

Surname <i>StemUp Model Solution</i>	Centre Number	Candidate Number
First name(s)		0



GCSE

3310U30-1



A20-3310U30-1

TUESDAY, 3 NOVEMBER 2020 – MORNING

MATHEMATICS – NUMERACY
UNIT 1: NON-CALCULATOR
INTERMEDIATE TIER

1 hour 45 minutes

ADDITIONAL MATERIALS

The use of a calculator is not permitted in this examination.
A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the additional page at the back of the booklet. Question numbers must be given for all work written on the additional page.

Take π as 3.14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

In question 2(a), the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	12	
3.	6	
4.	3	
5.	3	
6.	11	
7.	6	
8.	11	
9.	3	
10.	3	
11.	6	
12.	6	
13.	5	
Total	80	

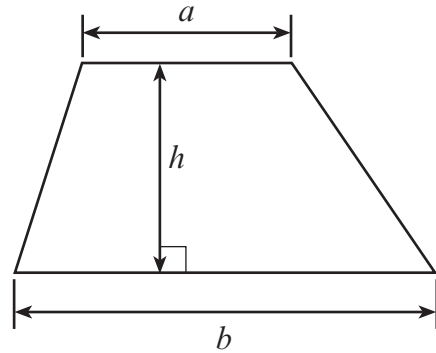
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01



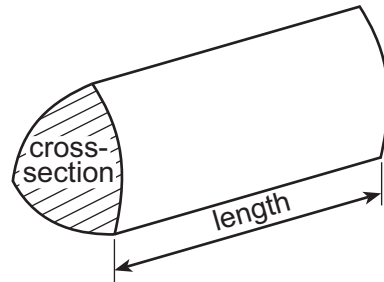
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Formula List – Intermediate Tier

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross-section $\times$ length



1. Marium buys some blueberries and strawberries.



Blueberries cost £4 per kg



Strawberries cost £3.60 per kg

Marium buys 1.5 kg of blueberries.
She receives £6.80 change from a £20 note.

Calculate the mass of the strawberries that Marium buys.

[5]

$$\text{Cost of blueberries} = 1.5 \times £4 = £6.00$$

$$\text{Money spent altogether} = £20.00 - £6.80 = £13.20$$

$$\text{Cost of strawberries} = £13.20 - £6.00 = £7.20$$

$$\text{Mass of strawberries} = £7.20 \div £3.60 \text{ per kg}$$

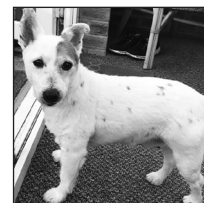
$$= 72 \div 36 = 2 \text{ kg}$$

Marium buys 2 kg of strawberries.



2. (a) In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Suzy buys a Jack Russell dog.
The dog costs her £450.
Pet insurance costs £18 per month.
Food for a Jack Russell costs £7 per week.



Calculate the total cost of buying, insuring and feeding Suzy's dog for the **first year**.

You must show all your working.

[4 + 2 OCW]

There are 12 months and 52 weeks in a year.

Cost of buying the dog = £450

Cost of insurance for the year = $12 \times £18 = £216$

($12 \times 18 = 120 + 96 = 216$)

Cost of food for the year = $52 \times £7 = £364$

($52 \times 7 = 350 + 14 = 364$)

Total cost for the first year = $£450 + £216 + £364$

= $£666 + £364$

= £1030

The total cost of buying, insuring and feeding Suzy's dog

for the first year is £1030.



(b)

Remember:

1 inch $\approx$ 2.5 cm

The height of a fully-grown Jack Russell dog is between 25 cm and 30 cm.
A fully-grown Jack Russell dog has a mass of between 6 kg and 8 kg.

Complete each of the following statements.

- (i) 'The height of a fully-grown Jack Russell dog is between

.....10..... inches and 12..... inches.'

[3]

$$25 \div 2.5 = 250 \div 25 = 10 \text{ inches}$$

$$30 \div 2.5 = 300 \div 25 = 12 \text{ inches}$$

- (ii) 'A fully-grown Jack Russell dog has a mass of between

.....13.2..... pounds and 17.6..... pounds.'

