

# Mark Scheme (Results)

November 2012

GCSE Mathematics (Linear) 1MA0  
Higher (Calculator) Paper 2H

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## NOTES ON MARKING PRINCIPLES

- 1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- 2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- 3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- 4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- 5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- 6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
  - i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*  
Comprehension and meaning is clear by using correct notation and labeling conventions.
  - ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*  
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.
  - iii) *organise information clearly and coherently, using specialist vocabulary when appropriate.*  
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

**7 With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the “correct” answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

**8 Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**9 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

**10 Probability**

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**11 Linear equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

**12 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

### 13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

#### Guidance on the use of codes within this mark scheme

M1 – method mark  
A1 – accuracy mark  
B1 – Working mark  
C1 – communication mark  
QWC – quality of written communication  
oe – or equivalent  
cao – correct answer only  
ft – follow through  
sc – special case  
dep – dependent (on a previous mark or conclusion)  
indep – independent  
isw – ignore subsequent working

| 1MA0_2H  |     |                                                                 |                                                         |      |                                                                                                                                                                                                                      |
|----------|-----|-----------------------------------------------------------------|---------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                                         | Answer                                                  | Mark | Notes                                                                                                                                                                                                                |
| 1        |     | $\frac{\sqrt{20.4}}{6.2 \times 0.48} = \frac{4.5166359}{2.976}$ | 1.5176(868)                                             | 2    | B2 for 1.5176...<br>(B1 for sight of 4.51(66359..) <b>or</b> 4.52 <b>or</b> 2.97(6) <b>or</b> 2.98 <b>or</b> 1.51 <b>or</b> 1.52 <b>or</b> 1.518 <b>or</b> 1.517 <b>or</b> 1.5177 <b>or</b> $\frac{\sqrt{510}}{5}$ ) |
| 2        | (a) |                                                                 | Triangle with vertices<br>(1, 5) (4, 5) (4,7)           | 2    | B2 correct reflection<br>(B1 a translation of the correct answer with the final shape above $y = x$ <b>or</b> any two correct vertices)                                                                              |
|          | (b) |                                                                 | Translation by $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$ | 2    | SC : B1 for a triangle with vertices at (2, 5) (4, 5) (4, 8)<br><br>B1 Translation<br>B1 $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$<br><br>NB. Award no marks for a combination of transformations                     |

| 1MA0_2H  |  |                                                                                              |                  |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|--|----------------------------------------------------------------------------------------------|------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |  | Working                                                                                      | Answer           | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| *3       |  | $3 \times \pounds 193.86 = \pounds 581.58$<br>$\pounds 581.58 \times 0.85 = \pounds 494.343$ | $\pounds 494.34$ | 5    | <p>M1    <math>3 \times 193.86 (= 581.58)</math></p> <p>B1    ft correct discount % identified or used in working<br/>(may be identified in table)</p> <p>M1    '581.58' <math>\times</math> '0.15' (=87.23(7))</p> <p>M1    (dep on the previous M1) '581.58' – '87.23(7)'<br/>(= 494.34(3) <b>or</b> 494.35)</p> <p>C1    (dep on all method marks) for <math>\pounds 494.34</math> <b>or</b> <math>\pounds 494.35</math> identified<br/>as final answer with correct money notation</p> <p><b>OR</b></p> <p>M1    <math>3 \times 193.86 (= 581.58)</math></p> <p>B1    ft correct discount % identified or used in working<br/>(may be identified in table)</p> <p>M2    '581.58' <math>\times</math> '0.85' (= 494.34(3))</p> <p>(M1    '581.58' <math>\times</math> '1.15' (=668.81(7))</p> <p>C1    (dep on all method marks) for <math>\pounds 494.34</math> <b>or</b> <math>\pounds 494.35</math> identified<br/>as final answer with correct money notation</p> <p><b>NB. Throughout, values may be rounded or truncated to 2<br/>decimal places</b></p> |

| 1MA0_2H  |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |        |           |        |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------|-----------|--------|--------|----|----|--------|----|----|----------|----|-----|---------|----|-----|-------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |           | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  | Answer | Mark      | Notes  |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4        |           | <table><tr><th>Bird</th><th>Frequency</th><th>Angles</th></tr><tr><td>Magpie</td><td>15</td><td>75</td></tr><tr><td>Thrush</td><td>10</td><td>50</td></tr><tr><td>Starling</td><td>20</td><td>100</td></tr><tr><td>Sparrow</td><td>27</td><td>135</td></tr></table> <p>Angles <math>\frac{15}{72} \times 360</math>, <math>\frac{10}{72} \times 360</math>, <math>\frac{20}{72} \times 360</math>, <math>\frac{27}{72} \times 360</math></p> <p>OR</p> <p><math>360 \div 72 = 5</math> <math>5 \times 15 = 75</math> etc</p> |  | Bird   | Frequency | Angles | Magpie | 15 | 75 | Thrush | 10 | 50 | Starling | 20 | 100 | Sparrow | 27 | 135 | Correct pie chart | 3 | <p>M1 for any one of <math>\frac{15}{72} \times 360</math>, <math>\frac{10}{72} \times 360</math>, <math>\frac{20}{72} \times 360</math>, <math>\frac{27}{72} \times 360</math> oe ('72' must clearly come from adding frequencies)</p> <p>A1 for 75 seen from correct working <b>or</b> 50 seen <b>or</b> 100 seen <b>or</b> 135 seen <b>or</b> one sector of angle 50° or 100° or 135° labelled correctly with bird's name <b>or</b> all sectors correctly drawn</p> <p>A1 for correct pie chart fully labelled with birds' names</p> <p><b>OR</b></p> <p>M1 for <math>\frac{75}{15} \times 10</math> <b>or</b> <math>\frac{75}{15} \times 20</math> <b>or</b> <math>\frac{75}{15} \times 27</math> ('75' should be in the range 73 - 77)</p> <p>A1 for 50 seen <b>or</b> 100 seen <b>or</b> 135 seen <b>or</b> one sector of angle 50° or 100° or 135° labelled correctly with bird's name <b>or</b> all sectors correctly drawn</p> <p>A1 for correct pie chart fully labelled with birds' names</p> <p><b>NB. Allow a tolerance of <math>\pm 2^\circ</math> on all drawn angles</b></p> |
| Bird     | Frequency | Angles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |        |           |        |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Magpie   | 15        | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |        |           |        |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Thrush   | 10        | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |        |           |        |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Starling | 20        | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |        |           |        |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Sparrow  | 27        | 135                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |        |           |        |        |    |    |        |    |    |          |    |     |         |    |     |                   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| 1MA0_2H  |  |                                                                                                  |        |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|--|--------------------------------------------------------------------------------------------------|--------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |  | Working                                                                                          | Answer | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 5        |  | $25 \div 50 = 0.5 \text{ h} = 30 \text{ min}$<br>$25 \div 60 = 0.416 \text{ h} = 25 \text{ min}$ | 5      | 3    | <p>M1 for <math>25 \div 50</math> <b>or</b> <math>\frac{60}{50} \times 25</math> <b>or</b> 30 (min) <b>or</b> 0.5(h)</p> <p><b>or</b> <math>25 \div 60</math> <b>or</b> <math>\frac{60}{60} \times 25</math> <b>or</b> 25 (min) <b>or</b> 0.41(6)(h) <b>or</b> 0.42 (h)</p> <p>M1(dep) '0.5' – '0.416' <b>or</b> '30' – '25'</p> <p>A1 cao</p> <p><b>OR</b></p> <p>M1 for <math>60 \div 25 (= 2.4)</math> <b>and</b> <math>60 \div "2.4"</math> <b>or</b> <math>50 \div 25 (= 2)</math> <b>and</b> <math>60 \div "2"</math></p> <p>M1(dep) '30' – '25'</p> <p>A1 cao</p> |

