given if the mark before it has been given.
SC	Special case: credit for a common misreading that still has some mathematical worth.
oe	Or equivalent: accept any equal value or form, e.g. 0.5 for $\frac{1}{2}$.
cao	Correct answer only.
$[a, b]$	Accept any value from a to b inclusive.
3.14 ...	Accept any answer that begins 3.14, e.g. 3.14, 3.142, 3.1416.
()	Working in brackets does not need to be seen.

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)	219	191	164	130	96	62	45
This paper alone, rough guide (out of 80)	73	64	55	43	32	21	15

Indicative only. Based on the real AQA 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)	$2^2 \times 3^3 \times 7$	M1	correct method to find prime factors, e.g. factor tree or repeated division with at most one error, or 2, 2, 3, 3, 3, 7 seen
		A1	$2^2 \times 3^3 \times 7$ oe in index form <i>Additional guidance:</i> Factors may be in any order. Accept 7^1 . $2 \times 2 \times 3 \times 3 \times 3 \times 7$ scores M1A0. $2^2, 3^3, 7$ (as a list) scores M1A0.
1(b)	7560 (or $2^3 \times 3^3 \times 5 \times 7$)	B1	7560 or $2^3 \times 3^3 \times 5 \times 7$ oe <i>Additional guidance:</i> 108 or $2^2 \times 3^2$ (the HCF) is B0.
Total for Question 1: 3 marks			
2	$y = 2 + 3x$	B1	$y = 2 + 3x$
3(a)	3.549150699	B1	3.549150 ... (at least 3.54915) <i>Additional guidance:</i> Accept 3.549150699 or 3.5491507 or more figures that are correct, e.g. 3.5491506987
3(b)	3.55	B1ft	3.55 ft their answer to (a) with more than 3 significant figures
Total for Question 3: 2 marks			
4	No: her percentage profit is 40%	M1	$\frac{203 - 145}{145} (\times 100)$ or $\frac{58}{145}$ or $203 \div 145$ or 1.4 oe
		A1	No and 40(%) oe <i>Additional guidance:</i> Accept No with 140% and 40% profit stated. No with only "she divided by 203" (no correct value) scores M0A0. Yes with $\frac{58}{203} \times 100 = 28.6$ scores M0A0.
5	100 people leaving the library on a Saturday morning	B1	100 people leaving the library on a Saturday morning
6	£385	M1	$100 - 12$ or 88 or 0.88 seen
		M1dep	$338.80 \div 0.88$ or $338.80 \div 88 (\times 100)$ oe
		A1	385 or 385.00 <i>Additional guidance:</i> $338.80 \times 1.12 = 379.456$ (or 379.46) scores M0. $338.80 \div 0.88$ alone scores M2.
7(a)	46.25 minutes	M1	at least four correct midpoints $\times$ frequencies, e.g. 10×7 , 30×12 , 50×11 , 75×6 , 105×4 , or 1850
		M1dep	their $1850 \div 40$
		A1	46.25 (accept 46.3 or 46 with correct working)

(continued)

Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Using upper class bounds ($2200 \div 40 = 55$) or lower class bounds ($1500 \div 40 = 37.5$) scores M0M0. $1850 \div 5 = 370$ scores M1M0.
7(b)	No: the other 36 episodes could be shorter than their class midpoints, so the actual mean could still be less than the estimate.	B1	No with a valid reason, e.g. the lengths in the other classes are not known or the other episodes could be shorter than their midpoints oe <i>Additional guidance:</i> Accept “you cannot tell” with the same reason. Do not accept “No, it is only an estimate” or “No, the data is grouped” on its own. Yes scores B0.
Total for Question 7: 4 marks			
8	Account B, by £11.76	M1	$6000 \times 0.036 \times 5$ or 1080 or 7080
		M1	6000×1.034^5 oe
		A1	[7091.75, 7091.76] or interest [1091.75, 1091.76]
		A1	B and [11.75, 11.76]
			<i>Additional guidance:</i> Year-by-year build-up for B is acceptable for the second M1 if complete and correct to the nearest penny each year (6204, 6414.94, 6633.05, 6858.57, 7091.76). Using simple interest for both (7020 for B) scores M1 only. Final A1 needs both the account and the difference; condone 11.8 if 7091.75 or 7091.76 is seen.
9	$-2x^3 + x^2 + 27x - 36$	M1	two brackets expanded correctly, e.g. $2x^2 + 5x - 12$ or $-x^2 - x + 12$ or $-2x^2 + 9x - 9$
		M1dep	their 3-term quadratic multiplied by the third bracket, giving six terms with at least four correct (ft)
		A1	$-2x^3 + x^2 + 27x - 36$ <i>Additional guidance:</i> Terms may be in any order. $2x^3 - x^2 - 27x + 36$ (every sign wrong, from using $(x - 3)$ instead of $(3 - x)$) scores M1M0A0. Ignore further incorrect working (e.g. attempting to solve) after the correct answer is seen.
10(a)	£33.50	M1	$225 \div 5 \times 8$ or 360 oe
		M1	their $360 \div 16 \times 148.9$ or 22.5×148.9 or 3350(.25)

