

**AQA • GCSE MATHEMATICS 8300**

# Higher Tier — Paper 2

Calculator

June 2024 exam series

**MARK SCHEME**

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# GCSE MATHEMATICS 8300/2H

Higher Tier Paper 2 Calculator

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**Mark scheme**

June 2024

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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 Examiner.

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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from [aqa.org.uk](https://aqa.org.uk)

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## 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.

|                        |                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>M</b>               | Method marks are awarded for a correct method which could lead to a correct answer.                                                    |
| <b>A</b>               | 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>B</b>               | Marks awarded independent of method.                                                                                                   |
| <b>ft</b>              | Follow through marks. Marks awarded for correct working following a mistake in an earlier step.                                        |
| <b>SC</b>              | Special case. Marks awarded for a common misinterpretation which has some mathematical worth.                                          |
| <b>M dep</b>           | A method mark dependent on a previous method mark being awarded.                                                                       |
| <b>B dep</b>           | A mark that can only be awarded if a previous independent mark has been awarded.                                                       |
| <b>oe</b>              | Or equivalent. Accept answers that are equivalent.<br>eg accept 0.5 as well as $\frac{1}{2}$                                           |
| <b>[a, b]</b>          | Accept values between a and b inclusive.                                                                                               |
| <b>[a, b)</b>          | Accept values $a \leq \text{value} < b$                                                                                                |
| <b>3.14 ...</b>        | Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416                                                                                 |
| <b>Use of brackets</b> | 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.

| Q | Answer  | Mark | Comments |
|---|---------|------|----------|
| 1 | segment | B1   | region A |
|   | sector  | B1   | region B |

| Q | Answer                                                                                                                       | Mark  | Comments                                                                                                                                     |
|---|------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | 88(%) or 0.88                                                                                                                | M1    | oe eg 1 – 0.12                                                                                                                               |
|   | $2\,200\,000 \div 88 (\times 100)$<br>or $25\,000 (\times 100)$                                                              | M1dep | oe eg $2.2 \times 10^6 \div (100 - 12) (\times 100)$<br>or $2\,200\,000 \times [1.136, 1.14]$<br>or 2 500 000                                |
|   | $2.5 \times 10^6$                                                                                                            | A1    | oe standard form eg $2.500\,000 \times 10^6$<br>SC1 $2.2 \times 10^6$ oe standard form seen<br>SC1 any value seen converted to standard form |
|   | <b>Additional Guidance</b>                                                                                                   |       |                                                                                                                                              |
|   | M1 or SC1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |                                                                                                                                              |
|   | M1 may be seen in a trial or incorrect working<br>eg $3\,000\,000 \times 0.88$ or 88% of 2 200 000                           |       | M1                                                                                                                                           |
|   | $2\,200\,000 \div 88\%$ not recovered                                                                                        |       | M1M0                                                                                                                                         |
|   | $2\,200\,000 \times 1.12 = 2\,464\,000$<br>$2.464 \times 10^6 = 2.5 \times 10^6$                                             |       | SC1                                                                                                                                          |

| Q    | Answer                               | Mark | Comments |
|------|--------------------------------------|------|----------|
| 3(a) | The number of blueberries in the tub | B1   |          |

| Q                                                                    | Answer                                                                                            | Mark | Comments |   |     |    |    |    |                                                                                   |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------|----------|---|-----|----|----|----|-----------------------------------------------------------------------------------|
| 3(b)                                                                 | <table><tr><td>2</td><td>6</td><td>8</td></tr><tr><td>120</td><td>40</td><td>30</td></tr></table> | 2    | 6        | 8 | 120 | 40 | 30 | B2 | B1 40 or 8 in the correct position<br>or $(k =) 120 \times 2$ or $(k =) 240$ seen |
|                                                                      | 2                                                                                                 | 6    | 8        |   |     |    |    |    |                                                                                   |
|                                                                      | 120                                                                                               | 40   | 30       |   |     |    |    |    |                                                                                   |
|                                                                      | Additional Guidance                                                                               |      |          |   |     |    |    |    |                                                                                   |
| $(k =) 240$ or $(k =) 120 \times 2$ may be seen anywhere on the page |                                                                                                   |      |          |   |     |    |    |    |                                                                                   |
| 240 may be seen embedded in the formula eg $120 = \frac{240}{2}$     |                                                                                                   |      | B1       |   |     |    |    |    |                                                                                   |

| Q    | Answer                                                                                                                   | Mark | Comments                                                                                    |
|------|--------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------|
| 4(a) | The same number of 7s as even numbers                                                                                    | M1   | any order<br>may be in a list or on the spinner<br>must be at least one 7                   |
|      | 5, 5, 6, 7, 7, 8                                                                                                         | A1   | any order<br>may be in a list or on the spinner<br>may be implied                           |
|      | $\frac{2}{6}$                                                                                                            | A1ft | oe fraction, decimal or percentage<br>ft M1A0 with completed spinner or list of six numbers |
|      | <b>Additional Guidance</b>                                                                                               |      |                                                                                             |
|      | Ignore simplification or conversion attempt after correct answer seen                                                    |      |                                                                                             |
|      | Accept 0.33(...) or 33.(...) % for $\frac{2}{6}$                                                                         |      |                                                                                             |
|      | A list/spinner with blanks and/or using other numbers may still score M1<br>eg 5, 5, 7, 10 or 5, 6, 7, 7, 8, 9           |      | M1                                                                                          |
|      | $\frac{2}{6}$ with no incorrect working<br>eg 5, 6, 7, 8 on spinner with 2 blanks answer $\frac{2}{6}$ (M1A1 is implied) |      | M1A1A1                                                                                      |
|      | 5, 5, 6, 6, 7, 7 with answer $\frac{2}{6}$                                                                               |      | M1A0A1ft                                                                                    |
|      | 5, 5, 5, 5, 6, 7 with answer $\frac{4}{6}$                                                                               |      | M1A0A1ft                                                                                    |
|      | 5, 6, 6, 7, 7, 9 with answer $\frac{2}{6}$                                                                               |      | M1A0A0ft                                                                                    |
|      | 5, 5, 5, 5, 5, 6 with answer $\frac{5}{6}$                                                                               |      | M0A0A0ft                                                                                    |

