

Mark Scheme

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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... (B1 for sight of 4.51(66359..) or 4.52 or 2.97(6) or 2.98 or 1.51 or 1.52 or 1.518 or 1.517 or 1.5177 or $\frac{\sqrt{510}}{5}$ )
2	(a)	Triangle with vertices (1, 5) (4, 5) (4,7)	2	B2 correct reflection (B1 a translation of the correct answer with the final shape above $y = x$ or 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) B1 Translation B1 $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$ NB. Award no marks for a combination of transformations

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



1MA0\_2H

Question	Working	Answer	Mark	Notes															
4	<table border="1" data-bbox="439 344 1010 523"> <thead> <tr> <th>Bird</th> <th>Frequency</th> <th>Angles</th> </tr> </thead> <tbody> <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> </tbody> </table> <p data-bbox="439 563 931 719">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 data-bbox="439 759 483 791">OR</p> <p data-bbox="439 831 775 863"><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 data-bbox="1391 312 1917 384">M1 for any one of <math>\frac{15}{'72'} \times 360</math>, <math>\frac{10}{'72'} \times 360</math>,</p> <p data-bbox="1391 392 1715 464"><math>\frac{20}{'72'} \times 360</math>, <math>\frac{27}{'72'} \times 360</math> oe</p> <p data-bbox="1391 472 1973 504">('72' must clearly come from adding frequencies)</p> <p data-bbox="1391 544 1951 711">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 data-bbox="1391 743 1973 807">A1 for correct pie chart fully labelled with birds' names</p> <p data-bbox="1391 855 1447 887"><b>OR</b></p> <p data-bbox="1391 895 1939 967">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></p> <p data-bbox="1391 975 1805 1007">('75' should be in the range 73 - 77)</p> <p data-bbox="1391 1046 1951 1182">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 data-bbox="1391 1214 1962 1278">A1 for correct pie chart fully labelled with birds' names</p> <p data-bbox="1391 1318 2007 1350"><b>NB. Allow a tolerance of <math>\pm 2^\circ</math> on all drawn angles</b></p>
Bird	Frequency	Angles																	
Magpie	15	75																	
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1MA0_2H				
Question	Working	Answer	Mark	Notes
5	$25 \div 50 = 0.5 \text{ h} = 30 \text{ min}$ $25 \div 60 = 0.416 \text{ h} = 25 \text{ min}$	5	3	<p>M1 for <math>25 \div 50</math> or <math>\frac{60}{50} \times 25</math> or 30 (min) or 0.5(h)</p> <p>or <math>25 \div 60</math> or <math>\frac{60}{60} \times 25</math> or 25 (min) or 0.41(6)(h) or 0.42 (h)</p> <p>M1(dep) '0.5' – '0.416' or '30' – '25'</p> <p>A1 cao</p> <p><b>OR</b></p> <p>M1 for <math>60 \div 25 (= 2.4)</math> and <math>60 \div "2.4"</math> or <math>50 \div 25 (= 2)</math> and <math>60 \div "2"</math></p> <p>M1(dep) '30' – '25'</p> <p>A1 cao</p>

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

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

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Question	Working	Answer	Mark	Notes	
8	(a)		-1, 0, 1, 2, 3	2	B2 for all 5 correct values; ignore repeats, any order (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> $x \leq 3$ (B1 for $-4 < x$ <b>or</b> $x > -4$ <b>or</b> $x \leq 3$ <b>or</b> $3 \geq x$ <b>or</b> $x > -4$ <b>or</b> $x \leq 3$ <b>or</b> $-4 \leq x < 3$ ) NB : Accept the use of any letter
	(c)	$3y - 2 > 5$ $3y > 7$	$y > \frac{7}{3}$	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 <b>or</b> $3y > 7$ <b>or</b> $3y < 7$ <b>or</b> $3y = 7$ A1 $y > \frac{7}{3}$ <b>or</b> $y > 2\frac{1}{3}$ <b>or</b> $y > 2.\dot{3}$ NB. final answer <b>must</b> be an inequality  (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> (all of above may be seen in working space or indicated on S&L) <b>or</b> clear attempt to find UQ and LQ from a list of values or in stem and leaf diagram A1 cao

