

Mark Scheme

Sample Assessment Material

GCSE

GCSE in Mathematics Specification A
Higher Tier

Paper 2: (Calculator)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear

Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) select and use a form and style of writing appropriate to purpose and to complex subject matter

Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

Guidance on the use of codes within this mark scheme

M1 - method mark

A1 - accuracy mark

B1 - working mark

C1 - communication mark

QWC - quality of written communication

oe - or equivalent

cao - correct answer only

ft - follow through

sc - special case

Specification A Paper 2 Higher Tier

1MA0/2H																												
Question	Working	Answer	Mark	Additional Guidance																								
1.	$\frac{4}{5} \times 75 = 60$ $60 \div 5 = 12$ $3 \times 12 = 36$ $2 \times 12 = 24$	Roger 24 Bethan 36	4	M1 $\frac{4}{5} \times 75$ M1 '60' $\div (3+2)$ A1 Roger 24 A1 Bethan 36 (Allow 3 marks for the correct numbers the wrong way round)																								
Total for Question: 4 marks																												
2.	$f(x) = x^3 - 5x$ <table style="margin-left: 20px;"> <tr><td>x</td><td>4.00</td></tr> <tr><td></td><td>4.10</td></tr> <tr><td></td><td>4.20</td></tr> <tr><td></td><td>4.30</td></tr> <tr><td></td><td>4.40</td></tr> <tr><td></td><td>4.50</td></tr> <tr><td></td><td>4.60</td></tr> <tr><td></td><td>4.70</td></tr> <tr><td></td><td>4.80</td></tr> <tr><td></td><td>4.90</td></tr> <tr><td></td><td>5.00</td></tr> <tr><td></td><td>4.35</td></tr> </table>	x	4.00		4.10		4.20		4.30		4.40		4.50		4.60		4.70		4.80		4.90		5.00		4.35	4.3	4	B2 for trial between 4.3 and 4.4 inclusive (B1 for trial between 4 and 5 inclusive) B1 for different trial between 4.33 and 4.37 inclusive B1 (dep on at least one previous B1) for 4.3 only NB trials where x has 1 d.p should be rounded or truncated to at least 2 SF; trials where x has 2 d.p. or more should be rounded or truncated to at least 3 SF
x	4.00																											
	4.10																											
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	4.30																											
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	4.50																											
	4.60																											
	4.70																											
	4.80																											
	4.90																											
	5.00																											
	4.35																											
Total for Question: 4 marks																												

1MA0/2H				
Question	Working	Answer	Mark	Additional Guidance
3.	$25^2 - 7^2 = 576$ $\sqrt{576} = 24$ $\frac{1}{2} \times 24 \times 7$	84 cm ²	4	M1 $25^2 - 7^2$ M1 $\sqrt{25^2 - 7^2}$ M1 (dep) $\frac{1}{2} \times 24 \times 7$ A1 cao
Total for Question: 4 marks				
4. FE	18000 – 6475 = 11525 $11525 \times \frac{20}{100} = 2305$	£ 1152.50	4	M1 18000 – 6475 A1 11525 M1 '11525' $\times \frac{20}{100}$ A1 £1152.50
	(b) $\frac{2305}{18000} \times 100$	12.8	2	M1 $\frac{2305}{18000} \times 100$ A1 ft on '2305'
Total for Question: 6 marks				

1MA0/2H				
Question	Working	Answer	Mark	Additional Guidance
5. (a)	0: 8 1: 023578 2: 0122233 3: 1345 4: 456 Key 4 6 means 46 minutes	Correct stem and leaf	3	B3 Fully correct (B2 All entries correct, no key) (B1 correct entries unordered, key or no key) OR (B2 Three rows correct, key or no key) (B1 Two rows correct, key or no key)
(b)	Old median = 22 New median = $22 + 5$	27 minutes	2	M1 finds median correctly for original data and adds 5 A1 cao OR M1 Redoes table (ft) with each value increased by 5 and attempts to find median A1 cao
(c)		The same + reason	1	C1 All the values have increased by 5 minutes so when you subtract the 5 minutes will cancel out.
Total for Question: 6 marks				

