

Mark Scheme

AQA Higher Mock Set A Paper 1

For AQA GCSE Mathematics (8300)

Higher tier • Paper 1 (Non-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	$\frac{4}{11}$	B1	$\frac{4}{11}$
2	Adult 150 (reached the top 60, did not 90); Junior 90 (reached the top 18, did not 72)	B1	150 and 90 in the first-level boxes
		B1ft	60 and 90 for adults, ft 0.4× their 150 and their 150 – their 60
		B1ft	18 and 72 for juniors, ft 0.2× their 90 and their 90 – their 18
			<i>Additional guidance:</i> Diagram takes precedence over working. If the values are written as fractions or probabilities (e.g. $\frac{150}{240}$), withhold the first mark only. Each pair of second-level boxes must add to the value in the box it comes from for the ft marks.
3(a)	20°	B1	20
3(b)	18	B1ft	18, ft 360÷ their (a) if it gives an integer
Total for Question 3: 2 marks			
4	$2\frac{5}{12}$	M1	correct method to divide, e.g. $\frac{8}{3} \times \frac{5}{8}$ or $\frac{40}{24}$ or $\frac{5}{3}$ or $1\frac{2}{3}$ oe
		M1	correct method to add their fraction to $\frac{3}{4}$ with a common denominator, e.g. $\frac{20}{12} + \frac{9}{12}$ or $\frac{160}{96} + \frac{72}{96}$
		A1	$2\frac{5}{12}$ cao
			<i>Additional guidance:</i> SC1 for $1\frac{19}{141}$ or $\frac{160}{141}$ (from adding before dividing). $\frac{29}{12}$ or $\frac{232}{96}$ as the final answer scores M1M1A0. Decimal answer 2.416 scores M1M1A0.
5(a)	5.8×10^{-5}	B1	5.8×10^{-5}
5(b)	1.4×10^6	B2	1.4×10^6
		(B1	14×10^5 or 1400 000 or $1.4 \times 10^a \times 10^b$ with $a + b = 6$, or 1.4×10^n where $n \neq 6$)
			<i>Additional guidance:</i> Condone 1.40×10^6 .
Total for Question 5: 3 marks			
6	372	M1	6:10:15 oe, or 6:10 and 10:15 oe, or blue = $\frac{6}{15}$ red oe
		M1dep	$108 \div (15 - 6)$ or $108 \div 9$ or 12
		M1dep	their $12 \times (6 + 10 + 15)$ or their 12×31 , or 72, 120 and 180

(continued)

Q	Answer	Marks	Guidance
		A1	372 <i>Additional guidance:</i> Alternative: algebra, e.g. blue = $6k$, white = $10k$, red = $15k$ and $9k = 108$ (M1M1), $k = 12$ and $31k$ (M1), 372 (A1). Ratios joined without matching white (e.g. 3:5:3 or 3:5:2:3) score M0M0M0A0. Answer 372 with no working scores 4 marks.
7	$x = 2$	M1	multiplies all terms by 12 (or another common multiple) correctly, e.g. $3(3x + 2) - 4(x - 5) = 36$ oe, or combines the fractions to $\frac{3(3x+2)-4(x-5)}{12}$
		M1dep	$5x + 26 = 36$ oe, or $9x + 6 - 4x + 20 = 36$
		A1	2 <i>Additional guidance:</i> Condone one sign error in the expansion of $-4(x - 5)$ for the first M1 only. $9x + 6 - 4x - 20 = 36$ leading to $x = 10$ scores M1M0A0.
8	-3	M1	$-19 < 5x$ or $5x > -19$ or $-5x < 19$ oe (allow with = or the wrong inequality sign), or $x > -3.8$ oe
		A1	-3 <i>Additional guidance:</i> $x > -3.8$ as the final answer scores M1A0. -4 (from $x < -3.8$ or from rounding -3.8) scores M1A0. Answer -3 with no working scores 2 marks.
9	$22 + 6\pi$ m	B1	5 (width of rectangle)
		M1	$\pi \times 12 \div 2$ or 6π , or $\pi \times 6$
		A1	$22 + 6\pi$ oe <i>Additional guidance:</i> $34 + 6\pi$ (diameter included) scores B1M1A0. $22 + 12\pi$ (full circumference) scores B1M0A0. Condone $6\pi + 22$.
10(a)	The part of M that is not in D is shaded	B1	only the region in M and not in D shaded
10(b)	$\frac{18}{54} = \frac{1}{3}$	M1	$120 - 50 - 34$ or 36 (drama only)
		M1dep	their $36 \div 2$ or 18 (both)
		A1	$\frac{18}{54}$ oe, e.g. $\frac{1}{3}$ <i>Additional guidance:</i> Values may be seen on the Venn diagram. $\frac{18}{120}$ scores M1M1A0. SC1 for $\frac{18}{50}$ oe (given music club). Allow decimals or percentages, e.g. 0.33 ..., 0.333, 33.3%; do not accept 0.3 or 0.33.

