**AQA**

# GCSE
# Mathematics

Paper 3 Foundation Tier

Mark scheme

8300
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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.

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. eg 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 |
| **3.14 …** | Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416 |
| **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 student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

**Questions which ask students to show working**

Instructions on marking will be given but usually marks are not awarded to students who show no working.

**Questions which do not ask students to show working**

As a general principle, a correct response is awarded full marks.

**Misread or miscopy**

Students often copy values from a question incorrectly. If the examiner thinks that the student 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.

**Continental notation**

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **1** | –7°C | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **2** | $4n$ | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **3** | $\frac{1}{3}$ | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **4** | 32 | B1 | |

| | | | |
|---|---|---|---|
| | $a^3 + 2b$ | B2 | B1 for $a^3$ (+) or (+) $2b$ |

**Additional Guidance**

| | |
|---|---|
| Do not accept $2 \times b$ or $b2$ for 2b | |
| Do not accept $^3a$ for $a^3$ | |
| Do not accept further working for B2<br>eg $a^3 + 2b = a^32b$ | B1 |
| Do not accept further working for B1<br>eg $3a + 2b = 5ab$ or $a^3$  $b^2 = a^3b^2$ | B0 |
| $a^3 + b^2$ | B1 |
| $3a + 2b$ | B1 |
| $a^3$   $2b$ | B1 |
| $a^3$   $2b = a^32b$ | B1 |
| $a^3 \times 2b$ or $a^32b$ without working for B1 | B0 |
| $a^3 \times b^2$ or $a^3b^2$ | B0 |
| $3a \times 2b$ | B0 |
| $3a - 2b$ | B0 |

**5(a)** applies to the block above.

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | $5x$ (+) 15 | B1 | Implied by correct answer |
| | $4x$ + 17 | B2ft | B2ft  their $5x$ + 15 in the form  $5x + b$ or $ax$ + 15, both their terms with correct ft in final answer<br><br>B1ft  $4x$ or (+)17<br><br>B1ft their  $5x$ + 15 in the form  $5x + b$ or $ax$ + 15, one of their terms with correct ft in final answer |

| **5(b)** | **Additional Guidance** | |
|---|---|---|
| | ft $4x$ or (+)17 or must use $5x + b - x + 2$  or  $ax + 15 - x + 2$ | |
| | $4x$ + 17 with no expansion seen | B1B2 |
| | Ignore further working with an attempt to solve after their $4x$ + 17<br><br>eg  $4x$ + 17 = 0 followed by $x$ = –4.25 | B1B2 |
| | Do not ignore further working with an attempt to simplify after their $4x$ + 17<br><br>eg  $4x$ + 17 followed by $21x$ | B1B1 |
| | $5x$ + 15 – $x$ + 2 followed by $4x$ + 15 = –2 | B1B1 |
| | $5x$ + 3 followed by $4x$ + 5  also  $5x$ – 15 followed by $4x$ – 13 | B0B2ft |
| | Ignore further working after $5x$ + 15 for first B1<br><br>eg  $5x$ + 15 followed by $20x$ and $20x$ – $x$ + 2 followed by $19x$ + 2 | B1B0 |
| | $5x$   15 | B1 |
| | $4x + k$, $k \neq$ 17, with no expansion seen | B0B1ft |
| | $kx$ + 17, $k \neq$ 4, with no expansion seen | B0B1ft |
| | $5x$ + 15 – $5x$ + 10 followed by 25 | B1B0 |
| | $5x$ + 3 followed by $4x$ + 1 | B0B1ft |
| | $5x^2$ + 15  followed by $5x^2 - x$ + 17 | B0B1ft |
| | $5x$ + 3 followed by $4x$ + 1 followed by $5x$ | B0B0ft |
| | $5x$ + 3 followed by $6x$ + 1 | B0B0ft |
| | $5x^2$ + 3  followed by $5x^2 - x$ + 5 | B0B0ft |

| Question | Answer | | Mark | Comments |
|---|---|---|---|---|
| | **Cards** | **Total** | | |
| | 1 and 2 | 3 | | B3 for any three or four pairs giving the correct totals |
| | 3 and 6 | 9 | | B2 for any two pairs giving the correct totals |
| | 4 and 7 | 11 | B4 | B1 for any one pair giving the correct total |
| | 5 and 9 | 14 | | |
| | 8 and 11 | 19 | | |
| | 10 and 12 | 22 | | |

<table>
<tr><td colspan="2" align="center"><b>Additional Guidance</b></td></tr>
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| | |
|---|---|
| **Mark pairs from top down** and mark table only | |
| Numbers in pairs can be reversed eg 6 and 3 Total 9 | |
| Accept first use of a number, in a correct or incorrect pair, but discount further use of the same number in a subsequent pair | |
| Do not accept repeated numbers eg 7 and 7 or 11 and 11 as a correct pair (this is incorrect, not discounted) | |
| Do not accept use of other numbers eg 9 and 13 is not a correct pair | |
| 4 and 5 Total 9 correct<br>5 and 6 Total 11 discount (5 already used in a correct pair)<br>6 and 8 Total 14 correct (first use of 6 as 5 and 6 discounted)<br>8 and 11 Total 19 discount (8 already used in a correct pair)<br>10 and 12 Total 22 correct | 3 correct<br>B3 |
| 3 and 6 Total 9 correct<br>7 and 4 Total 11 correct (order reversed)<br>7 and 7 Total 14 discount (7 already used in a correct pair)<br>7 and 12 Total 19 discount (7 already used in a correct pair)<br>10 and 12 Total 22 correct (first use of 12 as 7 and 12 discounted) | 3 correct<br>B3 |