1MA0/2H				
Question	Working	Answer	Mark	Additional Guidance
6. FE QWC ii, iii	<p>1 gallon = 4.54 litres, 200 gallons = 908 litres = 908000 cm³ Vol of tank $60^2 \times \pi \times 180 =$ 2035752.04...cm³ 908000 < 1017876.02</p> <p>OR</p> <p>Vol of tank $60^2 \times \pi \times 180 = 2035752.04... \text{cm}^3$ Half vol of tank = 1017876.02 cm³ = 1017.876...litres</p> <p>1017.876 ÷ 4.54 = 224 gallons 224 > 200</p>	No	5	<p>Response may convert into gallons, litres, or cm³</p> <p>Calculations may be performed in different orders</p> <p>M1 Using formulae to find volume of tank B1 Converts between litres and cubic centimetres M1 reads off graph for 1l, 2l, 4l, 5l or 10 litres within tolerance (4.4 – 4.6) A1 Answer in cm³, litres or gallons</p> <p>C1 Decision and reason QWC: Decision should be stated, with appropriate supporting statement</p>
(b)	<p>"908000" cm³ × 0.85 g/cm³ = 771800 g</p>	771.8	3	<p>M1 "908000" × 0.85 M1 (dep) 771800 ÷ 1000 A1 770 – 772</p>
Total for Question: 8 marks				
7.	<p>$\frac{10 + 45 + 150 + 245 + 225 + 55}{120}$</p>	6.08 hours	4	<p>M1 for mid interval values M1 for multiplying frequencies by mid-interval values M1 for adding (freq × mid-interval values) ÷ 120 A1 cao</p>
Total for Question: 4 marks				

1MA0/2H		Working	Answer	Mark	Additional Guidance
8.	(a)	<p>Fred pays $\frac{x}{3}$ and Jim pays $\frac{x-10}{2}$</p> <p>Malcolm gets £170 for Fred and Jim, so Malcolm gets</p> $\frac{x}{3} + \frac{x-10}{2} = 170$	Clear and coherent explanation	1	C1 a clear and coherent explanation
	(b)	<p>Fred has $\frac{2x}{3}$ left, so solving for x using</p> $\frac{x}{3} + \frac{x-10}{2} = 170$ $2x + 3(x-10) = 170 \times 6$ $5x = 1050$ $x = 210$ <p>OR</p> $\frac{x}{3} + \frac{x-10}{2} = \frac{2x + 3(x-10)}{6}$ $\frac{5x - 30}{6} = 170$ $5x = 1050$ $x = 210$	£140	4	<p>M1 multiply through by 6 and cancels fractions M1 (dep) expand $3(x-10)$</p> <p>M1 (dep) collect terms on each side correctly A1 cao</p> <p>OR</p> <p>M1 collects terms over 6 M1 (dep) expand $3(x-10)$</p> <p>M1 (dep) multiply through by 6 and collect terms A1 cao</p>
Total for Question: 5 marks					

1MA0/2H			
Question	Working	Answer	Mark
9. QWC i, iii FE	Makes a comparison of the shape of the distribution by drawing Makes a comparison of the modal classes(31–40, 11–20) Makes a comparison of the class intervals that contain the medians. (31–40, 21–30) Works out an estimate of the total sales of each shop(2635, 3530)	Correct comparisons	4
Additional Guidance			
B1, B1, B1 for any 4 of the following done correctly Plots frequency polygon or produces table compares modes compares medians compares total sales C1 for comments on shape of the distributions QWC: Decisions should be stated, and all comments should be clear and follow through from any working or diagrams			
Total for Question: 4 marks			