| 1MA0_2H  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| Question | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Answer                     | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6        | <p>Angle <math>DEC = 180 - 41 = 139</math><br/> <u>Angles on a straight line</u> sum to <math>180^\circ</math><br/> Angle <math>EDC = 60 - 38</math> <b>or</b><br/> Angle <math>ABD = 180 - 120 - 38 (=22)</math><br/> <u>Co-interior/allied angles</u> of parallel lines sum to <math>180^\circ</math> <b>or</b><br/> <u>Angles</u> in a <u>triangle</u> sum to <math>180^\circ</math> <b>and</b> <u>Alternate angles</u><br/> <math>x = )180 - '139' - '22' (=19)</math><br/> <u>Angles</u> in a <u>triangle</u> sum to <math>180^\circ</math></p> <p><b>OR</b></p> <p>Angle <math>ADC = 180^\circ - 120^\circ = 60^\circ</math><br/> <u>Co-interior/allied angles</u> of parallel lines sum to <math>180^\circ</math> Angle <math>EDC = 22^\circ</math><br/> Angle <math>ECD = 41^\circ - 22^\circ = 19^\circ</math><br/> <u>Exterior angle of triangle equals sum of the two opposite interior angles</u></p> <p><b>OR</b></p> <p>Angle <math>DBC = 38^\circ</math>      <u>Alternate angles</u><br/> Angle <math>BCE = 101^\circ</math>      <u>Angle sum of a triangle</u> is <math>180^\circ</math><br/> Angle <math>BCD = 120^\circ</math>      <u>Opposite angles</u> of a <u>parallelogram</u> are <u>equal</u><br/> Angle <math>ECD = 120^\circ - 101^\circ = 19^\circ</math></p> | $x = 19^\circ$ and reasons | 4    | <p>M1 for <math>DBC = 38^\circ</math> <b>or</b><br/> <math>ADC = 60^\circ</math> (can be implied by <math>BDC = 22^\circ</math>) <b>or</b> <math>ABC = 60^\circ</math> <b>or</b><br/> <math>DCB = 120^\circ</math> <b>or</b><br/> <math>(ABD = ) 180 - 120 - 38 (=22)</math></p> <p>M1 for <math>(BDC = ) 60 - 38 (=22)</math> <b>or</b><br/> <math>BDC = '22'</math> <b>or</b><br/> <math>(DEC = ) 180 - 41 (=139)</math> <b>or</b><br/> <math>(BCE = ) 180 - 41 - 38 (=101)</math></p> <p>M1 (dep on both previous M1) for complete correct method to find <math>x</math> <b>or</b><br/> <math>(x = ) 19</math></p> <p>C1 for <math>x = 19^\circ</math> <b>AND</b><br/> <u>Co-interior/allied angles</u> of parallel lines sum to <math>180^\circ</math> <b>or</b><br/> <u>Opposite angles</u> of a <u>parallelogram</u> are <u>equal</u> <b>or</b><br/> <u>Alternate angles</u></p> <p><b>AND</b><br/> <u>Angles</u> on a straight <u>line</u> sum to <math>180^\circ</math> <b>or</b><br/> <u>Angles</u> in a <u>triangle</u> sum to <math>180^\circ</math> <b>or</b><br/> <u>Exterior angle of triangle equals sum of the two opposite interior angles</u> <b>or</b><br/> <u>Angles</u> in a <u>quadrilateral</u> sum to <math>360^\circ</math></p> |

| 1MA0_2H  |                                                                                                                                                                                                                                                           |           |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question | Working                                                                                                                                                                                                                                                   | Answer    | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 7        | $17.8 \div 160 \times 210 = 0.11125 \times 210 = 23.3625 \text{ g}$<br><b>OR</b><br>$210 \div 160 \times 17.8 = 1.3125 \times 17.8 = 23.3625 \text{ g}$<br><b>OR</b><br>$210 - 160 (=50)$<br>$\frac{17.8}{160} \times '50' (= 5.5625)$<br>$17.8 + 5.5625$ | 23.3(625) | 3    | M1 $17.8 \div 160 (=0.11125)$ <b>or</b> $17.8 \times 210 (=3738)$<br><b>or</b> $210 \div 160 (=1.3125)$<br>M1 (dep) $'0.11125' \times 210$ <b>or</b> $'3738' \div 160$<br><b>or</b> $'1.3125' \times 17.8$<br>A1 for answer in range 23.3 - 23.4<br><br><b>OR</b><br>M1 for $\frac{17.8}{160} \times (210 - 160) (= 5.5625)$<br>M1 (dep) for $17.8 + '5.5625'$<br>A1 for answer in range 23.3 - 23.4<br><br><b>OR</b><br>M1 for correct method to find weight of 2 cm <b>or</b> 5 cm <b>or</b> 10 cm<br>M1 (dep) for complete method<br>A1 for answer in range 23.3 - 23.4 |

| 1MA0_2H  |     |                          |                   |      |                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----|--------------------------|-------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                  | Answer            | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                         |
| 8        | (a) |                          | -1, 0, 1, 2, 3    | 2    | B2 for all 5 correct values; ignore repeats, any order<br>(B1 for 4 correct (and no incorrect values) eg. 0, 1, 2, 3 <b>or</b> one additional value, eg -1, 0, 1, 2, 3, 4)                                                                                                                                                                                                    |
|          | (b) |                          | $-4 < x \leq 3$   | 2    | B2 for $-4 < x \leq 3$ <b>or</b> $x > -4$ <b>and</b> $x \leq 3$<br>(B1 for $-4 < x$ <b>or</b> $x > -4$ <b>or</b> $x \leq 3$ <b>or</b> $3 \geq x$<br><b>or</b> $x > -4$ <b>or</b> $x \leq 3$ <b>or</b> $-4 \leq x < 3$ )<br>NB : Accept the use of any letter                                                                                                                  |
|          | (c) | $3y - 2 > 5$<br>$3y > 7$ | $y > \frac{7}{3}$ | 2    | M1 for clear intention to add 2 to both sides (of inequality or equation) or clear intention to divide all three terms by 3<br><b>or</b> $3y > 7$ <b>or</b> $3y < 7$ <b>or</b> $3y = 7$<br>A1 $y > \frac{7}{3}$ <b>or</b> $y > 2\frac{1}{3}$ <b>or</b> $y > 2.\dot{3}$<br>NB. final answer <b>must</b> be an inequality<br><br>(SC B1 for $\frac{7}{3}$ oe seen if M0 scored) |
| 9        | (a) |                          | 32                | 1    | B1 cao                                                                                                                                                                                                                                                                                                                                                                        |
|          | (b) | LQ = 21 UQ = 45          | 24                | 2    | M1 for 45 <b>or</b> 21 <b>or</b> 43.5 <b>or</b> 19.5 <b>or</b> 7.75 <sup>th</sup> <b>or</b> 8 <sup>th</sup> <b>or</b> 23.25 <sup>th</sup> <b>or</b> 24 <sup>th</sup><br>(all of above may be seen in working space or indicated on S&L)<br><b>or</b><br>clear attempt to find UQ and LQ from a list of values or in stem and leaf diagram<br>A1 cao                           |