1MA0_2H																				
Question	Working		Answer	Mark	Notes															
10	<p><b>For example</b></p> <table border="1"> <thead> <tr> <th></th> <th>UK</th> <th>USA</th> </tr> </thead> <tbody> <tr> <td><b>\$ per US gal</b></td> <td>(\$6.90(8412))</td> <td>[\$3.15]</td> </tr> <tr> <td><b>£ per litre</b></td> <td>[£1.24]</td> <td>(£)0.56(53...)</td> </tr> <tr> <td><b>£ per US gal</b></td> <td>(£)4.69(96)</td> <td>(£)2.14(28...)</td> </tr> <tr> <td><b>\$ per litre</b></td> <td>(\$1.82(28))</td> <td>(\$0.83(11...))</td> </tr> </tbody> </table> <p>Cost in £ per US gal of UK fuel = <math>£1.24 \times 3.79</math> = £4.6996 Cost in \$ per US gal of UK fuel = <math>\\$1.47 \times 4.6996</math> = \$6.908412</p> <p><b>OR</b> Cost in £ of 1 US gal of US fuel = <math>\\$3.15 \div 1.47</math> = £2.14 Cost in £ per litre of US fuel = <math>£2.14 \div 3.79</math> =£0.56(53..)</p> <p><b>OR</b> Cost in UK in £ per US gal = <math>£1.24 \times 3.79</math> (=£4.6996) Cost in USA in £ per US gal = <math>£3.15 \div 1.47</math> (=2.1428)</p> <p><b>OR</b> Cost in UK is \$ per litre = <math>£1.24 \times 1.47</math> (=1.8228) Cost in USA in \$ per litre = <math>3.15 \div 3.79</math> (=0.8311...)</p>			UK	USA	<b>\$ per US gal</b>	(\$6.90(8412))	[\$3.15]	<b>£ per litre</b>	[£1.24]	(£)0.56(53...)	<b>£ per US gal</b>	(£)4.69(96)	(£)2.14(28...)	<b>\$ per litre</b>	(\$1.82(28))	(\$0.83(11...))	Cheaper in US	4	<p>M1 for <math>1.24 \times 3.79</math> (= 4.6996) <b>or</b> <math>1.24 \times 1.47</math> (=1.8228) M1 for <math>1.47 \times '4.6996'</math> <b>or</b> <math>3.79 \times '1.8228'</math> A1 for 6.90(8412) C1 (dep on M2) for '\$6.90(8412)' or '\$6.91' and reaching a conclusion consistent with their calculation</p> <p><b>OR</b> M1 for <math>3.15 \div 1.47</math> (=2.1428..) <b>or</b> <math>3.15 \div 3.79</math> (=0.8311) M1 for '<math>2.14 \div 3.79</math> <b>or</b> '0.8311' <math>\div 1.47</math> A1 for 0.56(53...) C1 (dep on M2) for '£0.56(53...)' or '£0.57' and reaching a conclusion consistent with their calculation</p> <p><b>OR</b> M1 <math>1.24 \times 3.79</math> (= 4.6996) M1 <math>3.15 \div 1.47</math> (=2.1428..) A1 4.69(96) and 2.14(28...) 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</p> <p><b>OR</b> M1 for <math>1.24 \times 1.47</math> (=1.8228) M1 for <math>3.15 \div 3.79</math> (=0.8311...) A1 for 1.82(28) <b>and</b> 0.83(11...) C1 (dep on M2) for '\$1.82(28)' and '\$0.83(11...)' and reaching a conclusion consistent with their calculation</p> <p><b>NB:</b> 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.</p>
	UK	USA																		
<b>\$ per US gal</b>	(\$6.90(8412))	[\$3.15]																		
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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 vol cuboid = $10x$ A1 correct completion leading to $x^3 - 10x = 100$																																						
	(b)	5.4	4	B2 for a trial $5 \leq x \leq 6$ evaluated correctly (B1 for any <b>two</b> trials evaluated correctly for positive values of $x$ ) B1 for a different trial $5.3 < x < 5.4$ evaluated correctly B1 (dep on at least one previous B1) for 5.4  Accept trials correct to the nearest whole number (rounded or truncated) if the value of $x$ is to 1 d.p., but correct to 1 d.p. (rounded or truncated) if the value of $x$ is to 2 or more d.p.  NB. Allow 100 for a trial of $x = 5.355$																																						
	<table border="1"> <tbody> <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> </tbody> </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)			
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$x = 5.1$	81.(651)																																									
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$x = 5.3$	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)		2	B2 Fully correct polygon. Points plotted at the midpoint (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))  NB: ignore polygon before 1 <sup>st</sup> point, and after last point. Ignore any histograms.
	(b)		1	B1 Allow any notation eg, 30-40 ft polygon
	(c)	$(6 + 2) = 8, (4 + 8 + 14 + 16 + 6 + 2) = 50$	2	M1 $(6 + 2) \div (4 + 8 + 14 + 16 + 6 + 2)$ <b>or</b> ft figures from polygon <b>or</b> $\frac{8}{a}$ with $a > 8$ <b>or</b> $\frac{c}{50}$ with $c < 50$ <b>or</b> 8 and 50 used but notation incorrect (eg. 8:50 , 8 out of 50)  A1 $\frac{8}{50}$ oe (eg. 0.16) <b>or</b> ft figures from polygon



