

Set B: Review Materials – Junior Certificate Strand 1 and Strand 2

Before you attempt these questions have a look at the “Geometry and Trigonometry Tutorial”

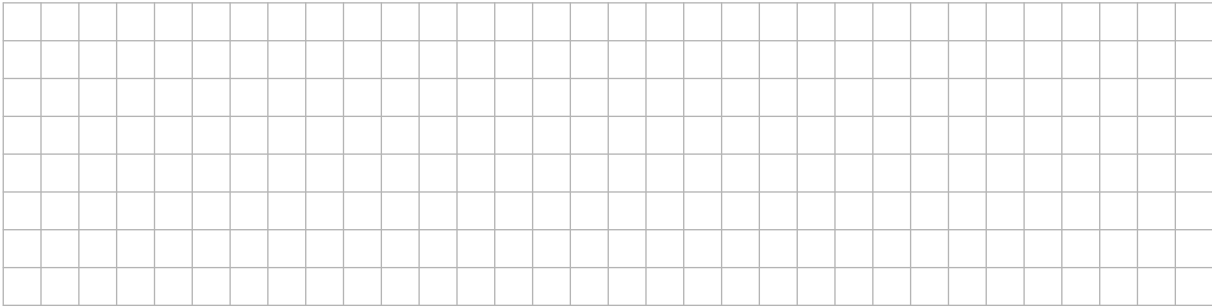
**https://emea67395290.adobeconnect.com/_a858841383/maths/
the Using Geometry and Trigonometry to solve problems
presentation**

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229/presentation](https://emea67395290.adobeconnect.com/_a858841383/p15113229/presentation)**

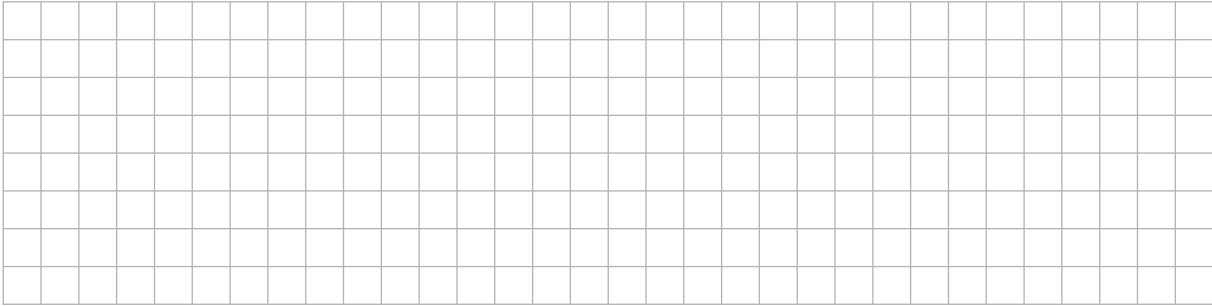
and the *concept of slope* presentation.

This set of questions; compiled in two documents are intended to help you as you review your work in preparation for Paper 2 in the Junior Certificate examination. They are not intended to be exact matches of what will come up in the exam but they should give you a flavour of how the concepts can be examined in context. Other questions and activities can be found in the Mathematics Resources for Students on the student zone at www.ncca.ie/projectmaths

(c) Choose three sticks that will make a right-angled triangle.



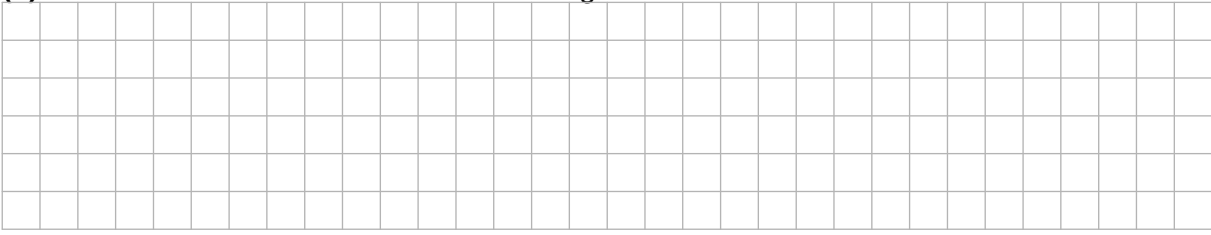
(d) Choose three other sticks which will also make a right-angled triangle.



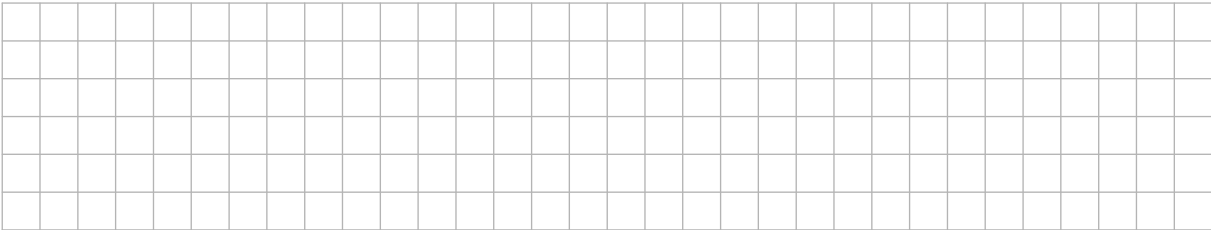
(e) Show how you know that, in each of these cases, the sticks will make a right-angled triangle.