[3]

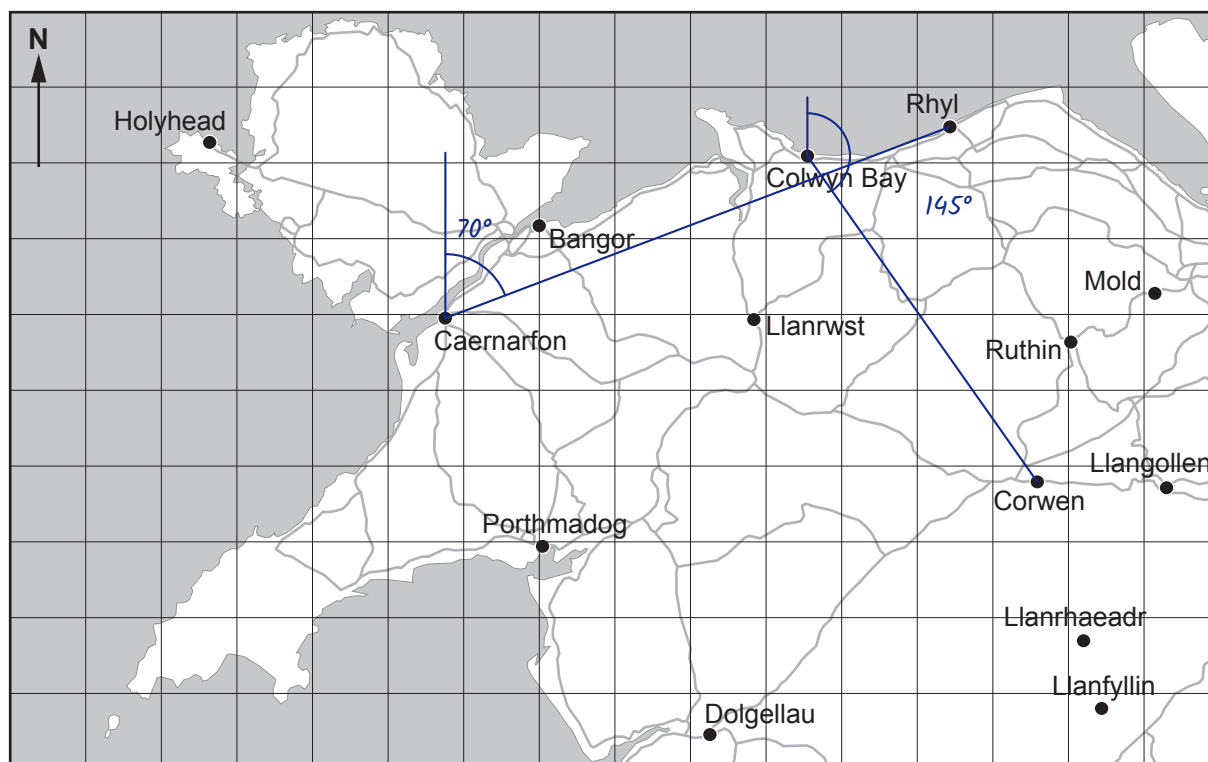
$$1 \text{ kg} \approx 2.2 \text{ pounds}$$

$$6 \times 2.2 = 13.2 \text{ pounds}$$

$$8 \times 2.2 = 17.6 \text{ pounds}$$



3. (a) The map shows part of Wales.



- (i) Write down the bearing of Rhyl from Caernarfon.

[1]

..... 070 °

- (ii) Name the place on the map that is on a bearing of 145° from Colwyn Bay.

[2]

..... Corwen

- (b) Another map has a scale of 1 : 20 000.
Gwen measures 3.5 cm on this map.
What distance does this represent in **metres**?

[3]

3.5 cm on the map represents $3.5 \times 20\,000 = 70\,000\text{ cm}$

$70\,000\text{ cm} \div 100 = 700\text{ m}$

(1 cm represents 200 m, so $3.5 \times 200 = 700\text{ m}$)

..... 700 metres



4. A new runway is to be built at an airport.

The plan below shows some of the angles.

Bryn has been asked to complete the plan by finding each of the missing angles, x , y and z .

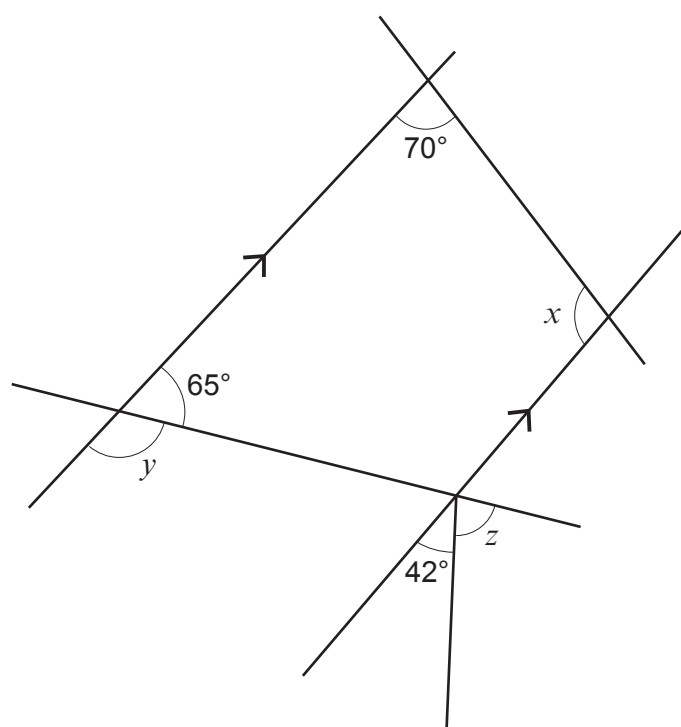


Diagram not drawn to scale

Calculate the size of each of the angles x , y and z .

