

Mark Scheme

AQA Higher Mock Set B 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)	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(a)	9.05×10^8	B1	9.05×10^8 <i>Additional guidance:</i> 90.5×10^7 or 9.05×10^{-8} scores B0.
1(b)	3.61×10^{10}	M1 A1	$3.608 \dots \times 10^{10}$ or 36 083 333 333 or 36 083 000 000 or $8.66 \times 10^7 \div (2.4 \times 10^{-3})$ oe 3.61×10^{10} <i>Additional guidance:</i> 36 100 000 000 scores M1A0. 3.6×10^{10} or 3.608×10^{10} scores M1A0. Dividing by 2.4×10^3 (36 083.3 ...) scores M0A0.
Total for Question 1: 3 marks			
2	684	M1 M1dep A1	0.64×2850 or 1824 or $2850 - 0.36 \times 2850$ oe $\frac{3}{8} \times 1824$ or $1824 - \frac{5}{8} \times 1824$ or $1824 - 1140$ oe 684 <i>Additional guidance:</i> $2850 - 1026 - \frac{5}{8} \times 2850$ (= 42.75) scores M0. $\frac{3}{8} \times 2850 = 1068.75$ scores M0. 1140 (the number who bought online) given as the answer scores M1M0A0.
3	$(x + 13)(x - 13)$	B1	$(x + 13)(x - 13)$
4(a)	0.272 (or $\frac{68}{250} = \frac{34}{125}$)	M1 A1	$250 - (31 + 44 + 38 + 29 + 40)$ or $250 - 182$ or 68 $\frac{68}{250}$ or 0.272 or 27.2% oe <i>Additional guidance:</i> 68 alone as the answer scores M1A0. $\frac{1}{6}$ scores M0A0. Accept $\frac{34}{125}$.
4(b)	No: 136 is only an estimate; the actual number of 6s could be more or less than 136.	B1	No with a valid reason, e.g. it is only an estimate or the results will vary or the number of 6s is random or it might be more or less than 136 oe <i>Additional guidance:</i> Do not accept “No, because the dice is biased” or “No, you cannot get exactly 136” with no further reason. Yes scores B0.
Total for Question 4: 3 marks			
5	153 cm^2	M1 M1dep A1	$23^2 - 7^2$ or 480 or $\sqrt{480}$ or [21.9, 21.91] $\frac{1}{2} \times 14 \times \sqrt{480}$ or $7 \times [21.9, 21.91]$ oe 153 (accept [153.3, 153.4] with 153 seen)

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Alternative: angle at the bottom vertex = $2 \sin^{-1}\left(\frac{7}{23}\right) = [35.4, 35.44]$ M1, $\frac{1}{2} \times 23 \times 23 \times \sin 35.43 \dots$ M1, 153 A1. $23^2 - 14^2 = 333$ leads to $\frac{1}{2} \times 14 \times \sqrt{333} = 127.7 \dots$ and scores MOM0A0. $\frac{1}{2} \times 14 \times 23 = 161$ scores MOM0A0.
6	Plan B (£460.80 compared with £515)	M1	95 + 24 × 17.50 or 515
		M1	24 × (15 + 3 × 1.40) or 24 × 19.20 or 360 + 100.80 or 460.8(0) oe
		A1	Plan B with 515 and 460.8(0) <i>Additional guidance:</i> Comparing monthly costs is acceptable: Plan A $95 \div 24 + 17.50 = 21.458 \dots$ and Plan B 19.20, with Plan B, scores M1M1A1. Charging all 9 GB ($24 \times (15 + 9 \times 1.40) = 662.40$) scores M1M0A0. The difference 54.20 alone, with B, implies M1M1 and scores A1 if one total is also seen.
7	34 years	M1	x , $3x$ and $3x - 5$ oe (any letter)
		M1dep	$3x - 5 - 6 = 4(x - 6)$ oe
		M1dep	$x = 13$ or Poppy = 39
		A1	34 <i>Additional guidance:</i> Taking 6 off Luke's age only ($3x - 5 = 4(x - 6)$, $x = 19$, answer 52) scores M1MOM0A0. $3x - 11 = 4x - 6$ (bracket not expanded correctly) scores M1M1M0A0. 28 (Georgia's age six years ago) as the answer scores M1M1M1A0. 34 with no working, or by trial with a correct check, scores 4.
8	10 packs	M1	$4.2 \times 3.5 - 1.4 \times 1.2$ or $2.8 \times 1.2 + 4.2 \times 2.3$ or 13.02 or 130 200 oe
		M1	their area $\div 0.16$ or their area in $\text{cm}^2 \div 1600$ or 81.375 or their area $\div 1.44$ or 9.04... (consistent units)
		A1	10

