
GCSE

Mathematics (Linear)

Foundation Tier Paper 1

Mark scheme

43651F

November 2015

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.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

| | |
|------------------------|--|
| 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. |
| 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. |
| 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. e.g. accept 0.5 as well as $\frac{1}{2}$ |
| [a, b] | Accept values between a and b inclusive. |
| [a, b) | Accept values $a \leq \text{value} < b$ |
| 3.14... | Accept answers which begin 3.14 e.g. 3.14, 3.142, 3.1416 |
| Q | Marks awarded for quality of written communication |
| 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

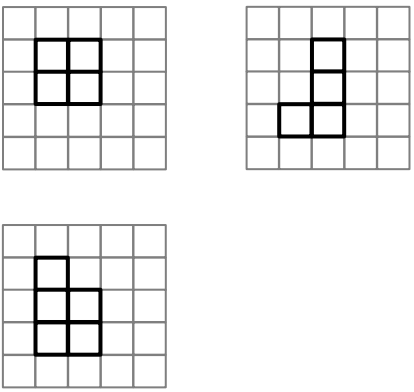
Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Paper 1 Foundation Tier

| Q | Answer | Mark | Comments |
|----|--|------|---|
| 1a | Evens | B1 | |
| 1b | Impossible | B1 | |
| 1c | Unlikely | B1 | |
| 2 | $\frac{3}{2}$ or $\frac{2}{3}$ seen or $\frac{24}{3}$ or $120 \div 15$ or build up to at least 12 $1\frac{1}{2}, 3, 4\frac{1}{2}, 6, 7\frac{1}{2}, 9, 10\frac{1}{2}, 12$ or correct partitioning of 12 eg $3 + 3 + 3 + 3 = 1\frac{1}{2} + 1\frac{1}{2} + 3 + 3 + 3$ | M1 | Allow one error in build up Partitioning must get as far as two $1\frac{1}{2}$ s |
| | 8 | A1 | |
| 3 | $500 - (149 + 55)$ or 204 or 351 or 445 | M1 | oe Allow mixed units |
| | (£)2.96(p) | A1 | |
| 4 | 1.04 1.34 1.4(0) 1.43 | B1 | |
| 5a | 28 | B1 | |

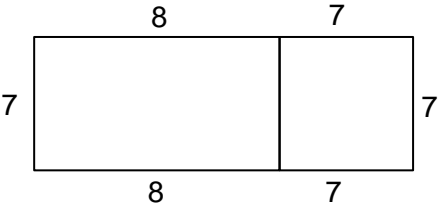
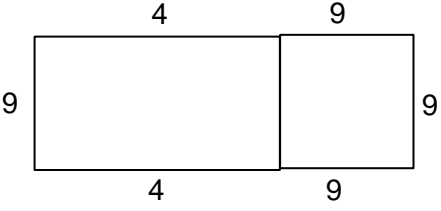
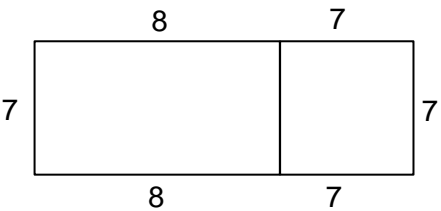
| Q | Answer | Mark | Comments |
|----|---|------|---|
| 5b | $-2x - 3$ or $-3 - 2x$ | B2 | B1 (+) $-2x$ or (+) -3 or $-2x + -3$ Do not ignore further work ie B2 response with further work is B1 B1 response with further work is B0 |
| 5c | $4 \times 4 + 5 \times 1$ or 4×4 or 16 seen | M1 | |
| | 21 | A1 | |
| 6a | Arrow at 640 | B1 | Accept any clear indication Must be over halfway between 600 and 650 and less than 650 |
| 6b | 2.38 or 238 and 0.93 or 93 | M1 | |
| | (£)1.45 | A1 | Allow £1.45p |
| | Additional guidance | | |
| | Allow transcription or misread errors if student clearly selecting 2.38 and 93 and not a different value from the table eg 2.28 – 93 2.38 – 98 2.38 – 1.24 (wrong row) | | M1A0 M1A0 MOA0 |
| | Answer only of (£)1.45(p) | | M1A1 |