[3]

$$x = 180^\circ - 70^\circ = 110^\circ \text{ (co-interior angles add up to } 180^\circ\text{)}$$

$$y = 180^\circ - 65^\circ = 115^\circ \text{ (angles on a straight line add up to } 180^\circ\text{)}$$

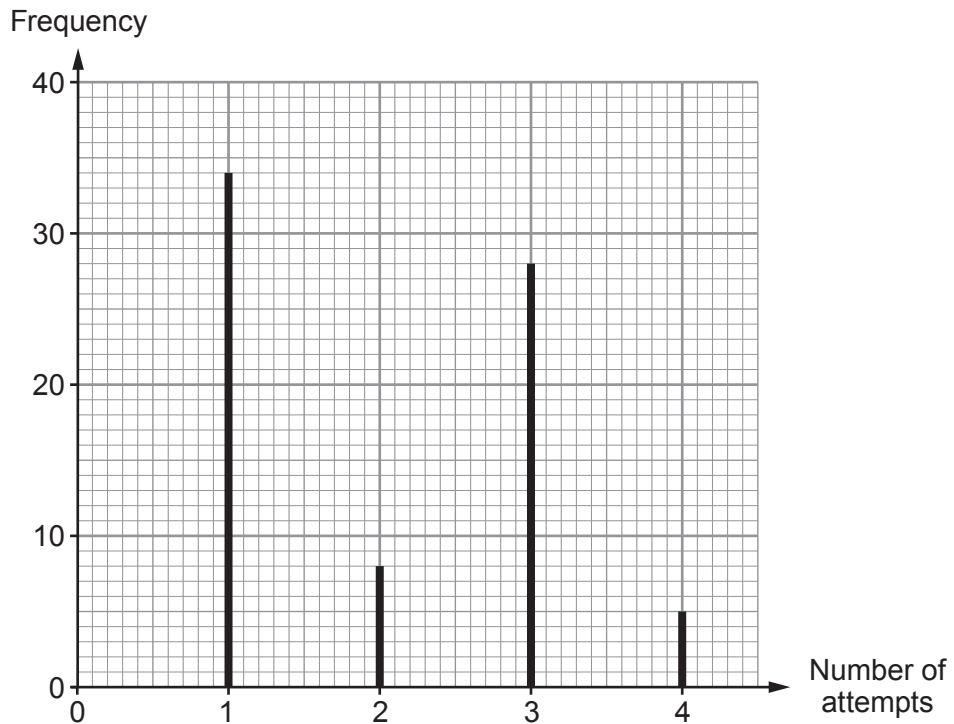
$$\text{Angle at bottom junction} = 115^\circ \text{ (corresponding angles), so } z = 115^\circ - 42^\circ = 73^\circ$$

$$x = 110^\circ \quad y = 115^\circ \quad z = 73^\circ$$



5. In an office, the ICT technician recorded the number of attempts each of 75 employees took to enter their correct password into a computer.

The results are displayed below.



- (a) What was the modal number of attempts taken to enter the correct password?
Circle your answer.

[1]

1

2

2.5

3

4

Highest bar is 1 attempt (34 employees)

- (b) What was the median number of attempts taken to enter the correct password?
Circle your answer.

[1]

1

2

2.5

3

4

75 employees: median is the 38th. 1 attempt: 34, up to 2 attempts: $34 + 8 = 42$



- (c) A further 10 employees attempted to enter their correct password into a computer. The median number of attempts for all these 85 employees is 3.

Did any of these 10 employees take fewer than 3 attempts to enter their correct password?

Yes

☐

No

☒

You must show working to support your answer.

[1]

Number of the first 75 employees taking fewer than 3 attempts = $34 + 8 = 42$

For 85 employees the median is the $(85 + 1) \div 2 = 43$ rd person.

If any of the 10 took fewer than 3 attempts, at least 43 people would have taken 1 or 2 attempts, so the median would be 2 or less, not 3.

So none of the 10 employees took fewer than 3 attempts.



6. (a) Rowan is going to make some muffins.

To make the muffins, he buys:

- muffin cases,
- ingredients,
- 1 flag per muffin, for decoration.



A pack of 16 muffin cases costs 22p.

The ingredients to make 6 muffins cost 25p.

A bag of 12 flags costs 40p.

Rowan buys 4 bags of flags.

Rowan plans to make as many muffins as possible and have no cases, ingredients or flags left over.

He will sell the muffins for 30p each.

Calculate Rowan's profit when he sells all the muffins he makes.

You must show all your working.

