AQA Qualifications

GCSE

Mathematics Linear

Paper 1 43651H

Mark Scheme

43651H

November 2013

Final version 1.0

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.

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.
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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. e.g. accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between *a* and *b* inclusive.
[a, b)	Accept values a ≤ value < b
25.3 …	Allow answers which begin 25.3 e.g. 25.3, 25.31, 25.378.
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.

Paper 1 Higher Tier

Q	Answer	Mark	Comments
1	4 (cm) **and** 6 (cm) seen	B1	[3.9, 4.1], [5.9, 6.1] Accept measurements in mm, ie [39, 41] and [59, 61] Units need not be stated
	0.5 × their 4 × their 6	M1	0.5 × their 4 × their 6 × sin 90
	[11.5, 12.5]	A1ft	Accept answer only for full marks
2	$20T$ **or** $16C$	B1	Ignore any extra £ signs
	$20T + 16C$ or $20 \times T + 16 \times C$ or $4(5T + 4C)$ or $T \times 20 + C \times 16$	B1	$T20 + C16$ is B1
3(a)	$6c - 3$	B1	Mark final answer
3(b)	200	B1	
3(c)	$3y + 7y = 10y$ **or** $30 - 6 = 24$	M1	Allow rearrangement to get y terms on right ($-10y$ if correct)
	$10y = 24$	A1	
	$\frac{24}{10}$, $\frac{12}{5}$, $2\frac{2}{5}$, 2.4 oe	A1ft	ft if M awarded and at most one error
4(a)	130	B1	
4(b)	Vertically opposite	Q1	Strand (i)
5(a)	3×10^2 or 100 seen	M1	
	300	A1	SC1 900

Q	Answer	Mark	Comments
5(b)	Julie	B1	
	m must be mentioned, eg Should have √m as well as √E or mv^2 is not $(mv)^2$	B1	**NB** reference may be made to the box, so error could be indicated there This mark is independent so can be awarded even if Phil ticked
6 Alt 1	6.5 or 3.25 seen	M1	
	9.75 or 6.5 + 3.25 or 65 – (6.5 + their 3.25) or 65 – (their 6.5 + 3.25)	M1dep	**NB** 9.75 is 2 marks
	55.25	A1	
6 Alt 2	0.15 × 65	M1	oe
	9.75 or 65 – their (0.15 × 65) oe	M1dep	
	55.25	A1	
6 Alt 3	0.85	M1	oe
	0.85 × 65	M1dep	oe
	55.25	A1	

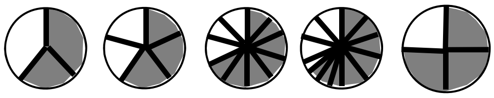
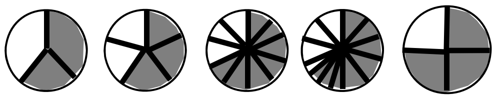
Q	Answer	Mark	Comments
*7 Alt 1	$(24 \div 3) + 5$ or 13 or $24 + 15$ or 39	M1	oe 13 or 39 seen as numerators or denominators scores M1, eg in $\frac{13}{24}$
	$\frac{13}{39}$ or 13 **and** 39 or 13, 13, 13 or 13 : 26	A1	
	Yes ticked and $\frac{13}{39} = \frac{1}{3}$ or equivalent, eg $3 \times 13 = 39$, or $39 \div 13 = 3$	Q1ft	Strand (ii) ft on wrong calculation for $24 \div 3$ and No ticked SC1 Yes (incorrect or no working)

Q	Answer	Mark	Comments
*7 Alt 2	$\frac{5}{15}$	M1	
	$\frac{5}{15} = \frac{1}{3}$	A1	
	Yes ticked and clear explanation that same proportion of blue added	Q1	Strand (ii) SC1 Yes (incorrect or no working)

This scheme is for a 'written' explanation with no contradictory values calculated.

