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# GCSE MATHEMATICS

**2023 PRACTICE PAPER SET 2** Higher Tier Paper 2  
Mark Scheme

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8300/2H

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Version 1.0

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Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Further copies of this Mark Scheme are available from [aqa.org.uk](http://aqa.org.uk)

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## Glossary for Mark Schemes

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GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

<b>M</b>	Method marks are awarded for a correct method which could lead to a correct answer.
<b>A</b>	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
<b>B</b>	Marks awarded independent of method.
<b>ft</b>	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
<b>SC</b>	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
<b>M dep</b>	A method mark dependent on a previous method mark being awarded.
<b>B dep</b>	A mark that can only be awarded if a previous independent mark has been awarded.
<b>oe</b>	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
<b>[a, b]</b>	Accept values between <i>a</i> and <i>b</i> inclusive.
<b>3.14 ...</b>	Allow answers which begin 3.14 eg 3.14, 3.142, 3.1416
<b>Use of brackets</b>	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles.

**Diagrams**

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

**Responses which appear to come from incorrect methods**

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

**Questions which ask students to show working**

Instructions on marking will be given but usually marks are not awarded to students who show no working.

**Questions which do not ask students to show working**

As a general principle, a correct response is awarded full marks.

**Misread or miscopy**

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

**Further work**

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

**Choice**

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

**Work not replaced**

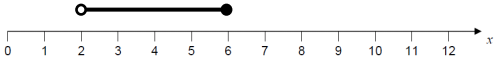
Erased or crossed out work that is still legible should be marked.

**Work replaced**

Erased or crossed out work that has been replaced is not awarded marks.

**Premature approximation**

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q	Answer	Mark	Comments
1	$5n - 2$	B2	B1 $5n+k$ , $k$ any integer other than $-2$
2	$\frac{1}{200}$	B1	
3	$-2$	B1	
4	Obtains an equivalent ratio or writes out two or more multiples of 11	M1	eg $6 : 16$ $9 : 24$ $11, 22, \dots$
	22	A1	
5(a)	$2x \leq 4 \times 3$ or $x \leq 4 \times \frac{3}{2}$ or $\frac{x}{3} \leq \frac{4}{2}$	M1	
	$x \leq 6$	A1	
	<b>Additional Guidance</b>		
	$x \leq 6$ in working lines and 6 on answer line		M1A1
5(b)	$x + 1 > 12 \div 4$ or $4x + 4 > 12$	M1	
	$x > 2$	A1	SC1 $> 2$ SC1 $x \geq 2$
	<b>Additional Guidance</b>		
	Working uses = but recovery to $x > 2$		M1A1
	$x > 2$ in working lines and 2 on answer line		M1A1
5(c)		B1ft	Correct or ft their two inequalities from (a) and (b) Condone dotted line

Q	Answer	Mark	Comments
6	<b>Alternative method 1</b>		
	$6300 = 0.2(E - 12\,570)$	M1	oe
	$6300 \div 0.2$ or 31 500	M1dep	oe 6300 $\times$ 5
	44 070	A1	
	<b>Alternative method 2</b>		
	$6300 = 0.2(E - 12\,570)$	M1	oe
	$6300 + 0.2 \times 12\,570$ or $6300 + 2\,514$ or 8814	M1dep	
	44 070	A1	
7	3.5 and $-3.5$	B2	oe B1 for each
	<b>Additional Guidance</b>		
	$\pm 3.5$		B2
8(a)	$\frac{4}{3} \times \pi \times 6^3$	M1	oe
	[903, 905] or $\frac{864}{3}\pi$	A1	
	<b>Additional Guidance</b>		
	$\frac{4}{3} \times 3(.1) \times 6^3$		M0
8(b)	$6 \times 2$ or 12	M1	May be seen on diagram
	$6 \times 8$ or their $12 \times 4$ or 48	M1	May be seen on diagram
	their $12 \times$ their $12 \times$ their 48	M1	oe
	6912	A1	SC2 864 (for using $6 \times 6 \times 24$ )