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) M1 (dep on 1 <sup>st</sup> M1) '450' $\times 6.6$ A1 cao  SC: If no marks awarded then award B1 for an answer of 5940
14	(a)	$x(x+7)$	1	B1 cao
	(b)	$(y-8)(y-2)$	2	M1 $(y \pm 8)(y \pm 2)$ <b>or</b> $y(y-2) - 8(y-2)$ <b>or</b> $y(y-8) - 2(y-8)$ A1 cao
	(c)(i)	$2t^2 + 5t + 2 = (2t+1)(t+2)$	3	M1 $(2t+2)(t+1)$ <b>oe or</b> $2t(t+2) + 1(t+2)$ <b>or</b> $t(2t+1) + 2(2t+1)$ A1 $(2t+1)(t+2)$
	(ii)	This is always a product of two whole numbers each of which is greater than 1		B1 ft from (i) for a convincing explanation referring to factors found in (i)
15	$9 - 3 = 6$ $10^2 - 6^2 = 64$ $BC = 8$ $AC^2 = 9^2 + 8^2 = 145$	12.0	5	M2 $10^2 - (9-3)^2$ (=64) <b>or</b> $BC = 8$ (M1 $9 - 3$ (= 6) may be seen on diagram) M1 (indep) $9^2 + 'BC'^2$ where $BC$ is a numerical value  M1 (dep on previous M1) $\sqrt{81 + '64'}$ 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 $64.8 - 59.3 (=5.5)$ M1 (dep) $\frac{'5.5'}{64.8} \times 100$ oe A1 $8.48 - 8.49$  <b>OR</b> M1 $\frac{59.3}{64.8} \times 100$ oe (= 91.5(12...)) M1 (dep) $100 - '91.5'$ A1 $8.48 - 8.49$  <b>OR</b> M1 $\frac{59.3}{64.8} (=0.915(12\dots))$ M1 (dep) $100 \times (1 - '0.915')$ 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	<p>M1 <math>\sin 60 = \frac{x}{32}</math> <b>or</b> <math>\frac{x}{\sin 60} = \frac{32}{\sin 90}</math> oe</p> <p>M1 <math>(x =) 32 \times \sin 60</math> <b>or</b> <math>(x =) \frac{32}{\sin 90} \times \sin 60</math></p> <p>A1 27.7 – 27.72</p> <p><b>OR</b></p> <p>M1 <math>\cos(90 - 60) = \frac{x}{32}</math></p> <p>M1 <math>(x =) 32 \times \cos(90 - 60)</math></p> <p>A1 27.7 – 27.72</p> <p>Radians : – 9.7539398...</p> <p>Gradians : 25.888554...</p> <p>SC : B2 for an answer in the range (–) 9.75 to (–)9.754 <b>or</b> 25.8 to 25.9</p>																	
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 (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	<p>M1 at least 6 points plotted correctly from their table</p> <p>A1 cao for correct curve drawn from (0.5, 12) to (6, 1)</p>																	