| Q    | Answer                                                                                                                                           | Mark | Comments                         |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------|
| 4(b) | Valid reason                                                                                                                                     | B1   | eg sum of probabilities is not 1 |
|      | <b>Additional Guidance</b>                                                                                                                       |      |                                  |
|      | Ignore irrelevant statements alongside a correct statement<br>eg the sum of the probabilities is not 1 and the probabilities are not percentages |      | B1                               |
|      | Do not ignore incorrect statements alongside a correct statement<br>eg the sum of the probabilities is 0.11 not 1                                |      | B0                               |
|      | They add up to 1.1                                                                                                                               |      | B1                               |
|      | They add up to 110%                                                                                                                              |      | B1                               |
|      | It is 0.1 too much                                                                                                                               |      | B1                               |
|      | One of the probabilities is 0.1 too much                                                                                                         |      | B1                               |
|      | It should be something like 0.1, 0.2, 0.3, 0.4                                                                                                   |      | B1                               |
|      | B should be 0.4                                                                                                                                  |      | B1                               |
|      | They don't add up correctly                                                                                                                      |      | B0                               |
|      | They add up to 0.11                                                                                                                              |      | B0                               |
|      | It's not a fair spinner                                                                                                                          |      | B0                               |

| Q    | Answer                                                                               | Mark | Comments                                                              |
|------|--------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------|
| 5(a) | $C (0, 6)$                                                                           | B1   | if answer space is blank, accept (0, 6) written at $C$ on the diagram |
|      | $D (3, 0)$                                                                           | B1   | if answer space is blank, accept (3, 0) written at $D$ on the diagram |
|      | <b>Additional Guidance</b>                                                           |      |                                                                       |
|      | For each part mark the answer space unless blank                                     |      |                                                                       |
|      | Allow $x$ and $y$ written above the coordinates but do not allow eg (0 $x$ , 6 $y$ ) |      |                                                                       |

| Q    | Answer                     | Mark | Comments |
|------|----------------------------|------|----------|
| 5(b) | 5                          | B1   |          |
|      | 3                          | B1   |          |
|      | <b>Additional Guidance</b> |      |          |
|      | Mark the answer lines only |      |          |
|      | Do not allow eg (0, 5)     |      |          |

| Q | Answer                | Mark | Comments                                   |
|---|-----------------------|------|--------------------------------------------|
| 6 | $6.4 \times 10^{-14}$ | B1   | oe standard form eg $6.40 \times 10^{-14}$ |

| Q | Answer                                                                                                                       | Mark | Comments                                             |
|---|------------------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------|
| 7 | $\frac{52}{200}$ or $\frac{26}{100}$ or $\frac{13}{50}$                                                                      | B1   | oe fraction, decimal or percentage<br>eg 0.26 or 26% |
|   | Valid reason involving the number of trials                                                                                  | B1   | eg it is from using the largest number of flips      |
|   | <b>Additional Guidance</b>                                                                                                   |      |                                                      |
|   | 1st B1 Ignore simplification or conversion attempt after correct answer seen<br>eg $\frac{52}{200} = 0.28$                   |      | 1st B1                                               |
|   | 52 out of 200 or 52 : 200                                                                                                    |      | 1st B0                                               |
|   | Probability from incorrect working eg $\frac{10 + 30 + 40 + 50}{50 + 100 + 150 + 200} = \frac{130}{500}$                     |      | 1st B0                                               |
|   | Ignore irrelevant statements alongside a correct statement<br>eg Using most flips and they could have done more              |      | 2nd B1                                               |
|   | Do not ignore incorrect statements alongside a correct statement<br>eg Uses all the flips but they could have used 100 flips |      | 2nd B0                                               |
|   | It uses all the flips                                                                                                        |      | 2nd B1                                               |
|   | More spins                                                                                                                   |      | 2nd B1                                               |
|   | 200 is the largest amount of data                                                                                            |      | 2nd B1                                               |
|   | 200 is the highest number                                                                                                    |      | 2nd B1                                               |
|   | 200 is the total number of flips                                                                                             |      | 2nd B0                                               |
|   | 200 flips gives 52 heads                                                                                                     |      | 2nd B0                                               |
|   | 200 is the final result                                                                                                      |      | 2nd B0                                               |
|   | That is the highest number in the table                                                                                      |      | 2nd B0                                               |
|   | The highest results are more accurate                                                                                        |      | 2nd B0                                               |
|   | 100 flips is easier to work out                                                                                              |      | 2nd B0                                               |
|   | He could use any of the results                                                                                              |      | 2nd B0                                               |
|   | B0B1 is possible eg Answer 27% Reason Use the one from most spins                                                            |      | B0B1                                                 |

| Q | Answer                                                                                                                                               | Mark  | Comments                                                                                                                            |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------|
| 8 | A change in distance for an integer time interval<br>or<br>a change in distance for a non-integer time interval with the corresponding time interval | M1    | integer time intervals are<br>[88, 92] [70, 74] [52, 56]<br>[34, 38] [16, 20]<br>may be seen on graph                               |
|   | $\frac{\text{their change in distance}}{\text{corresponding time interval}}$                                                                         | M1dep | oe eg $\frac{[88, 92]}{5}$<br>must see their change in distance and the corresponding time interval<br>division by 1 may be implied |
|   | 18                                                                                                                                                   | A1    | SC1 24                                                                                                                              |
|   | <b>Additional Guidance</b>                                                                                                                           |       |                                                                                                                                     |
|   | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts                                |       |                                                                                                                                     |
|   | $90 \times 5$                                                                                                                                        |       | M1M0                                                                                                                                |
|   | (1 second) Answer [16, 20] is awarded at least M2                                                                                                    |       |                                                                                                                                     |
|   | 18 from incorrect working cannot score A1                                                                                                            |       |                                                                                                                                     |
|   | 18 followed by further work eg $18 \div 5 = 3.6$                                                                                                     |       | M1M0                                                                                                                                |