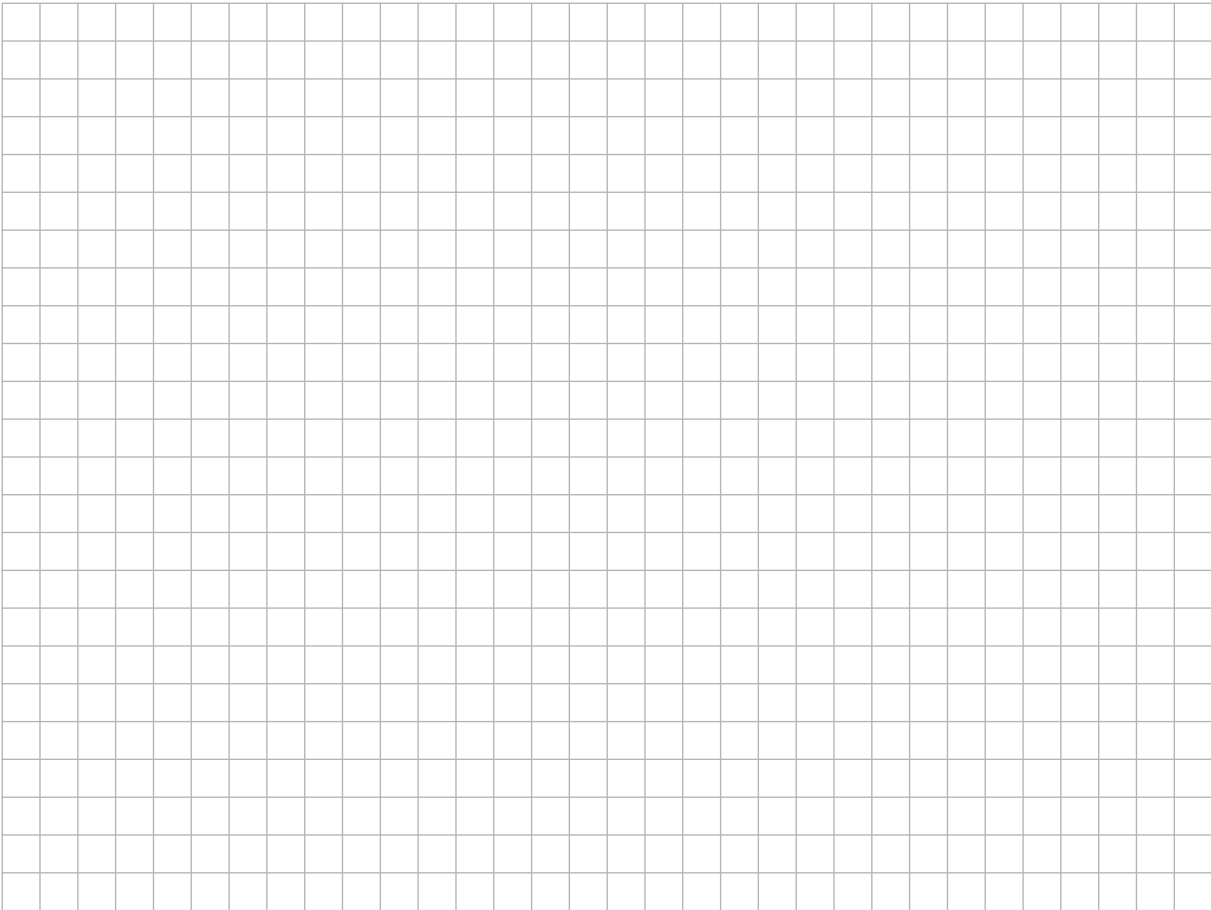
(c) Choose three sticks that will make a triangle?



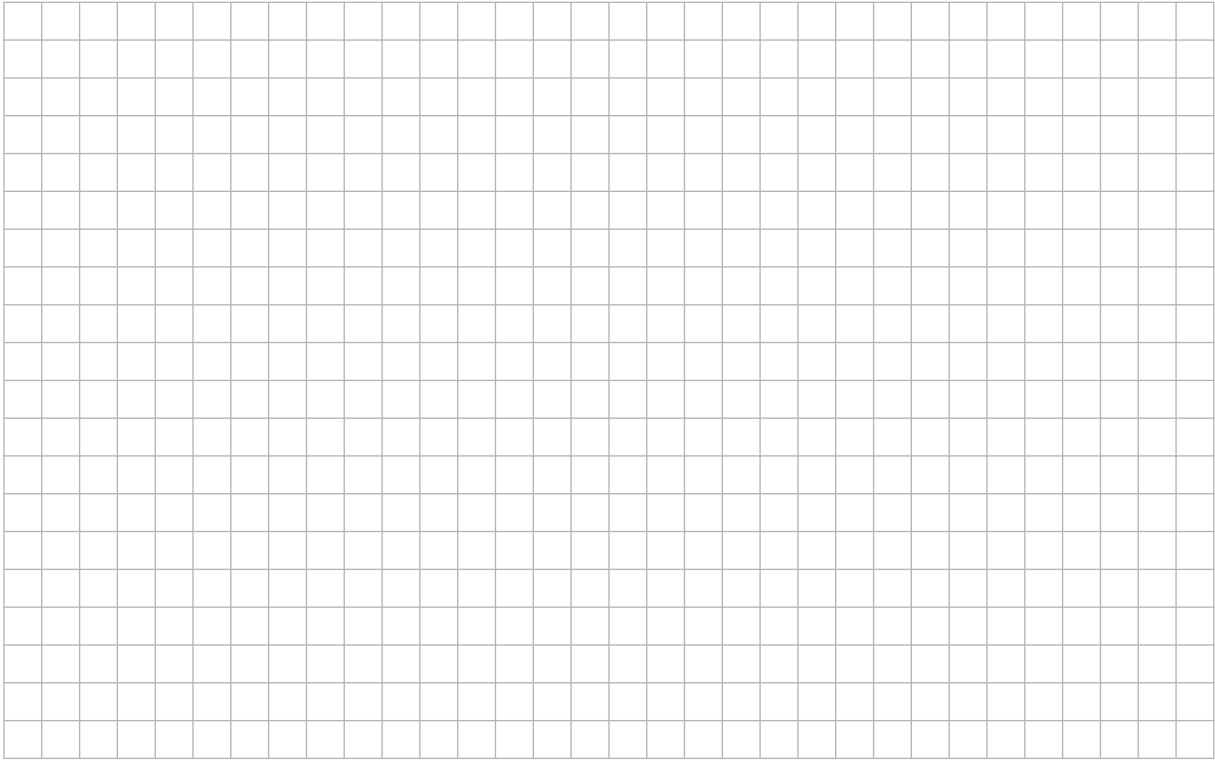
(d) Choose three other sticks that will also make a triangle?