**Additional Guidance continues on the next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **6 cont** | 2  and  7  Total   9   discount (2 already used in correct pair)<br>5  and  6  Total 11   correct<br>4  and 10  Total 14   correct<br>9  and 10  Total 19   discount (10 already used in a correct pair)<br>11  and 11  Total 22   incorrect (11 is a repeated number in a pair) | 2 correct<br>B2 | |
|  | 3  and  3  Total   9   incorrect (3 is a repeated number in a pair)<br>3  and  8  Total 11   discount (3 already used in an incorrect pair)<br>6  and  8  Total 14   correct (first use of 8 as 3 and 8 discounted)<br>9  and 10  Total 19   correct<br>7  and 15  Total 22   incorrect (15 is not a card number) | 2 correct<br>B2 | |
|  | 3  and  5  Total   9   incorrect<br>3  and  8  Total 11   discount (3 already used in an incorrect pair)<br>7  and  7  Total 14   incorrect (7 is a repeated number in a pair)<br>7  and 12  Total 19   discount (7 already used in an incorrect pair)<br>10  and 12  Total 22   correct (first use of 12 as 7 and 12 discounted) | 1 correct<br>B1 | |

| **7(a)** | 10 | B1 | |

| **7(b)** | −14 | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **8(a)** | 2nd | B1 | |

| | | | |
|---|---|---|---|
| | (4 + 2 + 4 + 8 + 8 + 7 + 9 + 5) ÷ 10<br>or (6 + 12 + 15 + 14) ÷ 10<br>or (25 + 22) ÷ 10 or 2.5 + 2.2<br>or 47 ÷ 10 | M1 | Condone the omission of brackets<br>Accept one error or omission in reading from diagram |
| **8(b)** | 4.7 | A1 | oe |

| Additional Guidance | |
|---|---|
| 5 on answer line with 4.7 in working | M1A1 |
| 4 on answer line with 4.7 in working | M1A0 |
| (4 + 2 + 4 + 8 + 8 + 7 + 9) ÷ 10  is one omission<br>(4 + 2 + 4 + 8 + 8 + 7 + 9 + 6) ÷ 10  is one error<br>(6 + 12 + 15 + 13) ÷ 10  assume one error<br>(25 + 23) ÷ 10  assume one error<br>2.5 + 2.3  assume one error | M1 |
| Do not accept further calculation after 4.7 seen<br>47 ÷ 10 = 4.7<br>4.7 × 4 = 18.8 | M1A0 |
| Use of away goals only, treat as misread from the words in part (a)<br>(2 + 8 + 7 + 5) ÷ 10  or  2.2 condone the omission of brackets | M1A0 |
| 5 on answer line without working | M0A0 |
| (6 + 12 + 15) ÷ 10  assume two omissions | M0A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **8(c)** | **Alternative method 1** | | |
| | 4 + 4 + 8 + 9 and 2 + 8 + 7 + 5 <br> or <br> 25 and 22 | M1 | Accept one error in reading from diagram |
| | 3 | A1 | |
| | **Alternative method 2** | | |
| | 4 – 2 or 2 <br> and <br> 4 – 8 or –4 <br> and <br> 8 – 7 or 1 <br> and <br> 9 – 5 or 4 | M1 | Accept one error in reading from diagram <br> Differences may be seen on the diagram |
| | 3 | A1 | |

| Additional Guidance | |
|---|---|
| 25 – 22 = 3 | M1A1 |
| 4 – 2 = 2 and 4 – 8 = –4 and 8 – 6 = 2 and 9 – 5 = 4 is one reading error | M1 |
| 4 – 2 = 2 and 4 – 8 = 4 and 8 – 7 = 1 and 9 – 5 = 4 | M1 |
| 4 + 4 + 8 + 9 and 2 + 7 + 7 + 5 is one reading error <br> 24 – 21 = 3 | M1 <br> A0 |
| 1$^{st}$ 2   2$^{nd}$ 4   3$^{rd}$ 1   4$^{th}$ 4 is one error in calculation without working | M0A0 |
| 1$^{st}$ 2   3$^{rd}$ 1   4$^{th}$ 4 is one omission | M0A0 |
| 24 – 21 = 3 with no other working | M0A0 |
| 4 + 4 + 8 + 8 and 2 + 8 + 6 + 5 is two reading errors <br> 24 – 21 = 3 | M0 <br> A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **8(d)** | No and valid reason<br><br>eg  Indicates that one or more home teams might have won a game or games by a lot of goals | B1 | |

