General Certificate of Secondary Education
January 2013

Mathematics (Linear) B **4365**
Paper 1
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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting 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.

Set and published by the Assessment and Qualifications Alliance.

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.
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 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.
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.

Paper 1 Higher Tier

Q	Answer	Mark	Comments
1(a)	Line from (08 00, 0) to (09 30, 60)	B1	Line need not be straight ± 1 small square
	1 cm horizontal line from their (09 30, 60) **or** horizontal line ending at 10 00	B1ft	± 1 small square
	Line from (10 00, 60) to meet the time axis between (11 06, 0) and (11 18, 0) inclusive **or** line from their (10 00, 60) down 6 cm and across 2.4 cm	B1ft	Line need not be straight ± 1 small square
1(b)	Correct ft decision and reference to their graph **or** correct ft decision and correct ft time (±6 minutes) read from their graph	B1ft	Must be from a line that meets the time axis at at least 6 minutes past their 10 00.
1(b) Alt	Correct ft decision and calculation of home time eg 60 miles at 50 mph = 1.2 hours 11 30 is 1.5 hours after 10 or 10 + 1.2 hours = 11 12	B1ft	ft from their 10 00

Q	Answer	Mark	Comments
2(a)	Fully correct diagram with vertices within 1mm	B2	B1 for 2 or 3 sides correct from a full hexagon. B1 for symmetrical diagram (about vertical line) with bottom vertex correct. Ignore any internal lines.
2(b)	($\times$) 3 ($\times$) or 1 : 3	B1	Accept – 3 or both
3	$5x - 3x$ **or** $11 + 9$	M1	Implied by $2x$ **or** 20
	$2x = 20$	A1	
	10	A1ft	ft on one error only
4(a)	75 ÷ 3	M1	75 ÷ 60 $\times$ 20 or 1.25 km per minute
	25	A1	
4(b)	Any correct conversion between miles and km seen, eg 5 miles = 8 km or 1 mile = 1.6 km or 1km = 5/8 mile	M1	$75 \times \frac{5}{8}$
	Slower as limit is 80 km	A1	Slower as 46.875 < 50
5(a)	27	B1	
	81	B1ft	ft their 27 $\times$ 3 Answers must be evaluated
5(b)	3^{13} or 13	B1	
5(c)	3^5 or 5	B1	

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<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
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Q	Answer	Mark	Comments
7(a)	(27 – 5) ÷ 2	M1	Condone omission of brackets
	11	A1	
	3	B1ft	ft (their 11 – 5) ÷ 2 if A0 awarded SC1 for 0.75 SC1 for 24.5 **and** 22

Q	Answer	Mark	Comments
7(a) Alt 1	$2x + 5 = 27$	M1	
	11 or $2(2x + 5) + 5 = 27$ oe or (27 – 15) ÷ 4	A1	
	3	A1	

Q	Answer	Mark	Comments
7(a) Alt 2	Two fully correct trials eg any two of $u_1 = 1$, $u_2 = 7$, $u_3 = 19$ $u_1 = 2$, $u_2 = 9$, $u_3 = 23$ $u_1 = 4$, $u_2 = 13$, $u_3 = 31$ $u_1 = 5$, $u_2 = 15$, $u_3 = 35$	M1	
	Fully correct trial with first term 3 ie $u_1 = 3$, $u_2 = 11$, $u_3 = 27$	M1dep	
	3	A1	3, 11, 27 on answer line is full marks.

Q	Answer	Mark	Comments
7(b)	$4n$	M1	Accept $4 \times n$ or $n \times 4$ but not $n4$
	$4n + 2$	A1	oe eg $4 \times n + 2$ $3n + n + 2$ $2(2n + 1)$ SC1 for $n4 + 2$

Q	Answer	Mark	Comments
8	$\pi \times 6 \times 6 \div 2$	M1	oe accept a numerical value for π
	18π or a numerical value [55.8, 56.57]	A1	Accept $\pi \times 18$ or $\pi 18$
*9a	Open circle at –2 with line going right to at least 4 or with arrow (of any length) to the right	Q1	Strand (i) If line is marked with any sort of circle at the RHS this is Q0
9b	$3x \leq 11 - 5$ or $3x \leq 6$ or $x - 2 \leq 0$	M1	Working with = sign must be recovered to ≤ to gain any credit
	$x \leq 2$	A1	Must have $x \leq$ on answer line SC1 for $x < 2$ Any slight error in notation, e.g. $x \leq 2$ or x= less than 2 is M1, A0

Q	Answer	Mark	Comments
10	8 and 10	B3	B2 for any whole number combination that satisfies the median equal to the mean. There are an infinite number. Common ones are (1, 12), (2, 11), (3, 10), (4, 9), (5, 8), (2, 6), (6, 7), (9, 14), (10, 18), (11, 22) (11 + n, 22 + 4n), (15, 18), (16, 17), (any pair greater than 11 that total 33). B1 for any decimal combination that satisfies the median equal to the mean. There are an infinite number. Common ones are (7.5, 8), (8.5,12), (8.5 + n, 12 + 4n).