| Q | Answer                   | Mark | Comments       |
|---|--------------------------|------|----------------|
| 9 | Only intersection shaded | B1   | mark intention |

| Q  | Answer                                                                                                                       | Mark  | Comments                                                                |
|----|------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------|
| 10 | <b>Alternative method 1: works year by year</b>                                                                              |       |                                                                         |
|    | 90 000 $\times$ 1.03 or 92 700<br>or 90 000 $\times$ 1.08 or 97 200                                                          | M1    | oe eg 90 000 + 90 000 $\times$ 0.03                                     |
|    | 90 000 $\times$ 1.03 $\times$ 1.08<br>or 100 116                                                                             | M1dep | oe eg 92 700 $\times$ 1.08                                              |
|    | 100 116 and Yes                                                                                                              | A1    | oe eg 100 116 > 100 000<br>SC1 99 900 seen                              |
|    | <b>Alternative method 2: uses multipliers</b>                                                                                |       |                                                                         |
|    | 1.03 $\times$ 1.08 or 1.112(4)                                                                                               | M1    | oe                                                                      |
|    | $\frac{100\,000}{90\,000}$ or 1.111(...)<br>or $\frac{100\,000}{1.03 \times 1.08}$ or [89 895, 89 900]                       | M1    | oe<br><br>$\frac{100\,000}{1.03 \times 1.08}$ or [89 895, 89 900] is M2 |
|    | 1.112(4) and 1.111(...) and Yes<br>or [89 895, 89 900] and Yes                                                               | A1    | oe<br>eg 1.112(4) and 1.111(...) so it is more<br>SC1 99 900 seen       |
|    | <b>Additional Guidance</b>                                                                                                   |       |                                                                         |
|    | M1 or SC1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |                                                                         |
|    | A correct value is sufficient for showing working<br>eg1 Alt 1 100 116<br>eg2 Alt 1 100 116 and Yes                          |       | M2A0<br>M2A1                                                            |
|    | Alt 1 90 000 $\times$ 103% not recovered                                                                                     |       | M0                                                                      |
|    | Alt 2 Yes cannot be implied only by an inequality                                                                            |       |                                                                         |
|    | SC1 is from increasing 90 000 by 11%                                                                                         |       |                                                                         |

| Q  | Answer                                                                                                                                                                                                                                                          | Mark | Comments                                                                                                                                                                                                                                                                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | $15 \times 20\,000 \div 100 \div 1000$                                                                                                                                                                                                                          | M2   | oe full method<br>eg $300\,000 \div 100 \div 1000$<br>or $0.2 \times 15$<br>or $0.00015 \times 20\,000$<br><br>M1 one correct step<br>eg $15 \times 20\,000$ or $300\,000$<br>or $20\,000 \div 100$ or $200$<br>or $20\,000 \div 1000$ or $20$<br>or $15 \div 100$ or $0.15$<br>or $15 \div 1000$ or $0.015$<br>or $100 \times 1000$ or $100\,000$ |
|    | 3                                                                                                                                                                                                                                                               | A1   |                                                                                                                                                                                                                                                                                                                                                    |
|    | <b>Additional Guidance</b>                                                                                                                                                                                                                                      |      |                                                                                                                                                                                                                                                                                                                                                    |
|    | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts                                                                                                                                           |      |                                                                                                                                                                                                                                                                                                                                                    |
|    | M2 will usually be seen in stages<br>eg $20\,000 \div 100 = 200$ $200 \times 15 = 3000$ $3000 \div 1000$                                                                                                                                                        |      | M2                                                                                                                                                                                                                                                                                                                                                 |
|    | M1 may be seen embedded in more than one step (extra steps could be incorrect)<br>eg $15 \times 20\,000 \div 100$ or $3000$<br>or $15 \times 20\,000 \div 1000$ or $300$<br>or $20\,000 \div 100 \div 1000$ or $0.2$<br>or $15 \div 100 \div 1000$ or $0.00015$ |      | M1                                                                                                                                                                                                                                                                                                                                                 |
|    | Ignore their units for method marks                                                                                                                                                                                                                             |      |                                                                                                                                                                                                                                                                                                                                                    |
| Q  | Answer                                                                                                                                                                                                                                                          | Mark | Comments                                                                                                                                                                                                                                                                                                                                           |
| 12 | SSS                                                                                                                                                                                                                                                             | B1   |                                                                                                                                                                                                                                                                                                                                                    |

| Q  | Answer                                                                                                                | Mark  | Comments                                                                  |
|----|-----------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------|
| 13 | $15 \times 7.2$ or 108<br><b>and</b><br>$18 \times 7.6$ or 136.8<br><b>and</b><br>$7 \times 8$ or 56                  | M1    | oe<br>implied by 300.8<br>allow one product or $fx$ value to be incorrect |
|    | $(108 + 136.8 + 56) \div 40$<br>or<br>$300.8 \div 40$ or $\frac{188}{25}$                                             | M1dep | oe<br>do not allow if any exact $fx$ or $\Sigma fx$ value is approximated |
|    | 7.52                                                                                                                  | A1    | accept 7.5 if 7.52 in working lines with no incorrect method              |
|    | <b>Additional Guidance</b>                                                                                            |       |                                                                           |
|    | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |                                                                           |
|    | $15 \times 7.2$ $18 \times 7.6$ $7 \times 8$<br>$(108 + 137 + 56) \div 40$ ( $fx$ value 137 is approximated)          |       | M1<br>M0                                                                  |
|    | $108 + 136.8 + 56 = 300.8$<br>$300 \div 40$ ( $\Sigma fx$ value 300 is approximated)                                  |       | M1<br>M0                                                                  |
|    | M1dep Missing brackets must be recovered<br>eg $108 + 136.8 + 56 \div 40$ not recovered                               |       | M1M0                                                                      |
|    | 7.52 in working with answer $7.4 \leq d < 7.8$                                                                        |       | M2A0                                                                      |

