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General Certificate of Secondary Education
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Mathematics 43602H

Unit 2 Higher tier

FINAL

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Glossary for Mark Schemes

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.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	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	Marks awarded independent of method.
Q	Marks awarded for Quality of Written Communication
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between a and b inclusive.
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.149.
Use of brackets	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 candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

Questions which ask candidates to show working

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

Questions which do not ask candidates to show working

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

Misread or miscopy

Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate 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.

Unit 2 Higher Tier

Q	Answer	Mark	Comments
1a	$20 + 2 \times 5$	M1	oe
	30	A1	
1b	35	B1ft	ft their (a) + 5
1c	70 – 20 (= 50) or 70 – 20 – 20 (= 30)	M1	oe
	Their 30 ÷ 5 (= 6) or (20 +) 6 × 5	M1	oe M2 20 + 20 + 6 × 5
	28	A1	Accept 27.9…
2	$8x + 24$ (= 36)	M1	or $x + 3 = \frac{36}{8}$ oe
	$8x$ = 36 – their 24	M1	or x = their $\frac{36}{8} - 3$
	1.5	A1 ft	oe ft their equation if exactly one method mark awarded
3	Can be odd or even	B1	Accept any indication
	Always odd	B1	
	Always odd	B1	
4	4 × (0).34 (= 1.36) or 3.09 ÷ 3 (= 1.03)	M1	oe
	3.4(0) – their 1.36 (= 2.04)	M1	oe $0.6 \times 3.4(0)$
	3.09 – their 1.03 (= 2.06)	M1	oe $\frac{2}{3} \times 3.09 (= 2.06)$
	(£) 2.04 (SS) and (£) 2.06 (CC)	A1	oe
	Super Snacks	Q1ft	Strand (iii) Correct decision based on their figures with at least two method marks awarded

Q	Answer	Mark	Comments
5	1 hour 30 (minutes) ($\times$ 4)	M1	oe
	6 (hours)	A1	oe
	No and 5	Q1 ft	Strand (iii) Correct decision for their times, M1 awarded
	Alternative method 1		
	5 (hours) ($\div$ 4)	M1	oe
	1 hour 15 (minutes) or 75 (minutes) or 1.25 (hours) or $1\frac{1}{4}$ (hours)	A1	oe
	No and 1 hour 30 (minutes) or 90 (minutes) or 1.5 (hours) or $1\frac{1}{2}$ (hours)	Q1 ft	Strand (iii) Correct decision for their times, M1 awarded Must compare like for like eg 75 minutes with 90 minutes for 3 marks
	Alternative method 2		
	20 (squares) ($\div$ 4)	M1	6 (squares) (× 4)
	5 (squares)	A1	24 (squares)
	No and 6	Q1 ft	No and 20 Strand (iii) Correct decision for their values, M1 awarded.
	Alternative method 3		
	$\frac{1.5}{5}$ (hours) or $\frac{90}{300}$ (mins) or $\frac{6}{20}$ (sq)	M1	oe
	$\frac{6}{20}$ or $\frac{90}{300}$	A1	Or fraction with a denominator that is a multiple of 20
	No and $\frac{5}{20}$ or both fractions with same denominator	Q1ft	Strand (iii) oe Correct decision for their fractions, M1 awarded
	Alternative method 4		
	$\frac{1.5}{5}$ (hours) or $\frac{90}{300}$ (mins) or $\frac{6}{20}$ (sq)	M1	
	30% or 0.3	A1	
	No and 25% or No and 0.25	Q1ft	Strand (iii) oe Correct decision for their percentages, M1 awarded. Must compare like with like.

Q	Answer	Mark	Comments
6a	$-3 + 2 \times 4$ or $-3 + 8$	M1	
	$-3 \times -5 = 15$	M1	
	20	A1	SC1 -10 no working
6b	$\frac{1}{5}$ or $\frac{2}{10}$ or 0.2	B1	oe
	$\frac{4}{5}$ + their $\frac{1}{5}$ or $\frac{8}{10}$ + their $\frac{2}{10}$ or 0.8 + their 0.2	M1	Correct use of common denominator after product attempted oe or $\frac{5}{5}$ or $\frac{10}{10}$
	1	A1	SC1 $\frac{13}{25}$ oe eg 0.52, $\frac{26}{50}$
7	64 and 81	B2	either order B1 both correct and one incorrect B1 one correct and one incorrect SC1 8^2 and 9^2 on answer line SC1 8 and 9 on answer line **and** 64 and 81 in working
8a	a^{25}	B1	
8b	a^{15}	B1	
8c	a^{100}	B1	
9a	$f - 2 = 3g$	M1	oe or $\frac{f}{3} = g + \frac{2}{3}$
	$g = \frac{f - 2}{3}$	A1	oe or $g = \frac{f}{3} - \frac{2}{3}$ SC1 $g = \frac{f+2}{3}$ or $g = 3(f - 2)$
9b	$4x^2$ or $-x^3$	M1	
	$4x^2 - x^3$	A1	Do not ignore further working