Q	Answer	Mark	Comments
10 Alt1	$22 + x + y = 5x$	M1	oe
	$4x - y = 22$	M1	oe
	8 and 10	A1	

Q	Answer	Mark	Comments
10 Alt2	Chooses values for x and y (which may be the same) where both are between 7 and 11 inclusive and calculates mean correctly or compares total to $5x$. e.g. 8 and 9 chosen, Mean = 39 ÷ 5 = 7.8 or total = 39 ≠ 40 NB an attempt at another pair of values implies rejection of first pair	M1	
	Chooses two further values for x and y where both are between 7 and 11 inclusive and calculates mean correctly or compares total to $5x$. e.g. 9 and 10 chosen, Mean = 41 ÷ 5 = 8.2 or total = 41 > 40	M1	
	8 and 10	A1	

Q	Answer	Mark	Comments
11	$\pi \times 10^2 \times 4$	M1	
	$\pi \times 100 \times 4$ or $3.1 \times 100 \times 4$ or 31×40 or 124×10	A1	Any of these products or better Condone use of 3.14 or 3.142 or $\frac{22}{7}$
	1240	A1	Accept 1256 or 1256.8 or 1257.(...) or 1260

Q	Answer	Mark	Comments
12	Intersecting arcs on both sides of line joining sockets, of same radius centred on each socket	M1	
	Perpendicular bisector of sockets within tolerance (at least 3 cm long)	A1	Tolerance is ± 1mm through their intersecting arcs.
	Point marked on wall 2 cm from fireplace on either side	B1	
	Socket marked on bottom wall where their perpendicular bisector does intersect the wall.	A1	This mark is for showing that the socket can only be fitted on the bottom wall. If both positions marked then A0.

Q	Answer	Mark	Comments
*13	$6x - 4$	B1	
	LHS = $xy + 6x - xy - 4$	B1	Both brackets must be removed. Must see xy and $-xy$ Allow +4 for B1
	Expanding LHS and simplifying and stating $6x - 4 = 2(3x - 2)$ or $2(3x - 2) = 6x - 4$ or showing clearly that all terms cancel.	Q1	Strand (ii). For the Q mark this must be clearly shown and not ‘assumed’. If + 4 seen in expansion and this is subsequently changed to – 4 do not allow the Q mark unless the error is recognised and ‘recovered’.

Q	Answer	Mark	Comments
14	$2(2x + 3) - 4(3x - 3)$ **or** $4x + 6 - 12x + 12$	M1	This mark is for the numerator of the LHS. Ignore any denominators. Three terms correct if expanded without brackets seen.
	$-8x + 18$	A1	
	Their $-8x + 18 = 16$	M1	This mark is for dealing with the denominators of the LHS and the value on the RHS **NB** $2(2x + 3) - 4(3x - 3) = 16$ is M2
	0.25, ¼, 2/8 oe	A1ft	ft on one error only. Do not accept -1/-4

Q	Answer	Mark	Comments
14 Alt1	$(2x + 3) - 2(3x - 3)$ **or** $2x + 3 - 6x + 6$	M1	This mark is for the numerator of the LHS. Ignore any denominators. Three terms correct if expanded without brackets seen.
	$-4x + 9$	A1	
	Their $-4x + 9 = 8$	M1	This mark is for dealing with the denominators of the LHS and the value on the RHS **NB** $(2x + 3) - 2(3x - 3) = 8$ is M2
	0.25, ¼, 2/8 oe	A1ft	ft on one error only. Do not accept –1/–4

Q	Answer	Mark	Comments
14 Alt2	$\frac{x}{2} + \frac{3}{4} - \frac{3x}{2} + \frac{3}{2}$	M1	Three correct terms for M1
	$-x$ **or** $2\frac{1}{4}$	A1	
	$-x + 2\frac{1}{4} = 2$ or $-x + -\frac{3}{4} = 2$	M1	
	0.25, ¼, 2/8 oe	A1ft	ft on one error only. Do not accept –1/–4