| Q     | Answer                      | Mark  | Comments |
|-------|-----------------------------|-------|----------|
| 14(a) | $15 = 3^2 + c$ or $(c =) 6$ | M1    | oe       |
|       | $7^2 + \text{their } 6$     | M1dep | oe       |
|       | 55                          | A1    |          |

| Q     | Answer                   | Mark | Comments |
|-------|--------------------------|------|----------|
| 14(b) | It is impossible to tell | B1   |          |

| Q  | Answer                                                                                                                                                    | Mark | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 | <b>Alternative method 1: works out concrete poured in 30 minutes</b>                                                                                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | $10.9 \times 30 \times 60 \div 1000$ or $19.6(2)$<br><br><b>or</b><br><br>$10.9 \times 30 \times 60$ or $19\,620$<br>and<br>$20 \times 1000$ or $20\,000$ | M3   | oe full method<br>eg $10.9 \times 1800 \div 1000$<br>or $30 \times 654 \div 1000$<br>or $19\,620 \div 1000$<br><br>M2 two correct steps<br>eg $10.9 \times 30 \times 60$ or $19\,620$<br>or $10.9 \times 30 \div 1000$ or $0.327$<br>or $10.9 \times 60 \div 1000$ or $0.654$<br>or $30 \times 60 \div 1000$ or $1.8$<br><br>M1 one correct step<br>eg $10.9 \times 30$ or $327$<br>or $10.9 \times 60$ or $654$<br>or $10.9 \div 1000$ or $0.0109$<br>or $30 \times 60$ or $1800$<br>or $30 \div 1000$ or $0.03$<br>or $60 \div 1000$ or $0.06$<br>or $20 \times 1000$ or $20\,000$ |
|    | $19.6(2)$ and No<br><b>or</b><br>$19\,620$ and $20\,000$ and No                                                                                           | A1   | oe eg $19.62$ so it isn't                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Question 15 continues on the next page**

|            |                                                                                                                                                            |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15<br>cont | <b>Alternative method 2: works out time for 20 tonnes at given rate</b>                                                                                    |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | $20 \times 1000 \div 10.9 \div 60$ or $[30.5, 30.6]$<br><br><b>or</b><br><br>$20 \times 1000 \div 10.9$ or $[1834, 1835]$<br>and<br>$30 \times 60$ or 1800 | M3 | oe full method<br>eg $20000 \div 10.9 \div 60$<br>or $20 \times [91.7, 91.74312] \div 60$<br>or $[1834, 1835] \div 60$<br>M2 two correct steps<br>eg $20 \times 1000 \div 10.9$ or $[1834, 1835]$<br>or $20 \times 1000 \div 60$ or 333.(...)<br>or $20 \div 10.9 \div 60$ or $[0.0305, 0.031]$<br>or $1000 \div 10.9 \div 60$ or $[1.52, 1.53]$<br>M1 one correct step<br>eg $20 \times 1000$ or 20000<br>or $20 \div 10.9$ or $[1.83, 1.835]$<br>or $20 \div 60$ or 0.33(...)<br>or $1000 \div 10.9$ or $[91.7, 91.74312]$<br>or $1000 \div 60$ or $[16.6, 16.7]$<br>or $10.9 \times 60$ or 654<br>or $30 \times 60$ or 1800 |
|            | $[30.5, 30.6]$ and No<br>or<br>$[1834, 1835]$ and 1800 and No                                                                                              | A1 | oe eg 30.6 so it isn't                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|            | <b>Additional Guidance</b>                                                                                                                                 |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts                                |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | M3 or M2 will usually be seen in stages<br>eg Alt 1 $10.9 \times 30 = 327$ $327 \times 60 = 19620$ $19620 \div 1000$                                       |    | M3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|            | M2 or M1 may be seen embedded in more than one step (extra steps could be incorrect)                                                                       |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | No may be indicated by selecting the box or a statement in the working lines                                                                               |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | No cannot be implied only by an inequality                                                                                                                 |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | A correct value is sufficient for showing working eg Alt 1 19.62 and No                                                                                    |    | M3A1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|            | Ignore their units throughout                                                                                                                              |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | Other approaches are possible eg works out rate in kg per s for 20 tonnes in 30 minutes and compares to 10.9                                               |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Q  | Answer                                                                                                             | Mark | Comments                                                                                                                                                                                                     |  |
|----|--------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 16 | Fully correct box plot with<br>shortest at 2.4 cm<br>LQ at 4 cm<br>median at 6 cm<br>UQ at 7 cm<br>longest at 9 cm | B3   | mark intention<br><br>B2 box plot with four correct plots and one incorrect/omitted plot<br><br>or<br><br>box plot with five correct plots and at most one extra plot<br><br>B1 at least three correct plots |  |
|    | Additional Guidance                                                                                                |      |                                                                                                                                                                                                              |  |
|    | A box plot must be a rectangle with ‘whiskers’                                                                     |      |                                                                                                                                                                                                              |  |
|    | Accept ‘whiskers’ ending in points rather than vertical lines                                                      |      |                                                                                                                                                                                                              |  |
|    | For B2 condone the median given as a point in the rectangle                                                        |      |                                                                                                                                                                                                              |  |

