GCSE
MATHEMATICS (LINEAR)
4365/2H
Mark scheme

4365
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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* ≤ 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 2 Higher Tier

Q	Answer	Mark	Comments
1	$\dfrac{30}{20}$ or 1.5 seen or implied or 180 + 90 or 270 or 150 + 75 or 225 or 200 + 100 or 300 or 4 + 2 or 6	M1	oe
	Two from 270 or 225 or 300 or 6	A1	
	270 and 225 and 300 and 6	A1	

Q	Answer	Mark	Comments
2	$1\dfrac{3}{5} \div \dfrac{1}{5}$ or 5 (+) 3 or $\dfrac{8}{5}$	M1	oe eg 1.6 ÷ 0.2 $\dfrac{1600}{200}$ $\dfrac{1}{5}, \dfrac{1}{5}, \dfrac{1}{5}, \dfrac{1}{5}, \dfrac{1}{5}, \dfrac{1}{5}, \dfrac{1}{5}, \dfrac{1}{5}$ $\dfrac{5}{5}$ (+) $\dfrac{3}{5}$
	8	A1	oe

Q	Answer	Mark	Comments
3	$\dfrac{1}{6}$	B1	oe decimals 0.16… or 0.17
	2, 4 or 4, 2 or 3, 3 or 1, 5 or 5, 1 or 36 combinations seen or implied or $\dfrac{1}{6} \times \dfrac{1}{6}$ or $\dfrac{1}{36}$ or states or implies one of the ways of scoring 6	M1	oe decimals 0.027…
	2, 4 and 4, 2 and 3, 3 and 1, 5 and 5, 1 or $\dfrac{1}{6} \times \dfrac{1}{6} \times 5$ or states or implies there are 5 ways of scoring 6	M1dep	
	$\dfrac{5}{36}$	A1	oe decimals 0.138… or 0.14
	B (Correct conclusion for their probabilities)	Q1ft	Strand (iii) Both method marks awarded and probabilities shown ft their probabilities

Q	Answer	Mark	Comments
4	**Alternative Method 1**		
	$\frac{1}{2} \times 5 \times 5$ or 12.5 or $\frac{1}{2} \times 10 \times 5$ or 5 × 5 or 25	M1	oe area of any triangle
	$4 \times \frac{1}{2} \times 5 \times 5$ or $2 \times \frac{1}{2} \times 10 \times 5$ or 25 × 2 or $\frac{1}{2} \times 10 \times 10$ or 5 × 10	M1dep	oe
	50	A1	
	Alternative Method 2		
	$5^2 + 5^2$ or $\sqrt{5^2 + 5^2}$ or $\sqrt{50}$	M1	oe Accept 7.07... or 7.1 for $\sqrt{50}$
	$(\sqrt{50})^2$	M1dep	oe Accept 7.07... or 7.1 for $\sqrt{50}$ in $(\sqrt{50})^2$
	50	A1	Condone 49.9...

Q	Answer	Mark	Comments
5(a)	360 ÷ 5	M1	oe 180 – (180 × 3) ÷ 5 180 – 108
	72	A1	SC1 for 108

Q	Answer	Mark	Comments
5(b)	$5y = 540$ identified	B1	

Q	Answer	Mark	Comments
6(a)	7.5 (cm)	B1	[7.4, 7.6]
	their 7.5 × 25	M1	their 7.5 must be ≤ 11
	[185, 190]	A1ft	ft their 7.5 cm

Q	Answer	Mark	Comments
6(b)	Correct bearing seen or implied	M1	Line or point
	Point marked	A1	2 mm tolerance

Q	Answer	Mark	Comments
7(a)	Correct reflection	B2	B1 for a reflection in any line parallel to an axis B1 for correct vertices plotted but no triangle

Q	Answer	Mark	Comments
7(b)	Enlargement	B1	
	SF 4	B1	
	(Centre) (1, 1)	B1	

Q	Answer	Mark	Comments
8(a)	Third statement identified	B1	

Q	Answer	Mark	Comments
8(b)	(Angle *DEF* =) 180 – 144 or $\dfrac{360 - 288}{2}$	M1	oe
	(Angle *EDF* =) 180 – 36 – 108 or 36 + 36 + 108 = 180	M1dep	oe
	36, 36, (108) or state two angles equal	A1	SC1 for 36 seen Dependent on both method marks