1MA0/2H				
Question	Working	Answer	Mark	Additional Guidance
10. (a)	$x^{3/2} \times x^{1/2}$	x^2	3	B1 $x^{3/2}$ seen B1 $x^{2/4}$ oe seen A1 cao
(b)	$x^2 - 1x + 2x - 2 = 18$ $x^2 + x - 20 = 0$ $(x + 5)(x - 4)$	4, -5	4	M1 Correct expansion B1 $x^2 + x - 20 = 0$ B1 $(x + 5)(x - 4)$ A1 cao
(c)	$x^2 + x - 6 = 0$ $(x + 3)(x - 2)$ $x = -3, x = 2$	$x = -3, y = 8$ $x = 2, y = 3$	5	M1 Sets equations equal and rearranges B1 $x^2 + x - 6 = 0$ oe B1 $(x - 3)(x + 2)$ A2 Two correct pair of solutions A1 correct set of x values
Total for Question: 12 marks				

1MA0/2H				
Question	Working	Answer	Mark	Additional Guidance
11. (a)		28	1	B1 27 – 29
(b)	68 – 42	26	2	M1 68 – 42 A1 26 – 30 (need $\frac{1}{2}$ sq tolerance on each)
FE	15% of 80 = 12	Yes, with correct conclusion	2	M1 looks up 68 or 40 min on cumulative frequency A1 correct conclusion
Total for Question: 5 marks				
12. QWC ii, iii FE	$\sin 68^\circ = \frac{AC}{8.5}$ $AC = 8.5 \times \sin 68^\circ = 7.881$ $7.881 + 1 < 9$	Reason supported by calculation	4	M1 $\sin 68^\circ = \frac{AC}{8.5}$ M1 $AC = 8.5 \times \sin 68^\circ$ A1 7.88(1... C1 8.88(1... + conclusion QWC: Decision should be stated, supported by clearly laid out working Note $\frac{AC}{\sin 68} = \frac{8.5}{\sin 90}$ does not get marks until in the form $AC = \frac{8.5}{\sin 90} \times \sin 68$
Total for Question: 4 marks				

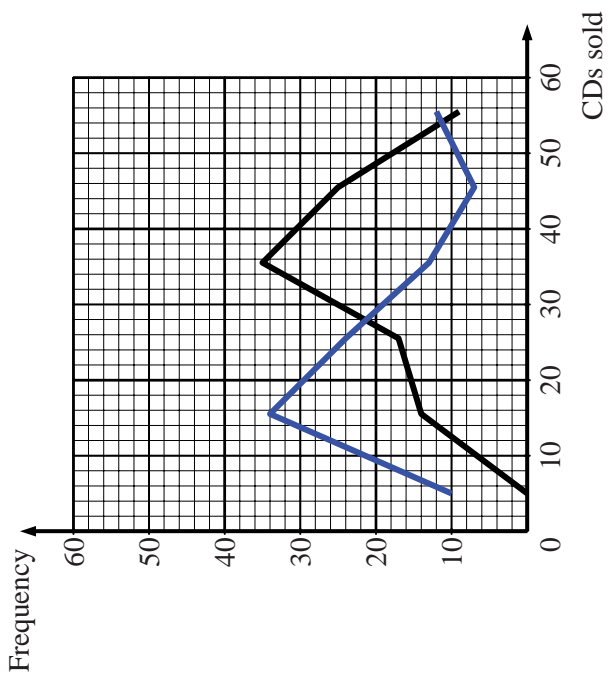
1MA0/2H				Additional Guidance
Question	Working	Answer	Mark	
13.	$T = k\sqrt{A}$; $40 = k\sqrt{100}$ $k = 4$ $T = 4\sqrt{A}$ $T = 4\sqrt{60}$	31.0	4	M1 $T = k\sqrt{A}$ M1 $40 = k\sqrt{100}$ A1 $T = 4\sqrt{A}$ A1 for 30.98... or 31(.0)
				OR M2 for $\frac{T}{40} = \sqrt{\frac{60}{100}}$ oe M1 for $T = 40 \times \sqrt{\frac{60}{100}}$ oe A1 for 30.98... or 31.0
				Total for Question: 4 marks

