AQA Qualifications

GCSE
MATHEMATICS

Unit 2 43602H
Mark scheme

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Mark schemes are prepared by the Lead Assessment Writer 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 associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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.

Further copies of this Mark Scheme are available from aqa.org.uk

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.
M dep	A method mark dependent on a previous method mark being awarded.
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.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
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.

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.

Q	Answer	Mark	Comments
1	**Alternative method 1**		
	2476 ÷ (3 + 1) or 619	M1	oe
	their 619 × (3 – 1) or their 619 × 2 or 2476 ÷ (3 – 1) or 2476 ÷ 2 or their 619 × 3 – their 619 or (2476 – their 619) – their 619 or 1857 – 619	M1	oe
	1238	A1	
	Alternative method 2		
	(3 + 1) ÷ (3 – 1) or 4 ÷ 2 or (3 – 1) ÷ (3 + 1) or 2 ÷ 4	M1	oe
	2476 ÷ their 2 or 2476 × their $\frac{1}{2}$	M1	oe
	1238	A1	
2	= > >	B1 B1 B1	

Q	Answer	Mark	Comments
3	$\frac{170}{100}\times 20$ or $\frac{170}{10}\times 2$ or 17 × 2 or 34 or $\frac{170}{100}\times 80$ or $\frac{170}{10}\times 8$	M1	oe (Tablet World)
	136	A1	
	180 ÷ 4 or 45 or $180\times\frac{3}{4}$	M1	oe (IT Supplies)
	135	A1	
	138	B1	(PC Heaven)
	IT Supplies	Q1ft	Strand (iii) ft for correct decision based on their values, must have both method marks and a total for PC Heaven
4(a)	$x(x-1)$ or $x \times (x-1)$ or $(x-1)x$ or $(x-1) \times x$	B1	

Q	Answer	Mark	Comments
4(b)	**Alternative method 1**		
	$(x – 1)(x – 1 – 1)$	Q1	Strand (ii) algebraic argument
	$(x – 1)(x – 1 – 1) = (x – 1)(x – 2)$	Q1	
	Alternative method 2		
	$x^2 – x – x + 1$ or $x^2 – 2x + 1$	Q1	Strand (ii) algebraic argument
	$x^2 – 2x + 1 – x + 1 = x^2 – 3x + 2$ $= (x – 1)(x – 2)$ or $x^2 – 2x + 1 – (x – 1) = x^2 – 3x + 2$ $= (x – 1)(x – 2)$	Q1	
	Alternative method 3		
	$x^2 – x – x + 1$ or $x^2 – 2x + 1$ or $x^2 – x – 2x + 2$ or $x^2 – 3x + 2$	Q1	Strand (ii) algebraic argument
	$x^2 – 2x + 1 – x + 1 = x^2 – 3x + 2$ **and** $(x – 1)(x – 2) = x^2 – 3x + 2$ or $x^2 – 2x + 1 – (x – 1) = x^2 – 3x + 2$ **and** $(x – 1)(x – 2) = x^2 – 3x + 2$	Q1	
	Alternative method 4 (next page)		

Q	Answer	Mark	Comments
4(b) continued	**Alternative method 4**		
	$(x-1)-1$ (= $x-2$) or $x-1-1$ (= $x-2$)	Q1	Strand (ii) algebraic argument
	$x-2$ (= $x-2$)	Q1	
4(c)	$5x^2$ or $-15x$	M1	oe
	$5x^2$ and $-15x$	A1	
	$5x^2-23x$ or $x(5x-23)$	A1ft	ft if M1A0 awarded and two terms in x correctly collected
5(a)	560.88	B1	
5(b)	45 600	B1	
5(c)	**Alternative method 1**		
	56 088 – 456	M1	
	55 632	A1	
	Alternative method 2		

	Traditional method of long multiplication with correct use of 0s (allow one arithmetic error) and attempt to add or Grid method with correct use of 0s (allow one arithmetic error) and attempt to add or Gelosia method (allow one arithmetic error) and attempt to add	M1	122 x 456 = 732, 6100, 48800 = 55632 or 456 x 122 = 912, 9120, 45600 = 55632 or 100 20 2 400 40000 8000 800 50 5000 1000 100 6 600 120 12 ↓ 40000 + 8000 + 5000 + 1000 + 800 + 600 + 100 + 120 + 12 = 55632 or Gelosia grid: 1 2 2 / 4 8 8 / 5 0 0 / 6 1 1 / 6 3 2 = 55632
	55 632	A1	

Q	Answer	Mark	Comments
6(a)	$C = \frac{4}{3}t + 50$	B3	oe oe for $\frac{4}{3}$ throughout B2 $C = \frac{4}{3}t + c$ any value of c or $\frac{4}{3}t + 50$ or gradient = $\frac{4}{3}$ **and** intercept = 50 or $y = \frac{4}{3}x + 50$ B1 $C = kt + 50$ $k \neq 0$ or $y = kx + 50$ $k \neq 0$ or $\frac{4}{3}t + c$ any value of c or gradient = $\frac{4}{3}$ or $\frac{4}{3}x + 50$ or intercept = 50
6(b)	Line from (0, 120) to (60, 120)	B1	
	Line from (60, 120) to at least (180, 360)	B1	
6(c)	290 or 2 × 180 or 360 or correct reading from their graph at t = 180	M1	
	70	A1ft	ft their 360 from graph or their 2 × 180