Accurately construct one of the triangles using the measurements that you have chosen. Show all your construction marks.



Proof:

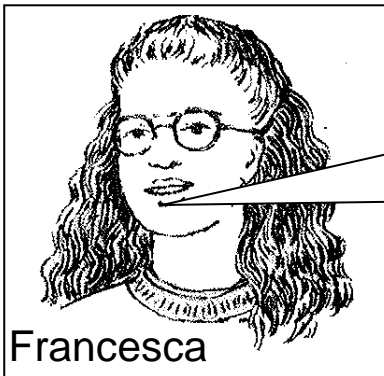
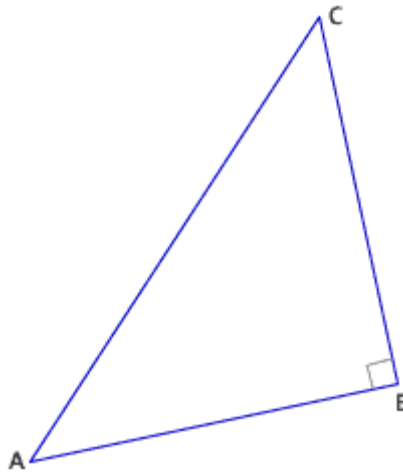


Note: The proof of this theorem is not examinable. However, you should be able to set out your explanation using the sequence of thinking that was involved in the task above.

Task 3: JCOL

Francesca and Leo were dissecting shapes and rearranging them to form new shapes. One of their tasks is shown below

Transform this right-angled triangle into a rectangle by dissecting it and rearranging the parts.



Francesca

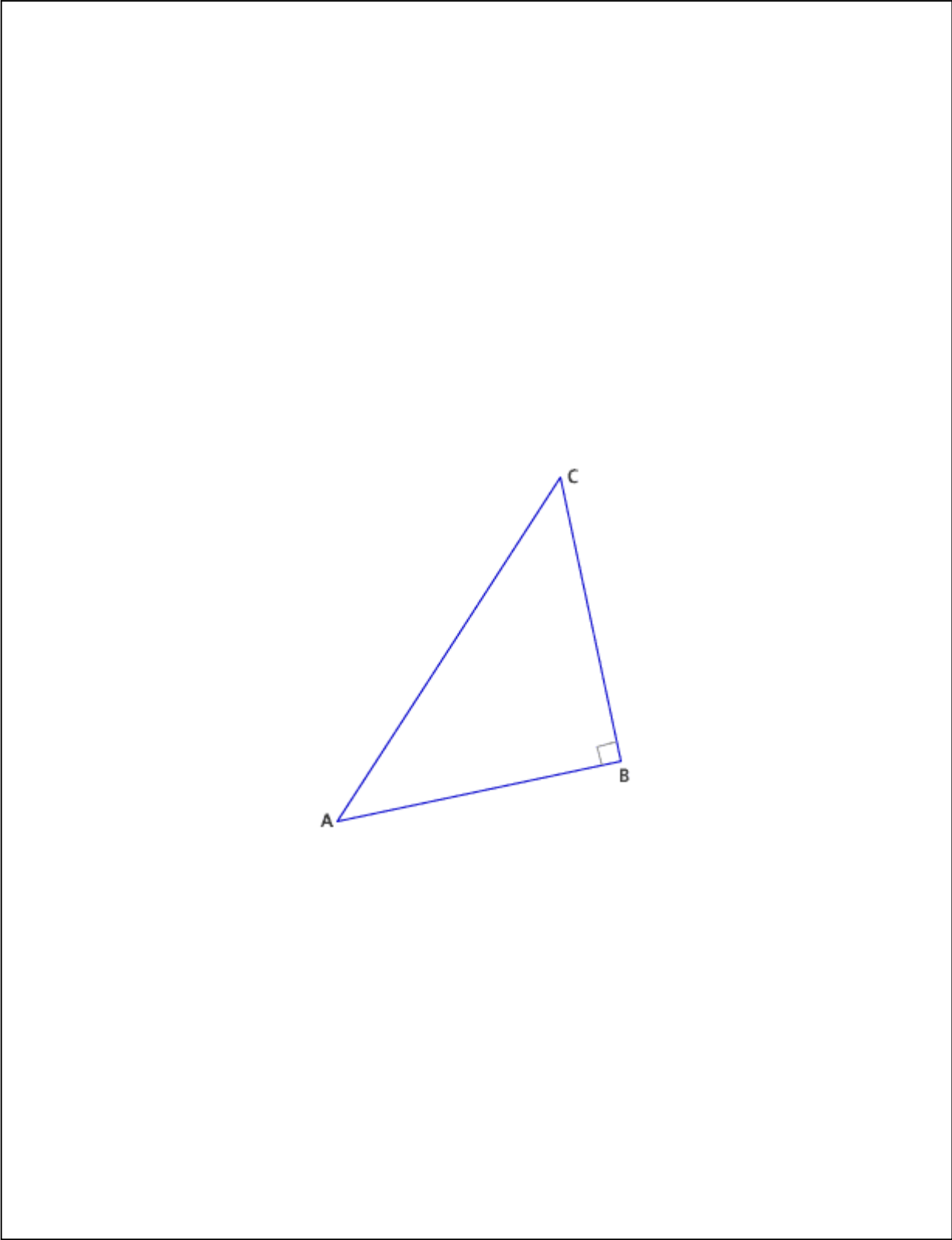
Construct the perpendicular bisector of CB. Label the midpoint of CB as the point D and the point of intersection of the bisector and AC as the point E.