[8]

$$\text{Number of muffins} = \text{number of flags} = 4 \times 12 = 48$$

$$(48 \div 16 = 3 \text{ packs of cases and } 48 \div 6 = 8 \text{ lots of ingredients, none left over})$$

$$\text{Cost of flags} = 4 \times 40p = 160p$$

$$\text{Cost of muffin cases} = 3 \times 22p = 66p$$

$$\text{Cost of ingredients} = 8 \times 25p = 200p$$

$$\text{Total cost} = 160p + 66p + 200p = 426p$$

$$\text{Money from selling the muffins} = 48 \times 30p = 1440p$$

$$\text{Profit} = 1440p - 426p = 1014p$$

$$\text{Rowan's profit is } 1014p = \text{£}10.14$$



- (b) Gerry makes biscuits.
Each box of biscuits costs him 80p to make.
He sells them for £4 a box.

Calculate the percentage profit Gerry makes on each box sold.

[2]

$$\text{Profit on each box} = 400p - 80p = 320p$$

$$\text{Percentage profit} = 320 \div 80 \times 100 = 4 \times 100$$

$$= 400\%$$

- (c) Chloe makes flapjacks.
A pack of flapjacks costs Chloe 60p to make.
She sells the flapjacks for a profit of 30%.
For how much does Chloe sell a pack of flapjacks?
Circle your answer.

[1]

90p

66p

72p

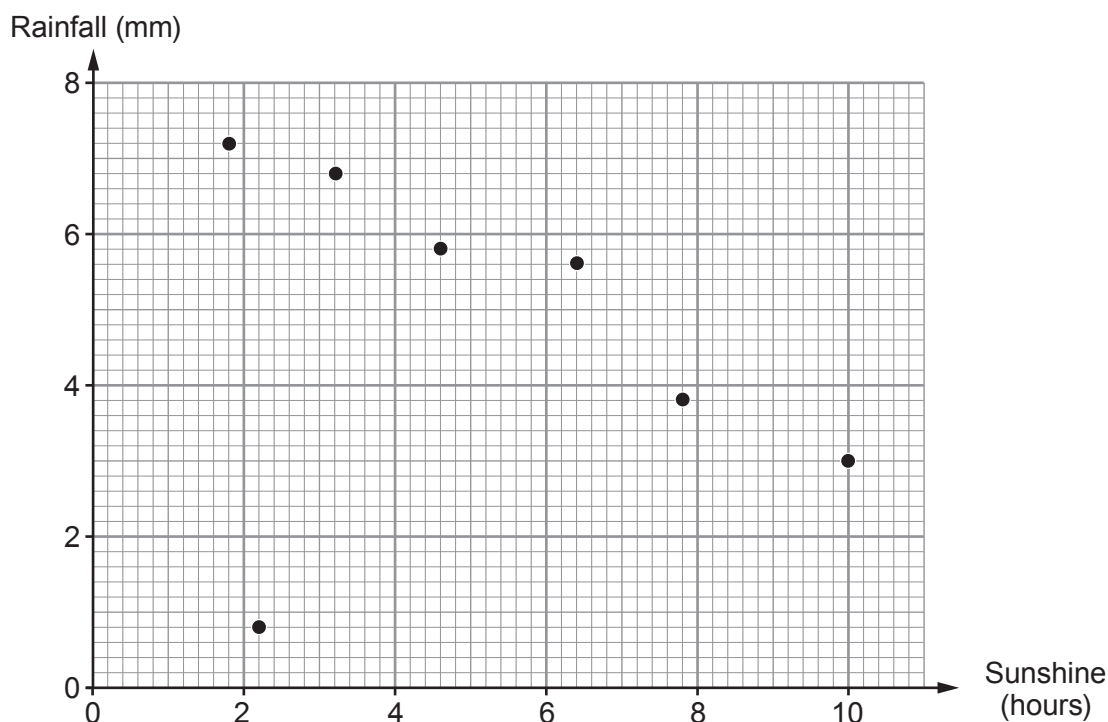
78p

42p

$$10\% \text{ of } 60p = 6p, \text{ so } 30\% = 18p. \quad 60p + 18p = 78p$$



7. (a) Rosie recorded the rainfall and the number of hours of sunshine each day last week.



- (i) On one day last week, the number of hours of sunshine was low and the rainfall was lower than on any other day. Which day was it? Circle your answer. [1]

Saturday

Sunday

Monday

Tuesday

Can't tell

- (ii) Rosie says,

There will be a positive correlation between rainfall and the number of hours of sunshine next week.

Is Rosie correct?