| **Additional Guidance** |||
|---|---|---|
| In numerical examples relating to results, the total home goals must be more than the total away goals and there cannot be more home wins than away wins<br><br>eg<br><br>No, the scores could have been<br><br>2-0  6-0  0-3  0-2  2-2  3-3  3-3  4-4  4-4  1-1<br><br>No, the scores could have been<br><br>2-0  6-0  0-3  0-2  and then all draws | | B1<br><br><br><br><br><br><br>B1 |
| If scores are given, assume home team first | | |
| Use of 'they' implies the home team in a statement relating to a team<br><br>eg  No, because they could score more just in one game | | B1 |
| No, the home team scored 0 in 9 matches and 25 in the final game | | B1 |
| No, the home team may have scored lots in one game | | B1 |
| No, multiple goals could be scored by a home team in one game | | B1 |
| No, the away team win a lot of games by one goal and lose by a lot of goals in one game | | B1 |
| Yes with or without an explanation | | B0 |
| No, the away team win a lot of games by one goal | | B0 |
| No, multiple goals could be scored in one game | | B0 |
| No, more goals scored at home but it doesn't mean that they won more | | B0 |
| No, we don't know how many goals were scored in each game | | B0 |
| No, the home team scored more goals in some games than others | | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **9(a)** | 1, 2, 3, 5, 6, 10, 15, 30 | B2 | B1 for one, two or three omissions or incorrect numbers |
| | **Additional Guidance** | | |
| | Accept factors as products eg  1 × 30 | | |
| | Accept factors as pairs in brackets eg  (1,30) | | |
| | Disregard any repeated factors or reversed factor pairs | | |
| | Disregard any negative factor pairs –5 × –6 | | |
| | 1, 2, 3, 5, 6, 10, 15, 30 shown in working<br>1, 2, 3, 5, 6, 10, 15 on answer line (Allow transcription error) | B2 | |
| | 1, 2, 3, 4, 5, 6, 10, 12, 15<br>(one omission of 30 and two incorrect numbers in 4 and 12) | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **9(b)** | $\frac{3}{8}$ | B1ft | oe fraction, decimal or percentage<br>ft their list in (a) with at least four numbers, at least one of which is two-digit |
| | **Additional Guidance** | | |
| | $\frac{3}{8}$ is B1, if not $\frac{3}{8}$ refer to 9(a) for possible ft | | |
| | 0.375 or 37.5% | | B1 |
| | Ignore further working with description of probability eg $\frac{3}{8}$ unlikely | | B1 |
| | Ignore further working with attempts to convert to percentage or decimal eg  $\frac{3}{8}$ = 37% or 38% | | B1 |
| | 3 : 8 in working with $\frac{3}{8}$ on answer line | | B1 |
| | 37% or 38% without $\frac{3}{8}$ or 37.5% in working | | B0 |
| | 3 : 8 on answer line | | B0 |

| | | |
|---|---|---|
| 3 out of 8 without $\frac{3}{8}$ in working | | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **10** | Rectangle: 4 | B1 | |
| | Triangle: 0.5 × ? × 16 = 24<br>or (2 ×) 24 ÷ 16<br>or (2 ×) 1.5<br>or 2 × 24 or 48 | M1 | oe |
| | 3 | A1 | |
| | **Additional Guidance** | | |
| | Ignore any units given | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **11** | **Alternative method 1** | | |
| | 18 (hours) or 36 (half hours)<br>or 24 (minutes per hour) | B1 | their hours × 2 × 12 implies 24 |
| | 18 × 2 × 12<br>or 18 × 24<br>or their hours × 2 × 12<br>or their hours × 24<br>or 36 × 12<br>or their half hours × 12 | M1 | oe |
| | 432 | A1 | Ignore fw in an attempt to convert 432 minutes to hours and minutes |
| | **Alternative method 2** | | |
| | Build up method using 12 minutes or 24 minutes with at least three additions | M1 | |
| | 36 additions using 12 minutes<br>or 18 additions using 24 minutes | M1dep | |
| | 432 | A1 | Ignore fw in an attempt to convert 432 minutes to hours and minutes |

**Additional Guidance continues on the next page**

| Question | Answer | Mark | Comments |
|----------|--------|------|----------|

| | Additional Guidance | |
|---|---|---|
| **11 cont** | 7 hours 12 minutes with 432 in working | B1M1A1 |
| | 7.2 hours or 7 hours 20 minutes with 432 in working | B1M1A1 |
| | 18 hours<br>18 ÷ 2 = 9 (half hours)<br>9 × 12<br>108 | B1M1A0 |
| | 7 hours 12 minutes without 432 in working | B1M1A0 |
| | 7.2 hours without 432 in working | B1M1A0 |
| | their hours × 2 × 12 implies 24<br>eg  2  2  2  2  2  2 (6 hours, 12 half hours))<br>    12 × 12<br>    144 | B1M1A0 |
| | Condone division of their number of hours by 2 to imply an attempt to calculate their number of half hours<br>eg  10 hours<br>10 ÷ 2 = 5 (half hours)<br>5 × 12<br>60 | B0M1A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **12** | $\frac{1}{4}$, $\frac{4}{10}$, 0.404, 44%<br><br>with no incorrect conversions<br>Accept values in any correct format | B2 | B1 two correct conversions to decimals<br>or two correct conversions to percentages<br>or two correct fractions with common denominators |