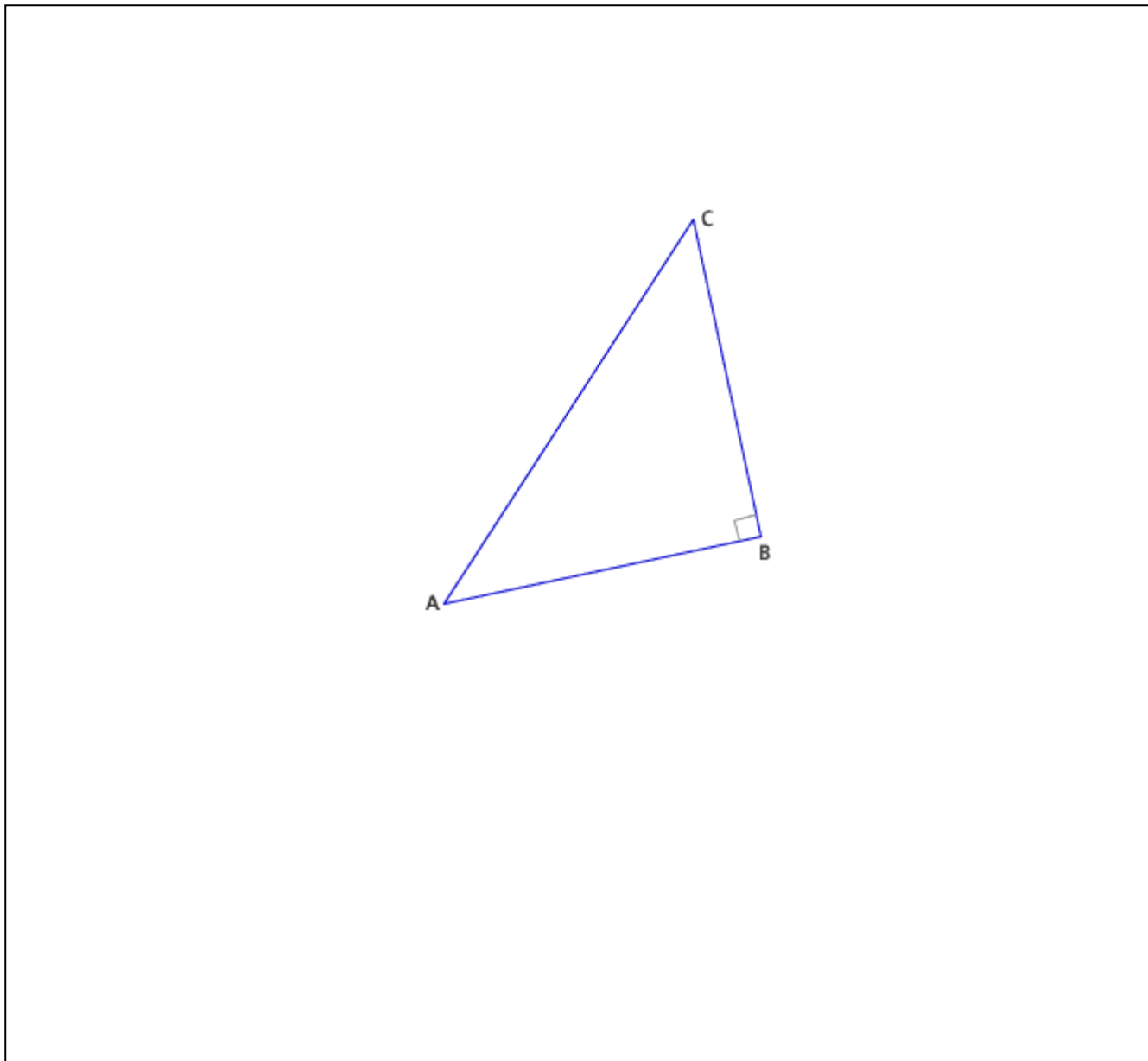
Leo

Yes I see... If we cut off the little triangle CED and sort of turn it so that CE lines up with AE. They are equal 'cos of that **theorem**. Then we will have a rectangle.

On the diagram below accurately follow Francesca's instructions. Show all construction marks clearly.



(a) Accurately complete Leo's instructions in the box below



(b) What theorem was Leo referring to when he said “ .. CE will line up with AE . They are equal ‘cos of that theorem...”

