AQA Qualifications

GCSE

Mathematics

Unit 2 43602H

Mark scheme

43602H
November 2014

Version/Stage: v1.1

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.
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.

Q	Answer	Mark	Comments
1(a)	93.42	B1	any clear indication
1(b)	34.6	B1	any clear indication
2	$\frac{30}{100} \times 4$ or 1.2(0) or 120 or $\frac{70}{100}$	M1	oe
	4 – their 1.2(0) or 2.8 or $\frac{70}{100} \times 4$	M1dep	oe
	(£) 2.80	Q1	Strand (i) Must have correct units do not accept 2.80p or 280p or 2.8

3	70×40 or 2800	M1	(Nisha)
	their $2800 - \frac{5}{100} \times$ their 2800 or $2800 - 140$ or 2660	M1dep	oe (Nisha)
	$70 \div 5$ or $\frac{1}{5} \times 70$ or 14 or $\frac{4}{5} \times 70$ or 56	M1	oe (Dipen)
	their $14 \times 4 \times 40$ or 56×40 or 70×40 – their 14×40 or their 2800 – their 14×40 or 2240	M1dep	oe dependent on 3rd method mark (Dipen)
	2660 and 2240	A1	
	420 and No	Q1ft	Strand (iii) correct comparison for their values, with at least one correct value

3	**Additional Guidance**
	2800 – 140 implies minimum **first** and **second** Method marks
	2800 – 560 implies minimum **third** and **fourth** Method marks

4(a)	5, 9, 13, 17, 21 seen	M1	allow one error or omission
	5 + 9 + 13 + 17 + 21 = 65	A1	

4(b)	$4n + 1$	B2	oe B1 $4n$ ($\pm k$)

4(b)	**Additional Guidance**	
	$4 \times n + 1$	is B2
	$4 \times n$ ($+ k$)	is B1

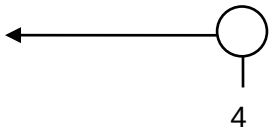
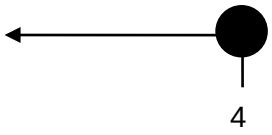
5	**Alternative method 1**		
	$x + x + 30 = 110$	M1	(x representing Ann)
	$(x =)\ 40$	A1	
	$\frac{\text{their } 40 + 30}{110}$	A1ft	oe fraction $\frac{7}{11}$
	Alternative method 2		
	$x + x - 30 = 110$	M1	(x representing Tom)
	$(x =)\ 70$	A1	
	$\frac{\text{their } 70}{110}$	A1ft	oe fraction $\frac{7}{11}$
	Alternative method 3		
	$(110 - 30) \div 2$ or $80 \div 2$	M1	
	40	A1	
	$\frac{\text{their } 40 + 30}{110}$	A1ft	oe fraction $\frac{7}{11}$
	Alternative method 4		
	$(110 + 30) \div 2$ or $140 \div 2$	M1	
	70	A1	
	$\frac{\text{their } 70}{110}$	A1ft	oe fraction $\frac{7}{11}$
	Alternative method 5		
	$110 \div 2 + 15$ or $55 + 15$	M1	
	70	A1	
	$\frac{\text{their } 70}{110}$	A1ft	oe fraction $\frac{7}{11}$

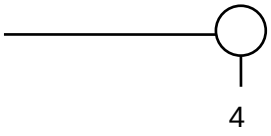
5	**Additional Guidance**	
	$\frac{85}{110}$	is M0 A0 A0ft

6	$6x + 15 – 2x + 8$	M1	allow one error
	$6x + 15 – 2x + 8$	A1	fully correct
	$4x + 23$	A1ft	do not ignore fw SC2 $4x + 7$