Q	Answer	Mark	Comments
*7 Alt 3	Yes ticked	B1	
	Full explanation that the extra added are in the same proportion. eg As $\frac{1}{3}$ of the extra are blue	Q2	Strand (ii) Q1 partial explanation eg 5 of each colour

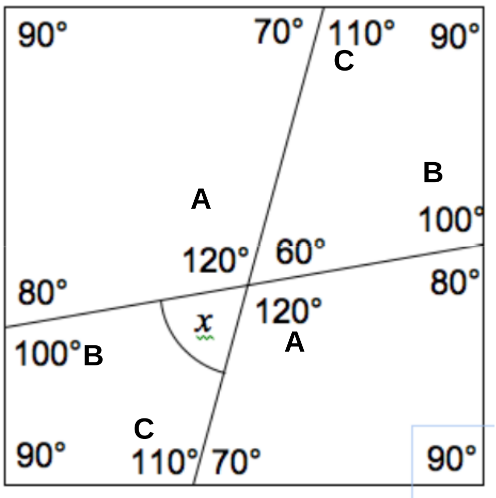
Q	Answer	Mark	Comments
8 Alt 1	Writes, correctly, at least two of given fractions with common denominator eg $\frac{40}{60}$, $\frac{36}{60}$, $\frac{42}{60}$, $\frac{39}{60}$, $\frac{45}{60}$	M1	**NB** The two fractions must have different denominators to those which they started with Accept decimal numerators
	Writes, correctly, at least three fractions with common denominator eg $\frac{40}{60}$, $\frac{36}{60}$, $\frac{42}{60}$, $\frac{39}{60}$, $\frac{45}{60}$	M1dep	**NB** The three fractions must have different denominators to those which they started with Accept decimal numerators
	$\frac{7}{10}$ (oe) **and** all 4 fractions written correctly with common denominator	A1	It is not necessary to write $\frac{3}{4}$ with the same denominator Accept decimal numerators
8 Alt 2	Writes, correctly, at least two of given fractions converted to percentages eg 66..% (67..%), 60%, 70%, 65%, 75%	M1	Condone missing % signs
	Writes, correctly, at least 3 fractions converted to percentages eg 66..% (67..%), 60%, 70%, 65%, 75%	M1dep	Condone missing % signs
	$\frac{7}{10}$ or 70% with all 4 fractions correctly converted to percentages	A1	It is not necessary to write $\frac{3}{4}$ as 75
8 Alt 3	Writes, correctly, at least two of given fractions converted to decimals eg 0.66 (0.67), 0.6, 0.7, 0.65, 0.75	M1	Any appropriate representation of $\frac{2}{3}$ to at least 2dp, eg 0.6r
	Writes, correctly, at least 3 fractions converted to decimals eg 0.66 (0.67), 0.6, 0.7, 0.65, 0.75	M1dep	
	$\frac{7}{10}$ or 0.7 with all 4 fractions correctly converted to decimals	A1	It is not necessary to write $\frac{3}{4}$ as 0.75

Q	Answer	Mark	Comments
8 Alt 4	Draws approximate diagrams of same shape for at least two of the fractions 	M1	
	Draws approximate diagrams for at least three fractions  The shaded areas must be such that $\frac{3}{5} < \frac{13}{20} < \frac{2}{3} < \frac{7}{10} < \frac{3}{4}$	M1dep	
	$\frac{7}{10}$ with all diagrams for all 4 fractions drawn and the shaded areas such that $\frac{3}{5} < \frac{13}{20} < \frac{2}{3} < \frac{7}{10}$	A1	It is not necessary to draw $\frac{3}{4}$

Q	Answer	Mark	Comments
8 Alt 5	Chooses a quantity, say, 60 and calculates, correctly, the appropriate fraction of that quantity for two of the given fractions eg 40, 36, 42, 39, 45	M1	
	Calculates, correctly, at least 3 values eg 40, 36, 42, 39, 45	M1dep	
	$\frac{7}{10}$ with all 4 values correctly calculated	A1	It is not necessary to calculate $\frac{3}{4}$ of the quantity

Q	Answer	Mark	Comments
9(a)	0.5 × 8 × (10 + 20)	M1	oe Condone missing brackets
	120	A1	
	m^2	B1	
9(b) Alt 1	0.5 × h × (4 + 10) or 42 ÷ 14	M1	oe
	(h =) 3	A1	May need to check diagram h = 3 must come from an area calculation
	QL = 10 – 4 – 3 = 3 = MR	A1	
9(b) Alt 2	h = 3	M1	May need to check diagram
	$\frac{1}{2}$ × 3 × (4 + 10)	M1dep	
	3 × 7 = 21	A1	
9(b) Alt 3	h = 3	M1	May need to check diagram
	Area **one** triangle = $\frac{1}{2}$ × 3 × 3 = 4.5	M1dep	
	Total area = 30 **and** 30 – 21 = 9 or 30 – 9 = 21	A1	Must mention 3 × 10 = 30 or total area 30, 30 – 2 × 4.5 = 21

