

GCSE MATHEMATICS

Unit 2 43602H
Mark Scheme

43602H
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.

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 |
| ft | Follow through marks. Marks awarded for correct working following a mistake in an earlier step. |
| SC | Special case. Marks awarded within the scheme 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. eg, accept 0.5 as well as $\frac{1}{2}$ |
| [a, b] | Accept values between <i>a</i> and <i>b</i> inclusive. |
| 3.14... | Allow answers which begin 3.14 eg 3.14, 3.142, 3.149. |
| 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.

| Q | Answer | Mark | Comments |
|------|---|------|--|
| 1 | $5x - x$ or $4x$ or $16 + 2$ or 18 | M1 | oe |
| | $4x = 18$ | A1 | |
| | 4.5 | A1ft | oe ft their rearrangement with one error if M1 awarded |
| 2(a) | 300 or 600 or 50 or 100 or 20 | M1 | |
| | 300 or 600 and 50 or 100 and 20 | M1 | |
| | 720 | A1 | SC2 480 SC2 860 SC2 719 SC1 any table value rounded to 1sf SC1 715 SC1 720 without M1 awarded |
| 2(b) | $(349 + 349 + 59 + 59 + 39$ or 855) – $(299 + 299 + 49 + 49 + 19$ or 715 or their incorrect total of exact values for July in part(a)) | M1 | |
| | 140 | A1ft | ft 855 – their incorrect total of exact values in part(a) |
| | Alternative Method | | |
| | $2 \times 50 + 2 \times 10 + 20$ or $350 + 350 + 60 + 60 + 40$ – their 720 | M1 | |
| | 140 | A1ft | ft 860 – their 720 from rounding in part(a) |

| Q | Answer | Mark | Comments |
|------|---|------|--|
| 3(a) | $5 \times 5 \times 5$ or $125 \div 5 \div 5 = 5$ or $5^2 = 25$ and 25×5 or $5^2 \times 5$ or 5^3 | B1 | oe Condone $\sqrt[3]{125} = 5$ |
| 3(b) | $a = 4$ and $b = 121$ and $a = 25$ and $b = 100$ (both in either order) | B2 | B1 $a = 4$ and $b = 121$ or $a = 25$ and $b = 100$ (either order) B1 correct list of square numbers to 100 allow one error or omission |
| 4 | Correct method to change $\frac{5}{8}$ and $\frac{2}{3}$ into fractions with common denominator with at least one correct numerator | M1 | eg $\frac{16}{24}$, $\frac{15}{24}$ (either way around) |
| | Correct fractions and No | A1 | |
| | Alternative method 1 | | |
| | Correct method to calculate $\frac{5}{8}$ of a chosen value and $\frac{2}{3}$ of the same value | M1 | eg $5 \times 40 \div 8$ and $2 \times 40 \div 3$ or $\frac{5}{8} \times 40$ and $\frac{2}{3} \times 40$ |
| | Correct evaluations and No | A1 | |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
|---|--------|------|----------|

| Alternative method 2 | | | |
|-----------------------------|--|----|--|
| | Correct method to change $\frac{5}{8}$ and $\frac{2}{3}$ into decimals or percentages | M1 | |
| | $\frac{5}{8} = 0.625$ or 62.5(%) and $\frac{2}{3} = 0.66(6\dots)$ or 0.67 or 66(.6\dots)(%) or 67(%) and No | A1 | Correct and consistent decimals or percentages |

| | | | |
|-------------|---|------|--|
| 5(a) | 18 (×) 2 or 12 (×) 3 or 9 (×) 2 (×) 2 or 3 (×) 3 (×) 4 or 2 (×) 3 (×) 6 | M1 | Allow on prime factor tree or repeated division Condone 18 (×) 2 (×) 1 etc. for this mark |
| | $2 \times 2 \times 3 \times 3$ | A1 | Allow on prime factor tree or repeated division |
| | $2^2 \times 3^2$ | A1ft | ft any product of prime numbers in index form if M1 awarded |
| 5(b) | 9 | B2 | B1 answer 3 or 3^2 or 3×3 or $81 = 3^4$ or $3 \times 3 \times 3 \times 3$ |