Yes

☐

No

☒

You must give a reason for your answer. [1]

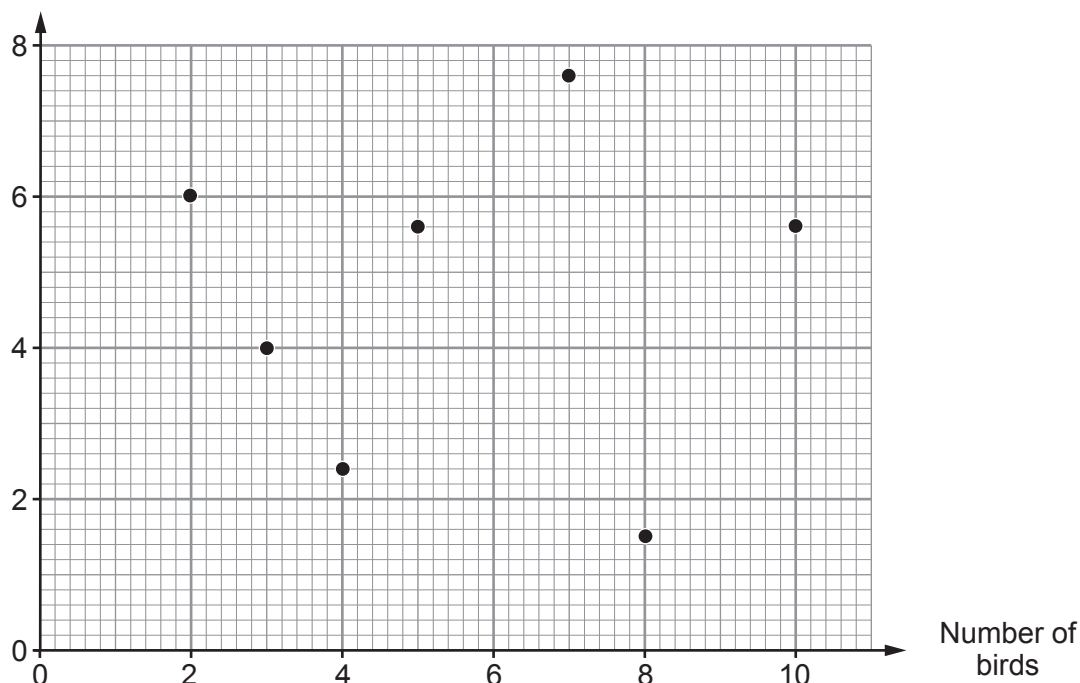
No. You cannot tell what will happen next week from last week's data.

Last week's graph shows negative correlation (more sun, less rain).



- (b) At 3 p.m. each day last week, Rosie recorded the wind speed and the number of birds feeding in her garden.

Wind speed (mph)



- (i) Was there a correlation between wind speed and the number of birds feeding in Rosie's garden last week?

Yes

☐

No

☒

You must give a reason for your answer.

[1]

No. The points are scattered randomly, there is no pattern or trend.

- (ii) The greatest wind speed at 3 p.m. last week was on Tuesday.
How many birds were feeding in Rosie's garden at this time?

[1]

..... 7 birds

- (iii) On Wednesday last week, the wind speed at 3 p.m. was a quarter of that on Friday.
Complete the following table.

[2]

Day	Wind speed (mph)
Wednesday	 <u>1.5</u>
Friday	 <u>6</u>

Friday = 6
 $6 \div 4 = 1.5$



8. Albert, Terri and Gareth are going camping.

- (a) Albert, Terri and Gareth paid for a tent between them.
The amount they each paid for the tent was in the ratio 1 : 4 : 6 respectively.
Gareth paid £66.36 towards the tent.

Calculate the cost of the tent.

[3]

$$\text{Gareth's 6 shares} = £66.36$$

$$1 \text{ share} = £66.36 \div 6 = £11.06$$

$$\text{Total shares} = 1 + 4 + 6 = 11$$

$$\text{Cost of tent} = 11 \times £11.06 = £121.66$$

$$(110.60 + 11.06 = 121.66)$$

$$\text{The tent cost } £121.66$$

- (b) The charge to stay at a campsite has increased by 5% each year for the last two years.
Two years ago, the charge was £24 per night for a large tent and three people.

Calculate the current charge per night for a large tent and three people.
You must show all your working.

[4]

First year:

$$5\% \text{ of } £24 = £24 \div 20 = £1.20$$

$$\text{Charge after 1 year} = £24 + £1.20 = £25.20$$

Second year:

$$10\% \text{ of } £25.20 = £2.52, \text{ so } 5\% = £1.26$$

$$\text{Charge after 2 years} = £25.20 + £1.26 = £26.46$$

$$\text{The current charge per night is } £26.46$$



(c) The diagram shows the groundsheet of a tent.