| 1MA0_2H       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |        |      |       |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| Question      | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                | Answer | Mark | Notes |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 10            | <div>For example</div> <table><tr><td></td><td>UK</td><td>USA</td></tr><tr><td>\$ per US gal</td><td>(\$6.90(8412)</td><td>[\$3.15]</td></tr><tr><td>£ per litre</td><td>[£1.24]</td><td>(£)0.56(53...)</td></tr><tr><td>£ per US gal</td><td>(£)4.69(96)</td><td>(£)2.14(28...)</td></tr><tr><td>\$ per litre</td><td>(\$1.82(28)</td><td>(\$0.83(11...)</td></tr></table> <div>Cost in £ per US gal of UK fuel= £1.24 × 3.79 = £4.6996</div> <div>Cost in \$ per US gal of UK fuel = \$1.47 × 4.6996 = \$6.908412</div> <div>OR</div> <div>Cost in £ of 1 US gal of US fuel = \$3.15 ÷ 1.47 = £2.14</div> <div>Cost in £ per litre of US fuel = £2.14 ÷ 3.79 =£0. 56(5..</div> <div>OR</div> <div>Cost in UK in £ per US gal = £1.24 × 3.79 (=£4.6996)</div> <div>Cost in USA in £ per US gal = £3.15 ÷ 1.47 (=2.1428)</div> <div>OR</div> <div>Cost in UK is \$ per litre = £1.24 × 1.47 (=1.8228)</div> <div>Cost in USA in \$ per litre = 3.15 ÷ 3.79 (=0.8311...)</div> |                |        | UK   | USA   | \$ per US gal | (\$6.90(8412) | [\$3.15] | £ per litre | [£1.24] | (£)0.56(53...) | £ per US gal | (£)4.69(96) | (£)2.14(28...) | \$ per litre | (\$1.82(28) | (\$0.83(11...) | Cheaper in US | 4 | <div>M1 for 1.24 × 3.79 (= 4.6996) <b>or</b> 1.24 × 1.47 (=1.8228)</div> <div>M1 for 1.47 × ‘4.6996’ <b>or</b> 3.79 × '1.8228'</div> <div>A1 for 6.90(8412)</div> <div>C1 (dep on M2) for \$‘6.90(8412)’ or \$‘6.91' and reaching a conclusion consistent with their calculation</div> <div>OR</div> <div>M1 for 3.15 ÷ 1.47 (=2.1428..) <b>or</b> 3.15 ÷ 3.79 (=0.8311)</div> <div>M1 for ‘2.14’ ÷ 3.79 <b>or</b> ‘0.8311' ÷ 1.47</div> <div>A1 for 0. 56(53...)</div> <div>C1 (dep on M2) for £‘0. 56(53...)' or '£0.57' and reaching a conclusion consistent with their calculation</div> <div>OR</div> <div>M1 1.24 × 3.79 (= 4.6996)</div> <div>M1 3.15 ÷ 1.47 (=2.1428..)</div> <div>A1 4.69(96) and 2.14(28...)</div> <div>C1 (dep on M2) for £‘4.69(96)' <b>or</b> £‘4.70’ <b>AND</b> £‘2.14(28...)' and reaching a conclusion consistent with their calculation</div> <div>OR</div> <div>M1 for 1.24 × 1.47 (=1.8228)</div> <div>M1 for 3.15 ÷ 3.79 (=0.8311...)</div> <div>A1 for 1.82(28) <b>and</b> 0.83(11...)</div> <div>C1 (dep on M2) for \$‘1.82(28)' and \$‘0.83(11...)' and reaching a conclusion consistent with their calculation</div> <div>NB: Throughout values can be rounded or truncated to 1 or more decimal places. In order to award the communication mark, correct currency must be shown with the calculated value(s) but these can still be rounded or truncated to one or more decimal places as they are being used for comparison.</div> |
|               | UK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | USA            |        |      |       |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| \$ per US gal | (\$6.90(8412)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | [\$3.15]       |        |      |       |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| £ per litre   | [£1.24]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (£)0.56(53...) |        |      |       |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| £ per US gal  | (£)4.69(96)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | (£)2.14(28...) |        |      |       |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| \$ per litre  | (\$1.82(28)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | (\$0.83(11...) |        |      |       |               |               |          |             |         |                |              |             |                |              |             |                |               |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| 1MA0_2H     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
|-------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---------|----|---------|----|---------|----|---------|-----|----------|-----|-----------|----------|-----------|----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-------------|------------|--------------|-------------|---------------|-----|---|
| Question    |               | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Answer  | Mark | Notes                                                                                                                                                          |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| 11          | (a)           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | show    | 2    | M1 for $x \times x \times x$ or $2 \times 5 \times x$ or vol of cube = $x^3$ or<br>vol cuboid = $10x$<br>A1 correct completion leading to<br>$x^3 - 10x = 100$ |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
|             | (b)           | <table><tr><td><math>x = 1</math></td><td>-9</td></tr><tr><td><math>x = 2</math></td><td>-2</td></tr><tr><td><math>x = 3</math></td><td>-3</td></tr><tr><td><math>x = 4</math></td><td>24</td></tr><tr><td><math>x = 5</math></td><td>75</td></tr><tr><td><math>x = 6</math></td><td>156</td></tr><tr><td><math>x = 10</math></td><td>900</td></tr><tr><td><math>x = 5.1</math></td><td>81.(651)</td></tr><tr><td><math>x = 5.2</math></td><td>88.(608)</td></tr><tr><td><math>x = 5.3</math></td><td>95.(877)</td></tr><tr><td><math>x = 5.4</math></td><td>103.(464)</td></tr><tr><td><math>x = 5.5</math></td><td>111.(375)</td></tr><tr><td><math>x = 5.6</math></td><td>119.(616)</td></tr><tr><td><math>x = 5.7</math></td><td>128.(193)</td></tr><tr><td><math>x = 5.8</math></td><td>137.(112)</td></tr><tr><td><math>x = 5.9</math></td><td>146.(379)</td></tr><tr><td><math>x = 5.35</math></td><td>99.6(30375)</td></tr><tr><td><math>x = 5.36</math></td><td>100.3(90656)</td></tr><tr><td><math>x = 5.355</math></td><td>100.0(101139)</td></tr></table> | $x = 1$ | -9   | $x = 2$                                                                                                                                                        | -2 | $x = 3$ | -3 | $x = 4$ | 24 | $x = 5$ | 75 | $x = 6$ | 156 | $x = 10$ | 900 | $x = 5.1$ | 81.(651) | $x = 5.2$ | 88.(608) | $x = 5.3$ | 95.(877) | $x = 5.4$ | 103.(464) | $x = 5.5$ | 111.(375) | $x = 5.6$ | 119.(616) | $x = 5.7$ | 128.(193) | $x = 5.8$ | 137.(112) | $x = 5.9$ | 146.(379) | $x = 5.35$ | 99.6(30375) | $x = 5.36$ | 100.3(90656) | $x = 5.355$ | 100.0(101139) | 5.4 | 4 |
| $x = 1$     | -9            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 2$     | -2            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 3$     | -3            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 4$     | 24            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5$     | 75            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 6$     | 156           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 10$    | 900           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.1$   | 81.(651)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.2$   | 88.(608)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.3$   | 95.(877)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.4$   | 103.(464)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.5$   | 111.(375)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.6$   | 119.(616)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.7$   | 128.(193)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.8$   | 137.(112)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.9$   | 146.(379)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.35$  | 99.6(30375)   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.36$  | 100.3(90656)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |
| $x = 5.355$ | 100.0(101139) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |      |                                                                                                                                                                |    |         |    |         |    |         |    |         |     |          |     |           |          |           |          |           |          |           |           |           |           |           |           |           |           |           |           |           |           |            |             |            |              |             |               |     |   |