| Q | Answer | Mark | Comments |
|----|--|------|---|
| 6c | Repeated addition $1.24 + 1.24 + 1.24 (+ \dots)$ or build up 1.24, 2.48, 3.72, ... or repeated subtraction from 10 $10 - 1.24 - 1.24 - 1.24 (- \dots)$ or build down 10, 8.76, 7.52, 6.28, ... or 3.72 or 4.96 or 6.20 or 7.44 or 8.68 or 9.92 or 11.16 seen or $12.40 - 1.24$ or 8×1.24 or 9×1.24 | M1 | Repeated addition/ subtraction or build up/ down must use at least three 1.24s Allow mixed units Allow 1.25 used |
| | 8 | A1 | With no arithmetic errors seen |
| 7 | Parallelogram joined to 'no lines of symmetry' Rectangle joined to 'all angles equal' Rhombus joined to 'all sides equal' | B2 | B1 one correct |
| 8a | 2.5 | B1 | oe eg $\frac{10}{4}$ or $\frac{5}{2}$ or $2\frac{1}{2}$ or 2.50 |
| 8b | -10 | B2 | B1 -14 |
| 9a | 7 | B1 | |
| 9b | $(7 + 11 + 8 + 12 + 7) \div 5$ or $45 \div 5$ | M1 | Condone missing brackets |
| | 9 | A1 | |

| Q | Answer | Mark | Comments |
|-----|---|------|--|
| 10a | 0.45 and 30% | B1 | |
| 10b | 20% and $\frac{1}{5}$ | B1 | |
| 10c | $\frac{1}{3}$ | B1 | |
| 11 |  | B3 | B1 each correct grid Accept shapes with or without internal lines Shapes must be in correct orientation but may be anywhere on the relevant grid |
| 12a | 11 and 23 | B2 | B1 one correct and no more than one incorrect or both correct and no more than one incorrect |
| 12b | Any two primes that add to a cube eg (3, 5), (3, 61), (5, 59), (11, 53), (17, 47), (23, 41) etc | B2 | B1 one prime and any other number that add to a cube number eg (1, 7), (2, 6), (2, 25), (7, 57) |

| Q | Answer | Mark | Comments | |
|----|--|--------|-------------------------------|--------|
| 13 | 180 – 81 or 99 | M1 | Angle may be shown on diagram | |
| | 360 – (their 99 + 74 + 32) or 360 – 205 | M1 dep | | |
| | 155 | A1 | | |
| | Additional Guidance | | | |
| | 155 must not come from 81 + 74 | | | M0M0A0 |
| | 99 seen for interior angle at D even if other working seen | | | M1 |

| Q | Answer | Mark | Comments | |
|---|---|----------------------------|---|--|
| 14 | $150 + 60 \times 6$ or 510 | M1 | oe | |
| | 0.2×600 or 120 or 0.8×600 or 480 | M1 | oe If a 'build up' method used to work out 20% or 80%, must be a fully correct method | |
| | $720 \div 4$ or 180 or $720 \div 4 \times 3$ or 540 | M1 | oe If a 'build up' method used to work out 25% or 75%, must be a fully correct method | |
| | 510 and 480 and 540 | A1 | | |
| | Correct conclusion based on their three values with at least two of 510, 480 or 540 correct | Q1ft | Strand (iii) | |
| | Additional Guidance | | | |
| | $150 + 360 = 510$ $0.2 \times 600 = \text{£}120$ $720 \div 4 \times 3 = \text{£}540$ Shop B | M1 M1 M1 A0 Q1 | | |
| | $150 + 360 = 410$ $0.8 \times 600 = \text{£}480$ $720 \div 4 = \text{£}180$ Shop C | M1 M1 M1 A0 Q0 | | |
| | $150 + 60 = \text{£}210$ $0.8 \times 600 = \text{£}480$ $720 \div 4 \times 3 = \text{£}540$ Shop A | M0 M1 M1 A0 Q1 | | |
| | Examples of build up | | | |
| | $10\% = 60, 2 \times 60 = \text{£}120$ | M1 | | |
| | $10\% = 600 \div 10 = 6, 2 \times 6 = \text{£}12$ | M1 | | |
| $10\% = 7.2, 20\% = 14.4, 5\% = 3.6, 25\% = 18$ | M0 | | | |