| Q | Answer | Mark | Comments |
|------|---|------|--|
| 6 | Line (0900,0) to (1100,80) | B1 | need not be straight, but gradient must be positive for all points on the line |
| | Horizontal line $4\frac{1}{2}$ squares long for stage 2 and Horizontal line 1 square across for stage 4 | B1ft | ft from the end of the preceding part of the journey and each stage must be in correct order The sections for stages 3 and 5 need not be straight, but gradient must be negative for all points on the line |
| | Line $\frac{1}{2}$ square across and 3 squares down for stage 3 | B1ft | |
| | line $1\frac{1}{2}$ squares across and down to time axis to represent arriving home for stage 5 | B1ft | |
| 7(a) | -10 | B2 | |
| 7(b) | $a(a + b + 1)$ | B2 | B1 $a^2 + a(b + 1)$ or $a(a + b) + a$ or $a(a + b + 1)$ three terms in bracket with two correct |
| 7(c) | $2x > 9 + 1$ or $2x > 10$ | M1 | oe |
| | $x > 5$ | A1 | SC1 ($x =$) 5 or $x < 5$ or $x \geq 5$ or $2x > 8$ and $x > 4$ together |

| Q | Answer | Mark | Comments |
|-------|--|------|--|
| 8 | 12×10 or $120(\text{£ or } \%)$ or 24×6 or $144(\text{£ or } \%)$ or 36×4 or $144(\text{£ or } \%)$ | M1 | oe Correct method to calculate comparable values |
| | $120(\text{£ or } \%)$ and $144(\text{£ or } \%)$ and $144(\text{£ or } \%)$ | A1 | |
| | A | Q1ft | Any indication Strand (iii) correct decision based upon their values after M1 awarded |
| 9(a) | $4n + 2$ | B1 | |
| 9(b) | $(4n, \text{ their } 4n + 2)$ | B1ft | ft their (a) |
| 9(c) | $y = x + 2$ or $4n$ circled in (a) and $y = x$ or $6n$ circled in (a) and $y = \frac{3x}{2}$ or $6n + 2$ circled in (a) and $y = \frac{3x}{2} + 2$ | B2 | oe all equations B1 $y = mx + c$ with $m = 1$ or $c = 2$ |
| 10 | 445 and 544 | B3 | B2 445 or 544 or 450 and 540 or 450 and 549 B1 450 or 540 or 545 or 549 |
| 11(a) | $x^2 - 5x - 6x + 30$ | M1 | four terms, three correct with a term in x^2 or $x^2 - 11x + k$ with $k \neq 0$ |
| | $x^2 - 11x + 30$ | A1 | |
| 11(b) | $8a^7 b^9$ | B2 | B1 two correct from $8, a^7$ and b^9 B1 correct answer with multiplication sign(s) |

| Q | Answer | Mark | Comments |
|------------|--|------|--|
| 12 | 4 540 000 000 or 4540×10^6 | M1 | |
| | $4.54(0) \times 10^9$ | A1 | SC1 their 4 540 000 000, with digits 454, correctly converted to standard form SC1 $4.54(0) \times 10^3$ (million) SC1 4.5×10^9 |
| 13(a) | $\frac{x^2}{x + 2x + x^2}$ | M1 | oe Condone numerator as x or $2x$ |
| | $\frac{x^2}{3x + x^2} = \frac{x}{x + 3}$ or $\frac{x^2}{x(3 + x)} = \frac{x}{x + 3}$ | A1 | SC1 chooses a value for x , evaluates the correct numbers of each colour bead and shows that the fraction of blue beads can be written in the form $\frac{x}{x + 3}$ eg. $x = 3$, red = 3, white = 6, blue = 9 and $\frac{9}{18} = \frac{3}{6}$ |
| 13(b) | $\frac{x}{x + 3} = 0.9$ | M1 | oe |
| | $x = 0.9x + 2.7$ or $0.1x = 2.7$ | M1 | |
| | $(x =) 27$ | A1 | |
| | Alternative method 1 | | |
| | Chooses a value for x , evaluates the correct numbers of each colour bead and the correct proportion of blue beads. | M1 | eg 3, 6, 9 and $\frac{1}{2}$ (oe fraction, decimal or percentage) |
| | Chooses a value for x , evaluates the correct numbers of each colour bead and the correct proportion of blue beads, for a proportion closer to 90% | M1 | eg 3, 6, 9 and $\frac{1}{2}$ (oe fraction, decimal or percentage) and 4, 8, 16 and $\frac{4}{7}$ (oe fraction, decimal or percentage) |
| $(x =) 27$ | A1 | | |

