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Mark Scheme
Sample Assessment Material

GCSE

GCSE in Mathematics Specification A
Higher Tier

Paper 2: (Calculator)

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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

1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
1.		$\frac{4}{5}\times 75$ =60 60 ÷ 5 = 12 3 × 12 = 36 2 × 12 = 24	Roger 24 Bethan 36	4	M1 $\frac{4}{5}\times 75$ M1 '60' ÷ (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.		x / $f(x) = x^3 - 5x$ 4.00 44.00 4.10 48.42 4.20 53.09 4.30 58.01 4.40 63.18 68.62 or 4.50 68.63 4.60 74.34 4.70 80.32 4.80 86.59 4.90 93.15 5.00 100.00 4.35 60.56	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
					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**	(a)	$18000 - 6475 = 11525$ $11525 \times \frac{20}{100} = 2305$	£ 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

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
5.	(a)	0: 8 1: 023578 2: 0122233 3: 1345 4: 456 Key 4 I 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

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

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
8.	(a)	Fred pays $\frac{x}{3}$ and Jim pays $\frac{x-10}{2}$ Malcolm gets £170 for Fred and Jim, so Malcolm gets $\frac{x}{3}+\frac{x-10}{2}=170$	Clear and coherent explanation	1	C1 a clear and coherent explanation
	(b)	Fred has $\frac{2x}{3}$ left, so solving for x using $\frac{x}{3}+\frac{x-10}{2}=170$ $2x+3(x-10)=170\times6$ $5x=1050$ $x=210$ **OR** $\frac{x}{3}+\frac{x-10}{2}=\frac{2x+3(x-10)}{6}$ $\frac{5x-30}{6}=170$ $5x=1050$ $x=210$	£140	4	M1 multiply through by 6 and cancels fractions M1 (dep)expand $3(x-10)$ M1 (dep)collect terms on each side correctly A1 cao **OR** M1 collects terms over 6 M1(dep) expand $3(x-10)$ M1(dep) multiply through by 6 and collect terms A1 cao
					Total for Question: 5 marks

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
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	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

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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

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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	(c)	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**		$\sin 68^o = \frac{AC}{8.5}$ AC = 8.5 × sin 68° = 7.881 7.881 + 1 < 9	Reason supported by calculation	4	M1 $\sin 68^o = \frac{AC}{8.5}$ M1 AC = 8.5 × sin 68° 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

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
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

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
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 though 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 × 3.65 = 30.4775	30.4775	2	M1 sight of 8.35 or 3.65 A1 30.4775
	(b)	LB 8.25 × 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

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
16.	(a)	Vol = $x \times (x-2) \times 2 = 51$ Vol = $2x^2 - 4x - 51 = 0$	Derives given answer and condition	4	M1 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 *BAC* = 180º — 47º — 58º = 75º $\frac{AC}{\sin 47} = \frac{220}{\sin 75} (= \frac{AB}{\sin 58})$ *AC* = $\frac{220 \sin 47}{\sin 75}$ = 166.57.. Area= $\frac{1}{2} \times 220 \times '166.57' \times \sin 58$ = 15538	15500 m^2	5	B1 for 75º M1 $\frac{AC}{\sin 47} = \frac{220}{\sin 75} (= \frac{AB}{\sin 58})$ M1 *AC* = $\frac{220 \sin 47}{\sin 75}$ M1 $\frac{1}{2}$ × 220 × "166.57" × sin58 A1 15500 m^2
					Total for Question: 5 marks