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Q	Answer	Marks	Guidance
Total for Question 10: 4 marks			
11	$100x - 10x = 51$, so $x = \frac{51}{90} = \frac{17}{30}$	M1 M1dep A1	two correct recurring decimals that differ by an exact number, e.g. $10x = 5.666 \dots$ and $100x = 56.666 \dots$ (recurring shown by dots or ...) subtracts to get $90x = 51$ oe, e.g. $900x = 510$ $\frac{51}{90}$ and $\frac{17}{30}$ with full working <i>Additional guidance:</i> Alternative: $0.5\dot{6} = 0.5 + 0.0\dot{6} = \frac{5}{10} + \frac{6}{90}$ (M1), $= \frac{45}{90} + \frac{6}{90}$ (M1dep), $= \frac{51}{90} = \frac{17}{30}$ (A1). Checking $17 \div 30 = 0.5666 \dots$ by division is not an algebraic proof: maximum MOMAO.
12(a)	Points (16, 0), (20, 4), (24, 15), (28, 34), (32, 48), (36, 56), (40, 60) joined with a smooth curve	B1 B1ft	4, 15, 34, 48, 56, 60 seen, or at least 4 points plotted correctly at upper class bounds all 6 points plotted correctly at upper class bounds (ft their cumulative frequencies) and joined with a curve or line segments <i>Additional guidance:</i> Tolerance $\pm \frac{1}{2}$ small square. Ignore (16, 0) plotted or not; condone a curve starting at (0, 0) for the first B1 only. Points plotted at mid-class values score BOB0 unless the cumulative frequencies are correct in the table (B1).
12(b)	Yes: about 18 runners took longer than 30 minutes, which is more than $\frac{1}{4} \times 60 = 15$	M1 A1ft	reading from graph at $t = 30$, or [38, 44] seen, or [16, 22] seen Yes, with [16, 22] (or their 60– reading) compared with 15; or with their reading compared with 45; or with $\frac{[16, 22]}{60} > \frac{1}{4}$ oe <i>Additional guidance:</i> ft their graph (tolerance $\pm \frac{1}{2}$ small square), but the decision must be correct for their values. Yes with no values seen scores MOAO. Comparing [38, 44] with 15 scores M1AO.
Total for Question 12: 4 marks			
13	Pot of herbs £2.70, tray of seedlings £3.80	M1	two correct equations and a correct method to eliminate one variable, e.g. $10h + 4s = 42.20$ and subtracting, or $6h + 8s = 46.60$ and $20h + 8s = 84.40$

(continued)

Q	Answer	Marks	Guidance
		A1	$h = 2.70$ or $s = 3.80$
		A1	£2.70 and £3.80
			<i>Additional guidance:</i> Working in pence is fine (270 and 380, with units if given). Condone £2.7 for the first A1 but not the final A1. Answers only, or from trial and improvement with no algebraic method: 0 or 3 marks (a fully correct answer with a correct check of both totals scores 3). Values the wrong way round score M1A1A0.
14	$\overrightarrow{MP} = \frac{1}{2}\mathbf{c} - \frac{1}{3}\mathbf{a}$ and $\overrightarrow{QC} = \mathbf{c} - \frac{2}{3}\mathbf{a} = 2\overrightarrow{MP}$, so MP is parallel to QC	M1	a correct route for $\overrightarrow{MP}$ with at least one correct vector, e.g. $\overrightarrow{MB} = \frac{1}{2}\mathbf{c}$ and $\overrightarrow{BP} = -\frac{1}{3}\mathbf{a}$, or $\overrightarrow{MA} + \overrightarrow{AO} + \overrightarrow{OC} + \overrightarrow{CP}$ with $\overrightarrow{CP} = \frac{2}{3}\mathbf{a}$
		A1	$\overrightarrow{MP} = \frac{1}{2}\mathbf{c} - \frac{1}{3}\mathbf{a}$ oe, or $\overrightarrow{PM} = \frac{1}{3}\mathbf{a} - \frac{1}{2}\mathbf{c}$ oe
		B1	$\overrightarrow{QC} = \mathbf{c} - \frac{2}{3}\mathbf{a}$ oe, or $\overrightarrow{CQ} = \frac{2}{3}\mathbf{a} - \mathbf{c}$ oe
		A1	$\overrightarrow{QC} = 2\overrightarrow{MP}$ oe, or both written as multiples of $3\mathbf{c} - 2\mathbf{a}$, and states parallel
			<i>Additional guidance:</i> Vectors may be seen on the diagram. The final A1 needs both vectors correct, a correct multiple shown (e.g. $\frac{1}{6}(3\mathbf{c} - 2\mathbf{a})$ and $\frac{1}{3}(3\mathbf{c} - 2\mathbf{a})$) and a statement. Accept the multiple in either direction, e.g. $\overrightarrow{MP} = \frac{1}{2}\overrightarrow{QC}$. "They are parallel because the vectors are similar" with no multiple shown scores at most M1A1B1A0.
15	5 m	M1	$k = 144$ or $B = \frac{144}{d^2}$ oe, or $\frac{16}{9}$ and $\sqrt{\frac{9}{16}}$ or $\frac{3}{4}$ (ratio method)
		M1dep	$d^2 = 9$ or $d = 3$, or $4 \times \frac{3}{4}$
		A1	5
			<i>Additional guidance:</i> Answer 3 (the final distance from the lamp) scores M1M1A0. Using $B = \frac{k}{d}$ ($k = 36$, $d = 2.25$, answer 5.75) scores MOMOA0. Using $B = kd^2$ scores MOMOA0. Answer 5 with no working scores 3 marks.
16	$x = \frac{4y+7}{y-2}$	M1	$y(x-4) = 2x+7$ and $xy-4y$ seen
		M1dep	$x(y-2) = 4y+7$ oe, e.g. $x(2-y) = -4y-7$
		A1	$x = \frac{4y+7}{y-2}$ oe, e.g. $\frac{-4y-7}{2-y}$