| Q | Answer | Mark | Comments |
|----|---|------|---|
| | Alternative method 2 | | |
| | $\frac{90}{100} = \frac{18}{20}$ or $\frac{36}{40}$ or $\frac{45}{50}$ or $\frac{54}{60}$ or $\frac{63}{70}$ or $\frac{72}{80}$ or $\frac{81}{90}$ | M1 | |
| | $\frac{27}{30}$ | M1 | |
| | $(x =) 27$ | A1 | |
| 14 | $(2x - y)(2x + y)$ | B2 | B1 $(2x - y)(2x - y)$ or $(2x + y)(2x + y)$ or $(2x - y)^2$ or $(2x + y)^2$ or $(4x + y)(x - y)$ or $(4x - y)(x + y)$ |
| 15 | Correct equation of any line or associated inequality | M1 | Ignore incorrect inequality signs |
| | Correct equations of all four lines or associated inequalities | M1 | Ignore incorrect inequality signs |
| | $x \geq 3$ and $y > 2$ and $x > y$ and $x + y \leq 8$ | A1 | |
| | Use of included inequality for at least one of the solid lines and Use of strict inequality for at least one of the dashed lines | Q1ft | Strand (i) correct use of notation |

| Q | Answer | Mark | Comments |
|----|--|------|---------------------------------|
| 16 | $9^{\frac{1}{2}} = 3$ or $(-7)^{\circ} = 1$ | B1 | |
| | $\left(\frac{1}{8}\right)^{\frac{1}{3}} = 8^{\frac{1}{3}}$ or $\frac{1}{\sqrt[3]{8}}$ or $\frac{1}{\frac{1}{2}}$ or $\sqrt[3]{8}$ or $\left(\frac{1}{2}\right)^{-1}$ or $\left(\frac{1}{8}\right)^{\frac{1}{3}} = \frac{1}{2}$ or $\sqrt[3]{8} = \frac{1}{2}$ | M1 | oe $-\frac{1}{2}$ implies M1 |
| | $\left(\frac{1}{8}\right)^{\frac{1}{3}} = 2$ | A1 | |
| | All three numbers correctly evaluated and in correct order $(-7)^{\circ}$ $\left(\frac{1}{8}\right)^{\frac{1}{3}}$ $9^{\frac{1}{2}}$ | A1 | |

| Q | Answer | Mark | Comments |
|----|---|------|---|
| 17 | $3(x + 2)$ or $4(x - 1)$ | M1 | Ignore RHS and denominator |
| | $3x + 6 - 4x + 4$ | M1 | Allow one error Ignore RHS and denominator this also implies first M1 mark |
| | $(x - 1)(x + 2)$ or $x^2 + 2x - x - 2$ or $x^2 + x - 2$ | M1 | As denominator |
| | $2x^2 + 4x - 2x - 4$ or $2x^2 + 2x - 4$ or $2(x - 1)(x + 2)$ or $2(x^2 + 2x - x - 2)$ or $2(x^2 + x - 2)$ | M1 | Ignore LHS this also implies third M1 mark |
| | $2x^2 + 3x - 14 = 0$ | A1 | |
| | $(2x + 7)(x - 2) (= 0)$ | M1 | Correct method to solve their quadratic equation by Correct substitution into the quadratic formula or Correct completion of the square or Correct factorisation |
| | $-\frac{7}{2}$ and 2 | A1ft | ft their quadratic but must be exact values (integers, fractions, decimals or surds) SC2 $x = -\frac{7}{2}$ or $x = 2$ |

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