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Q	Answer	Marks	Guidance
		A1	33.50 (accept 33.5) <i>Additional guidance:</i> 3350.25 or 3350 given as the answer (pence) scores M1M1A0. $225 \times 5 \div 8 = 140.625$ km is M0 but the second M1 can be scored for their $\text{km} \div 16 \times 148.9$.
10(b)	It is more than the answer to part (a)	B1	It is more than the answer to part (a)
Total for Question 10: 4 marks			
11	31.7°	M1	$\cos 32 = \frac{8.5}{AC}$ or $AC = \frac{8.5}{\cos 32}$ oe
		A1	$AC = [10.02, 10.03]$
		M1	$\tan x = \frac{6.2}{\text{their } AC}$ oe
		A1	[31.7, 31.8] <i>Additional guidance:</i> Alternative for AC: $BC = 8.5 \tan 32 (= 5.311 \dots)$ then $AC = \sqrt{8.5^2 + BC^2}$ scores M1A1 when AC is correct. $AD = \sqrt{AC^2 + 6.2^2} (= 11.785 \dots)$ followed by $\sin x = 6.2 \div AD$ or $\cos x = AC \div AD$ is a valid method for the second M1. Condone $AC = 10$ used for the second M1.
12(a)	8.32 g/cm ³	M1	$210 \div 8.96$ and $90 \div 7.13$ or [23.4, 23.44] and [12.6, 12.63] or total volume [36, 36.1]
		A1	[8.31, 8.32] <i>Additional guidance:</i> $300 \div (210 \div 8.96 + 90 \div 7.13)$ seen implies M1. $(210 \times 8.96 + 90 \times 7.13) \div 300 = 8.411$ (a weighted mean of the densities) scores MOA0. $(8.96 + 7.13) \div 2 = 8.045$ scores MOA0.
12(b)	The volumes of copper and zinc are not equal: there is more copper, so the density is closer to 8.96.	B1	valid reason, e.g. the amounts (masses or volumes) of the two metals are not equal or there is more copper than zinc or density = total mass $\div$ total volume <i>Additional guidance:</i> Do not accept “because the answer to (a) is not 8.045” with no reason.
Total for Question 12: 3 marks			
13	$x = 3.09$ and $x = -0.76$	M1	$3x^2 - 7x - 7 (= 0)$ oe
		M1	$\frac{7 \pm \sqrt{(-7)^2 - 4 \times 3 \times -7}}{2 \times 3}$ oe, ft their 3-term quadratic