| Q  | Answer                                                                                               | Mark  | Comments                                                                                                                        |
|----|------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------|
| 17 | $\frac{1}{4}x + 15 + \frac{2}{3}x - 44 = 180$                                                        | M1    | oe equation                                                                                                                     |
|    | $\frac{1}{4}x + \frac{2}{3}x = 180 - 15 + 44$<br>or<br>$3x + 180 + 8x - 528 = 2160$                  | M1dep | oe equation with terms collected<br>eg $\frac{11}{12}x = 209$<br>or<br>oe equation with fractions eliminated<br>eg $11x = 2508$ |
|    | $(x =) 209 \div \frac{11}{12}$<br>or $(x =) 228$                                                     | M1dep | oe calculation that leads to $(x =) 228$<br>eg $(x =) 2508 \div 11$<br>implied by 72 and 108                                    |
|    | 72 : 108                                                                                             | A1    | oe ratio<br>eg 2 : 3 or 1 : 1.5 or $\frac{2}{3} : 1$                                                                            |
|    | <b>Additional Guidance</b>                                                                           |       |                                                                                                                                 |
|    | Ignore simplification attempt after correct ratio seen<br>eg 72 : 108 in working with answer 36 : 52 |       | M3A1                                                                                                                            |
|    | Accept [0.66, 0.67] for $\frac{2}{3}$                                                                |       |                                                                                                                                 |
|    | Accept [0.91, 0.92] for $\frac{11}{12}$                                                              |       |                                                                                                                                 |
|    | Accept [1.09, 1.1] for $\frac{12}{11}$                                                               |       |                                                                                                                                 |

| Q  | Answer                                                                                                                | Mark  | Comments                                                                                                                             |
|----|-----------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------|
| 18 | <b>Alternative method 1: only uses trigonometry</b>                                                                   |       |                                                                                                                                      |
|    | $\cos 52 = \frac{x}{23.7}$                                                                                            | M1    | oe eg $\sin (90 - 52) = \frac{x}{23.7}$<br>or $\frac{x}{\sin 38} = \frac{23.7}{\sin 90}$<br>accept [0.61, 0.62] for cos 52 or sin 38 |
|    | $23.7 \times \cos 52$                                                                                                 | M1dep | oe eg $23.7 \times \sin 38 \div \sin 90$<br>accept [0.61, 0.62] for cos 52 or sin 38                                                 |
|    | [14.59, 14.6]                                                                                                         | A1    | SC1 [18.4, 18.723]                                                                                                                   |
|    | <b>Alternative method 2: uses trigonometry and Pythagoras</b>                                                         |       |                                                                                                                                      |
|    | $23.7^2$ and $(23.7 \times \sin 52)^2$<br>or<br>[561.6, 561.7] and [338, 351]                                         | M1    | oe<br>accept [0.78, 0.79] for sin 52<br>accept [18.4, 18.723] for $23.7 \times \sin 52$                                              |
|    | $\sqrt{23.7^2 - (23.7 \times \sin 52)^2}$<br>or $\sqrt{[210.6, 223.7]}$                                               | M1dep | oe<br>accept [0.78, 0.79] for sin 52<br>accept [18.4, 18.723] for $23.7 \times \sin 52$                                              |
|    | [14.59, 14.6]                                                                                                         | A1    | SC1 [18.4, 18.723]                                                                                                                   |
|    | <b>Additional Guidance</b>                                                                                            |       |                                                                                                                                      |
|    | M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |       |                                                                                                                                      |
|    | SC1 is from a diagonal making an angle of $38^\circ$ with $x$                                                         |       |                                                                                                                                      |

| Q     | Answer                                                                                          | Mark  | Comments                                                     |
|-------|-------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------|
| 19(a) | One of<br>$12x^2 + 8x$<br>$-12x^2 + 10x$<br>$-18x - 42$                                         | M1    | may be seen in a grid                                        |
|       | Two of<br>$12x^2 + 8x$<br>$-12x^2 + 10x$<br>$-18x - 42$                                         | M1dep | may be seen in a grid                                        |
|       | $12x^2 + 8x$<br>and $-12x^2 + 10x$<br>and $-18x - 42$<br>and $-42$                              | A1    | must see 6 correct terms and a final simplification to $-42$ |
|       | <b>Additional Guidance</b>                                                                      |       |                                                              |
|       | For terms seen in a grid accept eg $8x$ for $+8x$                                               |       |                                                              |
|       | Accept multiplication signs between coefficients and algebra<br>eg $12 \times x^2 + 8 \times x$ |       | 1st M1                                                       |
|       | Accept eg $+ -12x^2$ for $-12x^2$                                                               |       |                                                              |
|       | Do not accept unprocessed brackets eg do not accept $-(18x + 42)$                               |       |                                                              |
|       | Crossed out terms are likely to be their working rather than deleted work                       |       |                                                              |

| Q     | Answer                                                                                                                | Mark                                  | Comments                                                                                                                                                                                                        |
|-------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19(b) | $(4x + 5)(2x - 7)$                                                                                                    | B2                                    | oe factorisation eg $(-2x + 7)(-4x - 5)$<br>B1 $(ax + b)(cx + d)$<br>where $ac = 8$ and $bd = -35$<br>or<br>$(ax + b)(cx + d)$<br>where $ac = 8$ and $ad + bc = -18$<br>allow multiplication signs for B2 or B1 |
|       | <b>Additional Guidance</b>                                                                                            |                                       |                                                                                                                                                                                                                 |
|       | B1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts |                                       |                                                                                                                                                                                                                 |
|       | $(8x - 7)(x + 5)$                                                                                                     | $(ac = 8 \text{ and } bd = -35)$      | B1                                                                                                                                                                                                              |
|       | $(2x - 3)(4x - 3)$                                                                                                    | $(ac = 8 \text{ and } ad + bc = -18)$ | B1                                                                                                                                                                                                              |
|       | For B1 allow use of fractions or decimals eg $(4x + 10)(2x - 3.5)$                                                    |                                       | B1                                                                                                                                                                                                              |
|       | For B1 allow eg $8(x + 1.25)(x - 3.5)$                                                                                |                                       | B1                                                                                                                                                                                                              |
|       | Condone missing final bracket for B2 or B1                                                                            |                                       |                                                                                                                                                                                                                 |
|       | Ignore any attempt to 'solve'<br>eg $(4x + 5)(2x - 7)$ in working lines with $-1.25$ and $3.5$ on answer lines        |                                       | B2                                                                                                                                                                                                              |