| 1MA0_2H  |     |                                               |                           |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|-----|-----------------------------------------------|---------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                       | Answer                    | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 12       | (a) |                                               | Correct Frequency Polygon | 2    | <p>B2 Fully correct polygon. Points plotted at the midpoint<br/>           (B1 All points plotted accurately not joined, <b>or</b> one error in plotting but joined <b>or</b> all points plotted accurately and joined with, additionally, first joined to last <b>or</b> all points at the correct heights and consistently within or at the ends of the intervals <b>and</b> joined (Includes joining last to first to make a polygon))</p> <p>NB: ignore polygon before 1<sup>st</sup> point, and after last point.<br/>           Ignore any histograms.</p> |
|          | (b) |                                               | $30 < t \leq 40$          | 1    | B1 Allow any notation eg, 30-40 ft polygon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|          | (c) | $(6 + 2) = 8, (4 + 8 + 14 + 16 + 6 + 2) = 50$ | $\frac{8}{50}$ oe         | 2    | <p>M1 <math>(6 + 2) \div (4 + 8 + 14 + 16 + 6 + 2)</math><br/> <b>or</b> ft figures from polygon <b>or</b><br/> <math>\frac{8}{a}</math> with <math>a &gt; 8</math> <b>or</b> <math>\frac{c}{50}</math> with <math>c &lt; 50</math> <b>or</b><br/>           8 and 50 used but notation incorrect<br/>           (eg. 8:50 , 8 out of 50)</p> <p>A1 <math>\frac{8}{50}</math> oe (eg. 0.16) <b>or</b> ft figures from polygon</p>                                                                                                                                |

| 1MA0_2H  |                                                                                                                                                          |                                                                                        |                     |                                                                                                                                                                                                                                                                                                                                |  |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Question | Working                                                                                                                                                  | Answer                                                                                 | Mark                | Notes                                                                                                                                                                                                                                                                                                                          |  |
| 13       | $\text{Volume} = \frac{5 \times 12}{2} \times 15$ $\text{Mass} = \frac{5 \times 12}{2} \times 15 \times 6.6$                                             | 2970                                                                                   | 3                   | M1 $\frac{5 \times 12}{2} \times 15$ (=450)<br>M1 (dep on 1 <sup>st</sup> M1) '450' $\times 6.6$<br>A1 cao<br><br>SC: If no marks awarded then award B1 for an answer of 5940                                                                                                                                                  |  |
| 14       | (a)<br><br>(b)<br><br>(c)(i) $2t^2 + 5t + 2 = (2t + 1)(t + 2)$<br><br>(ii) This is always a product of two whole numbers each of which is greater than 1 | $x(x + 7)$<br><br>$(y - 8)(y - 2)$<br><br>$(2t + 1)(t + 2)$<br><br>Correct explanation | 1<br><br>2<br><br>3 | B1 cao<br><br>M1 $(y \pm 8)(y \pm 2)$ <b>or</b> $y(y - 2) - 8(y - 2)$ <b>or</b> $y(y - 8) - 2(y - 8)$<br>A1 cao<br><br>M1 $(2t + 2)(t + 1)$ <b>oe or</b> $2t(t + 2) + 1(t + 2)$ <b>or</b> $t(2t + 1) + 2(2t + 1)$<br>A1 $(2t + 1)(t + 2)$<br><br>B1 ft from (i) for a convincing explanation referring to factors found in (i) |  |
| 15       | $9 - 3 = 6$<br>$10^2 - 6^2 = 64$<br>$BC = 8$<br>$AC^2 = 9^2 + 8^2 = 145$                                                                                 | 12.0                                                                                   | 5                   | M2 $10^2 - (9 - 3)^2$ (=64) <b>or</b> $BC = 8$<br>(M1 $9 - 3$ (=6) may be seen on diagram)<br>M1 (indep) $9^2 + 'BC'^2$ where $BC$ is a numerical value<br><br>M1 (dep on previous M1) $\sqrt{81 + '64'}$<br>A1 12.0 – 12.042                                                                                                  |  |

| 1MA0_2H  |                                                                                                                                            |        |      |                                                                                                                                                                                                                                                                                                                                            |  |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------|--------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Question | Working                                                                                                                                    | Answer | Mark | Notes                                                                                                                                                                                                                                                                                                                                      |  |
| 16       | $\frac{64.8 - 59.3}{64.8} \times 100 (=8.487\dots)$ <p><b>OR</b></p> $\frac{59.3}{64.8} \times 100 = 91.512$ $100 - '91.512' = 8.487\dots$ | 8.49   | 3    | M1 $64.8 - 59.3 (=5.5)$<br>M1 (dep) $\frac{'5.5'}{64.8} \times 100$ oe<br>A1 $8.48 - 8.49$<br><p><b>OR</b></p> M1 $\frac{59.3}{64.8} \times 100$ oe (= 91.5(12...))<br>M1 (dep) $100 - '91.5'$<br>A1 $8.48 - 8.49$<br><p><b>OR</b></p> M1 $\frac{59.3}{64.8} (=0.915(12\dots))$<br>M1 (dep) $100 \times (1 - '0.915')$<br>A1 $8.48 - 8.49$ |  |

| 1MA0_2H  |     |                                                                                                                                                                                                                             |     |   |       |     |     |  |               |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   |   |   |    |     |     |   |       |     |     |               |   |                                         |
|----------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|-------|-----|-----|--|---------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|----|-----|-----|---|-------|-----|-----|---------------|---|-----------------------------------------|
| Question |     | Working                                                                                                                                                                                                                     |     |   |       |     |     |  | Answer        | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |   |   |   |   |   |    |     |     |   |       |     |     |               |   |                                         |
| 17       |     | $\sin 60^\circ = \frac{x}{32} \quad x = 32 \times \sin 60 (=27.712\dots)$                                                                                                                                                   |     |   |       |     |     |  | 27.7          | 3    | M1 $\sin 60 = \frac{x}{32}$ <b>or</b> $\frac{x}{\sin 60} = \frac{32}{\sin 90}$ oe<br>M1 $(x = ) 32 \times \sin 60$ <b>or</b> $(x = ) \frac{32}{\sin 90} \times \sin 60$<br>A1 $27.7 - 27.72$<br><br><b>OR</b><br>M1 $\cos(90 - 60) = \frac{x}{32}$<br>M1 $(x = ) 32 \times \cos(90 - 60)$<br>A1 $27.7 - 27.72$<br><br>Radians : $-9.7539398\dots$<br>Gradians : $25.888554\dots$<br>SC : B2 for an answer in the range<br>$(-) 9.75$ to $(-)9.754$ <b>or</b> $25.8$ to $25.9$ |   |   |   |   |   |   |    |     |     |   |       |     |     |               |   |                                         |
| 18       | (a) | <table border="1"><tr><td>x</td><td>0.5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>12</td><td>(6)</td><td>(3)</td><td>2</td><td>(1.5)</td><td>1.2</td><td>(1)</td></tr></table> |     |   |       |     |     |  | x             | 0.5  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2 | 3 | 4 | 5 | 6 | y | 12 | (6) | (3) | 2 | (1.5) | 1.2 | (1) | Correct table | 2 | B2 all 3 correct<br>(B1 1 or 2 correct) |
| x        | 0.5 | 1                                                                                                                                                                                                                           | 2   | 3 | 4     | 5   | 6   |  |               |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   |   |   |    |     |     |   |       |     |     |               |   |                                         |
| y        | 12  | (6)                                                                                                                                                                                                                         | (3) | 2 | (1.5) | 1.2 | (1) |  |               |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   |   |   |    |     |     |   |       |     |     |               |   |                                         |
|          | (b) |                                                                                                                                                                                                                             |     |   |       |     |     |  | Correct graph | 2    | M1 at least 6 points plotted correctly from their table<br>A1 cao for correct curve drawn from $(0.5, 12)$ to $(6, 1)$                                                                                                                                                                                                                                                                                                                                                        |   |   |   |   |   |   |    |     |     |   |       |     |     |               |   |                                         |