6	**Additional Guidance**
	Do not allow fw eg. $4x + 23 = 27x$ score A0 for final accuracy mark
	Allow fw in trying to solve equation after $4x + 23$ seen to score A1 for final accuracy mark
	$6x + 15 – 2x – 8$ $4x + 7$ is M1 A0 A1ft
	$4x + 7$ alone on answer line is SC2
	Two independent expanded brackets (shown one underneath the other) $6x + 15$ $2x – 8$ with $4x + 23$ on answer line is M1 A1 A1
	Two independent expanded brackets shown remotely (same line) $6x + 15$ $2x – 8$ with $4x + 23$ on answer line is M1 A1 A1
	Two independent expanded brackets shown remotely without correct answer on answer lines scores zero marks $6x + 15$ $2x – 8$ with answer line blank is M0 A0 A0

7(a)	$5x \geq 29 + 11$ or $x - \frac{11}{5} \geq \frac{29}{5}$ or $x \geq \frac{40}{5}$	M1	oe
	$x \geq 8$	A1	SC1 8 SC1 $x \geq 3.6$ or $x \geq 3\frac{3}{5}$

7(b)	 	B2	B1 $x < 4$ or  condone missing arrow for B2 or B1

7(b)	**Additional Guidance**
	Intention must be clear to indicate $x < 4$ with minimum of a line drawn to the left of hollow circle positioned at 4.  Is B2
	 implies is B1

8	**Alternative method 1**		
	$\frac{110}{200}$ or $\frac{140}{250}$	M1	oe
	$\frac{55}{100}$ **and** $\frac{56}{100}$	A1	oe both fractions correctly written with common denominator eg. $\frac{275}{500}$ **and** $\frac{280}{500}$
	Y11 **and** their $\frac{55}{100}$ **and** their $\frac{56}{100}$	Q1ft	oe Strand (iii) M1 and correct decision based on their fractions written with common denominator, with at least one correct
	Alternative method 2		
	$\frac{110}{200}$ or $\frac{140}{250}$	M1	oe
	0.55 **and** 0.56 or 55(%) **and** 56(%)	A1	
	Y11 **and** their 55(%) **and** their 56(%) or Y11 **and** their 0.55 **and** their 0.56	Q1ft	oe Strand (iii) M1 and correct decision based on their decimals or percentages, with at least one correct
	Alternative method 3		
	110 : 200 or 140 : 250	M1	oe
	27.5 : 50 **and** 28 : 50	A1	oe both ratios correctly written with common right side or left side for comparison
	Y11 **and** their 27.5 : 50 **and** their 28 : 50	Q1ft	Strand (iii) oe M1 and correct decision based on their ratios correctly written with common right side or left side for comparison, with at least one correct

8 (cont)	**Alternative method 4**		
	$\frac{200-110}{200}$ or $\frac{250-140}{250}$	M1	oe
	$\frac{45}{100}$ **and** $\frac{44}{100}$	A1	oe both fractions correctly written with common denominator eg. $\frac{225}{500}$ **and** $\frac{220}{500}$
	Y11 **and** their $\frac{45}{100}$ **and** their $\frac{44}{100}$	Q1ft	oe Strand (iii) M1 and correct decision based on their fractions written with common denominator, with at least one correct
	Alternative method 5		
	$\frac{200-110}{200}$ or $\frac{250-140}{250}$	M1	oe
	0.45 **and** 0.44 or 45(%) **and** 44(%)	A1	
	Y11 **and** their 45(%) **and** their 44(%) or Y11 **and** their 0.45 **and** their 0.44	Q1ft	oe Strand (iii) M1 and correct decision based on their decimals or percentages, with at least one correct
	Alternative method 6		
	(200 – 110) : 200 or (200 – 140) : 250	M1	oe
	22.5 : 50 **and** 22 : 50	A1	oe both ratios correctly written with common right side or left side for comparison
	Y11 **and** their 22.5 : 50 **and** their 22 : 50	Q1ft	oe Strand (iii) M1 and correct decision based on their ratios correctly written with common right side or left side for comparison, with at least one correct

9(a)	$(x + a)(x + b)$	M1	where $ab = \pm 24$ or $a + b = 10$
	$(x + 4)(x + 6)$	A1	oe

9(b)	$x = -4$ **and** $x = -6$	B1ft	ft their factorisation from part (a)