Q	Answer		Mark	Comments
10	$4x + 6y = 20$	or $12x - 3y = -3$	M1	oe Allow one error
	$7y = 21$	or $14x = 7$	M1	oe
	$x = \frac{1}{2}$ and $y = 3$		A1	oe
	Alternative method			
	$x = \frac{10 - 3y}{2}$ or $y = 4x + 1$ or $y = \frac{10 - 2x}{3}$ or $x = \frac{y - 1}{4}$		M1	oe
	$7y = 21$	or $14x = 7$	M1	oe
	$x = \frac{1}{2}$ and $y = 3$		A1	oe

11	y intercepts at 1 and -1	B1	oe eg 1 and (–) 1 marked on diagram
	(y =) 7 (at B) and (y =) -4 (at D)	B1	oe eg 7 and (–) 4 on diagram or in working
	1 – – 1 (= 2) **or** 7 – – 4 (= 11)	M1	Using their coordinates
	2 : 11	A1	oe

12a	$(x + a)(x + b)$	M1	where $ab = \pm 24$
	$(x + 8)(x - 3)$	A1	either order
12b	(x =) -8 and (x =) 3	B1 ft	ft their part (a)

Q	Answer	Mark	Comments
13a	7.2×10^{-4}	B1	
13b	80 000 000	B1	
	Their 80 000 000 ÷ 20 000 correctly evaluated	M1	
	Their answer correctly converted to standard form (4×10^3 if correct)	A1 ft	ft if B0 awarded
	Alternative method		
	8×10^7 or 2×10^4	M1	oe eg 80×10^6
	$\frac{8 \times 10^7}{2 \times 10^4}$	A1	oe using index form
	4×10^3	A1ft	ft if M1A0 awarded
14	$(x + y)(x - y)$ or $(0.77 + 0.23)(0.77 - 0.23)$	M1	
	their 1 × their 0.54	M1 dep	
	0.54	A1	oe eg $\frac{27}{50}$
	Alternative method 1		
	Full valid method to work out 0.77×0.77 or 0.23×0.23	M1	Accept as evidence the sight of digits 5929 or 529
	0.5929 or 0.0529	A1	
	0.54	A1	oe eg $\frac{27}{50}$
	Alternative method 2		
	Full valid method to work out 77×77 or 23×23	M1	Sight of 5929 or 529
	5400	A1	
	0.54	A1	oe eg $\frac{27}{50}$

Q	Answer	Mark	Comments
15a	$\sqrt{8\times 2}$ or $\sqrt{16}$ or $2\sqrt{2}\ \left(\times\sqrt{2}\right)$ or $\sqrt{2\times 2\times 2\times 2}$ or $\sqrt{4\times 4}$	M1	
	4	A1	Accept –4
15b	$\frac{12}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}}$	M1	$\frac{12\sqrt{3}}{3}$
	$4\sqrt{3}$	A1	
16	Sight of correct common denominator eg $2x$	M1	oe eg $2x^2$ any common multiple of 2 and x
	$\frac{11}{2x}-\frac{6}{2x}$	A1	oe eg $\frac{11x}{2x^2}-\frac{6x}{2x^2}$
	$\frac{5}{2x}$	A1	
17	$a = 3$	B1	
	$(2x+1)(ax+b)=2ax^2+ax+2bx+b$ or $(2x+1)(3x+b)=6x^2+3x+2bx+b$	M1	
	$3x+2bx=-5x$ or $3 + 2b = -5$ or $3x-8x=-5x$	M1dep	
	$b = -4$ and $c = -4$	A1	
18	Correct evaluation of a relevant power of 2 or 16 or $4c = d$	M1	eg $16^{\frac{1}{2}} = (\pm)4$ or $16^2 = 256$ or $2^4 = 16$ or $16^{\frac{1}{4}} = (\pm)2$ or $16^1 = 16$ or $16^0 = 1$
	One correct pair of answers	A1	A correct answer is such that $d = 4c$ eg $c = 0$, $d = 0$ $c = 1$, $d = 4$ or $c = -1$, $d = -4$ $c = 2$, $d = 8$ or $c=\frac{1}{8}$, $d=\frac{1}{2}$ etc…
	A second correct pair of answers	A1	