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> The second M1 is independent of the first: allow their area of the floor (from any rectangles) divided by the area of a tile or a pack in consistent units. 9 packs (rounding down) scores M1M1A0. Using $1\text{ m}^2 = 100\text{ cm}^2$ scores at most M1M0A0.
9	4 years	M1	$46\,500 \times 0.86^n$ for any $n \geq 2$ or 34 391.4 or 29 576.6 or 25 435.88 oe
		M1	$37\,500 \times 0.92^n$ for any $n \geq 2$ or 31740 or 29 200.8 or 26 864.74 oe
		A1	4 with [29 576, 29 577], [29 200, 29 201], [25 435, 25 436] and [26 864, 26 865] seen
			<i>Additional guidance:</i> Values may be rounded or truncated to the nearest pound. Alternative: $\left(\frac{0.86}{0.92}\right)^n < \frac{37\,500}{46\,500}$ with $n = 3$ and $n = 4$ checked scores M1M1A1. Simple decrease ($46\,500 - 6510n$ and $37\,500 - 3000n$, giving 3 years) scores M0M0A0. 4 with no working scores 0 (working is required).
10(a)	1.15	B1	1.15
10(b)	20%	M1	$1.38 \div 1.15$ or 1.2 or $\frac{138-115}{115}$ oe or a value increased by 15% and the same value increased by 38%, e.g. 115 and 138
		A1	20
			<i>Additional guidance:</i> 23 (from $38 - 15$) scores M0A0. 1.2 given as the answer scores M1A0. Any starting value may be used, e.g. $200 \rightarrow 230 \rightarrow 276$ and $\frac{46}{230}$.
Total for Question 10: 3 marks			
11(a)	$(x + 8)^2 - 71$	M1	$(x + 8)^2$ or $a = 8$
		A1	$(x + 8)^2 - 71$ or $a = 8$ and $b = -71$
			<i>Additional guidance:</i> $(x + 8)^2 - 57$ scores M1A0. $(x - 8)^2 - 71$ scores M0A0.
11(b)	$(x + 8)^2 \geq 0$, so $(x + 8)^2 - 71$ is never less than -71 . It cannot equal -75 .	B1ft	valid explanation, e.g. the minimum value is -71 (and $-75 < -71$) or $(x + 8)^2 = -4$ and a square cannot be negative oe
			<i>Additional guidance:</i> ft their $(x + a)^2 + b$ from part (a) only if their $b > -75$. “ -75 is negative” or “you cannot square root a negative” with no reference to $(x + 8)^2 = -4$ or the minimum scores B0.