Q	Answer	Mark	Comments
9(a)	$a(a - 3)$	B1	Do not accept fw oe eg $-a(-a + 3)$

Q	Answer	Mark	Comments
9(b)	$3y + 18$	B1	$\dfrac{7y}{3} + \dfrac{4}{3}$ (Must be separate terms)
	$7y - 3y = 18 - 4$ or $7y$ – their $3y$ = their $18 - 4$ or $4y = 14$	M1	$\dfrac{7y}{3} - y = 6 - \dfrac{4}{3}$ or their $\dfrac{7y}{3} - y = 6 -$ their $\dfrac{4}{3}$
	3.5 or $3\dfrac{1}{2}$ or $\dfrac{7}{2}$	A1ft	ft collecting their four terms

Q	Answer	Mark	Comments
10	$\dfrac{20}{100} \times 130$ or 26 or 1.2 seen or $\dfrac{1}{4} \times 195$ or 48.75 or $\dfrac{3}{4}$ seen	M1	or $\dfrac{1}{4} \times 200$ or 50
	130 + their 26 or 1.2 × 130 or $\dfrac{3}{4} \times 195$ or 195 – their 48.75	M1dep	oe or $\dfrac{3}{4} \times 200$ or 200 – their 50
	130 + their 26 or 1.2 × 130 and $\dfrac{3}{4} \times 195$ or 195 – their 48.75 or 156 or 146.25 or 146	M1dep	oe 130 + their 26 or 1.2 × 130 and $\dfrac{3}{4} \times 200$ or 200 – their 50 or 156 or 150
	156 and 146.25 or 156 and 146	A1	156 and 150
	Just bykes	Q1ft	Strand (iii) ft their 156 and their 146.25 or 146 or 150 provided both methods are fully correct

11	**Alternative Method 1**		
	41 + 22 + 28 + 17 or 108	M1	
	(0 +) 14 + 30 + 53 + 37 + 41 + 22 + 28 + 17 or their 108 + 14 + 30 + 53 + 37 or their 108 + 134 or 242	M1	oe
	$\dfrac{\text{their } 108}{\text{their } 242} \times 100$	M1dep	
	44.62(…) or 44.63	A1	
	44.6	B1ft	ft their 44.62 SC3 for 27.7 (percentage higher than grade C) SC2 for 27.6(8…)
	Alternative Method 2		
	14 + 30 + 53 + 37 or 134	M1	
	(0 +) 14 + 30 + 53 + 37 + 41 + 22 + 28 + 17 or their 134 + 41 + 22 + 28 + 17 or their 134 + 108 or 242	M1	oe
	$\dfrac{\text{their } 134}{\text{their } 242} \times 100$ or 55.37(…)	M1dep	
	44.62(…) or 44.63	A1	
	44.6	B1ft	ft their 44.62 or 55.37 SC3 for 27.7 (percentage higher than grade C) SC2 for 27.6(8…) Note: 55.4 scores M1M1M1A0B1ft

Q	Answer	Mark	Comments
12	(Median =) $\dfrac{2x+6x}{2}$ or $4x$ (= 12) seen	M1	oe
	$x = 3$	A1	oe
	3, 6, 18 and 33 seen or their 3 + 2(their 3) + 6(their 3) + 11(their 3) or their 3, 6, 18 and 33 seen or (Mean =) $\dfrac{x+2x+6x+11x}{4}$	M1	Allow one error
	$\dfrac{3+6+18+33}{4}$ or $\dfrac{20x}{4}$ or $5x$ or their $5x$ or (their 3 + 2(their 3) + 6(their 3) + 11(their 3)) ÷ 4	M1dep	
	15	A1ft	ft 5 × their x value