| Q | Answer | Mark | Comments |
|--|--|-------|--|
| | Side of square stated or shown as $\sqrt{36}$ or 6 or $6 \times 6 = 36$ | M1 | |
| | $(44 - (2 \times \text{their } 6)) \div 2$ or $(44 \div 2) - \text{their } 6$ or 16 or $(44 - 4 \times \text{their } 6) \div 2$ or $(44 \div 2) - 2 \times \text{their } 6$ or 10 | M1dep | 16 is their total length 10 is their length of R |
| | their 6 \times their 16 or $36 + \text{their } 6 \times \text{their } 10$ | M1dep | |
| | 96 | A1 | SC1 correct calculation of area for any large rectangle with perimeter of 44 |
| Additional Guidance | | | |
| 15 | $\sqrt{36} = 7$  Answer 105 | | M1 M1dep M1dep A0 |
| | $36 \div 4 = 9$  Answer = 117 | | SC1 |
| |  Answer 105 | | SC1 |
| see over for further additional guidance | | | |

| | | Additional Guidance cont | |
|----------------|--|---------------------------------|--------------------------------------|
| 15 cont | | | M1 M0 M0 A0 |
| | Answer 78 | | |
| | | | M1 M0 M0 A0 |
| Answer | 60 | | |
| | $7 \times 7 = 36$ $4 \times 7 = 26$ $44 - 26 = 22$ $22 \div 2 = 11, 11 + 7 = 18$ $7 \times 18 = 126$ | | M1 M1dep M1dep, A0 |

| Q | Answer | Mark | Comments |
|---------------|---|------|---|
| 16a | $\frac{9}{12}$ and $\frac{4}{12}$ | M1 | oe fractions with matching denominators eg $\frac{18}{24}$ and $\frac{8}{24}$ |
| | $\frac{5}{12}$ | A1 | oe fraction eg $\frac{10}{24}$ Accept full decimal answer ie 0.416 or 0.416r |
| 16b | Alternative method 1 | | |
| | One pair of fractions multiplied correctly eg $\frac{5}{18} (\times \frac{9}{10})$ oe or $\frac{45}{3 \times 6 \times 10}$ or $\frac{1 \times 5 \times 9}{180}$ | M1 | |
| | $\frac{45}{180}$ oe | A1 | May be implied by answer $\frac{1}{4}$ |
| | $\frac{1}{4}$ | A1ft | ft their fraction fully simplified if M1A0 awarded and all three fractions multiplied |
| | Alternative method 2 | | |
| | One numerator and one denominator cancelled correctly | M1 | eg $\frac{1}{\cancel{3}} \times \frac{5}{\cancel{6}} \times \frac{\cancel{9}^3}{10}$ |
| | Complete correct cancelling shown $\frac{1}{\cancel{3}} \times \frac{\cancel{5}}{2 \cancel{6}} \times \frac{\cancel{9}^3}{2 \cancel{10}}$ or $\frac{3}{12}$ or $\frac{5}{20}$ or $\frac{9}{36}$ or $\frac{15}{60}$ | A1 | Ignore further incorrect cancelling once M1A1 awarded |
| $\frac{1}{4}$ | A1 | | |