| Q  | Answer                                                                                                                                                    | Mark  | Comments                                                                                                                                                              |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 | $x^2 - 9x + 3x - 27$ or $x^2 - 6x - 27$                                                                                                                   | M1    | oe<br>implied by eg $\frac{1}{2}x^2 - \frac{9}{2}x + \frac{3}{2}x - \frac{27}{2}$<br>may be seen in a grid                                                            |
|    | their $(x^2 - 9x + 3x - 27) = 12 - 2x^2$                                                                                                                  | M1dep | oe equation with brackets expanded<br>eg their $\left(\frac{1}{2}x^2 - \frac{9}{2}x + \frac{3}{2}x - \frac{27}{2}\right) = 6 - x^2$                                   |
|    | $3x^2 - 6x - 39 (= 0)$<br>or<br>$3x^2 - 6x = 39$                                                                                                          | M1dep | oe $ax^2 + bx + c (= 0)$ or $px^2 + qx = r$<br>eg $x^2 - 2x - 13 (= 0)$<br>or $\frac{3}{2}x^2 - 3x - \frac{39}{2} (= 0)$<br>implied by eg $\frac{2 \pm \sqrt{56}}{2}$ |
|    | $d = k$ $e = 14k^2$ $f = k$<br>where $k$ is a non-zero constant                                                                                           | A1    | eg $d = 1$ $e = 14$ $f = 1$<br>or $d = 2$ $e = 56$ $f = 2$<br>or $d = 6$ $e = 504$ $f = 6$                                                                            |
|    | <b>Additional Guidance</b>                                                                                                                                |       |                                                                                                                                                                       |
|    | Take the values on the answer lines as the final answer<br>eg $\frac{2 \pm \sqrt{56}}{2}$ in working with $d = 2$ $e = \sqrt{56}$ $f = 2$ on answer lines |       | M3A0                                                                                                                                                                  |
|    | $1 \pm \sqrt{14}$ in working with $d = 1$ $e = 14$ $f =$ (blank)                                                                                          |       | M3A0                                                                                                                                                                  |
|    | For terms seen in a grid accept eg $3x$ for $+3x$                                                                                                         |       |                                                                                                                                                                       |
|    | For up to M2 accept algebraic fractions but do not allow 3rd M1 unless recovered<br>eg $\frac{x^2 - 9x + 3x - 27}{x + 3} = \frac{12 - 2x^2}{x + 3}$       |       | M1M1                                                                                                                                                                  |

| Q  | Answer                                                                    | Mark  | Comments                                                       |
|----|---------------------------------------------------------------------------|-------|----------------------------------------------------------------|
| 21 | <b>Alternative method 1: uses total and proportion in S with W</b>        |       |                                                                |
|    | $4480 \times \frac{9}{7}$ or 5760                                         | M1    | oe total in S with W eg $640 \times 9$                         |
|    | $1 - \frac{1}{4} - \frac{3}{10}$ or $\frac{9}{20}$                        | M1    | oe proportion in S with W<br>eg 0.45 or 45%                    |
|    | their 5760 $\div$ their $\frac{9}{20}$                                    | M1dep | oe full method<br>dep on M2                                    |
|    | 12 800                                                                    | A1    |                                                                |
|    | <b>Alternative method 2: uses total in S with W and total in N with E</b> |       |                                                                |
|    | $4480 \times \frac{9}{7}$ or 5760                                         | M1    | oe total in S with W eg $640 \times 9$                         |
|    | $4480 \times \frac{11}{7}$ or 7040                                        | M1    | oe total in N with E eg $640 \times 11$                        |
|    | their 5760 + their 7040                                                   | M1dep | oe full method eg $640 \times 20$<br>dep on M2                 |
|    | 12 800                                                                    | A1    |                                                                |
|    | <b>Alternative method 3: sets up an equation</b>                          |       |                                                                |
|    | $4480 \times \frac{9}{7}$ or 5760                                         | M1    | oe total in S with W eg $640 \times 9$                         |
|    | $\frac{1}{4}x + \frac{3}{10}x + \text{their } 5760 = x$                   | M1dep | oe equation in any variable<br>eg $10x + 12x + 230\,400 = 40x$ |
|    | their 5760 $\div \left(1 - \frac{1}{4} - \frac{3}{10}\right)$             | M1dep | oe full method eg $230\,400 \div 18$                           |
|    | 12 800                                                                    | A1    |                                                                |