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



1MA0\_2H

Question	Working	Answer	Mark	Notes																																																																
21	(b) $\frac{2}{7} \times \frac{5}{6} + \frac{3}{7} \times \frac{2}{6}$  OR  <table border="1" data-bbox="439 491 969 775"> <thead> <tr> <th></th> <th>1</th> <th>1</th> <th>2</th> <th>2</th> <th>2</th> <th>3</th> <th>3</th> </tr> </thead> <tbody> <tr> <th>1</th> <td>X</td> <td></td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <th>1</th> <td></td> <td>X</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <th>2</th> <td></td> <td></td> <td>X</td> <td></td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <th>2</th> <td></td> <td></td> <td></td> <td>X</td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <th>2</th> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td>√</td> <td>√</td> </tr> <tr> <th>3</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td></td> </tr> <tr> <th>3</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>X</td> </tr> </tbody> </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) OR at least one of $\frac{2}{7} \times \frac{3}{6}$ (1, 2) or $\frac{2}{7} \times \frac{2}{6}$ (1, 3) or $\frac{3}{7} \times \frac{2}{6}$ (2, 3) or $\frac{2}{7} \times \frac{5}{6}$ (1, 2 or 3)  M1 $\frac{2}{7} \times \frac{5}{6} + \frac{3}{7} \times \frac{2}{6}$ or $\frac{2}{7} \times \frac{3}{6} + \frac{2}{7} \times \frac{2}{6} + \frac{3}{7} \times \frac{2}{6}$ A1 $\frac{16}{42}$ oe OR M2 Fully correct sample space with the correct cases identified (M1 for 1,2 and 1,3 and 2,3 identified on a sample space) A1 $\frac{16}{42}$ oe SC: B2 for an answer of $\frac{16}{49}$
	1	1	2	2	2	3	3																																																													
1	X		√	√	√	√	√																																																													
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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)	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)  Eg. <math>OB^2 + OC^2 = 10^2</math> or <math>BO^2 = 50</math> or  <math>BO = \sqrt{50}</math> (=7.07..) or <math>BO = \frac{\sqrt{200}}{2}</math> or  <math>10^2 + 10^2 = BD^2</math> or <math>BD^2 = 200</math> or <math>BD = \sqrt{200}</math> (=14.1..)</p> <p>M1 (dep) correct method to find height of pyramid using triangle <math>AOB</math>  Eg. <math>AO^2 = 10^2 - \sqrt{50}^2</math> or <math>AO^2 = 50</math> or  <math>AO = \sqrt{50}</math> (=7.07..)</p> <p>M1 (indep) <math>\frac{1}{3} \times 10^2 \times \sqrt{50}</math> (but not <math>\frac{1}{3} \times 10^2 \times 10</math>)</p> <p>A1 235 – 236</p> <p><b>OR</b></p> <p>M1 correct method to start to find height of a face using triangle <math>AMC</math> (oe)  Eg. <math>AM^2 + 5^2 = 10^2</math> or <math>AM^2 = 75</math> or  <math>AM = \sqrt{75}</math> (=8.66..)</p> <p>M1 (dep) correct method to find height of pyramid using triangle <math>AOM</math>  Eg. <math>AO^2 = \sqrt{75}^2 - 5^2</math> or <math>AO^2 = 50</math> or  <math>AO = \sqrt{50}</math> (=7.07..)</p> <p>M1 (indep) <math>\frac{1}{3} \times 10^2 \times \sqrt{50}</math> (but not <math>\frac{1}{3} \times 10^2 \times 10</math>)</p> <p>A1 235 – 236</p>
				<p>Let <math>O</math> be the centre of the base.  <math>OB^2 + OC^2 = 10^2</math> ; <math>OB^2 = 50</math>  <math>AO^2 = AB^2 - OB^2 = 50</math>  <math>\text{Vol} = \frac{1}{3} \times 10^2 \times \sqrt{50}</math></p> <p><b>OR</b></p> <p>Let <math>M</math> be the midpt of side <math>BC</math> and let <math>O</math> be the centre of the base.  <math>AM^2 + MC^2 = 10^2</math> ; <math>AM^2 = 75</math>  <math>AO^2 = AM^2 - MO^2 = 50</math>  <math>\text{Vol} = \frac{1}{3} \times 10^2 \times \sqrt{50}</math></p>