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Q	Answer	Marks	Guidance
Total for Question 11: 3 marks			
12	$\sqrt{38}$	B1	$\sqrt{38}$
13	$x = \frac{5}{3}$ and $x = -\frac{1}{2}$	M1 M1dep A1	$6x^2 - 7x - 5 (= 0)$ oe $(3x - 5)(2x + 1) (= 0)$ $\frac{5}{3}$ and $-\frac{1}{2}$ oe <i>Additional guidance:</i> Accept 1.67 or better, or 1.6, for $\frac{5}{3}$; accept -0.5. The question asks for factorising: correct solutions from the quadratic formula with no factorisation score M1MOA0. $(3x + 5)(2x - 1)$ (solutions $-\frac{5}{3}, \frac{1}{2}$) scores M1MOA0.
14(a)	Adults: 115, 45, 160; Children: 175, 25, 200; Total: 290, 70, 360	B2 (B1)	fully correct table at least four correct values <i>Additional guidance:</i> Values may be seen in working rather than in the table.
14(b)	$\frac{115}{290} = \frac{23}{58}$	B1ft	$\frac{115}{290}$ oe (ft their table) <i>Additional guidance:</i> Accept 0.396 ... or 0.40 or 39.7%. $\frac{115}{360}$ or $\frac{115}{160}$ scores B0.
Total for Question 14: 3 marks			
15(a)	5040	B1	5040 <i>Additional guidance:</i> 10 000 or 10^4 scores B0. $9 \times 8 \times 7 \times 6 = 3024$ scores B0.
15(b)	No: $5 \times 10 \times 10 \times 10 = 5000$, which is less than 5040	M1 A1ft	$5 \times 10 \times 10 \times 10$ or 5×10^3 or 5000 No with 5000 and 5040 (or their answer to (a)) compared <i>Additional guidance:</i> ft their answer to part (a) for the A mark if it is more than 5000; their (a) must be seen or stated. No with no correct calculation scores MOA0. $4 \times 10 \times 10 \times 10 = 4000$ (first digit 6 to 9 only) scores MOA0. $10^4 = 10\,000$ (first-digit rule ignored) with Yes scores MOA0.
Total for Question 15: 3 marks			
16	10:30 am	M1 M1dep A1	2×60 or 120 or 20×96 or 1920 oe $(30\,000 - 1920) \div (96 + 120)$ or $28\,080 \div 216$ or 130 (minutes) or 150 (minutes) oe 10:30 am oe (e.g. half past ten, 10.30, 10:30)

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Ignoring the delay (30 000 ÷ 216 = 138.8 ... minutes, 10:19 am) scores M1MOA0. 130 minutes added to 8:00 am (10:10 am) scores M1M1A0. 2 hours 30 minutes or 150 minutes given as the answer scores M1M1A0. 30 000 ÷ (96 + 2) scores MOMOA0.
17	11.6 cm	B1 M1 A1	angle $ACB = 46$ $\frac{BC}{\sin 63} = \frac{9.4}{\sin 46}$ oe (ft their angle C) [11.6, 11.65] <i>Additional guidance:</i> $\frac{9.4 \times \sin 63}{\sin 71} = 8.85 \dots$ scores BOMOA0 unless 46 is seen. Using right-angled trigonometry scores M0. Alternative: drop a perpendicular from B to AC ; $9.4 \sin 63 = 8.375 \dots$ then $BC = 8.375 \dots \div \sin 46$ scores M1 and A1 when correct.
18(a)	Bars of height 1.4, 4.2, 3.8, 2 and 0.6 over 0–10, 10–15, 15–25, 25–40 and 40–70	B3 (B2) (B1)	fully correct histogram: five bars with heights 1.4, 4.2, 3.8, 2, 0.6 over the correct class widths four correct bars two correct bars or at least three correct frequency densities seen <i>Additional guidance:</i> Allow a tolerance of $\pm \frac{1}{2}$ small square for each bar height. Ignore shading. Bars of equal width, or heights equal to the frequencies, score B0 unless (B1) is earned from frequency densities.
18(b)	29	M1 A1	$\frac{5}{10} \times 38$ or 5×3.8 or 19 or $\frac{5}{15} \times 30$ or 5×2 or 10 29 <i>Additional guidance:</i> Allow ft from their frequency densities in part (a) for M1 only. $\frac{1}{2} \times 38 + \frac{1}{2} \times 30 = 34$ scores M1A0. $38 + 30 = 68$ scores MOA0. 19 or 10 alone as the answer scores M1A0.
Total for Question 18: 5 marks			
19	£230	M1 M1 M1dep	260.71 – 7.25 or 253.46 1.16×0.95 or 1.102 or their $253.46 \div 0.95$ or 266.8(0) oe their $253.46 \div 1.102$ or their $266.80 \div 1.16$ oe (complete method)