1MA0/2H				Additional Guidance
Question	Working	Answer	Mark	
14. (b)	Eliminate y to get $2x + 3 = 4x + 2$, $x = 0.5$ $y = 4$ OR $y = 2x + 3$ and $y = 4x + 2$ drawn correctly on graph paper Perpendicular drawn correctly through (0.5, 4) Intercept found Gradient found	$y = -0.5x + 4.25$	5	M1 eliminate y M1 substitute the found value of x in one equation A1 both answers M1 an equation of the form $y = mx + c$ with either c correct or m correct or the correct gradient stated A1 cao OR B1 $y = 2x + 3$ drawn B1 $y = 4x + 2$ drawn M1 draws perpendicular through point of intersection M1 an equation of the form $y = mx + c$ with either c correct or m correct or the correct gradient stated A1 cao
Total for Question: 5 marks				
15. (a)	UB $8.35 \times 3.65 = 30.4775$	30.4775	2	M1 sight of 8.35 or 3.65 A1 30.4775
(b)	LB $8.25 \times 3.55 = 29.2875$	30	2	M1 8.25×3.55 A1 30 (dep on 8.25 X 3.55 seen)
Total for Question: 4 marks				

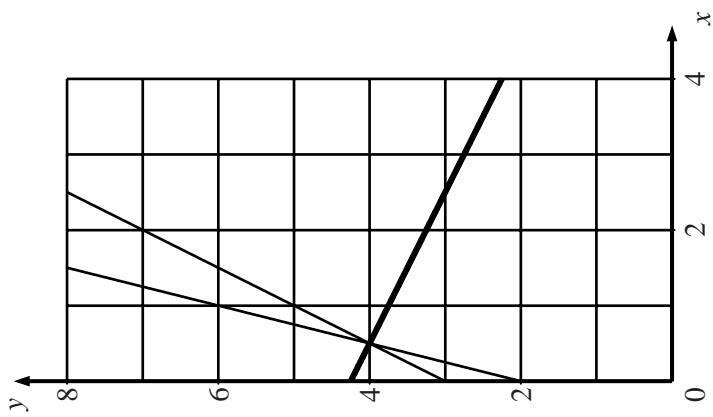
1MA0/2H				Additional Guidance
Question	Working	Answer	Mark	
16.	(a) $\text{Vol} = x \times (x - 2) \times 2 = 51$ $\text{Vol} = 2x^2 - 4x - 51 = 0$	Derives given answer and condition	4	M1 $\text{Vol} = x \times (x - 2) \times 2$ M1 expands bracket correctly A1 (E1) sets equal to 51 B1 $x > 2$ as the lengths of the cuboid have to be positive.
	(b) $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 2 \times (-51)}}{2 \times 2}$ $x = \frac{4 \pm \sqrt{424}}{4}$	6.15, -4.15 both to 3sf	3	M1 correct substitution (allow sign errors in a, b and c) into quadratic formula M1 $x = \frac{4 \pm \sqrt{424}}{4}$ A1 6.14(7...), -4.14(7...)
Total for Question: 7 marks				
17.	Angle $\text{BAC} = 180^\circ - 47^\circ - 58^\circ = 75^\circ$ $\frac{AC}{\sin 47} = \frac{220}{\sin 75} (= \frac{AB}{\sin 58})$ $AC = \frac{220 \sin 47}{\sin 75} = 166.57..$ $\text{Area} = \frac{1}{2} \times 220 \times 166.57 \times \sin 58 = 15538$	15500 m ²	5	B1 for 75° $\frac{AC}{\sin 47} = \frac{220}{\sin 75} (= \frac{AB}{\sin 58})$ $\frac{220 \sin 47}{\sin 75}$ M1 $AC = \frac{220 \sin 47}{\sin 75}$ $\frac{1}{2} \times 220 \times 166.57 \times \sin 58$ A1 15500 m ²
Total for Question: 5 marks				