| 1MA0_2H  |                                                                                                                                                                                                                                                                                          |                       |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Question | Working                                                                                                                                                                                                                                                                                  | Answer                | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| 19       | <p>16 metres: <math>8 \times 10^8</math> km.<br/> 16: <math>8 \times 10^8 \times 1000</math><br/> 16: <math>8 \times 10^{11}</math><br/> 1: <math>5 \times 10^{10}</math></p> <p><b>OR</b></p> <p>2 m to <math>10^8</math> km<br/> 2m to 100 000 000 000m<br/> 1m to 50 000 000 000m</p> | $1: 5 \times 10^{10}$ | 3    | <p>M1 (indep) correct method to convert to consistent units</p> <p>M1 <math>\frac{'8 \times 10^8'}{'16'}</math> (units may not be consistent) <b>or</b><br/> <math>5 \times 10^{10}</math> oe <b>or</b> <math>5 \times 10^7</math> oe</p> <p>A1 <math>1: 5 \times 10^{10}</math> <b>or</b> 1: 50 000 000 000</p> <p><b>OR</b></p> <p>M1 (indep) correct method to convert to consistent units</p> <p>M1 <math>\frac{'16'}{8}</math> to '<math>10^8</math>'</p> <p>A1 <math>1: 5 \times 10^{10}</math> <b>or</b> 1: 50 000 000 000</p> |  |
| 20       | $\frac{3(x+1)}{6} + \frac{2(x+3)}{6} = \frac{3x+3+2x+6}{6}$                                                                                                                                                                                                                              | $\frac{5x+9}{6}$      | 3    | <p>M1 Use of common denominator of 6 (<b>or</b> any other multiple of 6) and at least one numerator correct</p> <p>Eg. <math>\frac{3(x+1)}{6}</math> or <math>\frac{2(x+3)}{6}</math></p> <p>M1 <math>\frac{3(x+1)}{6} + \frac{2(x+3)}{6}</math> oe</p> <p>A1 cao</p>                                                                                                                                                                                                                                                                 |  |

| 1MA0_2H  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |   |   |   |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
|----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|--|--------|------|-------|---|---|---|---|---|---|---|---|--|--|--|--|--|---|---|---|--|--|--|--|--|---|--|--|---|--|--|--|--|---|--|--|--|---|--|--|--|---|--|--|--|--|---|--|--|---|--|--|--|--|--|---|--|---|--|--|--|--|--|--|---|----------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |   |   |   |  | Answer | Mark | Notes |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 21       | (a) | <div><math>\frac{2}{7} \times \frac{1}{6}</math></div> <div>OR</div> <table><tr><td></td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td>3</td><td>3</td></tr><tr><td>1</td><td>X</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>√</td><td>X</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td><td>X</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td>X</td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr></table> |   |   |   |   |   |  |        | 1    | 1     | 2 | 2 | 2 | 3 | 3 | 1 | X | √ |  |  |  |  |  | 1 | √ | X |  |  |  |  |  | 2 |  |  | X |  |  |  |  | 2 |  |  |  | X |  |  |  | 2 |  |  |  |  | X |  |  | 3 |  |  |  |  |  | X |  | 3 |  |  |  |  |  |  | X | $\frac{2}{42}$ | 2 | <div>M1 <math>\frac{2}{7} \times \frac{1}{6}</math></div> <div>A1 <math>\frac{2}{42}</math> oe</div> <div>OR</div> <div>M1 Fully correct sample space with the correct cases identified</div> <div>A1 <math>\frac{2}{42}</math> oe</div> <div>SC : B1 for an answer of <math>\frac{4}{49}</math></div> |
|          | 1   | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2 | 2 | 2 | 3 | 3 |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 1        | X   | √                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |   |   |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 1        | √   | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |   |   |   |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 2        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | X |   |   |   |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 2        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   | X |   |   |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 2        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |   | X |   |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 3        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |   |   | X |   |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |
| 3        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |   |   |   | X |  |        |      |       |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |   |  |  |  |  |  |   |  |  |   |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |  |   |  |  |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                |   |                                                                                                                                                                                                                                                                                                        |