Q	Answer	Mark	Comments
9	<b>Alternative method 1</b>		
	$7.5 \div 0.005$ or $7500 \div 5$ or 1500	M1	oe
	their $1500 \div 5 \times 3$	M1	oe
	900	A1	SC1 90 or 9 000
	<b>Alternative method 2</b>		
	$7.5 \div 5 \times 3$ or 4.5	M1	oe eg $7.5 : 4.5$
	their $4.5 \div 0.005$ or $4500 \div 5$	M1	oe
	900	A1	SC1 90 or 9 000
	<b>Alternative method 3</b>		
	$\frac{1000}{5} \div 5 \times 3$ or 120	M1	oe
	$7.5 \times$ their 120	M1	
	900	A1	SC1 90 or 9 000
10	J and K and ASA	B2	oe B1 J and K with incorrect reason
11	Enlargement	B1	
	(scale factor) 3	B1	oe
	(centre) (3, 0) or this point marked on grid	B1	oe
12	$2 \times 7 \times 4$	M1	
	56	A1	

Q	Answer	Mark	Comments
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13	<b>Alternative method 1</b>		
	$10\,271.80 \div 1.015$ or 10 120	M1	
	their $10120 - 2000$ or 8120	M1dep	
	their $8120 \div 1.015$	M1	
	8000	A1	SC2 [6027,6028]
	<b>Alternative method 2</b>		
	$1.015x + 2000$	M1	oe
	their $(1.015x + 2000) \times 1.015$ $= 10\,271.80$	M1dep	oe
	$1.015 \times 1.015x =$ $10\,271.80 - 1.015 \times 2000$ or $1.030225x = 8241.8(0)$	M1	oe
	8000	A1	

14	$2(2x - 4) = 3x + 4$	M1	oe Must be correct and have $x$ on both sides
	$4x - 8 = 3x + 4$	M1	oe their bracket(s) expanded correctly
	$x = 12$	A1	
	$2 \times$ their $12 - 4$ or 20 and $5 \times$ their $12 - 10$ or 50	M1	Substitutes their value of $x$ in $2x - 4$ and $5x - 10$
	$20 : 50$ and $2 : 5$	A1	oe eg $\frac{20}{50}$ and $\frac{2}{5}$
	<b>Additional Guidance</b>		
	$2x - 4 = 2(3x + 4)$		M0
	T & I leading to $x = 12$		M1M1A1

Q	Answer	Mark	Comments
<b>15(a)</b>	0.56	B1	oe
<b>15(b)</b>	0.7 and $1 - 0.3$ or 0.7 or $1 - 0.7$ or 0.3 and 0.9	M1	oe eg in fractions Pairs must be linked eg on a tree diagram
	$0.7 \times (1 - 0.3)$ or 0.49 or $(1 - 0.7) \times 0.9$ or 0.27	M1	May be seen on a tree diagram
	$0.7 \times (1 - 0.3)$ or 0.49 and $(1 - 0.7) \times 0.9$ or 0.27	M1	May be seen on a tree diagram
	0.76	A1	oe

<b>16</b>	$x^2 = 20$	M1	oe any letter May be implied
	$\sqrt{20}$ or $2\sqrt{5}$ or 4.4(72...) or 4.5	M1	
	(hypotenuse =) $\sqrt{(\sqrt{\text{their } 20})^2 + (2\sqrt{\text{their } 20})^2}$ or $\sqrt{20+80}$ or $\sqrt{100}$ or 10	M1	
	$10 + 3\sqrt{20}$ or $10 + 6\sqrt{5}$ or $10 + (1)\sqrt{180}$	A1	
	<b>Additional Guidance</b>		
	Condone $\pm\sqrt{20}$ and $\pm\sqrt{100}$ etc for 2nd and/or 3rd M1		



Q	Answer	Mark	Comments	
17(a)	Smooth curve passing through the points ( $\pm 0.5$ square) (3, 0), (4, 9), (5, 16), (6, 21), (7, 24), (8, 25), (9, 24), (10, 21)	B3	Accept a line drawn from (0,0) to (3,0) Condone no line drawn from (0,0) to (3,0) B2 At least 6 correct points worked out or plotted ( $\pm 0.5$ square) B1 At least 4 correct points worked out or plotted ( $\pm 0.5$ square)	
	Additional Guidance			
	Correct points may be implied by curve passing through the points			
	Condone curve continued beyond $t = 10$			
17(b)	$\frac{\text{their } 25 - \text{their } 16}{8 - 5}$ or $\frac{9}{3}$	M1		
	3	A1ft	ft their points	
18	$0.09 \times 0.4536$ or $0.0408(24)$ or $0.09 \times 0.4536 \times 1000$ or $40.82(4)$	M1		
	$2.54^3$ or $16.3879(064)$	M1	oe	
	their $0.0408 \times 1000 \div$ their $16.3879$ or their $40.82 \div$ their $16.3879$	M1dep	dep on M1M1	
	[2.49, 2.5]	A1		

