

Mark Scheme

AQA Higher Mock Set B Paper 3

For AQA GCSE Mathematics (8300)

Higher tier • Paper 3 (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)	223	195	168	133	99	65	48
This paper alone, rough guide (out of 80)	74	65	56	44	33	22	16

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	$0.\dot{3}\dot{7}$, 0.374, $\frac{3}{8}$, 37.6%, 0.3 $\dot{7}$	B2 (B1)	$0.\dot{3}\dot{7}$, 0.374, $\frac{3}{8}$, 37.6%, 0.3 $\dot{7}$ oe four in the correct order (one number misplaced), or all five correctly written as decimals to at least 3 d.p., e.g. 0.376, 0.3737 ..., 0.375, 0.3777 ..., 0.374 <i>Additional guidance:</i> Accept the numbers in their original form or as equivalent decimals or fractions. Correct order from largest to smallest scores B1. 0.3 $\dot{7}$ and 0.3 $\dot{7}$ swapped (all else correct) scores B1.
2	2 (at 1:15 pm and 4:15 pm)	M1 M1dep A1	90 (minutes) used with multiples of 36 and 90 (at least three of each), or $2^2 \times 3^2$ and $2 \times 3^2 \times 5$ 180 (minutes) or 3 hours or 1:15 pm (13:15) identified as the next common time 2 <i>Additional guidance:</i> 180 or 3 hours seen implies M1M1. Answer 1:15 pm and 4:15 pm (the two times) scores M1M1A1. Answer 3 (counting 10:15 am) scores M1M1A0. Using 130 minutes for 1 hour 30 minutes scores MOMOA0. 18 (HCF) used scores MOMOA0.
3	No (Abi is not correct). $7n + 4 = 303$ gives $n = 42.7 \dots$, which is not a whole number	M1 A1	$7n + 4$ oe, or $7n + 4 = 303$, or $(303 - 4) \div 7$ or $299 \div 7$, or $(303 - 11) \div 7$, or 298 and 305 seen as terms No with $42.7(\dots)$ or $42\frac{5}{7}$ or $41.7(\dots)$ (for $(303 - 11) \div 7$), or 298 and 305 shown to be consecutive terms, or '299 is not a multiple of 7' <i>Additional guidance:</i> No with no working, or with only '303 is odd', scores M0A0. Listing terms must reach 298 and 305 (or a correct statement that they are the 42nd and 43rd terms).
4	6	M1 A1	$560 \div 8 \times 75$ oe, or 70×75 , or 5250 or 5.25 seen 6 <i>Additional guidance:</i> Answer 5.25 or 5 scores M1A0. Answer 6 with no working scores M1A1.
5(a)	46 kWh (accept 44 to 48)	B1	[44, 48]
5(b)	25 °C is outside the range of the data, so the trend may not continue	B1	valid reason, e.g. 25 °C is outside the range of the data (temperatures only go up to 13 °C) oe

(continued)

Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Accept 'the line would give a negative amount of gas' or 'the heating would probably be off'. Do not accept 'there are not enough points', 'there may be outliers' or 'correlation does not mean causation'.
Total for Question 5: 2 marks			
6	No. Freddie improved by 8.09% but Jade improved by 8.18%	M1 M1 A1	correct method for the percentage change for one runner, e.g. $165 \div 2040$ or $2.75 \div 34$ or $1875 \div 2040$ (0.919 ...), or $135 \div 1650$ or $2.25 \div 27.5$ or $1515 \div 1650$ (0.918 ...) correct method for both runners No with [8.08, 8.09] and [8.18, 8.2], or 0.919(...) and 0.918(...) <i>Additional guidance:</i> Values may be in minutes or seconds. Accept 8.1 and 8.2 only if more accurate values are seen. Using 31.15, 27.30 and 25.15 for the times (8.38% and 7.88%) scores MOMOA0. Dividing by the June times (8.8% and 8.9%) scores MOMOA0. Yes or No with no working scores 0.
7(a)	Smooth U-shaped curve through $(-2, 8)$, $(-1, 2)$, $(0, -2)$, $(1, -4)$, $(2, -4)$, $(3, -2)$, $(4, 2)$, $(5, 8)$	B2 (B1)	fully correct smooth curve through all eight points (tolerance $\pm \frac{1}{2}$ small square) at least six points correctly plotted, or the table completed correctly $(2, -4, -4, 2)$ <i>Additional guidance:</i> Ruled line segments between the points score B1 maximum. Ignore any curve drawn outside $-2 \leq x \leq 5$.
7(b)	$x \approx -1.4$ and $x \approx 4.4$	B1ft	$[-1.5, -1.2]$ and $[4.2, 4.5]$, ft their graph
Total for Question 7: 3 marks			
8	16.8	M1 M1dep A1	52×16.2 or 842.4, or 24×15.5 or 372 $(842.4 - 372) \div 28$ oe or 470.4 16.8 <i>Additional guidance:</i> $2 \times 16.2 - 15.5 = 16.9$ (treating the classes as equal in size) scores MOMOA0. Answer 470.4 scores M1M1A0. Alternative: $24 \times (16.2 - 15.5) = 16.8$ below the mean, so class 10Q is $16.8 \div 28 = 0.6$ above: $16.2 + 0.6 = 16.8$ scores M1M1A1.
9(a)	$645 \leq y < 655$	B1	645 in the left box

(continued)

Q	Answer	Marks	Guidance
		B1	655 in the right box <i>Additional guidance:</i> Accept 654.9̇ for 655. $649.5 \leq y < 650.5$ scores B0B0.
9(b)	No. For example, $y = 647$ rounds to 600 to 1 significant figure	B1	No with a valid reason, e.g. a value in $[645, 650)$ that rounds to 600, or 'values below 650 round to 600' oe <i>Additional guidance:</i> Do not accept '650 rounds to 700' or a reason using a value outside the error interval.
Total for Question 9: 3 marks			
10	Region inside the circle of radius 4 cm, centre T , on the G side of the perpendicular bisector of GH	B1	circle or arc, centre T , radius 4 cm (± 2 mm), drawn within the field
		B1	perpendicular bisector of GH (± 2 mm, $\pm 2^\circ$) with two pairs of intersecting construction arcs
		B1ft	correct region shaded: inside the circle and on the G side of the bisector, ft their circle and bisector if both are attempted <i>Additional guidance:</i> The bisector need not be drawn across the whole field but must be long enough to define the region. A bisector with no construction arcs, or a radius of 40 mm drawn as 4 mm, scores B0 for that element. Shading outside the circle or on the H side scores B0 for the region.
11	No. The pressure is about 84 900 newtons/m ² , which is more than 80 000 newtons/m ²	M1	$\pi \times 0.3^2$ or $[0.282, 0.283]$, or $\pi \times 30^2$ or $[2827, 2828]$ (cm ²), or $4 \times \pi \times 0.3^2$ or $[1.13, 1.131]$
		M1	$24\,000 \div$ their area of one pad (in m ²), or $96\,000 \div$ their area of four pads (in m ²)
		A1	No (not safe) with $[84\,800, 84\,900]$, or with $80\,000 \times [0.282, 0.283] = [22\,560, 22\,640]$ compared with 24 000, or with area needed 0.3 m ² compared with $[0.282, 0.283]$

(continued)

Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Using the diameter ($\pi \times 0.6^2$, pressure 21 220) with Yes scores MOM1A0. Area in cm^2 not converted ($24\,000 \div 2827 = 8.49$) scores M1M0A0. Not dividing the force by 4 ($96\,000 \div 0.2827 = 339\,531$) with No scores M1M0A0.
12	91.6 kg	M1	$\pi \times 7^2 \times 78$ or [12 007, 12 008], or $\frac{2}{3} \times \pi \times 7^3$ or [718.3, 718.4]
		M1dep	(their cylinder volume + their hemisphere or sphere volume) $\times 7.2$, e.g. $(\pi \times 7^2 \times 78 + \frac{2}{3} \times \pi \times 7^3) \times 7.2$ oe, or [12 725, 12 726] $\times 7.2$, or [91 620, 91 630] (g)
		A1	[91.6, 91.63] <i>Additional guidance:</i> Cylinder height 85 ([99.3, 99.4] kg) scores M1M1A0 if the hemisphere volume is correct; it scores M0 for the cylinder on its own. A whole sphere used ([96.7, 96.8] kg) scores M1M1A0 if the cylinder volume is correct. Answer 91 600 (grams) scores M1M1A0. Accept 91.6 from $\pi = 3.14$ or 3.142.
13(a)	$-3 < x \leq 4$	M1	$-8 \leq -2x < 6$ oe, or $x \leq 4$, or $x > -3$
		A1	$-3 < x \leq 4$ oe <i>Additional guidance:</i> Accept $x > -3$ and $x \leq 4$, or $\{x: -3 < x \leq 4\}$. $-3 \leq x < 4$ or $-3 < x < 4$ scores M1A0. $4 \leq x < -3$ (signs not reversed) scores M1A0.
13(b)	$\{-2, -1, 0, 1, 2, 3, 4\}$	B1	$\{-2, -1, 0, 1, 2, 3, 4\}$
Total for Question 13: 3 marks			
14(a)	The angles are equal: corresponding angles are equal because DE is parallel to BC , and angle A is common	B1	all angles equal (or equiangular) with a reason, e.g. corresponding angles are equal because DE is parallel to BC , or angle A is common and corresponding angles are equal <i>Additional guidance:</i> Do not accept 'the sides are in proportion' or 'they are the same shape' without reference to the angles. Accept ' F angles' only with 'parallel'.
14(b)	3.6 cm	M1	$10.5 \div 6.3$ or $\frac{5}{3}$ or 1.66 ... or 1.67, or $6.3 \div 10.5$ or 0.6, or $AC = 9$
		A1	3.6

(continued)

Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Answer 9 scores M1A0. $5.4 \times 0.6 = 3.24$ scores M1A0. $10.5 - 6.3 = 4.2$ (difference used) scores M0A0.
Total for Question 14: 3 marks			
15	290 hectares	M1	500 (m) or 0.5 (km), or 50 000 ² , or 250 000 (m ²) or 0.25 (km ²)
		M1dep	$11.6 \times 250\,000$ or 2 900 000 (m ²) or 2.9 (km ²) or 2.9×10^{10} (cm ²)
		A1	290
			<i>Additional guidance:</i> $11.6 \times 50\,000 = 580\,000$ cm ² (linear scale only) scores M0M0A0. $11.6 \times 500 = 5800$ followed by $\div 10\,000 = 0.58$ scores M1M0A0. Answer 2 900 000 or 2.9 (not in hectares) scores M1M1A0.
16	$m = \frac{k^2 + 4}{k^2 - 1}$	M1	$k^2 = \frac{m + 4}{m - 1}$ oe
		M1dep	$k^2m - m = k^2 + 4$ oe, all terms in m on one side and all other terms on the other
		A1	$m = \frac{k^2 + 4}{k^2 - 1}$ oe, e.g. $\frac{-k^2 - 4}{1 - k^2}$
			<i>Additional guidance:</i> Correct answer with no working scores 3. $k^2(m - 1) = m + 4$ seen implies the first M1. $m = \frac{k^2 + 4}{k^2 - 1}$ followed by incorrect cancelling scores M1M1A0.
17(a)	912	M1	$\frac{38}{150} \times 3600$ oe, or $3600 \div 150 = 24$ and 24×38 , or 25.3(...) % of 3600
		A1	912
			<i>Additional guidance:</i> Accept [911, 912] from using 25.3%.
17(b)	It is only an estimate from a sample; a different sample would probably give a different answer	B1	valid reason, e.g. it is based on a sample (not all the trees), or another sample would give a different result, or the sample may not be representative
			<i>Additional guidance:</i> Do not accept 'the sample is biased' (the sample is random) or 'she may have made a mistake'.
Total for Question 17: 3 marks			
18	$x = 121^\circ$	M1	angle $OBA = 31$ and angle $AOB = 118$, or $180 - 2 \times 31$ (may be on the diagram)