Q	Answer	Mark	Comments
13	**Alternative Method 1**		
	Any trial leading to at least 2 correct answers	M1	e.g. Any two of $1 - 30 = - 29$ $1 - 12 = - 11$ $1 - 6 = - 5$
	A different trial leading to 2 correct answers	A1	e.g. Any two of $8 - 30 = - 22$ $4 - 12 = - 8$ $2 - 6 = - 4$
	3 and full verification	Q1	$27 - 30 = - 3$ $9 - 12 = - 3$ $3 - 6 = - 3$ Strand (ii)
	Alternative Method 2		
	$x^2 - x - 6 = 0$	M1	
	$(x - 3)\,(x + 2)$ $\dfrac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-6)}}{2(1)}$ or 3	A1	Correct factorisation or correct substitution into formula
	3 and full verification	Q1	$27 - 30 = - 3$ and $9 - 12 = - 3$ or $3 - 6 = - 3$ Strand (ii)

Q	Answer	Mark	Comments
14(a)	Fully correct c.f. diagram using UCBs and 3, 8, 20, 24 (40, 3) (60, 8) (80, 20) (100, 24)	B3	Ignore (20, 0) Ignore before 1st point and after last point B2 for one error e.g. Consistent plotting at mid class intervals with line joining points Consistent plotting at lower bounds with line joining points One error on cf values e.g. 3, 9, 21, 25 e.g. 3, 8, 21, 24 Points not joined B1 for 3, 8, 20, 24 B1 for bar chart indicating correct heights with no lines

| **14(b)** | Reading off at 18 and 6 with at least one reading in tolerance
eg 77 and 52 | M1 | Reading at 18 and reading at 6
± ½ square
Condone reading at 18.75 and reading at 6.25 if consistent |
| | 25 | A1ft | ft their polygon or curve |

Q	Answer	Mark	Comments
15(a)	− 2, 1, 6	B2	B1 for two correct terms

Q	Answer	Mark	Comments
15(b)	$8x - 5 - 1$	M1	$2(ax + b) + 1 = 8x - 5$ or $2n + 1 = 8x - 5$
	$\dfrac{\text{their } (8x - 5 - 1)}{2}$	M1	$2ax + 2b + 1 = 8x - 5$ or $2a = 8$ and $2b + 1 = -5$ or $a = 4$ and $b = -3$
	$4x - 3$	A1	$4x - 3$

Q	Answer	Mark	Comments
16	**Alternative Method 1**		
	20 × 15 × 90 or 27 000	M1	oe
	$\pi \times 4^2$ or [50, 50.3]	M1	oe
	$\pi \times 4^2 \times 90$ or [4500, 4527]	M1dep	oe
	their 20 × 15 × 90 − $\pi \times 4^2 \times 90$	M1dep	oe
	[22 473, 22 500]	A1	
	Alternative Method 2		
	20 × 15 or 300	M1	oe
	$\pi \times 4^2$ or [50, 50.3]	M1	oe
	$300 - \pi \times 4^2$	M1dep	oe
	their (20 × 15 − $\pi \times 4^2$) × 90	M1dep	oe
	[22 473, 22 500]	A1	

Q	Answer	Mark	Comments
17(a)	56	B1	

Q	Answer	Mark	Comments
17(b)	70	B1	
	Alternate segment (theorem)	Q1dep	Strand (i) Dependent on B1

Q	Answer	Mark	Comments
17(c)	2 × 47 or 94 or Angle BOA = 47 or Angle BOC = 47 or Angle BAC = 47 or Angle BCA = 47	M1	May be on diagram (obtuse angle)
	90 or right angle symbol seen at A or C or 180 – 90 – 47 or (180 – 2 × 47) ÷ 2	M1	oe
	43	A1	

Q	Answer	Mark	Comments
18(a)	– 3 and 0	B2	B1 for each

Q	Answer	Mark	Comments
18(b)	their 6 points plotted within tolerance	B1ft	$\frac{1}{2}$ square tolerance
	Smooth curve through their points	B1ft	Must be U shape through 6 points

Q	Answer	Mark	Comments
18(c)	– 1.5 and 2	B2ft	ft their graph $\frac{1}{2}$ square tolerance B1 for each [– 1.55, – 1.45] and [1.95, 2.05]