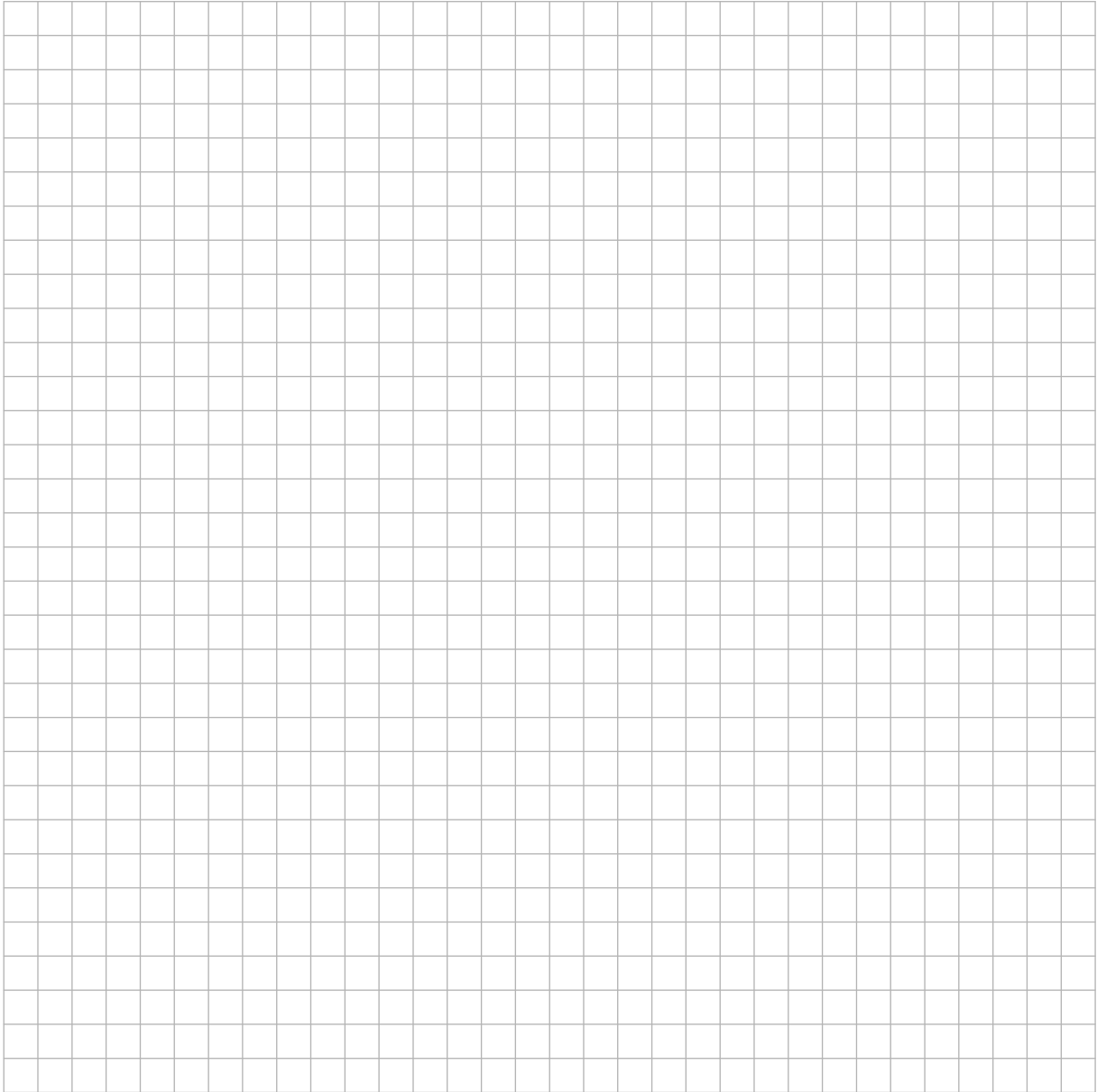
Why are CE and AE equal?

(c) Leo says that the re-arranged shapes will make a rectangle.

Do you agree with Leo?

Explain your thinking. You will need to write down some

properties of a rectangle and show how the figure Leo ends up with has these **properties**.