| 1MA0_2H  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   |   |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|--------|------|-------|---|---|---|---|---|---|---|--|---|---|---|---|---|---|--|---|---|---|---|---|---|---|--|--|---|--|--|---|---|---|--|--|--|---|--|---|---|---|--|--|--|--|---|---|---|---|--|--|--|--|--|---|--|---|--|--|--|--|--|--|---|-----------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |   |   |   |   | Answer | Mark | Notes |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 21       | (b) | $\frac{2}{7} \times \frac{5}{6} + \frac{3}{7} \times \frac{2}{6}$<br><br><b>OR</b><br><table border="1"><tr><td></td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td>3</td><td>3</td></tr><tr><td>1</td><td>X</td><td></td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr><tr><td>1</td><td></td><td>X</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr><tr><td>2</td><td></td><td></td><td>X</td><td></td><td></td><td>√</td><td>√</td></tr><tr><td>2</td><td></td><td></td><td></td><td>X</td><td></td><td>√</td><td>√</td></tr><tr><td>2</td><td></td><td></td><td></td><td></td><td>X</td><td>√</td><td>√</td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td>X</td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr></table> |   |   |   |   |   |        | 1    | 1     | 2 | 2 | 2 | 3 | 3 | 1 | X |  | √ | √ | √ | √ | √ | 1 |  | X | √ | √ | √ | √ | √ | 2 |  |  | X |  |  | √ | √ | 2 |  |  |  | X |  | √ | √ | 2 |  |  |  |  | X | √ | √ | 3 |  |  |  |  |  | X |  | 3 |  |  |  |  |  |  | X | $\frac{16}{42}$ | 3 | M1 for identifying all 3 possibilities of (1,2) and (1,3) and (2,3)<br><b>OR</b><br>at least one of $\frac{2}{7} \times \frac{3}{6} (1, 2)$ <b>or</b> $\frac{2}{7} \times \frac{2}{6} (1, 3)$<br><br><b>or</b> $\frac{3}{7} \times \frac{2}{6} (2, 3)$ <b>or</b> $\frac{2}{7} \times \frac{5}{6} (1, 2 \text{ or } 3)$<br><br>M1 $\frac{2}{7} \times \frac{5}{6} + \frac{3}{7} \times \frac{2}{6}$ <b>or</b> $\frac{2}{7} \times \frac{3}{6} + \frac{2}{7} \times \frac{2}{6} + \frac{3}{7} \times \frac{2}{6}$<br>A1 $\frac{16}{42}$ oe<br><b>OR</b><br>M2 Fully correct sample space with the correct cases identified<br>(M1 for 1,2 and 1,3 and 2,3 identified on a sample space)<br>A1 $\frac{16}{42}$ oe<br><br>SC: B2 for an answer of $\frac{16}{49}$ |
|          | 1   | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2 | 2 | 2 | 3 | 3 |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1        | X   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | √ | √ | √ | √ | √ |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1        |     | X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | √ | √ | √ | √ | √ |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | X |   |   | √ | √ |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   | X |   | √ | √ |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   | X | √ | √ |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 3        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   | X |   |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 3        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |   |   |   | X |        |      |       |   |   |   |   |   |   |   |  |   |   |   |   |   |   |  |   |   |   |   |   |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |   |   |   |  |  |  |  |   |   |   |   |  |  |  |  |  |   |  |   |  |  |  |  |  |  |   |                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| 1MA0_2H  |     |                                                                                                                                                                                               |               |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                                                                                                                                                                       | Answer        | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 22       | (a) | $x = \frac{-9 \pm \sqrt{9^2 - 4 \times 2 \times -7}}{2 \times 2} = \frac{-9 \pm \sqrt{137}}{4}$                                                                                               | 0.676, - 5.18 | 3    | <p>M1 <math>\frac{-9 \pm \sqrt{9^2 - 4 \times 2 \times -7}}{2 \times 2}</math> allow substitution of <math>\pm 7</math> for <math>c</math></p> <p>M1 <math>\frac{-9 \pm \sqrt{137}}{4}</math></p> <p>A1 answers in ranges 0.67 - 0.68 <b>and</b> - 5.17 to - 5.18</p> <p><b>OR</b></p> <p>M1 <math>(x + \frac{9}{4})^2</math> oe</p> <p>M1 for method leading to <math>\pm \sqrt{\frac{137}{16}} - \frac{9}{4}</math></p> <p>A1 answers in ranges 0.67 - 0.68 <b>and</b> - 5.17 to - 5.18</p> |
|          | (b) | <p>Put <math>y = \frac{1}{x}</math> and use part (a)</p> <p>Or</p> $7y^2 - 9y - 2 = 0$ $y = \frac{- -9 \pm \sqrt{(-9)^2 - 4 \times 7 \times (-2)}}{2 \times 7}$ $\frac{9 \pm \sqrt{137}}{14}$ | 1.48, - 0.193 | 2    | <p>M1 <math>y = \frac{1}{x}</math> <b>or</b> <math>x = \frac{1}{y}</math></p> <p>A1 (ft) answers in range 1.47 - 1.48 <b>and</b> - 0.19 to - 0.194</p> <p><b>OR</b></p> <p>M1 fully correct method which leads to <math>7y^2 - 9y - 2 = 0</math> <b>or</b> <math>-7y^2 + 9y + 2 = 0</math> with correct method to solve (condone sign errors in substitution)</p> <p>A1 (ft) answers in range 1.47 - 1.48 <b>and</b> - 0.19 to - 0.194</p>                                                    |

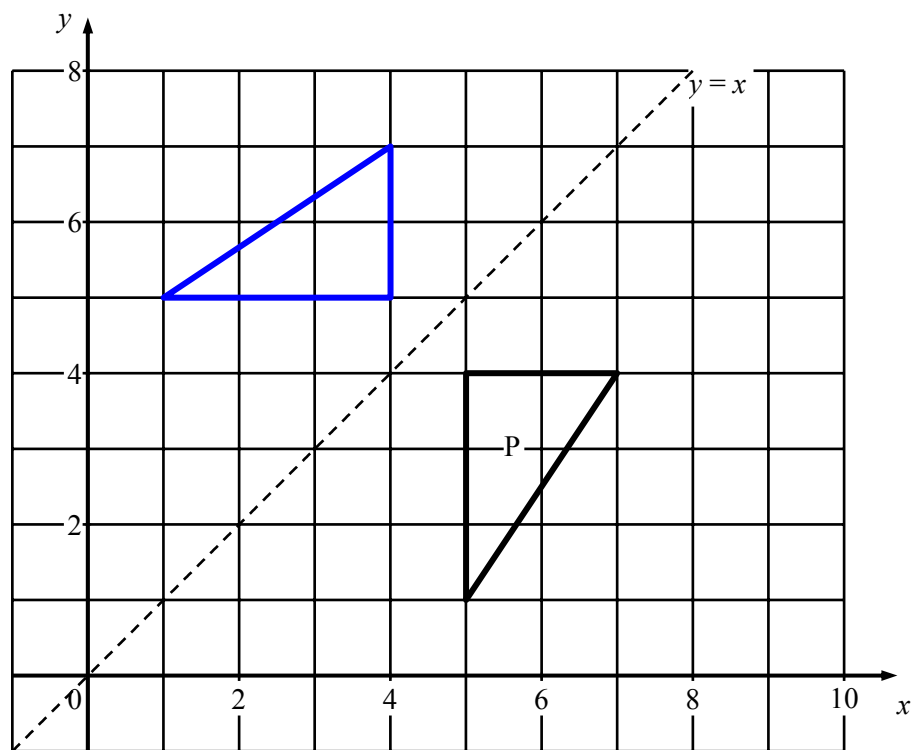
| 1MA0_2H  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Answer | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 23       | (a) | <p>Let <math>O</math> be the centre of the base.<br/> <math>OB^2 + OC^2 = 10^2</math> ; <math>OB^2 = 50</math><br/> <math>AO^2 = AB^2 - OB^2 = 50</math><br/> <math>\text{Vol} = \frac{1}{3} \times 10^2 \times \sqrt{50}</math></p> <p><b>OR</b><br/> Let <math>M</math> be the midpt of side <math>BC</math> and let <math>O</math> be the centre of the base.<br/> <math>AM^2 + MC^2 = 10^2</math> ; <math>AM^2 = 75</math><br/> <math>AO^2 = AM^2 - MO^2 = 50</math><br/> <math>\text{Vol} = \frac{1}{3} \times 10^2 \times \sqrt{50}</math></p> | 236    | 4    | <p>M1 correct method to start to find <math>BD</math> or <math>BO</math> using triangle <math>OBC</math> or triangle <math>BCD</math> (oe)<br/> Eg. <math>OB^2 + OC^2 = 10^2</math> <b>or</b> <math>BO^2 = 50</math> <b>or</b><br/> <math>BO = \sqrt{50}</math> (=7.07..) <b>or</b> <math>BO = \frac{\sqrt{200}}{2}</math> <b>or</b><br/> <math>10^2 + 10^2 = BD^2</math> <b>or</b> <math>BD^2 = 200</math> <b>or</b> <math>BD = \sqrt{200}</math> (=14.1..)<br/> M1 (dep) correct method to find height of pyramid using triangle <math>AOB</math><br/> Eg. <math>AO^2 = 10^2 - \sqrt{50}^2</math> <b>or</b> <math>AO^2 = 50</math> <b>or</b><br/> <math>AO = \sqrt{50}</math> (=7.07..)<br/> M1 (indep) <math>\frac{1}{3} \times 10^2 \times \sqrt{50}</math> (but <b>not</b> <math>\frac{1}{3} \times 10^2 \times 10</math>)<br/> A1 235 – 236</p> <p><b>OR</b><br/> M1 correct method to start to find height of a face using triangle <math>AMC</math> (oe)<br/> Eg. <math>AM^2 + 5^2 = 10^2</math> <b>or</b> <math>AM^2 = 75</math> <b>or</b><br/> <math>AM = \sqrt{75}</math> (=8.66...)<br/> M1 (dep) correct method to find height of pyramid using triangle <math>AOM</math><br/> Eg. <math>AO^2 = \sqrt{75}^2 - 5^2</math> <b>or</b> <math>AO^2 = 50</math> <b>or</b><br/> <math>AO = \sqrt{50}</math> (=7.07..)<br/> M1 (indep) <math>\frac{1}{3} \times 10^2 \times \sqrt{50}</math> (but <b>not</b> <math>\frac{1}{3} \times 10^2 \times 10</math>)<br/> A1 235 – 236</p> |