## 1MA0\_2H

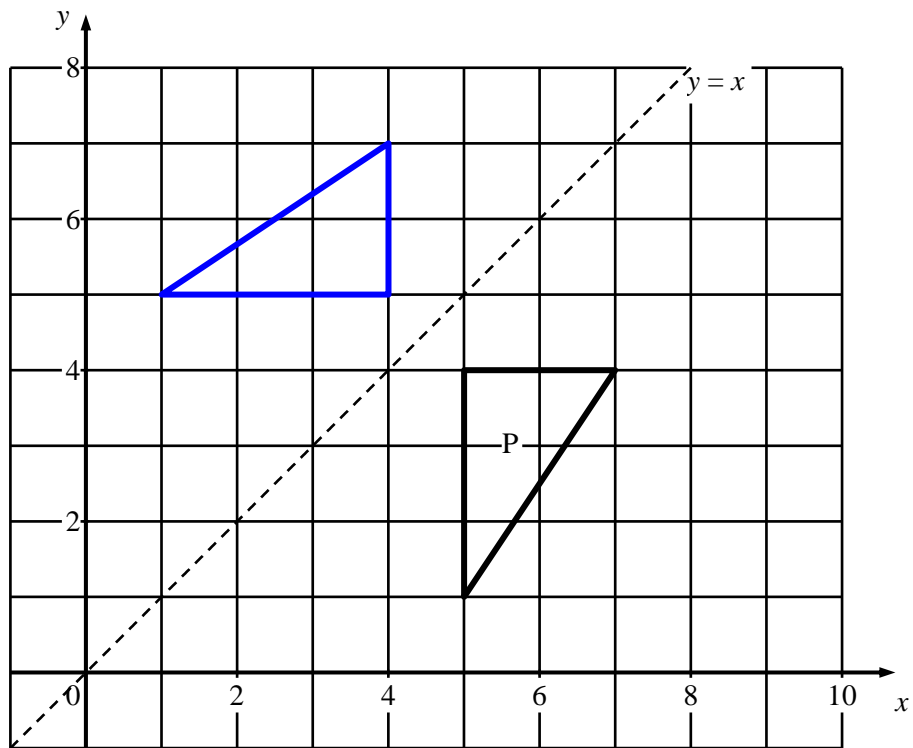
Question		Working	Answer	Mark	Notes
23 cont.	(a)				<p><b>OR</b></p> <p>M1 for <math>\sin 45 = \frac{x}{10}</math> <b>or</b> <math>\cos 45 = \frac{x}{10}</math></p> <p>M1 for <math>h = 10 \times \sin 45</math> <b>or</b> <math>h = 10 \times \cos 45</math> (=7.07..)</p> <p>M1 (indep) <math>\frac{1}{3} \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)	90	2	
	<p>Angle <math>ABO = 45^\circ</math>            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>            Angle <math>BAD = 180 - '45' - '45'</math></p> <p><b>OR</b></p> <p><math>\sin A = \frac{\sqrt{50}}{10}</math>  <math>A = 45</math>            Angle <math>BAD = 2 \times '45'</math></p>			<p>M1 Angle <math>DAB = 180 - 2 \times '45'</math>            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>            A1 89.98 - 90</p> <p><b>OR</b></p> <p>M1 <math>\sin A = \frac{\sqrt{50}}{10}</math>            A1 89.98 - 90</p>