| Additional Guidance | |
|---|---|
| Condone missing percentage signs | |
| 0.25, 0.4, 0.404, 0.44 | B2 |
| 25%, 40%, 40.4%, 44% | B2 |
| 25%, $\frac{2}{5}$, 0.404, 44% with no other working<br><br>(all correct, even though in different formats) | B2 |
| $\frac{1}{4}$, $\frac{4}{10}$, 0.404, 44% with no working | B2 |
| $\frac{1}{4}$, $\frac{4}{10}$, 0.404, 44% with conversions to 25%, 40%, 40.04%<br><br>(one incorrect conversion) | B1 |
| 25%, 40%, 40.04% ( two correct conversions) | B1 |
| 44%, 0.404, $\frac{4}{10}$, $\frac{1}{4}$ (in reverse order) with no working for B1 | B1 |

| | | |
|---|---|---|
| Correct tangent drawn | B1 | |

| | Additional Guidance | |
|---|---|---|
| **13(a)** | Accept unruled line if intention is clear | |
| | Tangent must be drawn without clear space between line and circle | |
| | Ignore square drawn on grid lines from part (b) | |
| | Tangent may be drawn as part of a square | B1 |
| | Accept tangent which does not extend to both sides of circle | B1 |
| | Accept tangent drawn and ignore any radius or diameter drawn | B1 |
| | Do not accept tangent and chord drawn together | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **13(b)** | Valid reason for the area of the circle or the square around the circle | B1 | |

| Additional Guidance | |
|---|---|
| The area of the circle stated to be [4.5, 6.2] without incorrect working | B1 |
| Area of circle of radius 1.5 (cm) is 7(.06…)  or 7.07 or 7.1 | B1 |
| The square around it is only 9 cm$^2$ or 9 squares or 3 × 3 square | B1 |
| There aren't 9 squares in the circle | B1 |
| The circle fits into a 9 cm$^2$ square or 9 squares or 3 × 3 square | B1 |
| It only covers about [4.5, 6.2] squares | B1 |
| Circle does not (completely) cover nine separate boxes | B1 |
| There is one whole square and 8 part squares in the circle | B1 |
| Because all of the space for 9 is not used up | B1 |
| Calculate radius = 1.6(9…) (cm) or 1.7 (cm) from area of circle 9 (cm$^2$) and states radius of circle drawn is smaller | B1 |
| She uses 9 squares that are half in and half out of the circle, she needed to work it out only using the squares inside the circle | B0 |
| Does not fill up the whole square  (no reference to 9) | B0 |
| Because the radius is not big enough for it to be 9 | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **14(a)** | Cube | B1 | |

| Additional Guidance | |
|---|---|
| Cuboid | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **14(b)** | Sphere | B1 | |

| Additional Guidance | |
|---|---|
| Accept misspelling as long as intention to indicate sphere | B1 |
| Spherical | B0 |
| Ball | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 1 of 4** | | |
| | Identifies any 3-digit cube number | M1 | 125 or 216 or 343 or 512 or 729 |
| | 125 and 216 and 343 and 512 and 729 | M1dep | |
| | 125 and 216 and 343 and 512 and 729<br><br>and<br><br>64 and 1000 | A1 | |
| | **Alternative method 2 of 4** | | |
| | Identifies any 3-digit cube number | M1 | 125 or 216 or 343 or 512 or 729 |
| **15** | $5^3 = 125$ and $9^3 = 729$<br>and 5, 6, 7, 8, 9 or $9 - 4 = 5$ | M1dep | |
| | $5^3 = 125$ and $9^3 = 729$<br>and 5, 6, 7, 8, 9 or $9 - 4 = 5$<br>and $(4^3 =)$ 64 and $(10^3 =)$ 1000 | A1 | |
| | **Alternative method 3 of 4** | | |
| | $\sqrt[3]{100} = 4.6\ldots$ | M1 | |
| | $\sqrt[3]{999} = 9.9\ldots$ or $\sqrt[3]{1000} = 10$ | M1 | |
| | $\sqrt[3]{100} = 4.6\ldots$<br>and<br>$\sqrt[3]{999} = 9.9\ldots$ or $\sqrt[3]{1000} = 10$<br>and<br>5, 6, 7, 8, 9 or $9 - 4 = 5$ | A1 | |

**Alternative method 4 continues on the next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **15 cont** | **Alternative method 4 of 4** | | |
| | $5^3 = 125$ | M1 | |
| | $10^3 = 1000$ or $\sqrt[3]{1000} = 10$ | M1 | |
| | $4^3 = 64$ and $5^3 = 125$<br>and<br>$10^3 = 1000$ or $\sqrt[3]{1000} = 10$<br>and 5, 6, 7, 8, 9 or 9 – 4 = 5 | A1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **16(a)** | $6 \div 3$ or $2$ or $9 \div 2$<br>or<br>$3 \div 6$ or $0.5$ or $9 \times 0.5$<br>or<br>$9 \div 6$ or $1.5$ or $3 \times 1.5$<br>or<br>$6 \div 9$ or $\dfrac{2}{3}$ or $3 \div \dfrac{2}{3}$ | M1 | oe |
| | 4.5 | A1 | oe |