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Q	Answer	Marks	Guidance
		A1	230 or 230.00 <i>Additional guidance:</i> $260.71 \div 1.102 = 236.58 \dots$ (fee not removed) scores M0M1M0A0. 253.46×0.89 or $253.46 \div 1.11$ (adding the percentages) scores M1M0M0A0. $253.46 \times 1.05 \div 1.16$ or scores M1M0M0A0. 230 with no working scores 4.
20	£97.50	M1	$\pi \times 3 \times 7$ or $2 \times \pi \times 1.5 \times 7$ or 21π or [65.9, 66]
		M1	$\pi \times 1.5^2$ or 2.25π or [7.06, 7.07]
		M1dep	(their curved area + their circle area) $\div 5$ and $\div 5$ (or $\div 25$) or [14.6, 14.61] litres or [2.92, 2.93] tins (dep on at least M1)
		A1	97.50 (accept 97.5) <i>Additional guidance:</i> Including the base (total [80.1, 80.2], 16.02 litres, 4 tins, £130) scores M1M1M1A0. Using radius 3 (curved area [131.9, 132]) scores M0 for that area. $[14.6, 14.61] \times 6.50$ (cost per litre) = [94.9, 95] scores M1M1M1A0.
21(a)	$x^2(x + 5) = 9$, so $x^2 = \frac{9}{x + 5}$ and $x = \frac{3}{\sqrt{x + 5}}$	M1	$x^2(x + 5) = 9$ or $x^2 = \frac{9}{x + 5}$
		A1	fully correct rearrangement including $x = \sqrt{\frac{9}{x + 5}}$ or $\frac{\sqrt{9}}{\sqrt{x + 5}}$ leading to $x = \frac{3}{\sqrt{x + 5}}$ <i>Additional guidance:</i> Working backwards from $x = \frac{3}{\sqrt{x + 5}}$ is acceptable if every step is shown and ends with $x^3 + 5x^2 - 9 = 0$. The A1 needs no incorrect steps.
21(b)	$x = 1.204$	M1	$x_2 = \frac{3}{\sqrt{6}}$ or [1.2247, 1.2248]
		M1dep	$x_3 = [1.2024, 1.2025]$ and $x_4 = [1.2045, 1.2046]$ and $x_5 = [1.2043, 1.20439]$
		A1	1.204 with $x_6 = [1.2044, 1.20441]$ seen