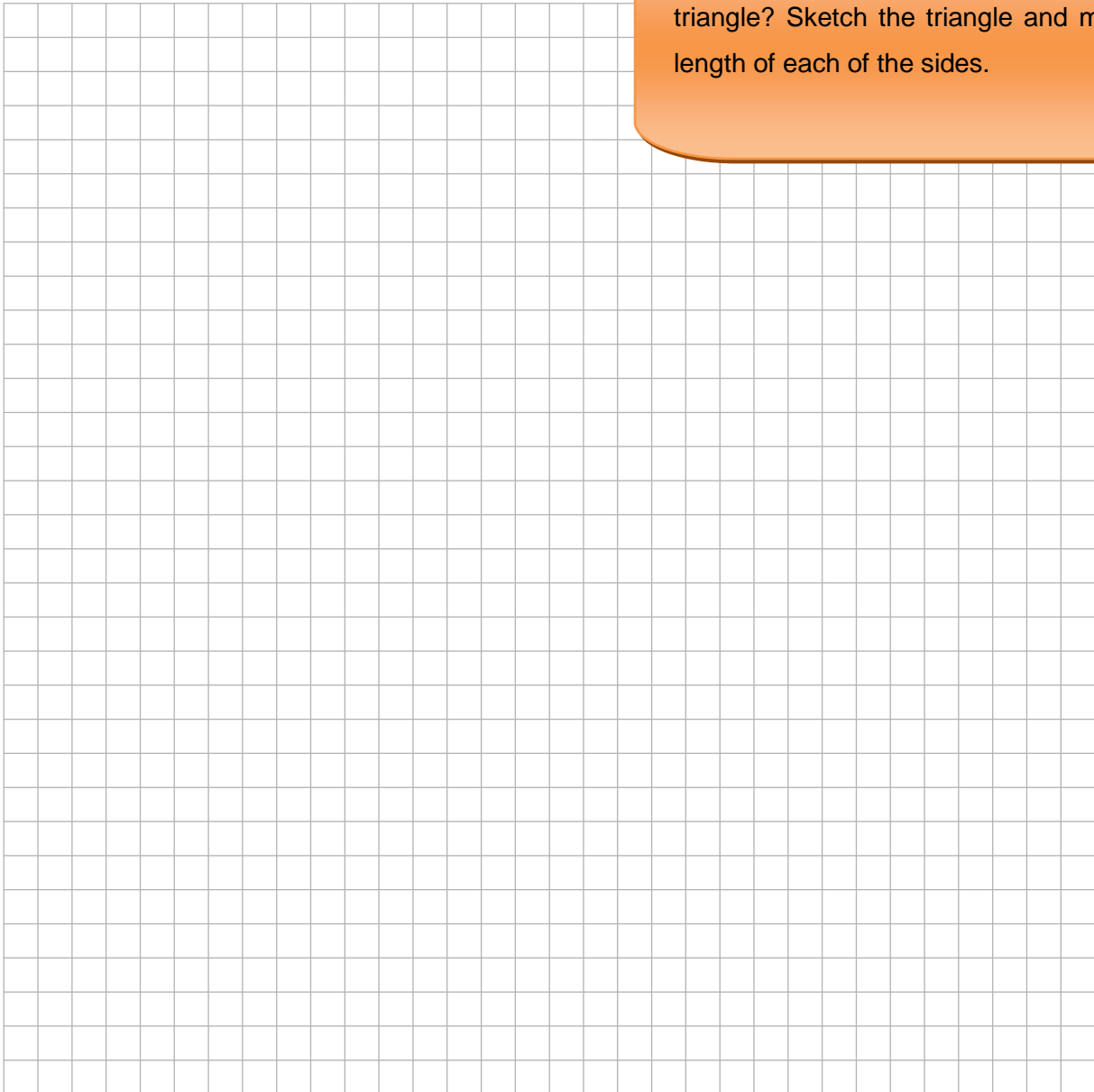
Task 4: JCHL

Calculate the height of

(a) an equilateral triangle of side length x

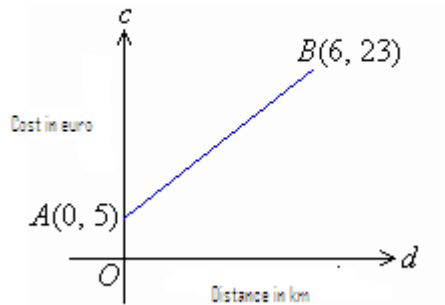
(b) an isosceles triangle of side lengths x and y

What are the properties of an isosceles triangle? Sketch the triangle and mark the length of each of the sides.

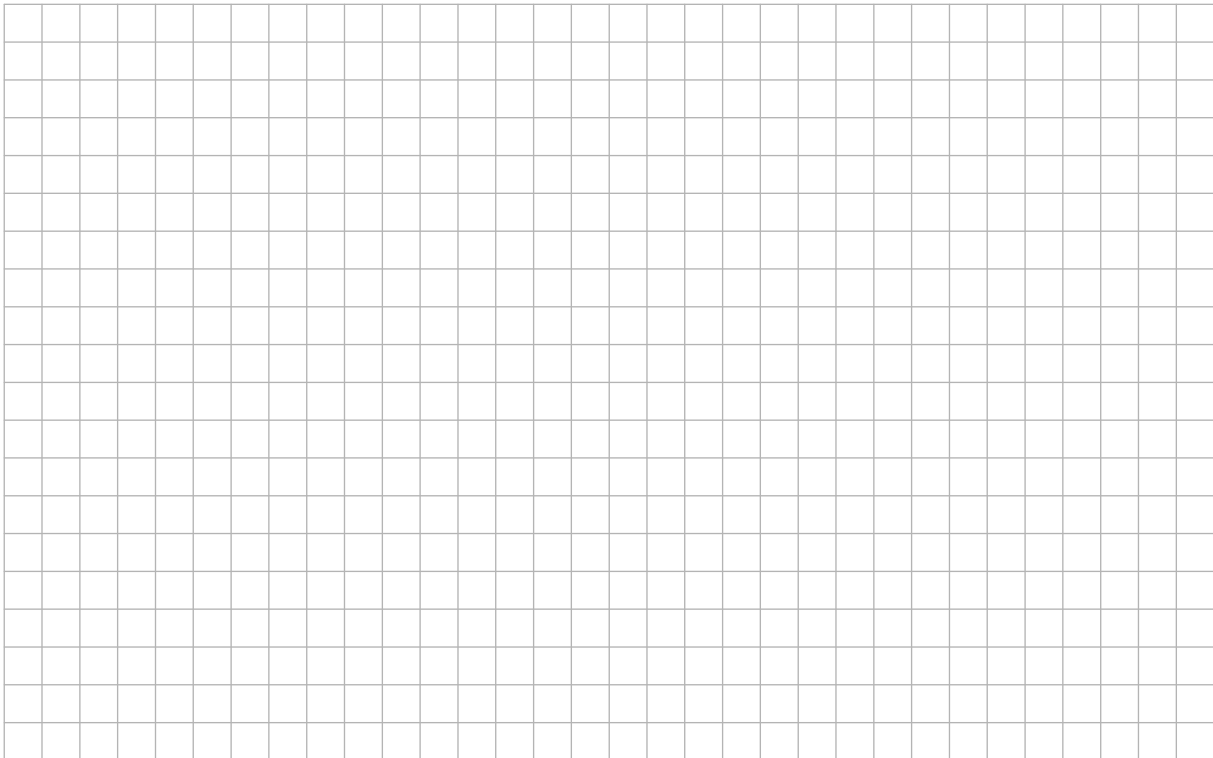


Task 5: JCHL

The cost of transporting documents by courier can be represented by the following straight line graph.