<div align="center"><b>Additional Guidance</b></div>

| | |
|---|---|
| Accept embedded answer 4.5 × 2 = 9 | M1A1 |
| Ignore further working in attempt to round after answer 4.5<br>eg  9 ÷ 2 = 4.5 with answer 5 | M1A1 |
| 'The length is double' without further working | M1A0 |
| 'The triangle is double' without further working | M0A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **16(b)** | 53 | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **17(a)** | *E* marked at midpoint of line | B1 | mark intention |
| | **Additional Guidance** | | |
| | Accept any clear marking of the point | | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **17(b)** | *R* marked 3 cm from *P* | B1 | mark intention |
| | **Additional Guidance** | | |
| | Accept any clear marking of the point | | |

| Question | Answer | Mark | Comments |
|----------|--------|------|----------|
| **18** | **Alternative method 1 of 6  – cost per hour** | | |
| | 3.6(0) ÷ 8 or (0).45<br>or<br>2.94 ÷ 6 or (0).49 | M1 | 360 ÷ 8 or 45<br>or<br>294 ÷ 6 or 49 |
| | their (0).45 ÷ 5 or (0).09<br>or<br>their (0).49 ÷ 5.5 or (0).08(9…) | M1dep | their 45 ÷ 5 or 9<br>or<br>their 49 ÷ 5.5 or 8.(9…) |
| | their (0).45 ÷ 5<br>**and**<br>their (0).49 ÷ 5.5 | M1dep | their 45 ÷ 5<br>**and**<br>their 49 ÷ 5.5 |
| | (£)0.09 and (£)0.08(9…) | A1 | 9(p) and 8.(9…) (p) |
| | brand B | A1ft | ft correct decision for their values with M3 scored |
| | **Alternative method 2 of 6  – cost per hour from price of pack** | | |
| | 8 × 5 or 40<br>or<br>6 × 5.5 or 33 | M1 | |
| | 3.6(0) ÷ their 40 or (0).09<br>or<br>2.94 ÷ their 33 or (0).08(9…) | M1dep | 360 ÷ their 40 or 9<br>or<br>294 ÷ their 33 or 8.(9…) |
| | 3.6(0) ÷ their 40<br>**and**<br>2.94 ÷ their 33 | M1dep | 360 ÷ their 40<br>**and**<br>294 ÷ their 33 |
| | (£)0.09 and (£)0.08(9…) | A1 | 9(p) and 8.(9…) (p) |
| | brand B | A1ft | ft correct decision for their values with M3 scored |

**Alternative method 3 continues on the next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 3 of 6 – number of hours per unit cost from number of batteries** | | |
| | 3.6(0) ÷ 8 or (0).45<br>or<br>2.94 ÷ 6 or (0).49 | M1 | 360 ÷ 8 or 45<br>or<br>294 ÷ 6 or 49 |
| | 5 ÷ their (0).45 or 11.1(…)<br>or<br>5.5 ÷ their (0).49 or 11.2(…) | M1dep | 5 ÷ their 45 or (0).111(…)<br>or<br>5.5 ÷ their 49 or (0).112(…) |
| | 5 ÷ their (0).45<br>**and**<br>5.5 ÷ their (0).49 | M1dep | 5 ÷ their 45<br>**and**<br>5.5 ÷ their 49 |
| | 11.1(…) (hours) and 11.2(…) (hours) | A1 | (0).111(…) (hours) and (0).112(…) (hours) |
| **18 cont** | brand B | A1ft | ft correct decision for their values with M3 scored |
| | **Alternative method 4 of 6 - common number of batteries** | | |
| | Scaling towards a cost for a common number of batteries (eg 24 batteries)<br>eg   8 × 3 × 5 or 120<br>**and** 6 × 4 × 5.5 or 132 | M1 | |
| | eg  3 × 3.60 or 10.8(0)<br>**and** 4 × 2.94 or 11.76 | M1 | eg  3 × 360 or 1080<br>and 4 × 294 or 1176 |
| | eg  their 10.8(0) ÷ their 120 or (0).09<br>**and**<br>their 11.76 ÷ their 132 or (0).08(9…) | M1dep | eg  their 1080 ÷ their 120 or 9<br>**and**<br>their 1176 ÷ their 132 or 8.(9…)<br>dependent on M1M1 |
| | (£)0.09 and (£)0.08(9…) | A1 | 9(p) and 8.(9…) (p) |
| | brand B | A1ft | ft correct decision for their values with M3 scored |