Q	Answer	Mark	Comments
15(a)	0.1 × 400 (=40) **or** 0.2 × 500 (=100)	M1	
	40 **and** 100	A1	
	140 or 140/900 but not 140 : 900	A1ft	SC2 for 760 SC1 for digits 14… ft on their 40 + their 100 if complete correct method seen.
15(b)	$\frac{4}{10}$ and $\frac{3}{9}$ identified as probabilities	M1	May be on branches of a tree diagram.
	$(\frac{4}{10} \times \frac{3}{9}) = \frac{12}{90} = \frac{2}{15}$	A1	Evidence of cancelling is necessary but $\frac{12}{90} = \frac{2}{15}$ is enough. NB $\frac{2}{5} \times \frac{1}{3}$ is 2 marks
16	$\pi rl + \pi r^2 = 24\pi$	M1	15π
	$3l + 9 = 24$	M1	oe e.g. $3\pi l = 15\pi$
	5	A1	SC1 for 8 from $\pi rl = 24\pi$ Must see working SC1 for 6 from $\pi rl + 2\pi r = 24\pi$ Must see working **NB** if height calculated after 5 seen ignore

Q	Answer	Mark	Comments
17(a)	$\sqrt{25}\ \sqrt{3}$ or $\sqrt{(25 \times 3)}$ $\sqrt{5} \times \sqrt{5} \times \sqrt{3}$ or $\sqrt{(5^2 \times 3)}$	B1	

Q	Answer	Mark	Comments
17(a) Alt	$(5\sqrt{3})^2 = 25 \times 3$	B1	

Q	Answer	Mark	Comments
17(b)	$\frac{6\sqrt{3}}{3}$ or $\frac{6\sqrt{3}}{\sqrt{3} \times \sqrt{3}}$ or $\sqrt{12}$	M1	
	$2\sqrt{3}$	A1	

Q	Answer	Mark	Comments
17(c)	$(5\sqrt{3} + 5\sqrt{3} +$ their $2\sqrt{3}) \div 3$	M1	Must use $5\sqrt{3} +$ not $\sqrt{75}$ Condone missing brackets. Working must be seen as answer can be obtained from wrong work.
	$4\sqrt{3}$	A1ft	ft on their answer to (b) if of form $a\sqrt{3}$ accuracy to 2 dp.

Q	Answer	Mark	Comments
18	$(3x - 1)(3x + 1)$	B1	
	$(3x \pm a)(x \pm b)$	M1	$ab = \pm 1$
	$(3x - 1)(x + 1)$	A1	
	Their $\frac{(3x-1)(3x+1)}{(3x-1)(x+1)} \times \frac{x-2}{3x+1}$	M1	This mark is for turning the second fraction upside down and multiplying by it. It can be awarded for cross multiplying at any stage eg $(9x^2 - 1)(x - 2) \div (3x^2 + 2x - 1)(3x + 1)$
	$\frac{x-2}{x+1}$	A1ft	Do not accept incorrect further work ft on $\frac{(3x-1)(3x+1)}{(3x+1)(x-1)} \times \frac{x-2}{(3x+1)}$ $= \frac{(3x-1)(x-2)}{(3x+1)(x-1)}$

Q	Answer	Mark	Comments
19	Evidence that any bar area has been calculated eg applying a scale to side and multiplying by width. These should be multiples of 12, 16, 22, 23, 19 and 8 but as 23 and 19 can be read from graph, do not award for these values unless an area calculation seen	M1	**NB** each little square is one mouse but if this is assumed and the total area is not shown to be 500 then only this M1 can be awarded.
	Total area calculated. Sum of above is 100.	A1	**NB** The bars cover 20 'big' squares, so if this is stated this is M1, A1
	Area scaled to 500 or a calculation done such as $12 \times 500 \div 100$	M1	Scale of 25, 50 for 'big' squares as fd.
	60	A1ft	This must come from valid working, so answer of 60 alone or 60 from, say, 3×20 is M1. ft their first bar total $\times$ 500 $\div$ their total **and** rounded or truncated to an integer.

19 Alt	20 'big' squares stated as area of all bars	M1	
	$500 \div 20$ (= 25)	A1	
	Their 25×2.4	M1	
	60	A1ft	