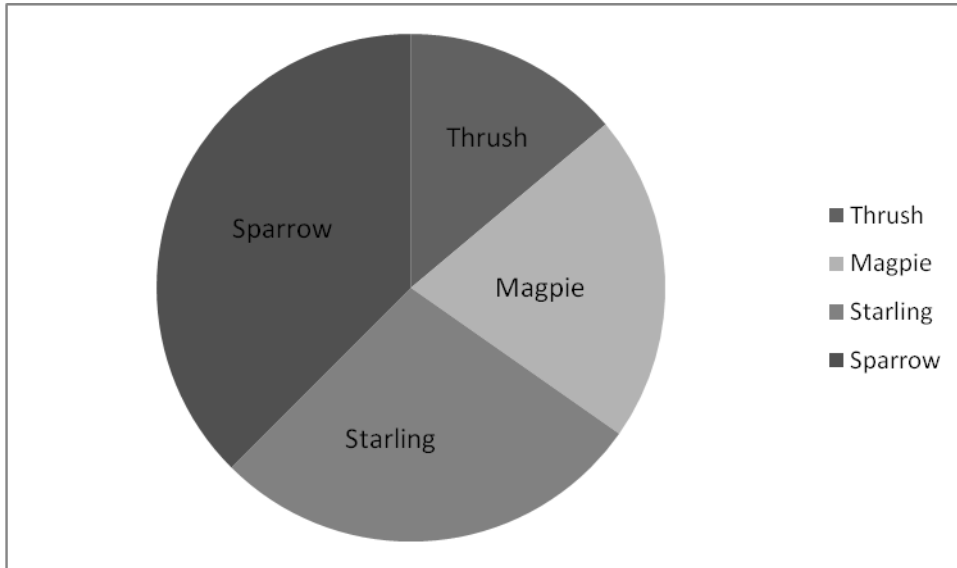


1MA0_2H																								
Question	Working			Answer	Mark	Notes																		
24	<table border="1"> <thead> <tr> <th>Height <math>h</math> m</th> <th>Freq</th> <th>FD</th> </tr> </thead> <tbody> <tr> <td><math>0 &lt; h \leq 2</math></td> <td>7</td> <td>3.5</td> </tr> <tr> <td><math>2 &lt; h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