**Alternative method 5 continues on the next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **18 cont** | **Alternative method 5 of 6 – number of hours per unit cost from batteries per unit cost** | | |
| | 8 ÷ 3.6(0) or 2.2(…)<br>or 6 ÷ 2.94 or 2.04(…) | M1 | 8 ÷ 360 or 0.022(…)<br>or 6 ÷ 294 or 0.0204(…) |
| | their 2.2(…) × 5 or 11.1(…)<br>or their 2.04(…) × 5.5 or 11.2(…) | M1dep | their 0.022(…) × 5 or 0.111(…)<br>or their 0.0204(…) × 5.5 or 0.112(…) |
| | their 2.2(…) × 5<br>**and** their 2.04(…) × 5.5 | M1dep | their 0.022(…) × 5<br>**and** their 0.0204(…) × 5.5 |
| | 11.1(…) (hours) and 11.2(…) (hours) | A1 | (0).111(…) (hours) and (0).112(…) (hours) |
| | brand B | A1ft | ft correct decision for their values with M3 scored |
| | **Alternative method 6 of 6 – cost for common number of battery hours** | | |
| | 3.6(0) ÷ 8 or (0).45<br>or<br>2.94 ÷ 6 or (0).49 | M1 | 360 ÷ 8 or 45<br>or<br>294 ÷ 6 or 49 |
| | Scaling towards a common number of battery hours (eg 55 hours)<br>eg  their (0).45 × 11<br>or<br>their (0).49 × 10 | M1dep | eg  their 45 × 11<br>or<br>their 49 × 10 |
| | eg  their (0).45 × 11<br>**and**<br>their (0).49 × 10 | M1dep | eg  their 45 × 11<br>**and**<br>their 49 × 10 |
| | eg  (£)4.95 and (£)4.9(0) | A1 | eg  495(p) and 490(p) |
| | brand B | A1ft | ft correct decision for their values with M3 scored |

**Additional Guidance continues on the next page**

| | **Additional Guidance** | |
|---|---|---|
| **18 cont** | For the first A mark the values must not be rounded to the same value | |
| | A1ft can be awarded after A0 for the same value for the correct decision<br>eg  0.09 and 0.09 with decision 'both the same' | M3A0A1ft |
| | $8 \times 5 = 40$ and $40 \div 3.6(0)$ **and**  $6 \times 5.5 = 33$ and $33 \div 2.94$<br>is equivalent to $8 \div 3.6(0) \times 5$ **and** $6 \div 2.94 \times 5.5$  on Alt 5 | M3 |
| | $8 \times 5 = 40$ and $40 \div 3.6(0)$ is equivalent to $8 \div 3.6(0) \times 5$  on Alt method 5 | M2 |
| | $6 \times 5.5 = 33$ and $33 \div 2.94$ is equivalent to $6 \div 2.94 \times 5.5$  on Alt method 5 | M2 |
| | $(0).45 \div 5$ | M1M1 |
| | $(0).45 \div 5$ and $(0).49 \div 5.5$ | M1M1M1 |
| | $(0).45 \div 5$ and $(0).415 \div 5.5$        0.415 is not from a correct method | M1M1M0 |
| | In Alt method 4<br>M1M1 can be awarded in either order | |
| | In Alt method 5<br>their 2.2(…) must be correct or from correct method<br>their 2.04(…) must be correct or from correct method | |
| | Accept misread of 4 batteries (A) or 3 batteries (B) for up to M3A0A1ft | |
| | Accept working with minutes<br>eg   in Alt method 3<br>      for 2$^{nd}$ M1dep accept<br>      $300 \div 45 = 6.6(…)$ or 6.7<br>or    $330 \div 49 = 6.7(…)$<br>      for 3$^{rd}$ M1dep accept<br>      $300 \div 45$<br>**and** $330 \div 49$<br>for first A mark must see 6.6(…) or 6.67 **and** 6.7(…)<br>      or 6.7 **and** 6.73(…) | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **19(a)** | 6, 15, 24, 60 in any order | B2 | B1 for 6, 15, 24, 60 with no more than one additional value<br><br>or three correct values with no more than one incorrect value |

| | **Additional Guidance** | |
|---|---|---|
| | Ignore repeated values for B2 and B1 | |
| | 6, 10, 15, 24, 60 | B1 |
| | 6, 10, 15, 24 | B1 |
| | 6, 10, 15, 24, 36 | B0 |
| | 2 × 3, 5 × 3, 2 × 12, 5 × 12 | B0 |
| | $6xy$, $15xy$, $24xy$, $60xy$ | B0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **19(b)** | $\dfrac{2-12}{2}$<br><br>or one correctly evaluated trial with correct substitutions for<br>$x = 2$ or $5$ and $y = 3$ or $12$<br>or two correct values from<br>$-\dfrac{10}{2}$, $-\dfrac{1}{2}$, $-\dfrac{7}{5}$, $\dfrac{2}{5}$ oe<br>or two correct values from<br>$-5$, $-0.5$, $-1.4$, $0.4$ oe | M1 | $\dfrac{2-3}{2} = -\dfrac{1}{2}$ oe<br><br>or $\dfrac{5-12}{5} = -\dfrac{7}{5}$ oe<br><br>or $\dfrac{5-3}{5} = \dfrac{2}{5}$ oe |
| | $-\dfrac{10}{2}$ or $-5$ | A1 | |

| | **Additional Guidance** | |
|---|---|---|
| | Two separate correct values can be in either fraction or decimal form | |
| | 2 – 12 ÷ 2 = – 5 (recovered) | M1A1 |
| | 2 – 12 ÷ 2 | M0A0 |
| | An example of an incorrect substitution with different values of $x$<br>eg $\dfrac{5-12}{2} = -\dfrac{7}{2}$ | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **20** | 33 + 75 or 108 seen<br>or<br>60 + 100 or 160 seen | M1 | |
| | (33 + 75) ÷ (60 + 100) (✕ 100)<br>or<br>their 108 ÷ their 160 (✕ 100)<br>or<br>0.675 (✕ 100) | M1dep | oe |
| | 67.5 or 68 | A1 | |