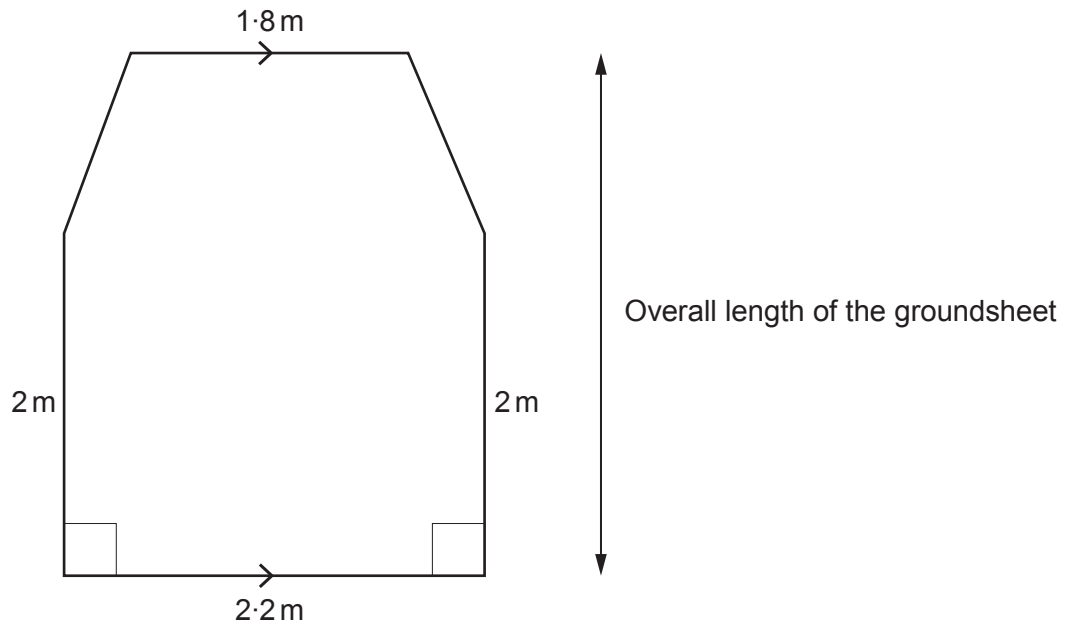


Diagram not drawn to scale

The area of the groundsheet is 6.8 m^2 .
The width of the groundsheet is 2.2 m .
Calculate the overall length of the groundsheet.

[4]

$$\text{Area of rectangle} = 2.2 \times 2 = 4.4 \text{ m}^2$$

$$\text{Area of trapezium} = 6.8 - 4.4 = 2.4 \text{ m}^2$$

$$\text{Area of trapezium} = \frac{1}{2} \times (2.2 + 1.8) \times h$$

$$\frac{1}{2} \times 4 \times h = 2.4$$

$$2 \times h = 2.4$$

$$h = 1.2 \text{ m}$$

$$\text{Overall length} = 2 + 1.2 = 3.2 \text{ m}$$

The overall length of the groundsheet is 3.2 m



9. The scale diagram below shows Haydn's garden.

His garden is 27 metres long and 18 metres wide.
The scale used is **1 cm represents 3 metres**.

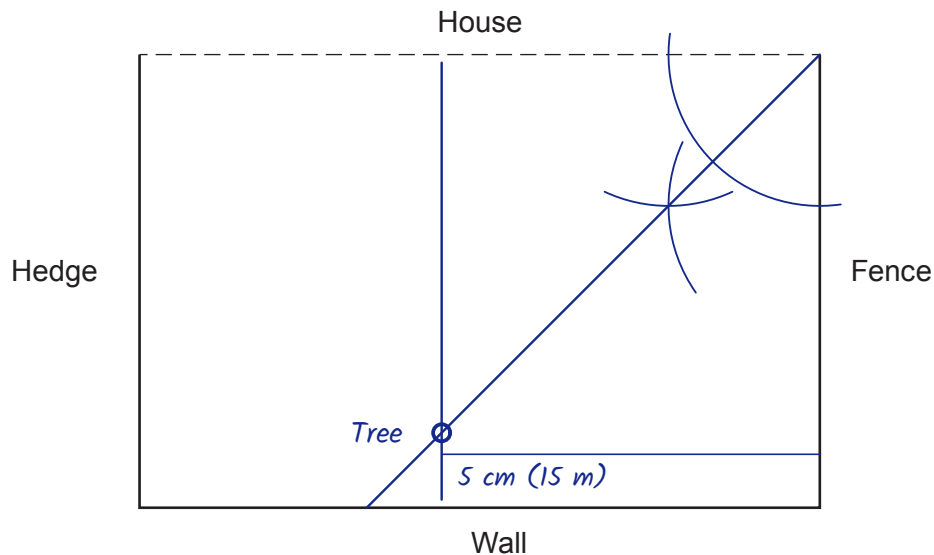
Haydn is planting a tree in his garden.

He decides that the tree must be planted:

- 15 metres from the fence,
- equidistant from the house and the fence.