10	**Alternative method 1**		
	$4\frac{1}{2} \times 3\frac{3}{4}$ or $\frac{9}{2}$ or $\frac{15}{4}$	M1	
	$\frac{9}{2} \times \frac{15}{4}$ or $\frac{135}{8}$	M1dep	
	$16\frac{7}{8}$	A1	oe mixed number
	Alternative method 2		
	4.5 × 3.75 or 15 or 1.875	M1	
	Full method to evaluate 4.5 x 3.75	M1dep	allow one error
	16.875	A1	condone rounding or truncation after correct answer seen

11	$3y = 12 - 4x$ or $\frac{4x}{3} + y = 4$ or $\frac{12 - 4x}{3}$	M1	oe
	$y = \frac{12 - 4x}{3}$ or $y = \frac{4(3 - x)}{3}$ or $y = 4 - \frac{4x}{3}$	A1	oe

12(a)	5	B1	

12(b)	(0, –4)	B1	

13	$10.8 \times 10^{(5-2)}$ or 10.8×10^3 or 540 000 x 0.02 or 5400 x 2 or 10 800	M1	oe
	1.08×10^4	A1	SC1 1.1×10^4

14	**Alternative method 1**			
	$8f + 4c = 40.2(0)$ and $3f + 4c = 19.2(0)$	$6f + 3c = 30.15$ and $6f + 8c = 38.4(0)$	M1	oe allow one error
	$5f = 21(.00)$	$5c = 8.25$	M1dep	oe correct elimination of one unknown for their equations
	$(f =)$ 4.2(0)	$(c =)$ 1.65	A1	
	21.75		A1	oe
	Alternative method 2			
	$3f + 4(10.05 – 2f)$ = 19.2(0) or $2\left(\frac{19.2(0) - 4c}{3}\right) + c = 10.05$		M1	oe allow one error
	$5f = 21(.00)$	$5c = 8.25$	M1dep	oe correct elimination of one unknown for their equations
	$(f =)$ 4.2(0)	$(c =)$ 1.65	A1	
	21.75		A1	oe
	Alternative method 3			
	$5f + 5c = 29.25$		M1	
	$f + c = 29.25 \div 5$ or $f + c = 5.85$		M1dep	
	$(f =)$ 4.2(0) or $(c =)$ 1.65		A1	
	21.75		A1	
	Alternative method 4			
	$5f + 5c = 29.25$		M1	
	$f + c = 29.25 \div 5$ or $f + c = 5.85$		M1dep	
	$2f + 2c = 10.7(0)$		A1	
	21.75		A1	

15	$x(x-2)$ or x^2-2x	M1	oe any correct common denominator seen
	$4x-3(x-2)$ or $4x-3x+6$	M1dep	oe correct numerator seen for their denominator, may be written as separate fractions
	$\frac{x+6}{x(x-2)}$ or $\frac{x+6}{x^2-2x}$	Q1	oe Strand (ii) correct answer with no errors in working

16	$(\sqrt{10}=)\sqrt{5}\times\sqrt{2}$ or $\sqrt{5\times2}$ or $(\sqrt{20}=)\sqrt{5}\times\sqrt{4}$ or $\sqrt{5\times4}$ or $2\sqrt{5}$ or $3\sqrt{200}$ or $3\sqrt{100\times2}$ or $3\sqrt{10\times10\times2}$ or $3\sqrt{25\times8}$ or $3\sqrt{5\times5\times8}$ or $3\sqrt{25\times2\times2\times2}$ or $3\sqrt{5\times5\times2\times2\times2}$ or $(3\sqrt{20}=)6\sqrt{5}$ or $3\times2\sqrt{5}$ or $6\sqrt{50}$ or $7\sqrt{50}$ or $(\sqrt{50}=)\sqrt{25}\times\sqrt{2}$ or $\sqrt{5\times5\times2}$ or $5\sqrt{2}$	M1	oe
	$30\sqrt{2}$ or $3\times10\sqrt{2}$ or $35\sqrt{2}$ or $7\times5\sqrt{2}$ or $13\sqrt{50}$ or $\sqrt{10}\times13\sqrt{5}$	M1dep	oe
	65	A1	allow $65\sqrt{2}$