| **Additional Guidance** | |
|---|---|
| 67.5 or 68 | M1M1A1 |
| 108 ÷ 160 = 0.67<br>67 | M1M1A0 |
| 0.675<br>67 | M1M1A0 |
| 67 with no working | M0M0A0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 1** | | |
| | Any correct scaling of the ratio 5 : 2<br>eg 10 (:) 4 or 20 (:) 8 or 25 (:) 10 | M1 | oe |
| | 22.5 (:) 9<br>or 22.5 (red)<br>or 30 (:) 12<br>or 12 (blue) | M1dep | oe |
| | 31.5 or $31\frac{1}{2}$ or $\frac{63}{2}$ | A1 | |
| | **Alternative method 2** | | |
| | $9 \div 2$ or 4.5<br>or $30 \div 5$ or 6 | M1 | oe<br>$2 \div 9$ or 0.22…<br>$5 \div 30$ or 0.16… or 0.17 |
| **21** | 5 × their 4.5 or 22.5<br>or 7 × their 4.5<br>or 2 × their 6 or 12<br>or 7 × their 6 or 42 | M1dep | oe |
| | 31.5 or $31\frac{1}{2}$ or $\frac{63}{2}$ | A1 | |
| | **Alternative method 3** | | |
| | $\frac{2}{7}$ × purple = blue<br><br>$\frac{5}{7}$ × purple = red | M1 | oe $\frac{2}{7}$ × purple = 9<br><br>$\frac{5}{7}$ × purple = 30 |
| | $9 \times \frac{7}{2}$<br><br>or $30 \times \frac{7}{5}$ or 42 | M1dep | oe |
| | 31.5 or $31\frac{1}{2}$ or $\frac{63}{2}$ | A1 | |

**Additional Guidance continues on the next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | **Additional Guidance** | | |
| **21 cont** | 28 + 3.5 = 31.5 | | M1M1A1 |
| | 28 + 3.5 | | M1M1A0 |
| | 31.5, answer 31 | | M1M1A1 |
| | 31.5 + 42 = 73.5 | | M1M1A0 |
| | 10   4 | | M1M0A0 |
| | 10,  4 | | M1M0A0 |
| | 10 + 4 | | M1M0A0 |
| | 'He has 2.5 times more red than blue' | | M1M0A0 |
| | 2.5 : 1 | | M1M0A0 |
| | 2.5 | | M0M0A0 |
| | 28 on its own | | M0M0A0 |

| | | | |
|---|---|---|---|
| **22(a)** | Could be true | B1 | |

| | | | |
|---|---|---|---|
| **22(b)** | Must be true | B1 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|

| | 5.5 in the correct position | B1 | oe |
|---|---|---|---|
| | 6.5 in the correct position | B1 | oe |

**23(a)**

| Additional Guidance | |
|---|---|
| 5.50 or $5\frac{1}{2}$ or $\frac{11}{2}$ | B1 |
| 6.50 or $6\frac{1}{2}$ or $\frac{13}{2}$ | B1 |

| | One correctly evaluated trial using (6, 6.5] + (4, 4.5) or (6, 6.5) + (4, 4.5]  or **two** values in the ranges given that work if correctly evaluated | M1 | eg 6.3 + 4.1 = 10.4  eg 6.4, 4.2 |
|---|---|---|---|
| | One correctly evaluated trial using (6, 6.5) + (4, 4.5) with an answer that rounds to 11 | A1 | eg 6.4 + 4.2 = 10.6  Ignore fw |

**23(b)**

| Additional Guidance | |
|---|---|
| 6.4 + 4.4 = 10.8 (= 11)  do not need to show 11 | M1A1 |
| 6.4999 + 4.4999 = 10.9998 | M1A1 |
| 6.5 + 4.4 = 10.9 | M1A0 |
| 4.5 + 6.2 = 10.7 | M1A0 |
| 6 + 4 = 10 | M0 |
| 6.5 + 4.5 = 11 | M0 |
| $6.4\dot{9} + 4.4\dot{9} = 11$ | M0 |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | $2x + 10 = 3x - 20$ | M1 | oe<br>$180 - (2x + 10) + 3x - 20 = 180$ |
| | $3x - 2x = 20 + 10$<br>or $x = 30$ | M1dep | oe |
| | $2 \times$ their $30 + 10$<br>or $3 \times$ their $30 - 20$<br>or 70 | M1dep | oe |
| | 110 | A1 | |

<div align="center"><b>Additional Guidance</b></div>

| | |
|---|---|
| $x = 30$, $y = 180 - 3(30) + 20 = 110$ | M1M1M1A1 |
| $x = 30$, $y = 180 - 3(30) - 20 = 110$  recovered missing bracket | M1M1M1A1 |
| $x = 30$, $y = 180 - 3(30) - 20 = 70$ not recovered | M1M1M0A0 |
| $2x + 10 = 3x - 20$<br>$3x - 2x = 20 + 10$<br>$x = 10$<br>$2 \times 10 + 10 (= 30)$ | M1M1M1A0 |
| $2x + 10 = 3x - 20$<br>$x = 10$<br>$2 \times 10 + 10 (= 30)$ | M1M0M0A0 |
| $y + 2x + 10 = 3x - 20 + y$ | M1M0M0A0 |
| $w = 3x - 20$ seen or on diagram | M0M0M0A0 |
| $w = 2x + 10$ seen or on diagram | M0M0M0A0 |