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Q	Answer	Marks	Guidance
		A1	3.09 and –0.76 <i>Additional guidance:</i> Correct answers with no working score 3 marks. Accept 3.088 ... and –0.755 ... for M1M1 but A0 unless rounded correctly. Completing the square is acceptable for the second M1: $\left(x - \frac{7}{6}\right)^2 = \frac{133}{36}$ oe.
14	Yes: $155 \div 9.55 = 16.23 \dots$, which is more than 16.1	B1	155 or 9.55 seen
		M1	$155 \div 9.55$ or (upper bound of distance) $\div$ (lower bound of time), where UB > 150 and LB < 9.6
		A1	16.2(3 ...) and Yes <i>Additional guidance:</i> $155 \div 9.65 = 16.06 \dots$ or $150 \div 9.6 = 15.625$ scores M0. Condone $155 \div 9.549$ (or 9.54) and 154.9 (or 154.9) for the B1 and M1. The A1 needs the box ticked (or Yes stated) and the value seen. Yes with no correct working scores 0.
15	113	M1	$20 \div 8$ or 2.5 or a correct scale, e.g. 1 small square = 0.5 suitcases or 0.5 per small square up the axis
		M1	one correct frequency for part of the range, e.g. $4 \times 5 = 20$ or 48 or 36 or $3 \times 3 = 9$ (ft their scale)
		M1dep	$4 \times 5 + 6 \times 8 + 3 \times 12 + 3 \times 3$ oe (all four parts, ft their scale)
		A1	113 <i>Additional guidance:</i> Counting squares: 226 small squares $\times 0.5 = 113$ is a full method. Using bar heights as frequencies ($5 + 8 + 12 + 3 = 28$) scores MOMOM0. Using whole classes 8–32 ($30 + 48 + 36 + 27 = 141$) scores M1M1M0A0.
16	3.2 litres	M1	$\sqrt{\frac{1600}{900}}$ or $\frac{4}{3}$ or 1.33 or $\frac{3}{4}$ oe (length scale factor)
		M1dep	$\left(\frac{4}{3}\right)^3$ or $\frac{64}{27}$ or 2.37 ... or $1.35 \times \frac{64}{27}$ oe
		A1	3.2 <i>Additional guidance:</i> $1.35 \times \frac{16}{9} = 2.4$ scores MOM0A0. $1600 \div 900$ alone scores M0. Premature rounding of the length scale factor (e.g. $1.33^3 \times 1.35 = 3.17 \dots$) can score M1M1A0.
17	432	M1	$0.24a = 0.4c$ oe or $a:c = 0.4:0.24$ oe

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Q	Answer	Marks	Guidance
		M1dep	$a:c = 5:3$ or $\frac{a}{c} = \frac{5}{3}$ oe or $1440 \div 8$ or 180
		M1dep	900 or 540 and 0.24×900 or 0.4×540 or 216
		A1	432
			<i>Additional guidance:</i> Alternative method: let T be the number of adults (and of children) on a tour; $\frac{T}{0.24} + \frac{T}{0.4} = 1440$ scores M1M1, $T = 216$ scores M1, 432 A1. Splitting 1440 in the ratio 24:40 or 3:5 (giving 540 adults, 900 children) scores M0 unless the equation is seen.
18(a)	At $x = 1$ the value is -6 and at $x = 2$ it is 5; there is a change of sign, so there is a solution between 1 and 2.	B1	-6 and 5 and a statement, e.g. "change of sign" or "one is negative and one is positive"
			<i>Additional guidance:</i> Accept $1 + 4 - 11 = -6$ and $8 + 8 - 11 = 5$. Values with no statement score B0. A comparison with 11 is acceptable: $1 + 4 = 5 < 11$ and $8 + 8 = 16 > 11$ with a statement.
18(b)	$x_4 = 1.6591$	M1	$x_2 = \sqrt[3]{5}$ or [1.7099, 1.71] and $x_3 = [1.608, 1.6084]$
		A1	1.6591
			<i>Additional guidance:</i> Values may be seen in a list. $x_5 = 1.6341 \dots$ given as the answer scores M1A0. Starting with $x_0 = 1.5$ (giving $x_4 = 1.6341$) scores M1A0. Correct x_2 only scores M0.
Total for Question 18: 3 marks			
19(a)	71 metres	M1	4.5, 8 and 10.5 read from the graph (allow $\pm \frac{1}{2}$ small square) or strip width 4 used with at least two correct readings
		M1dep	$\frac{1}{2} \times 4 \times 4.5 + \frac{1}{2} \times 4 \times (4.5 + 8) + \frac{1}{2} \times 4 \times (8 + 10.5)$ oe (ft their readings)
		A1	[70, 72]
			<i>Additional guidance:</i> Rectangles (e.g. $4 \times 4.5 + 4 \times 8 + 4 \times 10.5 = 92$ or $4 \times 0 + 4 \times 4.5 + 4 \times 8 = 50$) score M1M0A0. Use of the curve's exact area (72) without strips scores M0.
19(b)	Underestimate: the curve is above the tops of the strips, so some area is missed.	B1	Underestimate with a valid reason, e.g. the strips are below the curve or there are gaps between the strips and the curve

