AQA Qualifications

GCSE
MATHEMATICS (LINEAR)

4365/1H

Mark scheme

4365

June 2014

Version 1.0 Final

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.
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 $a \leq$ 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(a)	Expression	B1	
1(b)	Formula or equation	B1	
1(c)	Identity	B1	

Q	Answer	Mark	Comments
2	**Alternative Method 1**		
	(CD = £) 45 – 35 or 10 or $2d + c = 35$ **and** $2d + 2c = 45$	M1	
	(35 – their 10) ÷ 2 or (45 – 2 × their 10) ÷ 2 or 22.5 – their 10 or 12.5(0) or a pair of values that satisfy one of the statements	M1	Condone missing brackets
	3 × their 10 + their 12.5(0)	M1dep	Dep on second M
	42.5(0) or 7.5(0) remaining	A1	
	Correct conclusion based on their total	Q1ft	Strand (iii) ft correct conclusion based on their total if **two** Ms awarded. **NB** the difference between the cost of 3 CDs and 50 may be calculated and compared to the cost of a DVD to reach a conclusion. eg 50 – 3 × 10 = 20 > 12.5 so Yes is full marks.
	Alternative Method 2 (Trial and Improvement)		
	Chooses a value for CD and DVD and tests in **both** statements	M1	
	Chooses a new value for CD or DVD or both and tests in **both** statements	M1dep	
	Finds a pair of values for CD and DVD that the student thinks works in both statements and calculates 3 × their CD + their DVD	M1dep	
	42.5 (0)	A1	
	Correct conclusion based on their total	Q1ft	Strand (iii) ft correct conclusion based on their total if **three** Ms awarded.

Q	Answer	Mark	Comments
3(a)	Four different numbers in any order with median 5 and range 7 eg 1, 4, 6, 8 9, 6, 4, 2 3, 10, 6, 4 1, 3, 7, 8 2, 3, 7, 9 0, 4, 6, 7 1.5, 4, 6, 8.5 –1, 4.5, 5.5, 6	B2	B1 Four numbers in any order with median 5 and range 7 with repeats eg 4, 4, 6, 11 3, 3, 7, 10 1, 5, 5, 8 5, 5, 4, 11 B1 Four **different** numbers in any order with median 5 **or** range 7
3(b)	7 × 6 or 42 or 8 × 9 or 72 or 9 × 4 or 36 or 10 × 1 or 160	M1	At least one product shown or one correct value (not 10)
	(their 42 + their 72 + their 36 + their 10) ÷ 20	M1 dep	Must have the sum of 4 products divided by 20. Condone missing brackets (7 × 6 + 8 × 9 + 9 × 4 + 10 (× 1)) ÷ 20 is M2
	8	A1	

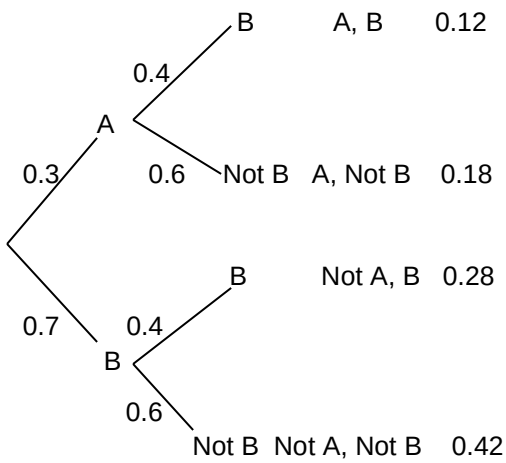
Q	Answer	Mark	Comments
4(a)	5 × 8	M1	oe ½ (8 + 8) × 5
	40	A1	
	cm^2	B1	
4(b)	Any **quadrilateral** that has neither line nor rotational symmetry. Ie 	B1	Rotations, translations and reflections of these. Must use dots as vertices. Condone internal lines if a clear quadrilateral is outlined. Lines do not need to be ruled.
5(a)	6	B2	B1 for answer of 2 or 3 or 2 × 3 B1 for 24 = {2, 2, 2, 3} or 2×2×2×3 or 42 = {2, 3, 7} or 2 × 3 × 7 or one pair of factors of 24 (not 1 × 24) eg 2 × 12, 3 and 8, 24 ÷ 4 = 6 (oe) **and** one pair of factors of 42 (not 1 × 42). eg 2 × 21, 3/14, (6, 7) (oe) or (24 =) {1, 2, 3, 4, 6, 8, 12, 24} or (42 =) {1, 2, 3, 6, 7, 14, 21, 42}