**24(a)** appears in the Question column.

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **24(b)** | $2x + 10 = 60$<br>or $2x = 60 - 10$<br>or $2x = 50$<br>or $x = 25$ | M1 | |
| | $3 \times$ their $25 - 20$ or $55$<br>or $180 - 55$ or $125$ | M1dep | oe |
| | $(y =)$ 125 and bigger<br>or $(y$ is) 15 bigger | A1ft | oe<br>ft their (a) |
| | **Additional Guidance** | | |
| | Note: A complete logical explanation of the effect of lines not being parallel<br>eg<br>$w$ is smaller so $2x + 10$ is smaller so $x$ is smaller so $3x - 20$ is smaller so $y$ is bigger | M1M1A1 | |
| | $2 \times 25 + 10 = 60$ | M1M0A0 | |
| | $y$ is bigger ticked but no valid working | M0M0A0 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| **25(a)** | $\dfrac{2}{3} \times 720$ or $\dfrac{3}{5} \times 700$ | M1 | oe<br>Accept use of 0.66… or 0.67 |
| | 480 or 420 | A1 | |
| | 900 | A1 | Ignore fw |
| | **Additional Guidance** | | |
| | 900 with no working | M1A1A1 | |
| | 900 out of 1420 or $\dfrac{900}{1420}$  (ignore fw) | M1A1A1 | |
| | $\dfrac{480}{720}$ (480 boys out of 720) or $\dfrac{420}{1420}$ (420 girls out of 1420 students) | M1A1A0 | |

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 1** | | |
| | 720 + 700 or 1420<br>or 720 + 700 – their 900<br>or 520 | M1 | oe |
| | $\dfrac{520}{1420}$ or $\dfrac{26}{71}$ | A1ft | oe fraction, decimal or percentage<br>0.36(6…) or 0.37<br>36.(6…)% or 37%<br>ft their part (a)<br>Ignore fw |
| | **Alternative method 2** | | |
| **25(b)** | 720 + 700 or 1420<br>or $\dfrac{1}{3}$ × 720 or 240<br>or $\dfrac{2}{5}$ × 700 or 280<br>or 240 + 280 or 520 | M1 | oe |
| | $\dfrac{520}{1420}$ or $\dfrac{26}{71}$ | A1 | oe fraction, decimal or percentage<br>0.36(6…) or 0.37<br>36.(6…)% or 37%<br>Ignore fw |
| | **Alternative method 3** | | |
| | 720 + 700 or 1420<br>or $\dfrac{900}{1420}$ or $\dfrac{45}{71}$<br>or $\dfrac{\text{their } 900}{1420}$ | M1 | oe fraction, decimal or percentage<br>0.63… or 0.63<br>63.(…)% or 63% |
| | $\dfrac{520}{1420}$ or $\dfrac{26}{71}$ | A1ft | oe fraction, decimal or percentage<br>0.36(6…) or 0.37<br>36.(6…)% or 37%<br>ft their part (a)<br>Ignore fw |

**Additional Guidance continues on the next page**

| Question | Answer | Mark | Comments |
|---|---|---|---|

| 25(b) cont | **Additional Guidance** | | |
|---|---|---|---|
| | $\dfrac{520}{1420}$ followed by incorrect simplification of fraction | | M1A1 |

| 26 | $(x + 2)(x - 6)$ | B1 | |
|---|---|---|---|

| Question | Answer | Mark | Comments |
|---|---|---|---|
| | **Alternative method 1** | | |
| | A includes 1<br>or B does not include 1 | B1 | oe<br>Correct statement about 1 without contradiction |
| | A does not include 6<br>or B includes 6 | B1 | oe<br>Correct statement about 6 without contradiction |
| | **Alternative method 2** | | |
| **27** | $1 \leq x < 6$<br>or $1 < x \leq 6$<br><br>or $1 \leq x$ and $1 < x$<br>or $x < 6$ and $x \leq 6$<br><br>or A is 1, 2, 3, 4, 5<br>or B is 2, 3, 4, 5, 6 | M1 | oe<br>eg $x \geq 1$ and $x < 6$ for 1st statement<br><br>A includes 3 and B includes 18<br><br>A is  3, …  17<br>and  B is  4, …  18 |
| | A is 1, 2, 3, 4, 5<br>and B is 2, 3, 4, 5, 6 | A1 | oe<br>eg  A = 1 to 5 and B = 2 to 6 |

| Additional Guidance | |
|---|---|
| For 2 marks, must have clearly indicated both sets of integer solutions | M1A1 |
| For 2 marks, must have clearly indicated both differences | B1B1 |
| A could be 1 but not 6, B could be 6 but not 1 | B1B1 |
| A is $x = 1$ and B is $x = 6$ | B1B1 |
| A: 3, 6, 9, 12, 15 and B: 6, 9, 12, 15, 18 | M1A0 |
| Comment that inequality signs are switched with no other working | B0B0 |
| '1 and 6 don't appear in both' – need to be correctly linked to A and B | B0B0 |