| Q | Answer | Mark | Comments |
|-----|---|-------|---|
| 17a | $\frac{1}{2} \times 8 \times 4.5 (= 18)$ or $8 \times 4.5 = 36$ and $36 \div 2 (= 18)$ | B1 | Must see 8 and 4.5 used ie only 4×4.5 is B0 |
| 17b | Alternative method 1 | | |
| | $9 \div 4.5$ and $24 \div 8$ oe | M1 | May show sides of rectangle divided into 2 and 3 or 2×3 |
| | their $2 \times$ their 3×2 or their 2×6 or their 3×4 | M1dep | Rectangle divided into 12 triangles |
| | 12 | A1 | |
| | Alternative method 2 | | |
| | 9×24 or 216 | M1 | |
| | their $216 \div 18$ | M1dep | |
| | 12 | A1 | |
| 18 | A point that lies on the circumference, eg (4, 5), (10, 5), (7, 2), (7, 8) | B2 | B1 (4, y) or (10, y) or (x, 2) or (x, 8) B1 for 4 or 10 clearly shown as min or max horizontal value B1 for 2 or 8 clearly shown as min or max vertical value |
| | Additional Guidance | | |
| | NB circle measurement is 2.6 cm so if subtracted or added then rounded can lead to correct answer, but allow as 2.6 rounds to 3, so mark answer line, ignore any other working | | |

| Q | Answer | Mark | Comments | |
|--|--|------|--|----------------|
| 19 | $270 \div (3 + 2 + 1)$ | M1 | | |
| | 45 | A1 | No wrong working seen | |
| | 135, 90, 45 | A1ft | ft their 45 if all values correctly evaluated Values must be written in order Correct answer only full marks Incorrect answer only with 45 as a part ratio is not M1, A1 NB Build up method must be fully correct | |
| | Additional Guidance | | | |
| | Be careful of correct answers from wrong work | | | |
| | eg $270 \div 3 = 90$, $270 \div 2 = 135$, $270 \div 1 = 270$ | | 135 : 90 : 270 | M0 |
| | eg $270 \div 3 = 90$, $270 \div 2 = 135$, $90 \div 2 = 45$, | | 135 : 90 : 45 | M0 |
| | $270 \div 6 = 35$ 105 : 70 : 35 | | | M1, A0 A1ft |
| | $270 \div 6 = 45$ 145 : 90 : 45 | | | M1, A1 A0 |
| | $270 \div 6 = 45$ 45 : 135 : 90 | | | M1, A1 A0 |
| | $270 \div 6 = 41.2$ 123.2 : 82.4 : 41.2 | | | M1, A0 A0ft |
| | $270 \div 6 = 41.2$ 123.6 : 82.4 : 41.2 124 : 82 : 41 | | Ignore rounding after correct ft | M1, A0 A1ft |
| | $270 \div 6 = 41.2$ 124 : 82 : 41 | | Answers do not ft. No intermediate values | M1, A0 A0ft |
| | 135 : 45 : 90 | | No working, not in order | M0 |
| | 145 : 90 : 45 | | No working, not correct | M0 |
| see over for further additional guidance | | | | |

| Additional Guidance cont | | |
|---------------------------------|--|---------------|
| 19 cont | $3 + 2 + 1 = 5$ $270 \div 5 = 54$ $162 : 108 : 54$ | M1 A0 A1ft |
| | $270 \div 5 = 54$ $162 : 108 : 54$ | M0 |