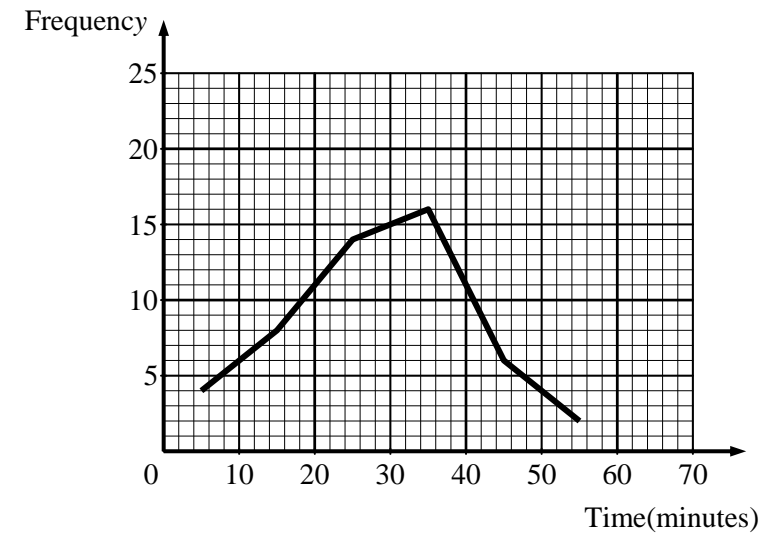
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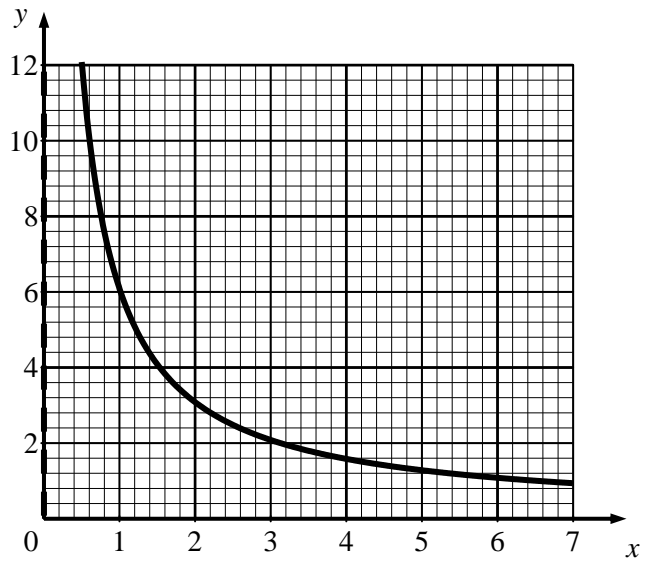
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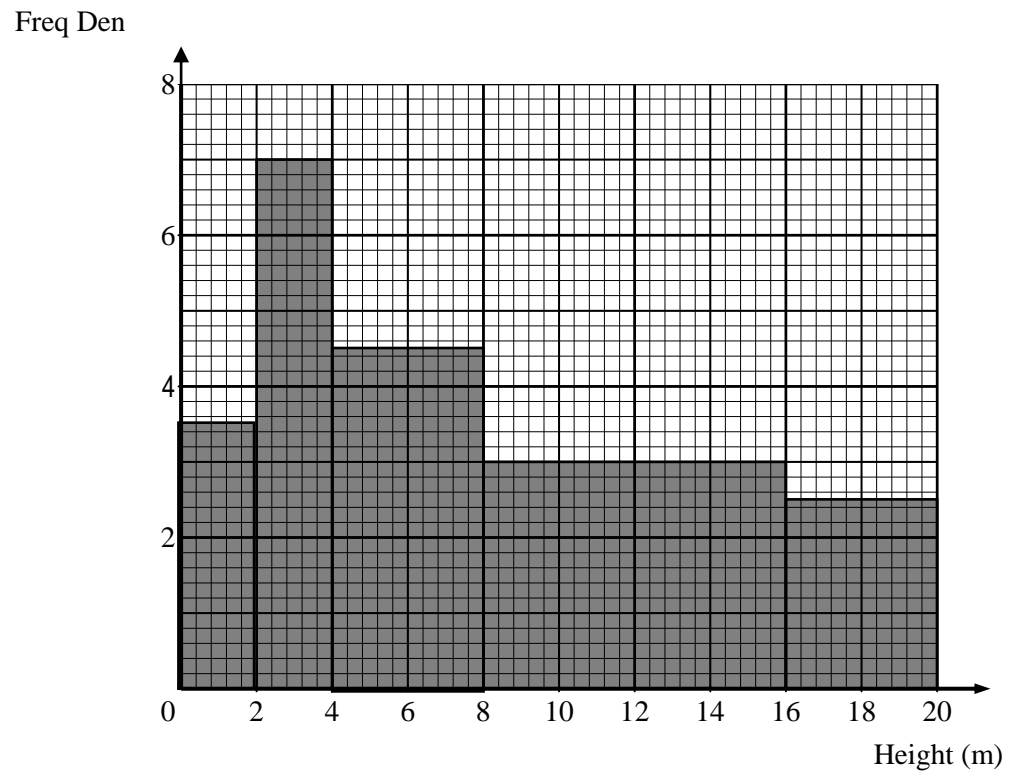
12.



18.



24.









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