Draw suitable lines on the diagram and show where Haydn should plant the tree. [3]

1 cm represents 3 metres



15 m ÷ 3 = 5 cm, so I drew a line 5 cm from the fence.

Equidistant from the house and the fence: bisector of the angle between the house and the fence.

The tree is planted where the two lines cross.



10. There are 600 pupils in a school.
8 of these pupils are to be selected to discuss changes to the school uniform.

The headteacher has a spreadsheet of the names of all 600 pupils.
There are 600 rows of pupil names in the spreadsheet, starting at row 1.
There is one pupil name on each row.

The headteacher uses a systematic sampling method.

- (a) The first pupil selected on the headteacher's list is a boy whose name is in the 25th row.

Give the row numbers in the spreadsheet of the other 7 pupils who would be selected.
Complete the table below. [2]

Sampling interval = $600 \div 8 = 75$

Add 75 each time: 25, 100, 175, 250, 325, 400, 475, 550

Pupil	1st	2nd	3rd	4th	5th	6th	7th	8th
Row in the spreadsheet	25th	<i>100</i>	<i>175</i>	<i>250</i>	<i>325</i>	<i>400</i>	<i>475</i>	<i>550</i>

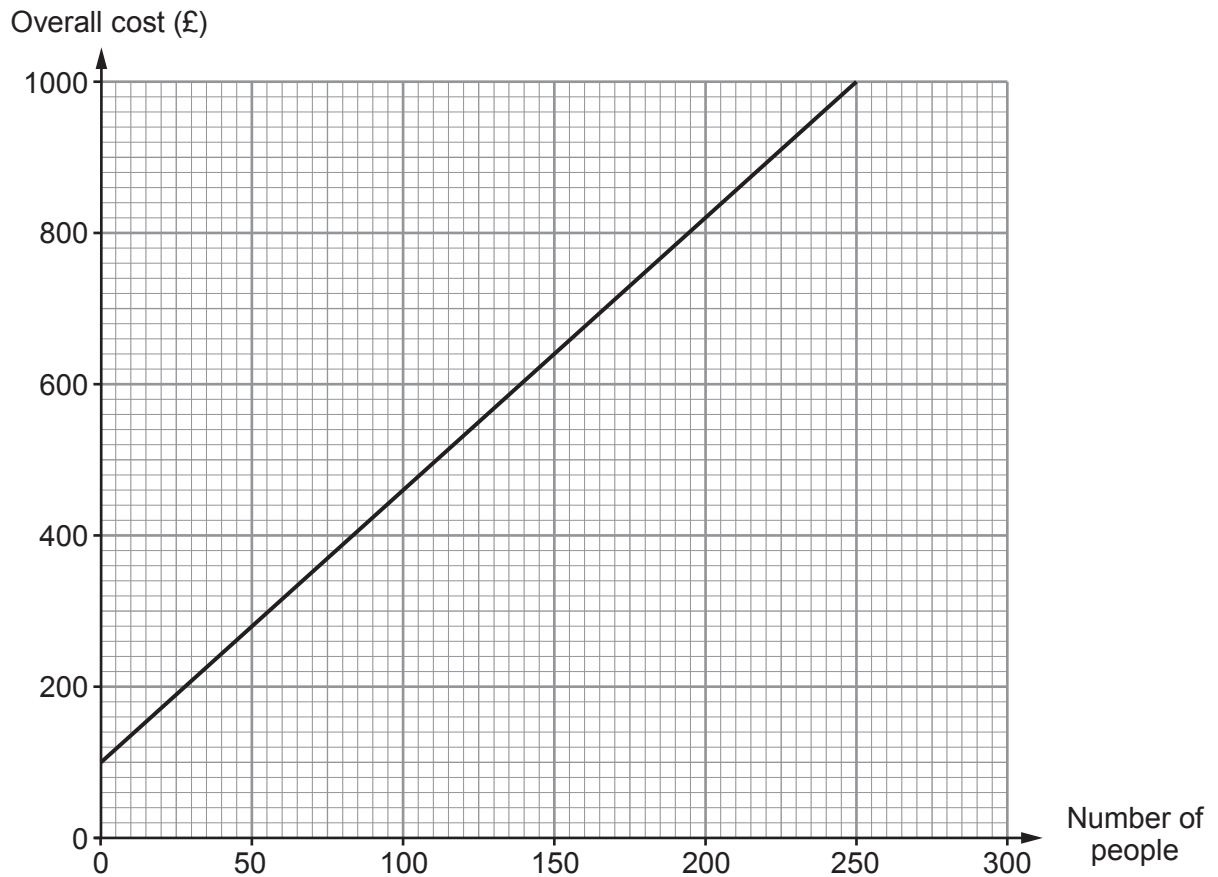
- (b) Explain how the headteacher selected the first pupil. [1]

*The headteacher chose a random number from 1 to 75 (the first 75 rows),
which was 25, and then selected every 75th row after that.*



11. Meinir is planning a charity event to be held at a hotel.

A section of a straight line graph showing the hotel charges for this event is shown below. These charges include a single payment for the room hire and the cost of one drink for each person attending.