(continued)

Q	Answer	Marks	Guidance
		M1dep A1	360 – 118 or 242, or $118 \div 2 = 59$ with $180 - 59$ 121 <i>Additional guidance:</i> Angles may be on the diagram but must be in the correct position. Answer 59 scores M1M0A0. Alternative: a point C on the major arc with angle $ACB = 59$ (angle at the centre), then $180 - 59 = 121$ (opposite angles of a cyclic quadrilateral): M1M1A1.
19(a)	59	M1 A1	$g(-3) = -8$, or $(3 \times (-3) + 1)^2 - 5$ 59 <i>Additional guidance:</i> $gf(-3) = 3 \times 4 + 1 = 13$ scores M0A0. $(-8)^2$ evaluated as -64 giving -69 scores M1A0.
19(b)	$x = \frac{2}{3}$ or $x = -\frac{4}{3}$	M1 A1	$(3x + 1)^2 - 5 = 4$ oe, or $9x^2 + 6x - 8 (= 0)$ $\frac{2}{3}$ and $-\frac{4}{3}$ <i>Additional guidance:</i> Accept 0.66 ... or 0.67 and -1.33 ... or -1.33 , or $-1\frac{1}{3}$. One correct solution only scores M1A0. $3(x^2 - 5) + 1 = 4$ (gf used) scores M0A0.
Total for Question 19: 4 marks			
20	The greyhound, by 2.46 seconds	M1 M1dep A1	$56 \times 1000 \div 3600$ oe or 15.5(...) or 15.6 (m/s), or $480 \div 1000 \div 56$ (0.00857 ... hours), or $480 \div 28.4 \times 3.6$ or [60.8, 60.9] (km/h) $480 \div$ their speed in m/s, or [30.76, 30.9] (seconds), or $0.00857 \dots \times 3600$ Greyhound and [2.36, 2.5] <i>Additional guidance:</i> Comparing speeds only (16.9 m/s and 15.6 m/s, or 60.8 km/h and 56 km/h) with greyhound scores M1M0A0. $56 \div 60 = 0.933$ used as m/s scores M0. Answer greyhound with no working scores 0.
21	4.30 cm	M1 M1dep M1 A1	$\frac{1}{2}(x + x + 6)(x - 2) = 40$ oe, or $(x + 3)(x - 2) = 40$ $x^2 + x - 46 (= 0)$ oe, e.g. $2x^2 + 2x - 92 (= 0)$ $\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-46)}}{2 \times 1}$ oe, or $\frac{-1 \pm \sqrt{185}}{2}$, or [6.3, 6.301], ft their three-term quadratic [4.3, 4.301]

(continued)

Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Completing the square, $(x + 0.5)^2 = 46.25$, may be used for the third M1. Answer 6.30 (x , not the height) scores M1M1M1A0. Answer 4.3 with 4.30 ... or 6.30 ... seen scores 4. Trial and improvement scores M0 for the third mark, but the first two marks can still be awarded.
22	No. In the worst case $44.5 \div 1.65 = 26.9 \dots$, so only 26 pieces are certain	B1	44.5 seen
		B1	1.65 or 165 (cm) seen
		M1	their $44.5 \div$ their 1.65, where $44.5 \leq \text{their LB} < 45$ and $1.6 < \text{their UB} \leq 1.65$, or $27 \times$ their UB
		A1	No with $26.9(\dots)$ or 26.96 or 26, or with $27 \times 1.65 = 44.55$ compared with 44.5 <i>Additional guidance:</i> Accept 44.499 for 44.5 and 1.649 for 1.65. $45.5 \div 1.55 = 29.3 \dots$ (wrong bounds) scores BOBOMOA0. $45 \div 1.6 = 28.1$ with Yes scores 0. $44.5 \div 1.6 = 27.8$ or $45 \div 1.65 = 27.2$ scores B1BOMOA0 or BOB1MOA0.
23	285°	B1	angle $SPQ = 72$ (may be on the diagram)
		M1	$5.2^2 + 3.7^2 - 2 \times 5.2 \times 3.7 \times \cos 72$ oe (ft their angle SPQ), or $SQ = [5.37, 5.371]$
		M1dep	$\frac{\sin PQS}{5.2} = \frac{\sin 72}{\text{their } SQ}$ oe, or angle $PQS = [67, 67.1]$, or angle $PSQ = [40.9, 41]$
		M1dep	352– their angle PQS , or 64+ their angle $PSQ + 180$
		A1	$[284.5, 285.5]$, rounded to 285 <i>Additional guidance:</i> Alternative using coordinates: $P(5.2 \sin 64, 5.2 \cos 64) = (4.67 \dots, 2.27 \dots)$ and $Q(5.18 \dots, -1.38 \dots)$; then $\tan^{-1}(5.18 \dots \div 1.38 \dots) = 75.06 \dots$ and $360 - 75.06 \dots$: award marks for equivalent stages. Answer 105 (bearing of Q from S) scores B1M1M1MOA0. Calculator in radians scores M0 for the stage affected. Angle $SPQ = 108$ ($SQ = 7.25 \dots$) scores B0 then can score M1M1M1A0 ft.

(continued)

Q	Answer	Marks	Guidance
24(a)	About 9 m/s (accept 8 to 10)	M1	tangent drawn at $t = 15$ and a correct method for its gradient, e.g. $\frac{\text{difference in } d}{\text{difference in } t}$ using two points on their tangent
		A1	[8, 10] <i>Additional guidance:</i> The tangent must touch the curve at $t = 15$ (± 1 small square) and must not cross it. Answer 4.5 ($67.5 \div 15$) scores MOAO. A correct answer with no tangent drawn scores MOAO.
24(b)	He has found the average speed over the first 15 seconds, not the speed at 15 seconds. The tram is accelerating, so its speed at 15 seconds is greater	B1	explains that his method gives the average speed (over the first 15 seconds) oe, or that the speed is changing / the graph is a curve so the gradient of the tangent is needed <i>Additional guidance:</i> Do not accept 'he should draw a tangent' on its own without a reason, or 'his answer is too small' on its own.
Total for Question 24: 3 marks			
25	$a = 3, b = 4$	M1	$2a + b = 10$ and $a^2 - b = 5$ oe
		M1dep	$a^2 + 2a - 15 (= 0)$ oe, or $b^2 - 24b + 80 (= 0)$ oe, or a correct substitution of one equation into the other
		A1	$a = 3$ and $b = 4$ <i>Additional guidance:</i> $a = 3$ and $b = 4$ with no working scores 3. $a = 3, b = 4$ with $a = -5, b = 20$ also given (not rejected) scores M1M1AO. Trial of values must be shown to satisfy both equations for full marks.
26	$\frac{51}{79}$ (0.646 to 3 s.f.)	M1	0.3×0.85 or 0.255
		M1	0.7×0.2 or 0.14
		M1dep	$\frac{0.255}{0.255 + 0.14}$ oe, or $\frac{0.255}{0.395}$ (dependent on M1M1)
		A1	$\frac{51}{79}$ or [0.645, 0.646]

(continued)

Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Answer 0.255 scores M1MOM0A0. Answer 0.395 scores M1M1M0A0. Answer 0.85 scores M0. Frequency method, e.g. out of 1000 mornings: 255 and 140 then $\frac{255}{395}$, scores full marks.