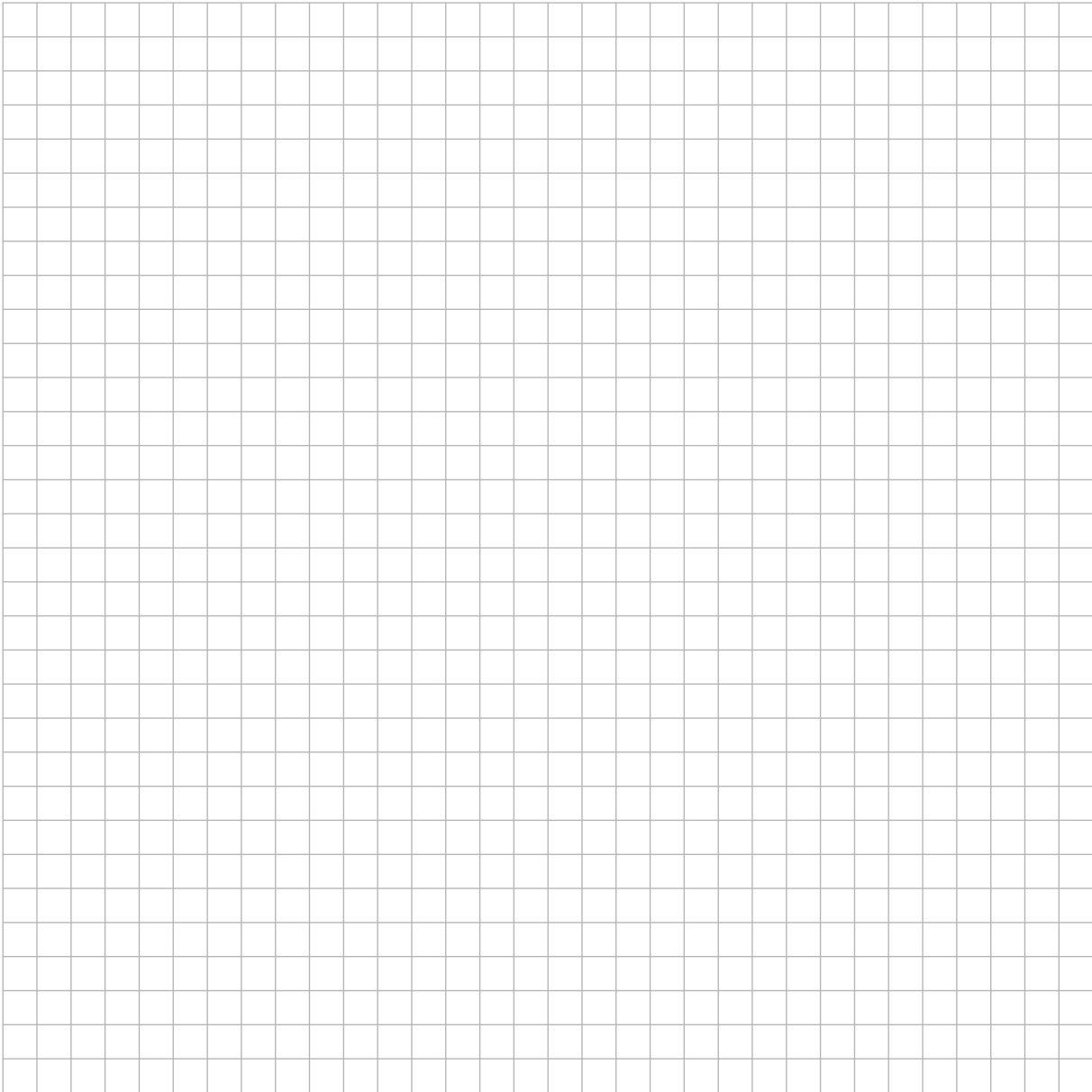


Use the graph to help you work out how the courier charges customers.



Can the second company stand by their claim of being the cheapest courier in town?

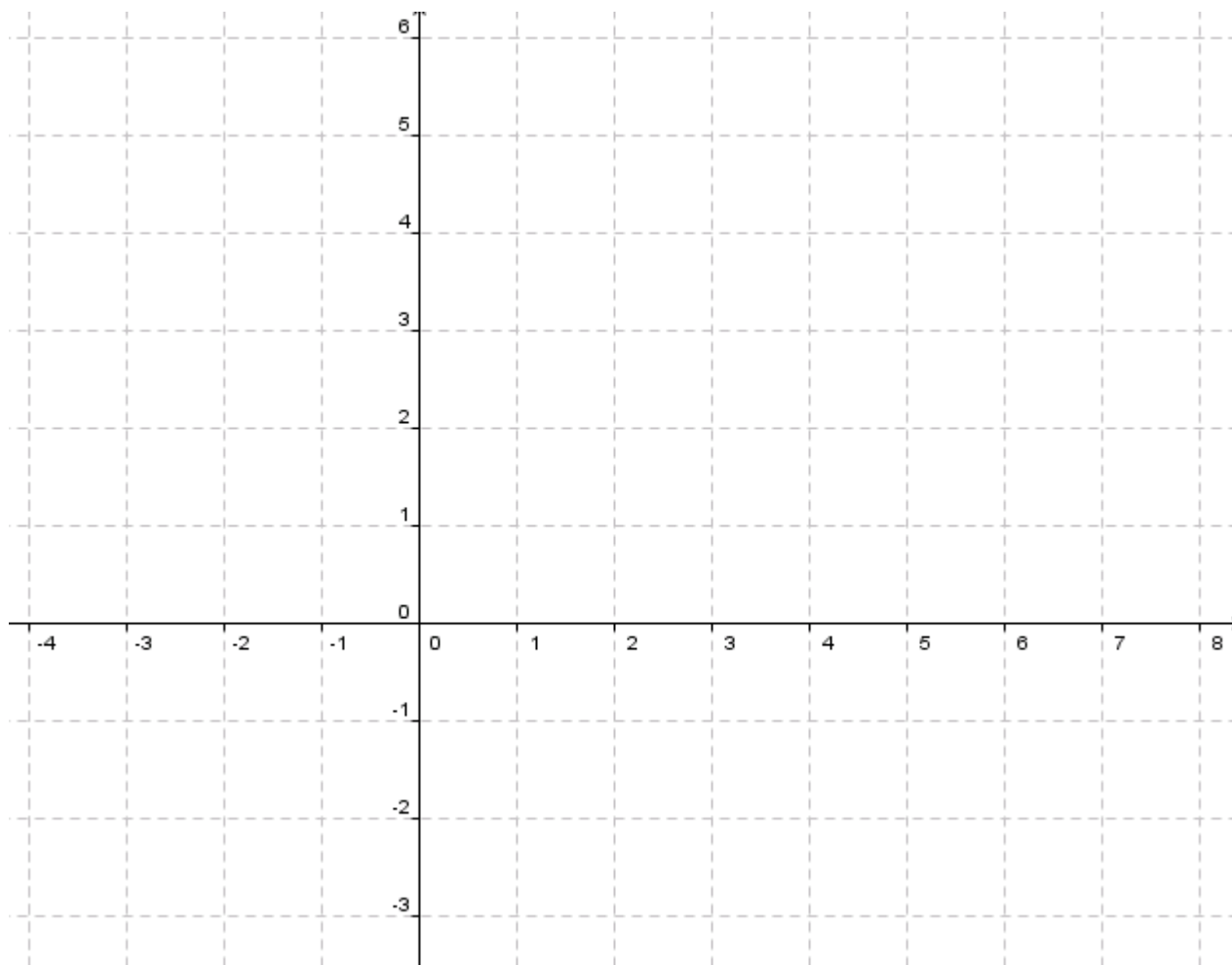
Justify your answer by referring to a graphical representation of each company's charges.