Question 21 continues on the next page

|                    |                                                                                                                                                                                                                 |       |                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>21<br/>cont</b> | <b>Alternative method 4: works out proportion in W or proportion in S</b>                                                                                                                                       |       |                                                                                                                                                                                                     |
|                    | $1 - \frac{1}{4} - \frac{3}{10}$ or $\frac{9}{20}$                                                                                                                                                              | M1    | oe proportion in S with W<br>eg 0.45 or 45%                                                                                                                                                         |
|                    | $\frac{7}{9} \times \text{their } \frac{9}{20}$ or $\frac{7}{20}$<br><br>or<br><br>$\frac{2}{9} \times \text{their } \frac{9}{20}$ or $\frac{2}{20}$                                                            | M1dep | oe proportion in W eg 0.35 or 35%<br>eg $\frac{7}{7+2} \times \text{their } \frac{9}{20}$<br><br>or<br><br>oe proportion in S eg 0.1 or 10%<br>eg $\frac{2}{7+2} \times \text{their } \frac{9}{20}$ |
|                    | $4480 \div \text{their } \frac{7}{20}$<br>or<br>$4480 \times \frac{2}{7} \div \text{their } \frac{2}{20}$                                                                                                       | M1dep | oe full method<br>eg $640 \times 20$                                                                                                                                                                |
|                    | 12 800                                                                                                                                                                                                          | A1    |                                                                                                                                                                                                     |
|                    | <b>Additional Guidance</b>                                                                                                                                                                                      |       |                                                                                                                                                                                                     |
|                    | Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts                                                                                     |       |                                                                                                                                                                                                     |
|                    | Proportions can be percentages but in calculations values must be used<br>eg Alt 1 $5760 \div 45\%$ is awarded M2 but cannot be awarded the 3rd M1 unless $\frac{9}{20}$ or 0.45 is subsequently used correctly |       |                                                                                                                                                                                                     |

| Q         | Answer                             | Mark | Comments                           |
|-----------|------------------------------------|------|------------------------------------|
| <b>22</b> | 4.791                              | B3   | B2 [4.789, 4.7913]<br>B1 4 or 4.75 |
|           | <b>Additional Guidance</b>         |      |                                    |
|           | Ignore values written as fractions |      |                                    |
|           | Ignore the suffixes                |      |                                    |

| Q  | Answer                                                                                                                                                                                                        | Mark  | Comments                                                                                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23 | One correct expression<br>eg $(\overrightarrow{DE} =) 6a + b + 2a - 5b$<br>or<br>$(\overrightarrow{DF} =) 6a + b + 4a - 6b$<br>or<br>$(\overrightarrow{EF} =) -2a + 5b + 4a - 6b$                             | M1    | oe<br>eg $(\overrightarrow{ED} =) -6a - b - 2a + 5b$<br>or<br>$(\overrightarrow{FD} =) -6a - b - 4a + 6b$<br>or<br>$(\overrightarrow{FE} =) 2a - 5b - 4a + 6b$<br>accept unprocessed brackets<br>eg $(\overrightarrow{EF} =) -(2a - 5b) + 4a - 6b$ |
|    | Two correct expressions from<br>$\overrightarrow{DE}$ $\overrightarrow{DF}$ $\overrightarrow{EF}$                                                                                                             | M1dep | oe eg $\overrightarrow{DE}$ and $\overrightarrow{FD}$<br>accept unprocessed brackets                                                                                                                                                               |
|    | Two fully simplified expressions from<br>$(\overrightarrow{DE} =) 8a - 4b$ $(\overrightarrow{DF} =) 10a - 5b$<br>$(\overrightarrow{EF} =) 2a - b$                                                             | A1    | oe eg<br>$(\overrightarrow{DE} =) 8a - 4b$ and $(\overrightarrow{FD} =) -10a + 5b$                                                                                                                                                                 |
|    | Two fully simplified expressions from<br>$(\overrightarrow{DE} =) 8a - 4b$<br>$(\overrightarrow{DF} =) 10a - 5b$<br>$(\overrightarrow{EF} =) 2a - b$<br>and<br>valid indication that the vectors are parallel | A1    | eg $(\overrightarrow{DE} =) 8a - 4b$ and $(\overrightarrow{FE} =) -2a + b$<br>and $8a - 4b = -4(-2a + b)$<br>or<br>$(\overrightarrow{DF} =) 10a - 5b$ and $(\overrightarrow{EF} =) 2a - b$<br>and $\overrightarrow{DF} = 5\overrightarrow{EF}$     |
|    | <b>Additional Guidance</b>                                                                                                                                                                                    |       |                                                                                                                                                                                                                                                    |
|    | Condone absence of vector notation                                                                                                                                                                            |       |                                                                                                                                                                                                                                                    |
|    | Condone eg $\overrightarrow{DCE}$ or $D$ to $E$ for $\overrightarrow{DE}$                                                                                                                                     |       |                                                                                                                                                                                                                                                    |
|    | If the only two correct expressions are eg $\overrightarrow{DE}$ and $\overrightarrow{ED}$ the maximum possible mark is M1                                                                                    |       |                                                                                                                                                                                                                                                    |
|    | Only combining the three given vectors                                                                                                                                                                        |       | Zero                                                                                                                                                                                                                                               |
|    | $\overrightarrow{DF} = \overrightarrow{DE} + \overrightarrow{EF}$ is not a valid indication                                                                                                                   |       |                                                                                                                                                                                                                                                    |
|    | Stating eg $\overrightarrow{DF}$ is a (scalar) multiple of $\overrightarrow{EF}$ is not enough for the final A1                                                                                               |       |                                                                                                                                                                                                                                                    |

| Q     | Answer                                                                | Mark | Comments                                     |
|-------|-----------------------------------------------------------------------|------|----------------------------------------------|
| 24(a) | $(k =) 21 \times 6$ or $(k =) 126$                                    | M1   | oe<br>may be implied eg $y = \frac{126}{x}$  |
|       | 10.5 or $\frac{21}{2}$                                                | A1   | oe value eg $\frac{126}{12}$<br>ignore units |
|       | <b>Additional Guidance</b>                                            |      |                                              |
|       | Ignore simplification or conversion attempt after correct answer seen |      |                                              |
|       | 10.5 only seen embedded eg $10.5 \times 12 = 126$                     |      | M1A0                                         |