Q	Answer	Mark	Comments
5(b)	48 as a **correct** product (except 1×48) eg 2×24 or 3×16 or 6×8 or $2 \times 3 \times 8$ or (2, 24) or (1, 2, 3, 8) etc	M1	oe eg $48 \div 2 = 24$ or branches on a prime factor tree showing at least one product or factor ladder showing a correct division. Ignore incorrect products if at least one correct product seen.
	$2 \times 2 \times 2 \times 2 \times 3$ or $2^4 \times 3^{(1)}$ or $2^3 \times 2 \times 3^{(1)}$ or $2^2 \times 2^2 \times 3^{(1)}$	A1	
6	D, B, C	B2	B1 for 2 correct
7	$\pi \times 5$ or $\pi \times 10 \div 2$ or $2 \times \pi \times 5 \div 2$ or 5π	M1	Accept numerical values eg $31 \div 2$ Allow $\pi = 3$
	15.5	A1	Accept 15.7 or 15.71
	25.5	A1ft	ft 10 + their 15.5 Accept 25.7 or 25.71 SC2 $5\pi + 10$
8(a)	6	B1	Allow embedded answers ie $6 \times 6 = 36$, $6^2 = 36$, $-6^2 = 36$, $-6 \times -6 = 36$
	– 6	B1	B2 for ±6

Q	Answer	Mark	Comments
8(b)	**Alternative method 1**		
	$2(y + 1) + 3(y – 2)$ or $2y + 2 + 3y – 6$	M1	Ignore any denominators. This is the numerator of the left hand side. If expanded straight away allow one sign or numerical error Invisible brackets must be recovered for M1 eg $2 \times y + 1 + 3 \times y – 2 = 5y – 1$ is M0 $2(y + 1) + 3(y – 2) = 12$ or $2y + 2 + 3y – 6 = 12$ is M2
	$5y – 4$	A1	Could be implied by rearrangement eg $5y = 6$ from $2y + 2 + 3y – 6 = 2$
	Their $5y – 4 = 12$	M1	oe eg $5y + 2 = 18$
	3.2	A1ft	oe eg $\frac{16}{5}$ ft on both Ms awarded and at most 1 error.
	Alternative method 2		
	$\frac{y}{3} + \frac{1}{3} + \frac{y}{2} - 1$	M1	Allow one sign or numerical error
	$\frac{5y}{6} - \frac{2}{3}$	A1	
	$\frac{5y}{6} = \frac{8}{3}$	M1	This is for rearranging their LHS = 2 with variable on one side and numbers on the other with terms simplified.
	3.2	A1ft	oe eg $\frac{16}{5}$ ft on both Ms awarded and at most 1 error.

Q	Answer	Mark	Comments
9(a)	$a = 6$	B1	Allow $6x$
	$b = 100$	B1	SC1 if values reversed. $y = 6x + 100$ seen in script with no contradictory answers for a and b given allow B2
9(b)	**Alternative Method 1**		
	Substitution of 80 into their formula	M1	y = their 6×80 + their 100. Their 6 must have a value, ie not 0.
	580	A1ft	ft their formula
	Alternative Method 2		
	400 + (280 – 100)	M1	Or use of values from graph
	580	A1	
10	One comparison on means but must clarify what this implies	B1	eg mens mean is lower so they are faster (on average) Women are slower on average
	One comparison on interquartile ranges but must clarify what this implies	B1	Women are more consistent as their IQR is smaller Men's times more varied as IQR bigger