| Q | Answer | Mark | Comments |
|--|---|------|--|
| 20a | 20 or 20 out of 120 or 20 in 120 | B1 | NB $\frac{20}{120}$ oe is B0 |
| 20b | Yes ticked | B1 | If boxes blank, yes may be implied by wording |
| | Valid reason eg 1 should be (about) 20 (but it is much lower) or 6 should be (about) 20 (but it is higher) or 6 is much higher than 1 or frequencies should be all (about) the same | Q1 | oe Strand (i) Only award if Yes ticked or implied |
| | Additional Guidance | | |
| | There are 4 ways to score the Q mark Comparing frequency of 1 to 20 Comparing frequency of 6 to 20 Referring to significant difference between frequency of 1 and 6 Referring to the fact that all frequencies should be the same | | |
| | Yes ticked and: | | B1 |
| | 6 has above the average which is 20 | | Q1 |
| | 6 more, 1 a lot less | | Q1 |
| | Lands more on 6. It should land on each side about the same number | | Q1 |
| | The range of results is too large on specific numbers (1,6) showing there is something making it land on a 6 and not a 1 | | Q1 |
| | The frequency of landing on 6 is over 7 times the frequency of landing on 1 | | Q1 |
| | There is a large range of 33 between the highest and lowest frequency | | Q1 |
| | Because the frequency is not all the same so it isn't fair | | Q1 |
| Frequency should be the same for all numbers | | Q1 | |
| see over for examples of Q0 | | | |

| Additional Guidance cont | | |
|---------------------------------|---|----|
| 20b cont | Yes ticked and: | B1 |
| | Lands more on 6 | Q0 |
| | 6 has appeared as the mode number whereas 1 is the least amount | Q0 |
| | Is heavier on number 6 | Q0 |
| | Landed on 6 38 times | Q0 |
| | All number are about average except 1 and 6 | Q0 |
| | Answers should be more evenly spaced out | Q0 |
| | Each time the number goes up, the frequency goes up | Q0 |

| Q | Answer | Mark | Comments | |
|----|--|--------------------------------|---|--|
| 21 | $2x + 2 + 3x - 1 = 36$ | M1 | oe | |
| | $5x = 35$ or $x = 35 \div 5$ | A1 | | |
| | 7 | A1ft | ft $5x = a$ ($a \neq 36$) or $bx = 35$ ($b \neq 2$ or 3) | |
| | 2 \times their 7 + 2 and 3 \times their 7 – 1 and 4 \times their 7 – 6 and 5 \times their 7 + 2 If no working shown at least 3 values must be correct for their 7 | M1 | Their 7 must come from the solution (correct or incorrect) of a single equation formed from an expression = 36 If 7 used, three of 16, 20, 22 and 37 | |
| | 16, 20, 22 and 37 and 21 shown as median or all 4 expressions correctly evaluated and median correctly identified | A1ft | SC3 $2x + 2 = 36$, $x = 17$, values 36, 50, 62, 87 and median identified as 56 SC2 $2x + 2 = 36$, $x = 17$, values 36, 50, 62, 87 SC1 $2x + 2 = 36$, $x = 17$ (no other equation seen) | |
| | Additional Guidance | | | |
| | NB As x is positive only the first 3 values are needed to find the median. If the 4 th value is worked out it must be evaluated correctly | | | |
| | NB Range is 21 so $37 - 16 = 21$ is A0 | | | |
| | $2x + 2 + 3x - 1 = 36$ $5x = 37$ $x = 7.4$ 16.8, 21.2, 23.6, 39 22.4 | M1 A0 A1ft M1 A1ft | | |
| | $2x + 2 = 36$, $x = 17$ and no other equation seen | SC1 | | |
| | Above and 36, 50, 62, 87 | SC2 | | |
| | Above and 56 | SC3 | | |
| | $3x - 1 = 36$, $x = 12.33$ 26.66, 36, 43.32, 63.65 39.66 (decimals must be to two dp or better) | M0 A0 A0 M1 A1ft | | |
| | see over for further additional guidance | | | |

| Additional Guidance cont | | |
|---------------------------------|---|---|
| 21 cont | $2x + 2 = 36$ $2x = 38$ $x = 19$ 36, 56, 70, 96 63 | M0 A0 A0 M1 A0ft Median correct but as last value evaluated wrongly, follow through mark is lost |
| | $2x + 2 + 3x - 1 = 36$ $3x = 39$ $x = 13$ 28, 38, 46, 67 42 | M1 A0 A0ft M1 A1ft Two errors in solving the equation |