1MA0/2H Question	Working	Answer	Mark	Additional Guidance
18.	<p>Pentagon = 5 equal isos triangles</p> $\frac{360}{5} = 72^\circ$ <p>Base angles = $(180 - 72) \div 2 = 54^\circ$ for finding equal sides of isosceles triangle;</p> $\frac{x}{\sin 54} = \frac{10}{\sin 72}$ <p>8.506508084...</p> <p>area of isosceles triangle =</p> $\frac{1}{2} x^2 \sin 72$ <p>= 34.40954801... area of pentagon = $5 \times 34.40954801 = 172.0477401$ area of dodecahedron = 12×172.0477401</p> <p>OR</p> <p>Using right-angled trigonometry; $h = 5 \tan 54^\circ = 6.8819...$ Area of isosceles triangle =</p> $\frac{1}{2} \times 10 \times h$ <p>= 34.40954801... area of pentagon = $5 \times 34.40954801 = 172.0477401$ area of dodecahedron = 12×172.0477401</p>	2065 cm ²	9	<p>B1 for $\frac{360}{5} = 72^\circ$ B1 $(180 - 72) \div 2 = 54^\circ$ M1 for finding equal sides of isosceles triangle; $x = \frac{10}{\sin 54} = \frac{10}{\sin 72}$ A1 for $x = 8.506508084...$ M1 for finding area of isosceles triangle = $\frac{1}{2} x^2 \sin 72$</p> <p>A1 for 34.40954801...(ft) B1 for area of pentagon = $5 \times (\text{ft}) = 172.0477401...$(ft) B1 for area of dodecahedron = $12 \times (\text{ft}) = 2064.572881...$ cm² A1 for 2065 cm² (oe)</p> <p>OR</p> <p>B1 for $\frac{360}{5} = 72^\circ$ B1 $(180 - 72) \div 2 = 54^\circ$ M1 for using right-angled trigonometry; $h = 5 \tan 54^\circ$ A1 for 6.8819... M1 for finding area of isosceles triangle = $\frac{1}{2} \times 10 \times h$</p> <p>A1 for 34.40954801...(ft) B1 for area of pentagon = $5 \times (\text{ft}) = 172.0477401...$(ft) B1 for area of dodecahedron = $12 \times (\text{ft}) = 2064.572881...$ cm² A1 for 2065 cm² (oe)</p>

1MA0/2H			
Question	Working	Answer	Mark
18. (Cont)	<p>OR</p> <p>Pentagon split into 3 isos triangles, where 2 are equal. Area of 2 isos triangles $= 2(\frac{1}{2} \cdot 10^2 \cdot \sin 108)$ $= 95.10565163...$ $\frac{x}{\sin 72} = \frac{10}{\sin 36}$ $x = 16.18033989...$ $x^2 = 261.803399..$ Area of 3rd isos triangle $= \frac{1}{2} (261.803399..) \sin 36$ $= 76.94208845..$</p>	2065 cm ²	9
	<p>OR</p> <p>B1 for 108° (and base angles 36°) B1 for base angles 72° (and 36°) M1 for finding equal sides of 3rd isos triangle: $\frac{x}{\sin 72} = \frac{10}{\sin 36}$ A1 for x = 16.18033989... M1 for area = $\frac{1}{2} x^2 \sin 36$ M1 for area = $2(\frac{1}{2} \cdot 10^2 \cdot \sin 108)$ A1 for one of (76.94208845.. and 95.10565163...) B1 for area of dodecahedron A1 for 2065 cm² (oe)</p>		
Total for Question: 9 marks			



9.



14.

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