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18.		Pentagon = 5 equal isos triangles $\frac{360}{5}$ =72º Base angles = (180 – 72) ÷ 2 = 54º for finding equal sides of isosceles triangle; $\frac{x}{\sin 54} = \frac{10}{\sin 72}$ = 8.506508084... area of isosceles triangle = $\frac{1}{2}x^2 \sin 72$ = 34.40954801.. area of pentagon = 5 × 34.40954801 = 172.0477401 area of dodecahedron = 12 ×172.0477401 **OR** Using right-angled trigonometry; h = 5tan54º = 6.8819... Area of isosceles triangle = $\frac{1}{2} \times 10 \times h$ = 34.40954801... area of pentagon = 5 × 34.40954801 = 172.0477401 area of dodecahedron = 12 ×172.0477401	2065 cm^2	9	B1 for $\frac{360}{5}$ = 72º B1 (180 – 72) ÷ 2 = 54º M1 for finding equal sides of isosceles triangle; $x = \frac{x}{\sin 54} = \frac{10}{\sin 72}$ A1 for x = 8.506508084... M1 for finding area of isosceles triangle = $\frac{1}{2}x^2 \sin 72$ A1 for 34.40954801...(ft) B1 for area of pentagon = 5 × (ft) = 172.0477401...(ft) B1 for area of dodecahedron = 12 × (ft)= 2064.572881... cm^2 A1 for 2065 cm^2 (oe) **OR** B1 for $\frac{360}{5}$ = 72º B1 (180 – 72) ÷ 2 = 54 º M1 for using right-angled trigonometry; h = 5 tan54º A1 for 6.8819... M1 for finding area of isosceles triangle = $\frac{1}{2} \times 10 \times h$ A1 for 34.40954801...(ft) B1 for area of pentagon = 5 × (ft) = 172.0477401...(ft) B1 for area of dodecahedron = 12 × (ft) = 2064.572881... cm^2 A1 for 2065 cm^2 (oe)

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1MA0/2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18. (Cont)		**OR** Pentagon split into 3 isos triangles, where 2 are equal. Area of 2 isos triangles $= 2(\frac{1}{2}10^2 \sin 108)$ = 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..)sin36 = 76.94208845..	2065 cm^2	9	**OR** 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 = $2(\frac{1}{2}10^2 \sin 108)$ A1 for one of (76.94208845.. and 95.10565163...) B1 for area of dodecahedron A1 for 2065 cm^2 (oe)
					Total for Question: 9 marks

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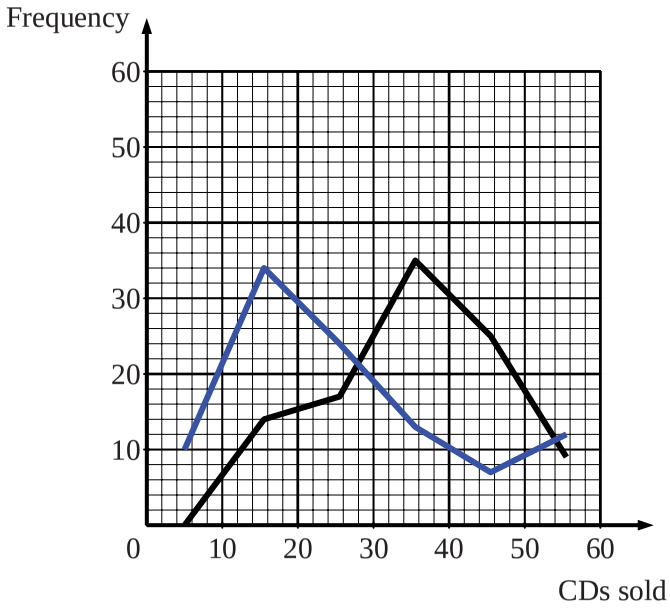
9.



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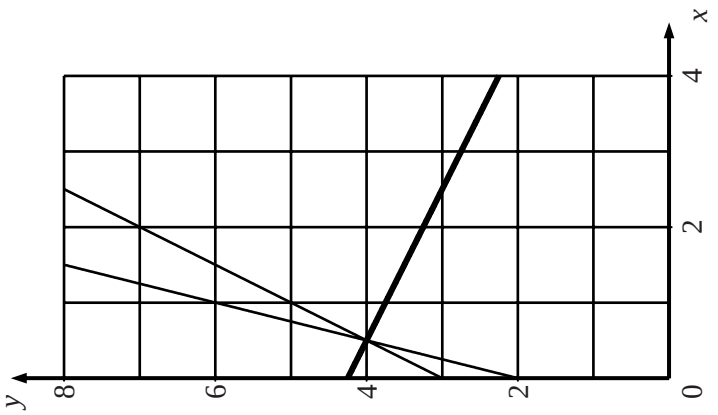
14.



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