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Values may be seen in a list or table. 1.204 with no working scores 0 (working is required). Starting with $x_0 = 1$ gives the same values, so condone the labels. 1.205 (stopping at x_4) scores M1M0A0. Alternative for the A1: 1.204 with a sign-change check of $x^3 + 5x^2 - 9$ at 1.2035 and 1.2045.
Total for Question 21: 5 marks			
22	16.2 m	M1	$\frac{\theta}{360} \times \pi \times 5.2^2 = 15$ oe or $\theta = [63.5, 63.6]$ or $\frac{15}{\pi \times 5.2^2}$ (= [0.176, 0.177])
		M1dep	their θ $\frac{\theta}{360} \times 2 \times \pi \times 5.2$ or $\frac{2 \times 15}{5.2}$ or [5.76, 5.78]
		A1	16.2 (accept [16.16, 16.2] with 16.2 seen) <i>Additional guidance:</i> Arc length only (5.8) scores M1M1A0. Arc plus one radius (11.0) scores M1M1A0. Premature rounding of θ to 64 (5.81, 16.21 ...) can score M1M1A1 only if 16.2 is given.
23	Triangle with vertices (1.2, 3.2), (5, 7) and (5, $\frac{2}{3}$) shaded and labelled R	B3	correct triangular region, shaded or clearly indicated, and labelled R
		(B2)	correct region not labelled or a region bounded by two of the three lines on the correct sides
		(B1)	one inequality shown correctly, e.g. the region below $y = x + 2$ indicated <i>Additional guidance:</i> Accept the required region shaded or the unwanted regions shaded if it is clear which region is R . Ignore whether $x = 5$ is redrawn dashed. The region above $y = x + 2$ (from reading $x - y \geq -2$ as $y \geq x + 2$) can score at most (B2) if the other two boundaries are correct.
24	$\overrightarrow{BX} = 2\mathbf{a} - 4\mathbf{b}$, $\overrightarrow{BN} = 3\mathbf{a} - 6\mathbf{b} = \frac{3}{2}\overrightarrow{BX}$; parallel with common point B	M1	$\overrightarrow{AB} = 6\mathbf{b} - 6\mathbf{a}$ and $\overrightarrow{OM} = 6\mathbf{a} + \frac{1}{2}(6\mathbf{b} - 6\mathbf{a})$ or $\overrightarrow{OM} = 3\mathbf{a} + 3\mathbf{b}$ oe
		A1	$\overrightarrow{OX} = 2\mathbf{a} + 2\mathbf{b}$ or $\overrightarrow{BX} = 2\mathbf{a} - 4\mathbf{b}$ or $\overrightarrow{XN} = \mathbf{a} - 2\mathbf{b}$ oe
		B1	$\overrightarrow{BN} = 3\mathbf{a} - 6\mathbf{b}$ oe or $\overrightarrow{NB} = 6\mathbf{b} - 3\mathbf{a}$ oe
		A1	$\overrightarrow{BN} = \frac{3}{2}\overrightarrow{BX}$ oe (or $\overrightarrow{BX} = 2\overrightarrow{XN}$) with a statement that they are parallel (or multiples) and have a common point

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Q	Answer	Marks	Guidance
			<i>Additional guidance:</i> Any pair of vectors joining B , X and N may be used. Vectors may be seen on the diagram. The final A1 needs both vectors correct and both “parallel” (or “multiple”) and “common point” (or “ B is on both”). $\overrightarrow{BX} + \overrightarrow{XN} = \overrightarrow{BN}$ as the only argument scores at most M1A1B1A0. $\overrightarrow{OX} = \frac{1}{2}\overrightarrow{OM}$ (ratio misread) leads to $\overrightarrow{BX} = \frac{3}{2}\mathbf{a} - \frac{9}{2}\mathbf{b}$ and scores M1A0B1A0.
25	Shown: $\frac{2(2x-1)}{(2x-1)(x+4)(x+2)} =$ $\frac{2}{x^2+6x+8}$	M1	$(2x-1)(x+4)$ or $(2x-1)(x+2)$
		M1	correct common denominator with at least one correct numerator, e.g. $\frac{9(x+2)-5(x+4)}{(2x-1)(x+4)(x+2)}$ or $\frac{9(2x^2+3x-2)-5(2x^2+7x-4)}{(2x^2+7x-4)(2x^2+3x-2)}$ oe
		A1	$\frac{4x-2}{(2x-1)(x+4)(x+2)}$ or $\frac{8x^2-8x+2}{(2x^2+7x-4)(2x^2+3x-2)}$ oe
		A1	fully correct working with $2(2x-1)$ cancelled, leading to $\frac{2}{(x+4)(x+2)}$ and $\frac{2}{x^2+6x+8}$ <i>Additional guidance:</i> Using the product of the two denominators is acceptable: $\frac{8x^2-8x+2}{(2x^2+7x-4)(2x^2+3x-2)} = \frac{2(2x-1)^2}{(2x-1)(x+4)(2x-1)(x+2)}$, then cancel. Numerator $9x+18-5x+20=4x+38$ (sign error) scores M1M1A0A0. The final A1 needs $(x+4)(x+2)$ or equivalent expansion seen; it is a “show that” question.