Q	Answer	Mark	Comments
7	23, 25 and 29	B2	any order B1 three correct and one incorrect or two correct and none or one incorrect SC1 any three or all four of 21, 22, 26 and 27 with no other number
8	A correct pair of fractions meeting all conditions eg $\frac{1}{9}$ and $\frac{2}{9}$ or $\frac{1}{12}$ and $\frac{1}{4}$	B3	B2 a pair of fractions which add to $\frac{1}{3}$ but which do not satisfy all conditions eg, $\frac{1}{6}$ and $\frac{1}{6}$ or $\frac{2}{3}$ and $-\frac{1}{3}$ or $\frac{1}{3}$ – any fraction less than $\frac{1}{3}$ correctly changed to common denominator with at least one numerator correct B1 $\frac{1}{3}$ changed to any equivalent fraction $\frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \ldots$ or $\frac{1}{3}$ – any fraction less than $\frac{1}{3}$

Q	Answer	Mark	Comments
9	$4x - 5$ or $\frac{2x+5}{4}$	M1	oe
	$4x - 5 = 2x$ or $\frac{2x+5}{4} = x$	M1	oe
	2.5	A1	oe SC2 input of 2.5 and answer 5 SC1 a correctly evaluated trial for any input
10	$y = 3x$ and $y = 3x + 1$	B2	B1 $y = 3x$ and $y = 3x + 1$ and one incorrect or $y = 3x$ or $y = 3x + 1$ and none or one incorrect
11(a)	1.24	B1	
11(b)	0.88^2	B1	

Q	Answer	Mark	Comments
12	**Alternative method 1**		
	$8x - 4y = 50$ or $12x - 16y = 80$ and $12x - 6y = 75$	M1	oe allow one error
	$5x = 30$ or $x = 6$ and $-10y = 5$ or $y = -\frac{1}{2}$	M1 dep	oe correct elimination of one unknown for their equations
	$x = 6$ and $y = -\frac{1}{2}$	A1	oe SC1 correct answer without working or with use of trial and improvement
	Alternative method 2		
	$x = \frac{20 + 4y}{3}$ or $y = \frac{3x - 20}{4}$ or $x = \frac{25 + 2y}{4}$ or $y = \frac{4x - 25}{2}$	M1	oe allow one error
	$10x = 60$ or $x = 6$ and $10y = -5$ or $y = -\frac{1}{2}$	M1 dep	oe correct elimination of one unknown for their equations and simplification to two terms
	$x = 6$ and $y = -\frac{1}{2}$	A1	oe SC1 correct answer without working or with use of trial and improvement
13	$(-4)^2$ or 16 or 7^2 or 49	M1	condone absence of brackets
	65	A1	

Q	Answer	Mark	Comments
14(a)	$x^2 - xy + xy - y^2$	B1	oe
14(b)	**Alternative method 1**		
	$7\frac{4}{5} + 2\frac{1}{5}$ or $7\frac{4}{5} - 2\frac{1}{5}$	M1	oe
	10 and $5\frac{3}{5}$	M1	oe
	56	A1	
	Alternative method 2		
	$\frac{39}{5} \times \frac{39}{5}$ or $\frac{11}{5} \times \frac{11}{5}$ or full valid method to work out 7.8 × 7.8 or 2.2 × 2.2 or digits 6084 or 484	M1	Allow one error in computation
	$\frac{1521}{25}$ or $\frac{121}{25}$ or $\frac{1400}{25}$ or 60.84 or 4.84	M1	oe
	56	A1	

Q	Answer	Mark	Comments
15	**Alternative method 1**		
	$(x^2 =)\frac{1.8\times10^8}{2\times10^5}$	M1	oe
	0.9×10^3	M1	
	9×10^2 or 900 or 30 or -30	A1	
	30 and -30	A1ft	ft positive and negative square root of their 900 if M1M1A0 or M1M0A0 scored
	Alternative method 2		
	180 000 000 or 200 000	M1	
	$(x^2 =)\frac{their 180000000}{their 200000}$	M1 dep	oe
	900 or 30 or -30	A1	
	30 and -30	A1ft	ft positive and negative square root of their 900 if M1M1A0 or M1M0A0 scored

Q	Answer	Mark	Comments
16	**Alternative method 1**		
	$3cd = 4(c-d)$ or $3c = \frac{4c-4d}{d}$	M1	
	$3cd = 4c - 4d$	M1	
	$3cd + 4d = 4c$ or $d(3c+4) = 4c$ or $\frac{4c}{3c+4}$	M1	
	$d = \frac{4c}{3c+4}$	A1	
	Alternative method 2		
	$3c = \frac{4c-4d}{d}$	M1	
	$3c = \frac{4c}{d} - 4$	M1	
	$3c+4 = \frac{4c}{d}$ or $\frac{1}{3c+4} = \frac{d}{4c}$ or $\frac{4c}{3c+4}$	M1	
	$d = \frac{4c}{3c+4}$	A1	
17	$101.4^{\frac{1}{2}}$ estimated as 10	B1	condone – 10
	$(6.43^0 =)$ 1	B1	
	$7.99^{\frac{2}{3}}$ estimated as 4	B1	
	14	B1ft	condone – 6 if – 10 used ft fully correct evaluation with B2 scored

Q	Answer	Mark	Comments
18	$5x^2 + 30x$ or $9x^2 + 15x + 15x + 25$ or $9x^2 + 30x + 25$	M1	
	$5x^2 + 30x – (9x^2 + 15x + 15x + 25)$ or $5x^2 + 30x – (9x^2 + 30x + 25)$ or $5x^2 + 30x – 9x^2 – 15x – 15x – 25$ or $5x^2 + 30x – 9x^2 – 30x – 25$	M1	allow one error
	$– 4x^2 – 25$ or $– (4x^2 + 25)$ from fully correct algebra	A1	
	Argues that both terms have to be negative so expression is negative	Q1ft	Strand (ii) correct mathematical argument and M2 scored argument may be that their expression is not negative for all values of x