Q	Answer	Mark	Comments
10(a) Alt 1	4 × 0.5 or 4 × 50 or 200(p) or (£)2	M1	
	6(00) + 4 × 0.5 (or 50) or 8(00) or (£)6(00) + (£)2(00) or (£)6(00) : (£)2(00)	M1dep	Allow mixture of units 8(00) seen is 2 marks
	8 ÷ 5 (= 1.6)	A1	
10(a) Alt 2	Juice = $\frac{1}{5}$ **and** Lemonade = $\frac{4}{5}$	M1	200ml of juice and 800ml of lemonade
	$\frac{1}{5}$ × 6 **and** $\frac{4}{5}$ × 0.5	M1dep	Allow mixture of units
	1.2 + 0.4 (= 1.6) or 120 + 40 (= 160)	A1	Allow mixture of units, eg 1.2 + 40 = 1.6
10(a) Alt 3	$\frac{1}{5}$ × 6 = 1.2 or $\frac{1}{5}$ × 6(00) = 120 **or** $\frac{4}{5}$ × 0.5 = 0.4 or $\frac{4}{5}$ × 0.5 or 50 = 40	M1	oe Must see calculation Allow mixture of units
	$\frac{1}{5}$ × 6 = 1.2 or $\frac{1}{5}$ × 6(00) = 120 **and** $\frac{4}{5}$ × 0.5 = 0.4 or $\frac{4}{5}$ × 0.5 or 50 = 40	M1dep	Must see calculation Allow mixture of units
	1.2 + 0.4 (= 1.6) or 120 + 40 (= 160)	A1	Allow mixture of units, eg 1.2 + 40 = 1.6
10(b)	40 seen or 2 ÷ 1.6 or 200 ÷ 160	M1	0.4 or 1.25 or 125% or 120%
	25% or 20%	A1	20% is allowed as this is defined a ‘profit margin’

Q	Answer	Mark	Comments
11		M1, A1	M1 for showing, or stating (right angles may be implied by subtraction) enough angles to solve the problem ie. An **obtuse** angle written at A or two **obtuse** angles written at B and C in same quadrant
			A1 for A = 120° **or** A1 for B = 100 **and** C = 110 in same quadrant
	180 – their A or 360 – (90 + their B + their C)	M1dep	
	60°	A1	60 no working SC3

Q	Answer	Mark	Comments
12	Reference to recording exam scores	B1	
	Reference to recording exam scores for both groups	B1	
	Record results in a way that allows a comparison (bar chart of totals, totals, average score for each group etc)	B1	
	Refers to comparing the results for their chosen method, eg higher total, bigger average and how this would confirm or deny the original hypothesis	Q1dep	Strand (iii) Must refer to third B1 for Q mark

Q	Answer	Mark	Comments
13 Alt 1	$6x - 9y = 21$ **and** $6x + 8y = 4$ **or** $8x - 12y = 28$ **and** $9x + 12y = 6$	M1	Must be correct, no arithmetic or sign errors
	$x = 2$ **or** $y = -1$	A1	
	$6x - 9y = 21$ **and** $6x + 8y = 4$ **or** $8x - 12y = 28$ **and** $9x + 12y = 6$ (new set of balanced equations) **or** substitution of their x or y into any of the previous linear equations.	M1dep	ie balances the other coefficient or substitutes their value for x or y
	$y = -1$ **or** $x = 2$	A1	ie the other value not already found **NB** answers only or from T&I SC1

Q	Answer	Mark	Comments
13 Alt 2	$x = \frac{3y}{2} + \frac{7}{2}$ **and** $3(\frac{3y}{2} + \frac{7}{2}) + 4y = 2$	M1	This is one example of a substitution scheme. Others marked the same way First M1 for rearranging one equation correctly to make x or y the subject **and** substituting into the other
	$y = -1$	A1	A1 is for solving to get one of the values
	$x = \frac{3 \times -1}{2} + \frac{7}{2}$	M1dep	This M1 is for doing a different substitution as above to find the other variable or substituting their value into one of the linear equations
	$x = 2$	A1	