Q	Answer	Mark	Comments
11	**Alternative Method 1**		
	(P:) (D =) 90T or (M:) (D =) 70(T + 1)	M1	oe
	90T = 70(T + 1)	M1dep	Condone missing bracket, ie 90T = 70T + 1 but no further marks unless bracket recovered,
	90T – 70T = 70	M1dep	oe **NB** 70 ÷ 20 is M3
	3.5	A1	oe 3.30 is M3, A0
	Alternative Method 2		
	Chooses a value for distance travelled and correctly works out time taken at 90kph **and** time taken at 70kph	M1	Lists distance travelled for Paul and Mary (for at least 2 hours) Eg 90, 180, 270, 360, … 70, 140, 210, 280, 350, ….
	Subtracts their values or repeats above with a different value	M1dep	Trying a new value implies that the difference between previously calculated times was not 1.
	Chooses a different value for distance travels and correctly works out time taken at 90kph **and** time taken at 70kph, but the difference in times must be closer to 1 hour than the previous choice.	M1dep	oe
	3.5	A1	oe 3.30 is M3, A0 SC2 315 km
	Alternative Method 3		
	(P:) (D =) 90(t – 1) or (M:) (D =) 70t	M1	**NB** this scheme is for working out the time that Mary takes. It can be 'recovered' for full marks but if it ends at 4.5 then 2 marks maximum. **oe**
	20t = 90, and t = 4.5	M1dep	**NB** 90 ÷ 20 = 4.5 is M2
	Their 4.5 – 1	M1dep	oe
	3.5	A1	oe 3.30 is M3, A0

Q	Answer	Mark	Comments
12			Mark the diagram first and only look in working space if blanks in diagram.
	P(B) = 0.4	B1	
	P(Not A) = 0.7 **and** 1 – their 0.4, and same probabilities on both second branches	B1ft	
	Any 1st event and 2nd event probability multiplied together	M1	Follow through their values even if 0.7 wrong, but probabilities must be $0 < p < 1$
	Full correct final probabilities	A1ft	ft their probabilities

Q	Answer	Mark	Comments
13	**Alternative Method 1**		
	$x + y = 15$ **and** $x - y = 8$	M1	oe
	Attempt to solve by eliminating x or y	M1	Eg $2x = 23$ or $2y = 7$
	$x = 11.5$ **or** $y = 3.5$	A1	
	$y = 3.5$ **and** $x = 11.5$	A1 ft	ft on one error but only for one variable. eg if x calculated wrongly but then substituted and y calculated correctly allow A0 for x but A1 ft for y SC2 correct answers but no working or by T&I
	Alternative Method 2		
	a **and** $15 - a$	M1	
	$15 - a - a = 8$	M1	
	$a = 3.5$	A1	
	$b = 11.5$	A1 ft	SC2 correct answers but no working or by T&I
	Alternative Method 3		
	b **and** $b + 8$	M1	b **and** $b - 8$
	oe $b + b + 8 = 15$	M1	oe $b + b - 8 = 15$
	$b = 3.5$	A1	$b = 11.5$
	$a = 11.5$	A1 ft	$a = 3.5$ SC2 correct answers but no working or by T&I

Q	Answer	Mark	Comments
14(a)	$3x(4x + 1) – 2(6x – 3)$	M1	if expanded straight away allow one sign or arithmetic error eg $12x^2 + 3x – 12x – 6$ (Must have an x^2 term, 2 'x' terms and a constant term) Condone missing brackets eg $3x \times 4x + 1 – 2 \times 6x – 3$
	$12x^2 + 3x – 12x + 6$	A1	
14(b)	$12x^2 – 9x + 6 = 6$ or $12x^2 – 9x = 0$ or $12x^2 = 9x$	M1	oe If their equation in (a) is $12x^2 – 9x – 6$ leading to $12x^2 – 9x – 12 = 0$ award M1
	$x(12x – 9)$ or $3x(4x – 3)$ or $x(4x – 3)$ or $12x = 9$	M1dep	use of formula or completing the square $\frac{9 \pm \sqrt{81}}{24}$ oe or $(x – \frac{3}{8})^2 = \frac{9}{64}$ oe $\frac{3 \pm \sqrt{73}}{8}$ from equation above
	$x = \frac{3}{4}$	A1	oe If $x = 0$ given do not award A1