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Condone $xy - 2x = 4y + 7$ with no factorising for the second M1 only if followed by a correct answer. Answer $x = \frac{4y+7}{y-2}$ with no working scores 3 marks.
17(a)	$\frac{25}{4}$ (or $6\frac{1}{4}$ or 6.25)	B2 (B1)	$\frac{25}{4}$ oe $\frac{125}{8}$ or $\frac{5}{2}$ or $\frac{2}{5}$ or $\frac{4}{25}$ seen <i>Additional guidance:</i> $-\frac{25}{4}$ or $\frac{4}{25}$ as the final answer scores B1.
17(b)	$2^{-\frac{5}{2}}$	B2 (B1)	$2^{-\frac{5}{2}}$ oe, e.g. $2^{-2.5}$ two of 2^6 , $2^{\frac{1}{2}}$, 2^9 seen, or $2^{\frac{13}{2}}$ or $2^{6.5}$ seen, or answer 2^{n-9} from 2^n with their numerator
Total for Question 17: 4 marks			
18	No, $1.4 \times 0.75 = 1.05$, which is an overall increase of 5%	M1 M1dep A1	1.4 and 0.75 oe, or a value increased by 40% then decreased by 25%, e.g. $100 \rightarrow 140 \rightarrow 105$ 1.4 $\times$ 0.75 or 1.05, or their final value correct for their starting value No with 5% (increase) or 1.05 interpreted, or with a correct final value compared with their value increased by 15% <i>Additional guidance:</i> Any starting price may be used, e.g. $\pounds 400 \rightarrow \pounds 560 \rightarrow \pounds 420$ and $420 \neq 460$. No, with a correct reason but no calculation, scores MOMOA0. Tick not needed if the statement clearly says she is wrong.
19(a)	$2(x-5)^2 - 9$	M1 M1dep A1	$2(x^2 - 10x)$ or $2\left(x^2 - 10x + \frac{41}{2}\right)$ oe, or $a = 2$ and $b = -5$ $2(x-5)^2$ seen, or $2(x-5)^2 - 50 + 41$ $2(x-5)^2 - 9$ <i>Additional guidance:</i> Comparing coefficients: $2x^2 + 4bx + 2b^2 + c$ (M1), $b = -5$ (M1), $c = -9$ (A1). $2(x-5)^2 + 16$ (from $-25 + 41$) scores M1M1A0.
19(b)	$(5, -9)$	B1ft	$(5, -9)$, ft their $(-b, c)$
Total for Question 19: 4 marks			
20	$x = 100^\circ$	M1 M1dep A1	angle $ADB = 50$ or angle $ABD = 50$ (may be on diagram) angle $BAD = 80$ (may be on diagram) 100