16	**Additional Guidance**
	First method mark is for any useful first step

17	$15x^2 – 6xy – 20xy + 8y^2$	M1	allow one error
	$15x^2 – 6xy – 20xy + 8y^2$	A1	fully correct
	$15x^2 – 26xy + 8y^2$	A1ft	ft their four terms do not ignore further work for final mark

18	$x^2 + ax + ax + (a^2)$ or $x^2 + 2ax + (a^2)$ or $2a = 8$ or $a^2 + b = 7$	M1	
	$(x + 4)^2$ or $a = 4$ or $b = –9$	A1	
	$(x + 4)^2 – 9$	A1	allow $a = 4$ **and** $b = –9$

19	**Alternative method 1**		
	$\left(\frac{1}{R}=\right)\ \frac{1}{0.6}+\frac{1}{1.8}$	M1	oe
	$\left(\frac{1}{R}=\right)\ \frac{3}{1.8}\ \left(+\frac{1}{1.8}\right)$	M1dep	oe
	$\left(\frac{1}{R}=\right)\ \frac{4}{1.8}$ or $(R=)\ \frac{1.8}{4}$	M1dep	oe
	0.45	A1	oe fraction or decimal
	Alternative method 2		
	$\left(\frac{1}{R}=\right)\ \frac{1}{\frac{6}{10}}+\frac{1}{\frac{18}{10}}$ or $\left(\frac{1}{R}=\right)\ \frac{1}{\frac{3}{5}}+\frac{1}{\frac{9}{5}}$	M1	oe
	$\frac{10}{6}$ or $\frac{30}{18}$ or $\frac{10}{18}$ or $\frac{5}{3}$ or $\frac{15}{9}$ or $\frac{5}{9}$	M1dep	oe
	$\left(\frac{1}{R}=\right)\ \frac{40}{18}$ or $\left(\frac{1}{R}=\right)\ \frac{20}{9}$	M1dep	oe
	$\frac{18}{40}$ or $\frac{9}{20}$	A1	oe fraction or decimal
	Alternative method 3		
	$\frac{1}{R}=\frac{R_2+R_1}{R_1R_2}$	M1	
	$\frac{R_1R_2}{R_2+R_1}$ or $\left(\frac{1}{R}=\right)\ \frac{1.8+0.6}{0.6\times1.8}$	M1dep	oe
	$\frac{0.6\times1.8}{1.8+0.6}$ or $\frac{0.6\times1.8}{2.4}$ or $\frac{1.8}{4}$	M1dep	oe
	0.45	A1	oe fraction or decimal

20	$\frac{1}{8^{\frac{2}{3}}}$ or $\frac{1}{\sqrt[3]{8^2}}$ or $\frac{1}{\left(\sqrt[3]{8}\right)^2}$ or $\sqrt[3]{8} = 2$ or $\frac{1}{2^2}$ or 2^{-2} or 4^{-1} or $2^2 = 4$	M1	
	$\frac{1}{4}$ or 0.25	A1	

21	m = 5	B1	
	$\left(3^2\right)^p = 3^m$ or $3^{2p} = 3^m$ or $\left(3^2\right)^p = 3^{\text{their 5}}$ or $3^{2p} = 3^{\text{their 5}}$ or $3^5 = 243$ or $3^{\text{their 5}} = \left(\sqrt{9}\right)^{\text{their 5}}$ or $3^{\text{their 5}}$ correctly evaluated $9^p = 9^{\frac{m}{2}}$ or $9^p = 3^{\text{their 5}}$ or $9^p = 243$ or $3^{2p} = 243$	M1	oe
	$2p = m$ or $2p$ = their 5 or $9^p = 9^{\frac{\text{their 5}}{2}}$	M1	oe
	p = 2.5	A1ft	oe ft for values of m and p where $p = \frac{m}{2}$