| Q     | Answer                                                                           | Mark | Comments                                                                                      |
|-------|----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------|
| 24(b) | $21 = A \times \frac{1}{3}$<br>or $(A =) 21 \times 3$ or $(A =) 63$              | M1   | oe eg $21 = A \times \left(\frac{1}{3}\right)^{\frac{1}{6} \times 6}$<br>implied by $(y =) 7$ |
|       | $(y =) 7$<br>and<br>middle box ticked                                            | A1ft | ft decision using their 10.5 in (a)<br>must have $(y =) 7$                                    |
|       | <b>Additional Guidance</b>                                                       |      |                                                                                               |
|       | A correct value is sufficient for showing working                                |      |                                                                                               |
|       | Decision may be indicated by selecting a box or a statement in the working lines |      |                                                                                               |
|       | Decision cannot be implied only by an inequality                                 |      |                                                                                               |

| Q  | Answer                                                                                                                                                             | Mark  | Comments                                                                                                                                                                                      |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 | <b>Alternative method 1: works out a scale factor</b>                                                                                                              |       |                                                                                                                                                                                               |
|    | $\frac{1}{2} \times 3(L) \times 4(L) \times 12(L)$ or $72(L^3)$<br>where $L$ is any variable or any positive value                                                 | M1    | oe volume<br>eg $(L = 2) \frac{1}{2} \times 6 \times 8 \times 24$ or 576                                                                                                                      |
|    | $1125 \div \text{their } 72$<br>or $\frac{125}{8}$ or 15.625                                                                                                       | M1dep | oe eg $1125 \times 2 \div (3 \times 4 \times 12)$<br>eg $(L = 2) 1125 \div \text{their } 576$ or $\frac{125}{64}$                                                                             |
|    | $\sqrt[3]{\text{their } \frac{125}{8}}$ or $\frac{5}{2}$ or 2.5                                                                                                    | M1dep | oe<br>eg $(L = 2) \sqrt[3]{\text{their } \frac{125}{64}}$ or $\frac{5}{4}$ or 1.25                                                                                                            |
|    | $2 \times 3 \times \text{their } 2.5 + 2 \times 4 \times \text{their } 2.5$<br>$+ 2 \times 5 \times \text{their } 2.5$<br>$+ 3 \times 12 \times \text{their } 2.5$ | M1dep | oe<br>eg $(L = 2)$<br>$2 \times 6 \times \text{their } 1.25 + 2 \times 8 \times \text{their } 1.25$<br>$+ 2 \times 10 \times \text{their } 1.25$<br>$+ 3 \times 24 \times \text{their } 1.25$ |
|    | 150                                                                                                                                                                | A1    | SC4 [119, 119.1]                                                                                                                                                                              |

Question 25 continues on the next page

|            |                                                                                                                                                                                                                                                                                                                                                     |       |                                                                                                                                                                                                                                                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25<br>cont | <b>Alternative method 2: works out a value of <math>a</math>, <math>b</math>, <math>c</math> or <math>d</math></b>                                                                                                                                                                                                                                  |       |                                                                                                                                                                                                                                                                                                                                     |
|            | Correct expression for volume in terms of $a$ or $b$<br>eg $\frac{1}{2} \times a \times \frac{4a}{3} \times \frac{12a}{3}$ or $\frac{8a^3}{3}$<br>or<br>$\frac{1}{2} \times \frac{3b}{4} \times b \times \frac{12b}{4}$ or $\frac{9b^3}{8}$                                                                                                         | M1    | oe in terms of $c$ or $d$<br>eg $\frac{1}{2} \times \frac{3c}{5} \times \frac{4c}{5} \times \frac{12c}{5}$ or $\frac{72c^3}{125}$<br>or<br>$\frac{1}{2} \times \frac{3d}{12} \times \frac{4d}{12} \times d$ or $\frac{d^3}{24}$<br>may be implied by an equation<br>eg $a \times \frac{4a}{3} \times \frac{12a}{3} = 1125 \times 2$ |
|            | $a^3 = 1125 \div \text{their } \frac{8}{3}$ or $a^3 = \frac{3375}{8}$<br>or<br>$b^3 = 1125 \div \text{their } \frac{9}{8}$ or $b^3 = 1000$                                                                                                                                                                                                          | M1dep | oe<br>eg $c^3 = 1125 \div \text{their } \frac{72}{125}$ or $c^3 = \frac{15\,625}{8}$<br>or<br>$d^3 = 1125 \div \text{their } \frac{1}{24}$ or $d^3 = 27\,000$                                                                                                                                                                       |
|            | $a = \sqrt[3]{\text{their } \frac{3375}{8}}$ or $a = 7.5$<br>or<br>$b = \sqrt[3]{1000}$ or $b = 10$                                                                                                                                                                                                                                                 | M1dep | oe<br>eg $c = \sqrt[3]{\text{their } \frac{15\,625}{8}}$ or $c = 12.5$<br>or<br>$d = \sqrt[3]{27\,000}$ or $d = 30$                                                                                                                                                                                                                 |
|            | $2 \times \text{their } a + 2 \times \frac{4}{3} \times \text{their } a$<br>$+ 2 \times \frac{5}{3} \times \text{their } a + 3 \times \frac{12}{3} \times \text{their } a$<br>or<br>$2 \times \frac{3}{4} \times \text{their } b + 2 \times \text{their } b$<br>$+ 2 \times \frac{5}{4} \times \text{their } b + 3 \times 3 \times \text{their } b$ | M1dep | oe correct method using their $c$ or their $d$                                                                                                                                                                                                                                                                                      |
|            | 150                                                                                                                                                                                                                                                                                                                                                 | A1    | SC4 [119, 119.1]                                                                                                                                                                                                                                                                                                                    |
|            | <b>Additional Guidance</b>                                                                                                                                                                                                                                                                                                                          |       |                                                                                                                                                                                                                                                                                                                                     |
|            | Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts                                                                                                                                                                                                                         |       |                                                                                                                                                                                                                                                                                                                                     |