| 1MA0_2H     |     |         |        |      |                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------|-----|---------|--------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question    |     | Working | Answer | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                |
| 23<br>cont. | (a) |         |        |      | <p><b>OR</b></p> <p>M1 for <math>\sin 45 = \frac{x}{10}</math> <b>or</b> <math>\cos 45 = \frac{x}{10}</math></p> <p>M1 for <math>h = 10 \times \sin 45</math> <b>or</b> <math>h = 10 \times \cos 45</math> (=7.07..)</p> <p>M1 (indep) <math>\frac{1}{3} \times 10^2 \times '7.07...'</math> (but <b>not</b> <math>\frac{1}{3} \times 10^2 \times 10</math>)</p> <p>A1 235 – 236</p> |

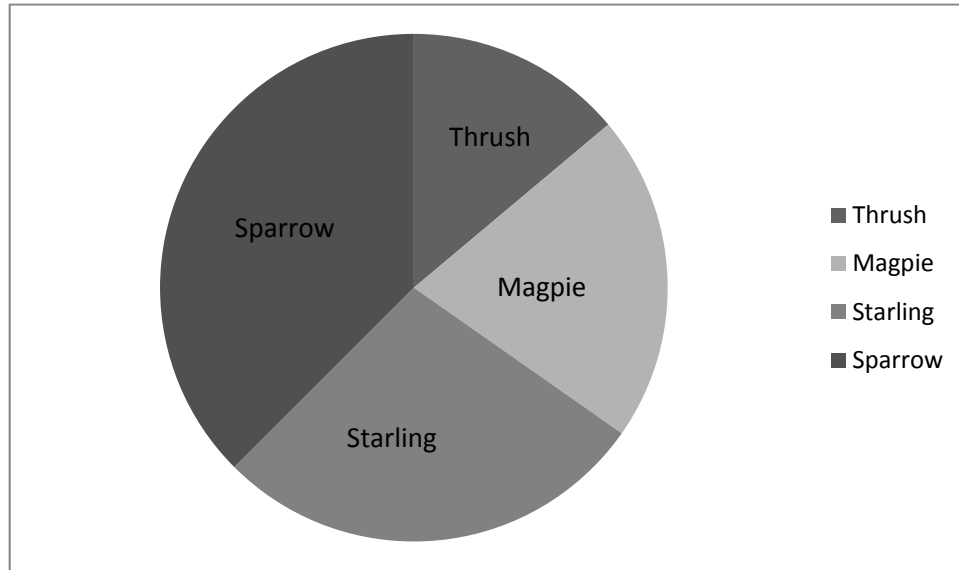
| 1MA0_2H  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |      |                                                                                                                                                                                                                                                                                                       |
|----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |     | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Answer | Mark | Notes                                                                                                                                                                                                                                                                                                 |
| 23       | (b) | <p>Angle <math>ABO = 45^\circ</math><br/> Angle <math>DAB = 180 - 45 - 45</math></p> <p><b>OR</b></p> <p>In <math>\triangle BAD</math>, <math>\cos A = \frac{10^2 + 10^2 - (\sqrt{200})^2}{2 \times 10 \times 10} = 0</math></p> <p><b>OR</b></p> <p>In <math>\triangle BOA</math>, <math>\cos B = \frac{(\sqrt{50})}{10}</math><br/> Angle <math>BAD = 180 - '45' - '45'</math></p> <p><b>OR</b></p> <p><math>\sin A = \frac{(\sqrt{50})}{10}</math><br/> <math>A = 45</math><br/> Angle <math>BAD = 2 \times '45'</math></p> | 90     | 2    | <p>M1 Angle <math>DAB = 180 - 2 \times '45'</math><br/> A1 89.98 - 90</p> <p><b>OR</b></p> <p>M1 <math>\cos BAD = \frac{10^2 + 10^2 - (\sqrt{200})^2}{2 \times 10 \times 10}</math><br/> A1 89.98 - 90</p> <p><b>OR</b></p> <p>M1 <math>\sin A = \frac{(\sqrt{50})}{10}</math><br/> A1 89.98 - 90</p> |