Q	Answer	Mark	Comments
19	$\dfrac{3}{5} \times \dfrac{4}{7}$ or $\dfrac{3}{5} \times \dfrac{3}{7}$ or $\dfrac{2}{5} \times \dfrac{4}{7}$ or $\dfrac{2}{5} \times \dfrac{3}{7}$	M1	oe decimals 0.6 × 0.57… or 0.6 × 0.428… or 0.6 × 0.43 or 0.4 × 0.57… or 0.4 × 0.428… or 0.4 × 0.43
	$\dfrac{3}{5} \times \dfrac{3}{7} + \dfrac{2}{5} \times \dfrac{4}{7} + \dfrac{3}{5} \times \dfrac{4}{7}$	M1dep	oe decimals $1 - \dfrac{2}{5} \times \dfrac{3}{7}$
	$\dfrac{29}{35}$	A1	0.828… or 0.83

Q	Answer	Mark	Comments
20(a)	$16a^{12}b^4$	B2	B1 for 2 correct terms Do not allow fw for final mark

Q	Answer	Mark	Comments
20(b)	$10x^2 + 4xy - 15xy - 6y^2$	M1	Allow one error
	$10x^2 + 4xy - 15xy - 6y^2$	A1	Fully correct
	$10x^2 - 11xy - 6y^2$	A1ft	ft their four terms

Q	Answer	Mark	Comments
21	$\dfrac{-2 \pm \sqrt{2^2 - (4 \times 1 \times -1)}}{2 \times 1}$	M1	Allow one error
	$\dfrac{-2 \pm \sqrt{2^2 - (4 \times 1 \times -1)}}{2 \times 1}$ or $\dfrac{-2 \pm \sqrt{8}}{2}$ or $-1 \pm \sqrt{2}$	A1	Fully correct
	0.41 and − 2.41	A1	SC2 for 0.41 or − 2.41

Q	Answer	Mark	Comments
22	**Alternative Method 1**		
	$x^2 - cx - cx + c^2$ or $x^2 - 2cx + c^2$ or $a = c^2$ or $12 = 2c$ or $12x = 2cx$ or $-12x = -2cx$	M1	
	$c = 6$	A1	
	$a = 36$	A1ft	ft their c^2
	Alternative Method 2		
	$(x - 6)^2 + a - 36$	M1	
	$c = 6$	A1	
	$a = 36$	A1ft	ft their c^2

Q	Answer	Mark	Comments
23	$(5x - 3)(x + 4)$	B1	
	$(x - 4)(x + 4)$	B1	
	$\dfrac{5x - 3}{x - 4}$	B1dep	Do not allow fw

Q	Answer	Mark	Comments
24	10 × 1.5 or 15 or 5 × 4 or 20 or 15 × 3 or 45 or 10 × 1 or 10 or 5 × 2 or 10	M1	May be on diagram Counting squares 6 or 8 or 18 or 4 or 4
	15 and 20 and 45 or 10 and 10 and 45 (working from end of histogram)	M1	May be on diagram 6 and 8 and 18 or 4 and 4 and 18 (working from end of histogram)
	$\dfrac{15}{45} \times (50 - 35)$ or 5 or $\dfrac{30}{45} \times (50 - 35)$ or 10 $\dfrac{6}{18} \times (50 - 35)$ or 5 or $\dfrac{12}{18} \times (50 - 35)$ or 10	M1dep	oe i.e. identifies that 15 or 30 is needed for median depending on which end they work from in middle bar or identifies that 6 squares or 12 squares is needed for median depending on which end they work from in middle bar
	40	A1	

Q	Answer	Mark	Comments
25	**Alternative Method 1**		
	1495 or 1505 or 1504.$\dot{9}$ seen	B1	
	74.5 or 75.5 or 75.4$\dot{9}$ seen	B1	
	$\dfrac{1495}{75.5}$ or $\dfrac{1495}{75.4\dot{9}}$	M1	$\dfrac{\text{their min } [1450, \ 1500)}{\text{their max } (75, \ 76]}$
	19.8(...)	A1	Must come from the correct calculation
	19	Q1ft	Strand (i) Rounding down their answer ft their 19.8
	Alternative Method 2		
	74.5 or 75.5 or 75.4$\dot{9}$ seen	B1	
	Any trial correctly evaluated	M1	eg 18 × 75.5 = 1359
	19 × 75.5 = 1434.5	A1	Accept 75.4$\dot{9}$
	20 × 75.5 = 1510	A1	Accept 75.4$\dot{9}$
	19	Q1ft	Strand (i) Lower value