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Angles may be seen on the diagram but must be in the correct position or named. Alternative: angle $SAD = 50$ (alternate segment theorem for chord AD) and $180 - 50 - 50 = 80$. 80 (angle BAD given as x) scores M1M1A0. 130 (from $180 - 50$) scores MOMOA0.
21	$12n^2 + 12n + 11 = 12(n^2 + n + 1) - 1$, which is 1 less than a multiple of 12	M1	three consecutive odd numbers in algebraic form, e.g. $2n - 1$, $2n + 1$, $2n + 3$ or $2n + 1$, $2n + 3$, $2n + 5$
		M1	correct expansion of at least two of their squares, e.g. $4n^2 - 4n + 1$ and $4n^2 + 4n + 1$
		A1	$12n^2 + 12n + 11$ oe, e.g. $12n^2 + 36n + 35$ from $2n + 1$, $2n + 3$, $2n + 5$
		A1	$12(n^2 + n + 1) - 1$ oe and a conclusion, or $12n^2 + 12n + 12 - 1$ and states that $12n^2 + 12n + 12$ is a multiple of 12 <i>Additional guidance:</i> Numerical examples only score MOMOA0A0. n , $n + 2$, $n + 4$ with n not defined as odd scores M0, but the second M1 may be awarded. Condone n not stated to be an integer. For the final A1, $12(n^2 + n + 1) - 1$ with no statement scores A0; “which is 1 less than a multiple of 12” or equivalent is enough.
22	$4\sqrt{5} + 3\sqrt{5} = 7\sqrt{5}$	M1	$\frac{20\sqrt{5}}{5}$ or $4\sqrt{5}$, or $\sqrt{45} = 3\sqrt{5}$
		A1	$7\sqrt{5}$ with $4\sqrt{5}$ and $3\sqrt{5}$ seen <i>Additional guidance:</i> Alternative: $\frac{20 + \sqrt{45}\sqrt{5}}{\sqrt{5}} = \frac{20 + 15}{\sqrt{5}} = \frac{35}{\sqrt{5}}$ (M1) = $\frac{35\sqrt{5}}{5} = 7\sqrt{5}$ (A1). Decimal work scores M0A0.
23(a)	$x^2 + y^2 = 68$	B1	$x^2 + y^2 = 68$ oe
23(b)	36.125 (or $36\frac{1}{8}$)	M1	gradient of $OP = -\frac{1}{4}$ or gradient of $OQ = 4$ oe
		M1dep	tangent gradient 4 at P or $-\frac{1}{4}$ at Q
		M1dep	equation of one tangent, e.g. $y = 4x - 34$ or $y = -\frac{1}{4}x + 8.5$ oe (may be unsimplified, e.g. $y + 2 = 4(x - 8)$), or $A(8.5, 0)$ or $B(0, 8.5)$
		M1	$\frac{1}{2} \times 8.5 \times 8.5$ oe, using their A and B from two tangents
		A1	36.125 or $36\frac{1}{8}$ or $\frac{289}{8}$ oe

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> $8.5 \times 8.5 = 72.25$ (no $\frac{1}{2}$) scores M1M1M1M0A0. The tangent formula $8x - 2y = 68$ or $2x + 8y = 68$ may be used (implies M1M1M1). 36.125 with no working scores 0. Using a tangent gradient equal to the radius gradient (e.g. $y = -\frac{1}{4}x$ at P) scores M1M0M0M0A0.
Total for Question 23: 6 marks			
24(a)	He has translated the curve 4 to the right instead of 4 to the left (the maximum is at $(-1, 5)$)	B1	states that the translation should be 4 to the left (or in the negative x -direction), or that he has moved it to the right, or that the maximum should be at $(-1, 5)$ <i>Additional guidance:</i> Accept “he added 4 to the x -coordinate when he should have subtracted 4”. “He went the wrong way” with no direction and no correct point stated scores B0.
24(b)	$k = 4$	B1	4 <i>Additional guidance:</i> -4 scores B0.
Total for Question 24: 2 marks			
25	$BD = 6\sqrt{2}$, $AB = \frac{6\sqrt{2}}{\sin 60^\circ} = \frac{12\sqrt{2}}{\sqrt{3}} =$ $\frac{12\sqrt{6}}{3} = 4\sqrt{6}$ cm	M1	$BD = 12 \sin 45$ or $12 \times \frac{\sqrt{2}}{2}$ or $\frac{12}{\sqrt{2}}$ or $6\sqrt{2}$, or $BD^2 = 72$ (Pythagoras with $BD = DC$)
		M1	$AB = \frac{\text{their } BD}{\sin 60}$ oe, or $AD = \frac{\text{their } BD}{\tan 60}$ and Pythagoras
		M1dep	$\frac{12\sqrt{2}}{\sqrt{3}}$ or $\frac{6\sqrt{2} \times 2}{\sqrt{3}}$ or $\sqrt{96}$ oe (dep on M1M1)
		A1	$\frac{12\sqrt{6}}{3} = 4\sqrt{6}$ or $\sqrt{96} = \sqrt{16 \times 6} = 4\sqrt{6}$, with no errors seen <i>Additional guidance:</i> Alternative for the last two marks: $AB^2 = \frac{72}{(\sqrt{3}/2)^2} = \frac{72 \times 4}{3} = 96$ (M1dep), $\sqrt{96} = 4\sqrt{6}$ (A1). Any decimal working (e.g. 9.79 ...) scores at most M1M1M0A0. Exact trig values must be correct and used.