| 1MA0_2H  |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|-------|----------------|---|-----|----------------|----|---|----------------|----|-----|-----------------|----|---|------------------|----|-----|---|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question |                                                                                                                                                                                                                                                                                                                                 | Working                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Answer       | Mark | Notes |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
| 24       |                                                                                                                                                                                                                                                                                                                                 | <table><tr><th>Height <math>h</math> m</th><th>Freq</th><th>FD</th></tr><tr><td><math>0 &lt; h \leq 2</math></td><td>7</td><td>3.5</td></tr><tr><td><math>2 &lt; h \leq 4</math></td><td>14</td><td>7</td></tr><tr><td><math>4 &lt; h \leq 8</math></td><td>18</td><td>4.5</td></tr><tr><td><math>8 &lt; h \leq 16</math></td><td>24</td><td>3</td></tr><tr><td><math>16 &lt; h \leq 20</math></td><td>10</td><td>2.5</td></tr></table> |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Height $h$ m | Freq | FD    | $0 < h \leq 2$ | 7 | 3.5 | $2 < h \leq 4$ | 14 | 7 | $4 < h \leq 8$ | 18 | 4.5 | $8 < h \leq 16$ | 24 | 3 | $16 < h \leq 20$ | 10 | 2.5 | 3 | 3 | B3 fully correct histogram with horizontal axis correctly scaled<br>(B2 for 4 correct blocks <b>or</b> 5 correct blocks with incorrect or no scale )<br>(B1 for 2 correct blocks of different widths <b>or</b> any 3 correct blocks)<br>SC : B1 for key, eg. $1 \text{ cm}^2 = 2$ (trees) <b>or</b> correct values shown for (freq $\div$ class interval) for at least 3 frequencies (3.5, 7, 4.5, 3, 2.5) |
|          |                                                                                                                                                                                                                                                                                                                                 | Height $h$ m                                                                                                                                                                                                                                                                                                                                                                                                                            | Freq | FD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 | $0 < h \leq 2$                                                                                                                                                                                                                                                                                                                                                                                                                          | 7    | 3.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 | $2 < h \leq 4$                                                                                                                                                                                                                                                                                                                                                                                                                          | 14   | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 | $4 < h \leq 8$                                                                                                                                                                                                                                                                                                                                                                                                                          | 18   | 4.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 | $8 < h \leq 16$                                                                                                                                                                                                                                                                                                                                                                                                                         | 24   | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 | $16 < h \leq 20$                                                                                                                                                                                                                                                                                                                                                                                                                        | 10   | 2.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
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|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
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|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
| 25       | $A = \frac{1}{2} \times x \times 2x \times \sin 30^\circ$ $A = \frac{1}{2} \times 2x^2 \times 0.5$<br><br><b>OR</b><br><br>Height = $2x \sin 30^\circ = x$ $A = \frac{x \times x}{2} = \frac{x^2}{2}$<br><br><b>OR</b><br><br>Height = $x \sin 30 = \frac{x}{2}$ $A = \frac{1}{2} \times 2x \times \frac{x}{2} = \frac{x^2}{2}$ | $x = \sqrt{2A}$<br>shown                                                                                                                                                                                                                                                                                                                                                                                                                | 3    | M1 $(A =) \frac{1}{2} \times x \times 2x \times \sin 30^\circ$<br><br>A1 $A = x^2 \times 0.5$ <b>or</b> $A = \frac{x^2}{2}$<br><br>C1 for completion with all steps shown<br><br><b>OR</b><br><br>M1 height = $2x \sin 30 (= x)$<br><br>A1 $A = x^2 \times 0.5$ <b>or</b> $A = \frac{x^2}{2}$<br><br>C1 for completion with all steps shown<br><br><b>OR</b><br><br>M1 for height = $x \sin 30 (= \frac{x}{2})$<br><br>A1 $A = x^2 \times 0.5$ <b>or</b> $A = \frac{x^2}{2}$<br><br>C1 for completion with all steps shown |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
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|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |      |       |                |   |     |                |    |   |                |    |     |                 |    |   |                  |    |     |   |   |                                                                                                                                                                                                                                                                                                                                                                                                            |

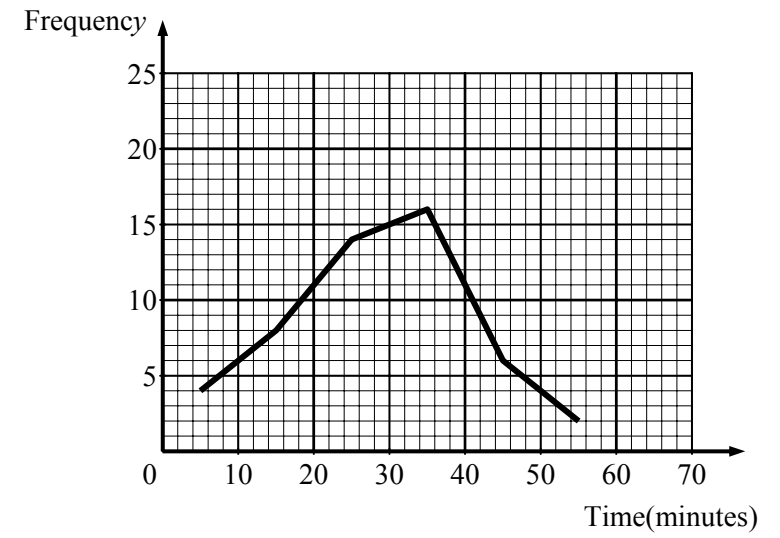
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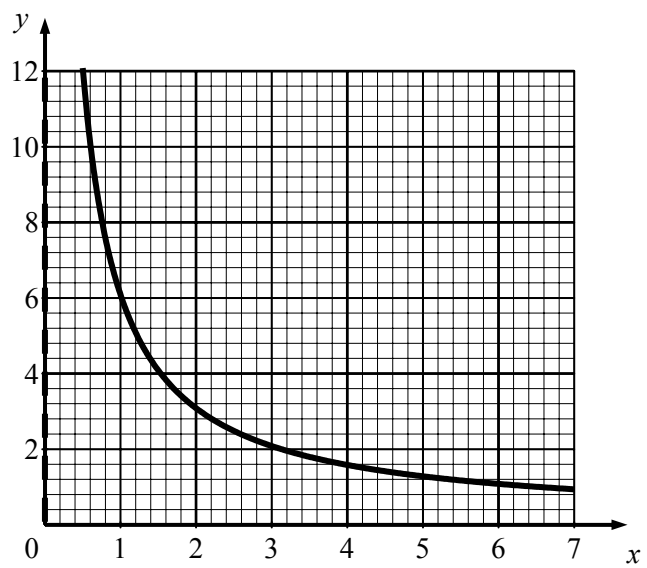
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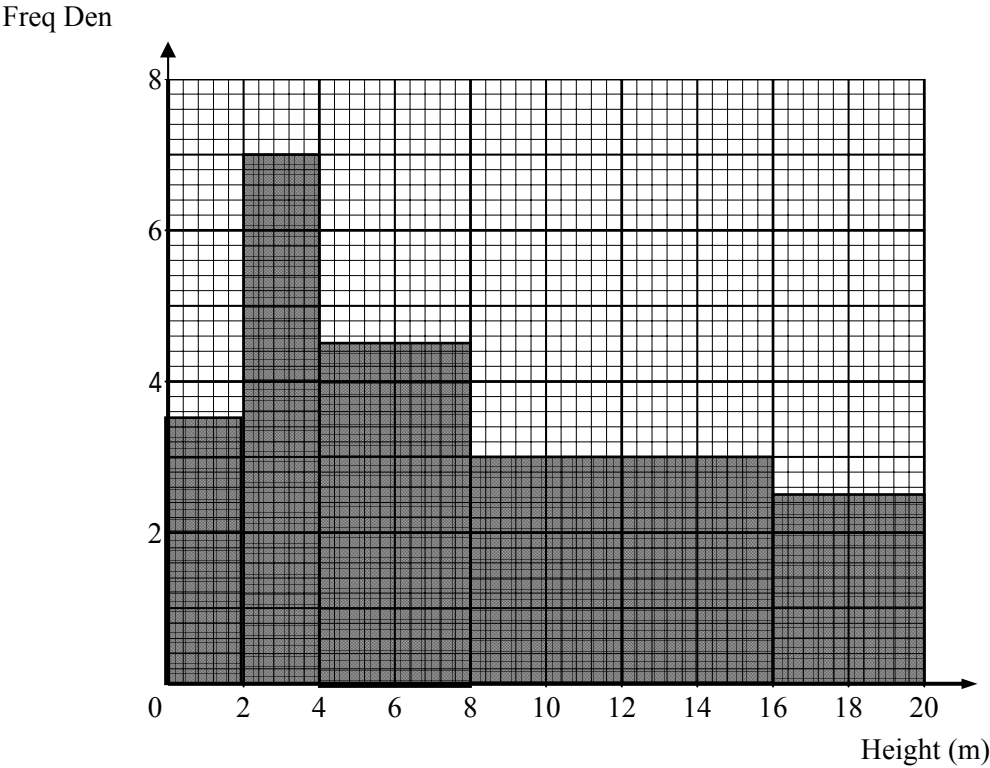
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24.







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