Q	Answer	Mark	Comments
19(a)	<b>Alternative method 1</b>		
	$4 + 21 + 28 + [1, 34]$ or $[54, 87]$ or $\frac{4}{5} \times 35$ or 28	M1	
	$8000 \times \frac{\text{their } 81}{100}$ or 6480	M1dep	oe
	233 280	A1	
	<b>Alternative method 2</b>		
	$\frac{8000}{100} \times 4$ or 320 and $\frac{8000}{100} \times 21$ or 1680 and $\frac{8000}{100} \times 28$ or 2240 and $\frac{8000}{100} \times [1, 34]$ or $[80, 2720]$	M1	
	$\frac{8000}{100} \times 4 + \frac{8000}{100} \times 21 + \frac{8000}{100} \times 28$ + $\frac{8000}{100} \times \text{their } 28$	M1dep	oe
	233 280	A1	
19(b)	Any appropriate explanation	B1	eg1 this is only a sample eg2 it may not reflect the whole population eg3 it may be different on another day

Q	Answer	Mark	Comments
20(a)	$(x+4)^2$ or $2a=8$ or $a=4$ or $a^2+b=6$	M1	
	$(x+4)^2-10$ or $a=4$ and $b=-10$	A1	
20(b)	<b>Alternative method 1</b>		
	$(x-4)^2+7$	M1	
	$x^2-4x-4x+16+7$ or $x^2-8x+23$	M1	Correct expansion of their $(x+m)^2+n$
	$c=-8$ and $d=23$	A1	
	<b>Alternative method 2</b>		
	$\left(x+\frac{c}{2}\right)^2+d-\frac{c^2}{4}$	M1	
	$\frac{c}{2}=-4$ and $d-\frac{c^2}{4}=7$	M1	Equates coefficients for their $(x+a)^2+b$
	$c=-8$ and $d=23$	A1	
	<b>Additional Guidance</b>		
	$16+4c+d=7$		M0

Q	Answer	Mark	Comments
21	$\cos 55^\circ = \frac{y}{30}$ or $30 \cos 55^\circ$ or $\sin 35^\circ = \frac{y}{30}$ or $30 \sin 35^\circ$ or 17.2(0...)	M1	Any letter $y$ is the horizontal side of the right angled triangle May be seen on diagram
	$\sin 55^\circ = \frac{x}{30}$ or $30 \sin 55^\circ$ or $\cos 35^\circ = \frac{x}{30}$ or $30 \cos 35^\circ$ or $\tan 55^\circ = \frac{x}{\text{their } y}$ or their $y \times \tan 55^\circ$ or $\tan 35^\circ = \frac{\text{their } y}{x}$ or $\frac{\text{their } y}{\tan 35}$ or $\sqrt{30^2 - \text{their } y^2}$ or [24.57, 24.6]	M1	Any letter $x$ is the vertical, dotted dividing line between the triangles May be seen on diagram
	Their $24.57^2 + 38^2 - 2 \times \text{their } 24.57 \times 38 \times \cos 80^\circ$ or [1720, 1724.8]	M1	
	$\sqrt{\text{their } [1720, 1724.8]}$ or [41.4, 41.55]	M1dep	dependent on third M1 May be seen on diagram
	$\frac{\text{their } 17.2 + \text{their } [41.4, 41.55] + 30 + 38}{20}$	M1dep	
	7	A1	
	<b>Additional Guidance</b>		
	Could find $x$ (vertical) first and then $y$ (horizontal)	M1M1	
	First 2 M marks Sides have been transposed	M0M0	
	Third M1 is not dependent		

Q	Answer	Mark	Comments
22	(cf values) 8, 56, 100, 110 and 120	M1	Allow one error but no omission Allow inclusion of 0 May be implied by correct frequencies
	(frequencies) 8 (–0) or 8 and their 56 – their 8 or 48 and their 100 – their 56 or 44 and their 110 – their 100 or 10 and their 120 – their 110 or 10	M1	ft their cf values Must have 5 frequencies
	(class widths) 20, 20, 40, 40 and 100	M1	All correct
	(frequency densities) 0.4 and 2.4 and 1.1 and 0.25 and 0.1	A1ft	ft their frequencies and their class widths Must have 5 frequency densities Must have first and second M1
	Suitable axes and scaling on grid	B1ft	ft their frequency densities
	Bars of correct width and height	A1	Must be fully correct
	<b>Additional Guidance</b>		
	Ignore any polygon drawn with a histogram		

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