Meinir decides to pay the room hire cost herself.

She decides to price the tickets so that she will be able to make £500 to give to charity.



- (a) Calculate the selling price of each ticket if Meinir plans the event for 50 people. [3]

From the graph, room hire (0 people) = £100

Overall cost for 50 people = £280

Cost of drinks for 50 people = £280 - £100 = £180

Money needed from tickets = £180 + £500 = £680

Ticket price = £680 ÷ 50 = £13.60

Each ticket should be sold for £13.60

- (b) Calculate the selling price of each ticket if Meinir plans the event for 400 people. [3]

Cost of one drink = £180 ÷ 50 = £3.60

Charity money per person = £500 ÷ 400 = £1.25

Ticket price = £3.60 + £1.25 = £4.85

(Check: $400 \times £4.85 = £1940 = 400 \times £3.60 + £500$)

Each ticket should be sold for £4.85



12. (a) A square piece of card measures 1 m by 1 m.

Calculate the area of this piece of card.
Give your answer in **standard form** in mm^2 .

[2]

$$1 \text{ m} = 1000 \text{ mm}$$

$$\text{Area} = 1000 \times 1000 = 1\,000\,000 \text{ mm}^2$$

$$1 \times 10^6 \text{ mm}^2$$

- (b) Some fabric shrinks when it is washed.

A piece of fabric is washed twice.

After the first wash, the area of the fabric is 75% of the area of the original piece of fabric.
After the second wash, the area of the fabric is 90% of the area of the fabric after the first wash.

After these two washes, the area of the fabric is 2700 cm^2 .

Calculate the area of the original piece of fabric.

[4]

After two washes the area is 90% of 75% of the original.

$$\text{Area after the first wash} = 2700 \div 0.9 = 27000 \div 9 = 3000 \text{ cm}^2$$

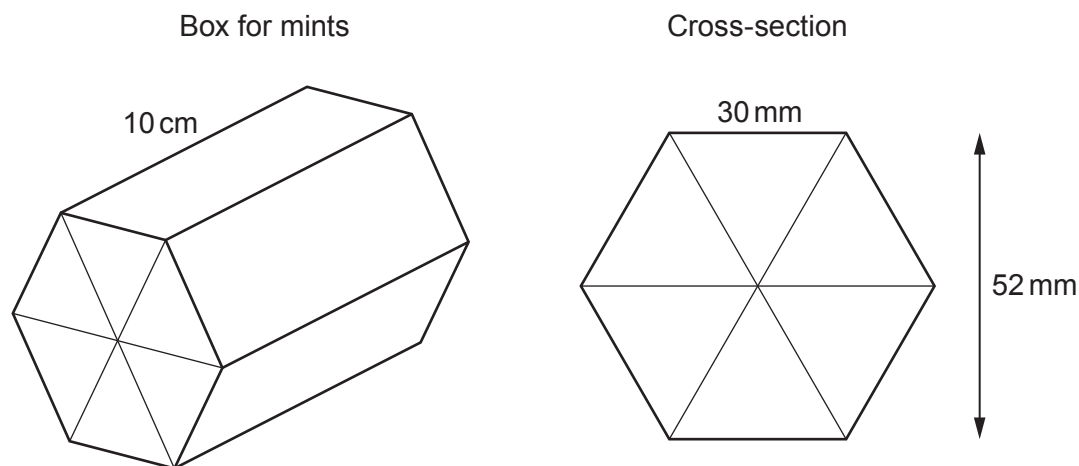
$$\text{Original area} = 3000 \div 0.75 = 3000 \div 3 \times 4$$

$$= 1000 \times 4 = 4000 \text{ cm}^2$$

The area of the original piece of fabric is 4000 cm^2



13. A box for mints is to be made in the shape of a hexagonal prism. The cross-section of the box is a regular hexagon. The volume of the box must be greater than $230\,000\text{ mm}^3$.



Diagrams not drawn to scale

Using the measurements above, show that this would make a suitable box for the mints. You must show all your working.

[5]

The hexagon is made of 6 equal triangles.

Each triangle: base = 30 mm, height = $52 \div 2 = 26$ mm

Area of one triangle = $\frac{1}{2} \times 30 \times 26 = 15 \times 26 = 390\text{ mm}^2$

Area of cross-section = $6 \times 390 = 2340\text{ mm}^2$

Length of box = 10 cm = 100 mm

Volume of box = area of cross-section $\times$ length

= $2340 \times 100 = 234\,000\text{ mm}^3$

$234\,000\text{ mm}^3 > 230\,000\text{ mm}^3$

The volume is greater than $230\,000\text{ mm}^3$, so this would make a suitable box for the mints.



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