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Do not accept “it is an estimate” or “the curve is a curve” as a reason.
			Total for Question 19: 4 marks
20(a)	$4x^2 - 20x + 26$	M1	$(5 - 2x)^2 + 1$ oe
		A1	$4x^2 - 20x + 26$
			<i>Additional guidance:</i> $fg(x) = 5 - 2(x^2 + 1) = 3 - 2x^2$ scores MOA0.
20(b)	$\frac{5 - x}{2}$	M1	$y = 5 - 2x$ and $2x = 5 - y$ or $x = 5 - 2y$ and $2y = 5 - x$ oe
		A1	$\frac{5 - x}{2}$ oe
			<i>Additional guidance:</i> Accept $2.5 - 0.5x$ or $-\frac{x-5}{2}$ or $\frac{x-5}{-2}$. Sign errors such as $\frac{x-5}{2}$ or $\frac{5+x}{2}$ score M1A0 if a correct first step is seen. $\frac{1}{5-2x}$ scores MOA0.
			Total for Question 20: 4 marks
21	22.5°	M1	$80^2 + 45^2$ or 8425
		A1	$AC = [91.7, 91.8]$ or $\sqrt{8425}$
		M1	$\tan x = \frac{38}{\text{their } AC}$ or $\sin x = \frac{38}{\sqrt{80^2 + 45^2 + 38^2}}$ oe
		A1	[22.4, 22.5]
			<i>Additional guidance:</i> $AG = \sqrt{9869} = [99.3, 99.35]$ may be used with sin or cos for the second M1. $\tan^{-1}(38 \div 80) = 25.4$ or $\tan^{-1}(38 \div 45) = 40.2$ scores MOM0.
22	£7.50	M1	$\frac{180}{x}$ or $\frac{180}{x + 1.5}$ oe (an expression for a number of calculators)
		M1dep	$\frac{180}{x} - \frac{180}{x + 1.5} = 4$ oe
		M1dep	correct 3-term quadratic, e.g. $4x^2 + 6x - 270 (= 0)$ or $2x^2 + 3x - 135 (= 0)$ oe
		M1	correct method to solve their 3-term quadratic, e.g. $(2x - 15)(x + 9)$ or correct substitution into the formula
		A1	7.50 (accept 7.5; and -9 rejected or not given)

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Alternative using n calculators: $(n - 4) \left(\frac{180}{n} + 1.5 \right) = 180$ M1M1, $n^2 - 4n - 480 = 0$ M1, $(n - 24)(n + 20)$ M1, $n = 24$ and 7.50 A1. Working in pence $\left(\frac{18\,000}{x} - \frac{18\,000}{x+150} = 4, x = 750 \right)$ is acceptable. Trial and improvement: 7.50 with both $180 \div 7.5 = 24$ and $180 \div 9 = 20$ seen scores SC3; 7.50 with no working scores 0. 24 (the number of calculators) as the answer can score M1M1M1M1A0.
23	10 pots	M1	$\frac{1}{3}\pi \times 12^2 \times 40$ or 1920π or $[6031, 6032.4]$ or $\frac{1}{3}\pi \times 7.5^2 \times 25$ or 468.75π or $[1472, 1473]$
		M1dep	$\frac{1}{3}\pi \times 12^2 \times 40 - \frac{1}{3}\pi \times 7.5^2 \times 25$ or 1451.25π or $[4558, 4560]$
		M1dep	$50\,000 \div$ their 4559 or $50 \div$ their 4.559 or $[10.9, 11]$
		A1	10 <i>Additional guidance:</i> Using a height of 15 for the large cone scores M0 for that volume. 11 with 10.96 ... seen scores M1M1M1A0. Conversion: 1 litre = 1000 cm^3 must be used correctly for the third M1.
24	4 red counters	M1	$\frac{n}{n+6} \times \frac{6}{n+5}$ or $\frac{6}{n+6} \times \frac{n}{n+5}$ oe
		M1dep	$\frac{n}{n+6} \times \frac{6}{n+5} + \frac{6}{n+6} \times \frac{n}{n+5} = \frac{8}{15}$ oe or $\frac{12n}{(n+6)(n+5)} = \frac{8}{15}$
		A1	$2n^2 - 23n + 60 = 0$ oe e.g. $8n^2 - 92n + 240 = 0$
		M1	$(2n - 15)(n - 4) (= 0)$ or correct use of the formula on their 3-term quadratic
		A1	4 (and 7.5 rejected or not given) <i>Additional guidance:</i> Any letter may be used. With replacement $\left(\frac{12n}{(n+6)^2} = \frac{8}{15} \right)$ scores M1M0. An answer of 4 by trial (e.g. checking $\frac{48}{90} = \frac{8}{15}$) with no algebra scores M1M1 only. Total number of counters (10) given as the answer scores M1M1A1M1A0.