Q	Answer	Mark	Comments
15	*AD* = *AE* (10 (cm) or sides of a square) or sides marked as 10 on diagram	B1	Must give a reason or mark sides as 10 on diagram
	AB = *AG* (10 (cm) or sides of a square) or sides marked as 10 on diagram	B1	Must give a reason or sides as 10 on diagram
	Angle *DAG* = angle *EAB* (135 or 90 + 45)	B1	Must state 135 or 90 + 45 or 135 shown for both angles on diagram
	Congruent due to SAS (could be expressed in words eg two sides and angle between them the same) or congruent due to ASA or AAS or SAA with 22.5 shown or stated (after 135 seen) as one of the other angles. (could be in words eg two angles and the side between them, or two angles and a side)	Q1	Q0 for congruent without SAS, AAS etc or the appropriate reason for their proof stated in words (strand (ii))
16(a)	Sight of x^2, $-xy$, $+xy$ and $-y^2$ plus some indication that xy terms cancel. Eg $x^2 - \cancel{xy} + \cancel{xy} - y^2$ Minimum would be $x^2 - xy + xy - y^2 = x^2 - y^2$	B1	

Q	Answer	Mark	Comments
16(b)	**Alternative method 1**		
	$\frac{1}{2} \times 5\sqrt{2} \times (\sqrt{3} - 1) \times \frac{\sqrt{3}+1}{2\sqrt{2}}$	B1	Correct substitution into ½ $ab\sin C$
	$(\sqrt{3} - 1)(\sqrt{3} + 1) = 3 - 1 (= 2)$	B1	This must be evaluated at some stage
	Clear indication that the expression cancels down to a fraction equivalent to $\frac{5}{2}$	Q1	Must show or state cancelling (strand(ii)) for justifying a result. Cancelling can be done at any stage
	Alternative method 2		
	Height = $(\sqrt{3} - 1) \times \frac{\sqrt{3}+1}{2\sqrt{2}} = \frac{\mathbf{1}}{\sqrt{2}}$	B1	Must get this correct to show explicitly or implicitly (eg could rationalise denominator) that $(\sqrt{3} - 1)(\sqrt{3} + 1) = 3 - 1 (= 2)$
	$\frac{1}{2} \times 5\sqrt{2} \times$their $\frac{\mathbf{1}}{\sqrt{2}}$	B1ft	
	Clear indication that the expression cancels down to a fraction equivalent to $\frac{5}{2}$	Q1	Must show or state cancelling (strand(ii)) for justifying a result. Cancelling can be done at any stage

Q	Answer	Mark	Comments
17	**Alternative Method 1**		
	Volume original = $\frac{1}{3} \times 10 \times 10 \times 30$ (= 1000)	M1	10×10 could be 10^2 Accept 0.33 or better for $\frac{1}{3}$
	Volume removed = $\frac{1}{3} \times 5 \times 5 \times 15$ (= 125)	M1	5×5 could be 5^2 $\frac{1}{3} \times (10 \times 10 \times 30 - 5 \times 5 \times 15)$ is M2
	875	A1	Correct answer only
	Alternative Method 2		
	Volume original = $\frac{1}{3} \times 10 \times 10 \times 30$ (= 1000)	M1	10×10 could be 10^2 Accept 0.33 or better for $\frac{1}{3}$
	(Linear scale factor $\frac{1}{2}$ so) volume scale factor $\frac{1}{8}$ or $\frac{7}{8}$	M1	
	875	A1	Correct answer only
18(a)	Substitution of $x = 0$ into equation	M1	$-\frac{1}{15} \times 1 \times -15$
	1	A1	
18(b)	$-\frac{1}{15}(2 \times 3.5 + 1)(2 \times 3.5 - 15)$	B2	B1 for $-\frac{1}{15}$(2 × their midpoint + 1)(2 × their midpoint – 15) or substituting into their expanded expression. B1 for graph intersects at $x = -0.5$ or midpoint = 3.5