Q	Answer	Mark	Comments
14(a)	$60 \div 300$ or $\frac{1}{5}$ or $\div 5$	M1	oe, eg 20%
	2	A1	
14(b)	$(35 + 20 + 15) \times \frac{1}{5}$ or $7 \times$ their (a) but **not** if their (a) = 10	M1	oe 7 + 4 + 3
	14	A1	
15(a)	$6x^2 + 3x - 8x - 4$	M1	Must have 4 terms shown or implied, including a quadratic term, two linear terms and a constant term. Could be in a grid from box method Allow one sign or arithmetic error for M1
	$6x^2 - 5x - 4$	A1	$kx^2 - 5x - 4$ or $6x^2 - 5x - k$ both imply M1
15(b)	$(ax \pm c)(bx \pm d)$	M1	$ab = 6$, $cd = 4$ or -4 $6x(x - 4) + (1)(x - 4)$ $x(6x + 1) - 4(6x + 1)$
	$(6x + 1)(x - 4)$	A1	Ignore any subsequent attempt to solve once the correct factorisation seen

Q	Answer	Mark	Comments
16(a)	3 + 4 = 7 or 3 : 4 = total 7 3 and 4 do not have any common factors (apart from 1)	B1	oe
16(b)	$\frac{3}{7}$ and $\frac{4}{7}$ seen	M1	or 2 equivalent fractions
	$\frac{3}{7} \times \frac{3}{7}$ or $\frac{4}{7} \times \frac{4}{7}$ or $\frac{3}{7} \times \frac{2}{6}$ or $\frac{4}{7} \times \frac{3}{6}$	M1dep	Maybe on tree diagram with appropriate branches shown and probability calculation shown for at least one pair of branches
	$\frac{3}{7} \times \frac{3}{7} + \frac{4}{7} \times \frac{4}{7}$	M1dep	$1 - 2 \times \frac{4}{7} \times \frac{3}{7}$
	$\frac{25}{49}$	A1ft	ft $\frac{18}{42}\left(=\frac{3}{7}\right)$ if without replacement calculated SC2 $\frac{18}{49}$ from $\frac{3}{7} \times \frac{2}{7} + \frac{4}{7} \times \frac{3}{7}$

Q	Answer	Mark	Comments

This scheme is if no line is drawn

Q	Answer	Mark	Comments
17 Alt 1	Gradient of AC = –2 or $y = -2x + 4$	M1	
	0 = their –2 × 1 + c	M1dep	
	c = 2 **and** $y = -2x + 2$	A1	

These schemes are if a line is drawn but use Alt1 if it gives a better score

Q	Answer	Mark	Comments
17 Alt 2	Line drawn parallel to AC passing through (0, 2) and B	M1	
	Calculating or stating gradient of both lines as –2 eg $y = -2x + 2$ **and** $y = -2x + 4$	M1dep	
	Reference to intercept being 2 and stating $y = -2x + 2$	A1	

Q	Answer	Mark	Comments
17 Alt 3	Line drawn parallel to AC passing through (0, 2) and B	M1	
	Intercepts are (0, 2) and (1, 0) so equation is (y intercept) × x + (x intercept)× y = (y intercept) × (x intercept)	M1dep	
	Therefore (2)× x + (1)× y = (2)(1) ➔ $2x + y = 2$	A1	

Q	Answer	Mark	Comments
18(a)	Correct graph	B1	Min point at (0, 5), shape maintained

Q	Answer	Mark	Comments
18(b)	Correct graph	B1	Min point at (3, 0), shape maintained

Q	Answer	Mark	Comments
Alt 1 19	$(x + 4)$	M1	Must be in brackets
	$(x + 4)^2 - 16 + 6$	A1	oe
	$x + 4 = \pm\sqrt{\text{their } 10}$	M1dep	Allow their 10 to be negative
	$(x =)\ -4 \pm \sqrt{\text{their } 10}$	A1ft	ft on one arithmetic error, but only if their 10 is positive $-4 + \sqrt{10}$ is 3 marks Correct answer with no working is 3 marks maximum

Q	Answer	Mark	Comments
Alt 2 19	$(x) = \dfrac{-8 \pm \sqrt{8^2 - 4 \times 1 \times 6}}{2 \times 1}$	M1	Must be correct use of formula
	$\dfrac{-8 \pm \sqrt{40}}{2}$	A1	
	$(x =)\ -4 \pm \sqrt{10}$	A1	