Task 6: JCFL

Draw the following shapes on the coordinate axes.

- a square
- a right angled triangle
- an isosceles triangle
- a parallelogram



Write down the co-ordinates of the **vertices** of each shape

Square (.....,) (.....,) (.....,) (.....,)

Right- angled triangle (.....,) (.....,) (.....,)

Isosceles triangle (.....,) (.....,) (.....,)

Parallelogram (.....,) (.....,) (.....,) (.....,)

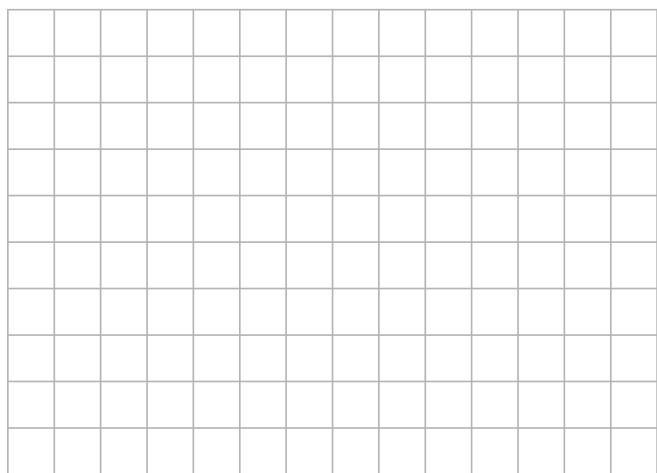
Task 7: JCOL

You're locked out of your house and the only open window is on the second floor, **7m** above the ground. You need to borrow a ladder from one of your neighbours. There's a bush along the edge of the house, so you'll have to place the bottom of the ladder **3m** from the house. What length of ladder do you need to reach the window?

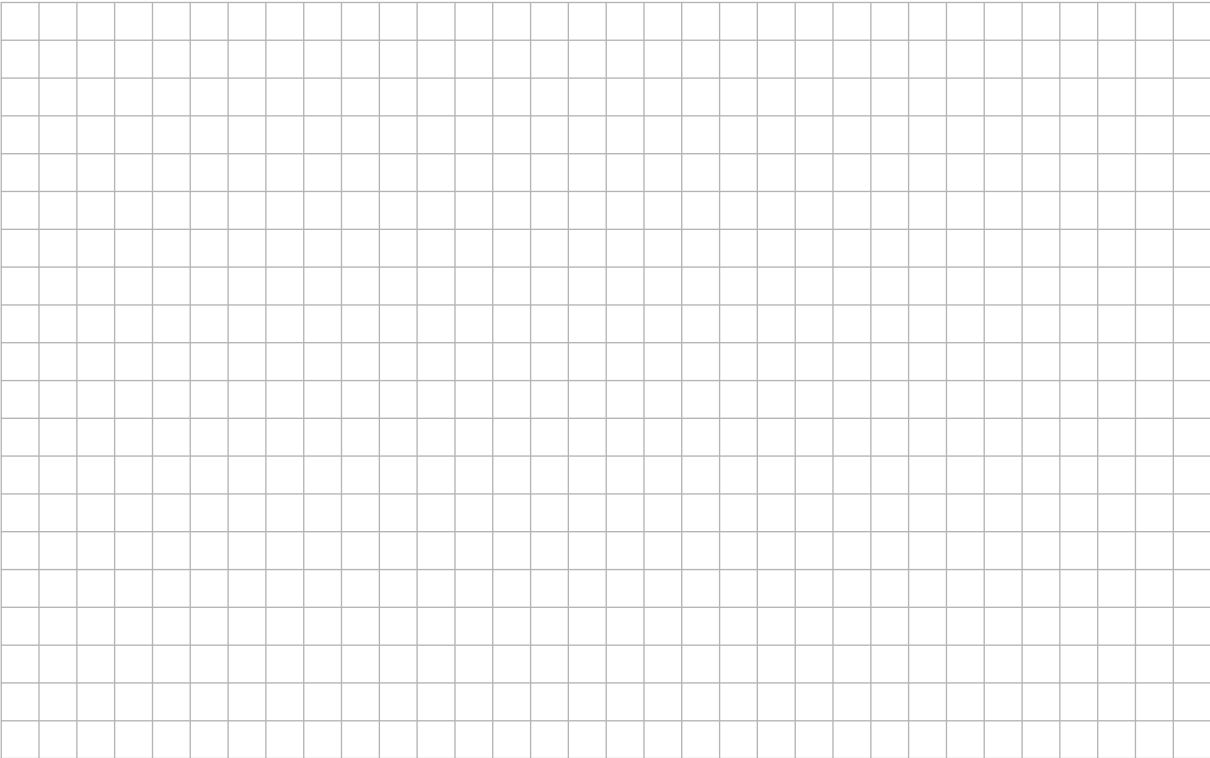


Sketch a mathematical diagram. Use straight lines to represent the **wall of the house**, the **ladder** and the **ground**. Mark each line with the correct measurement. If you do not know the measurement mark it x .

Use your geometry to calculate the length of the ladder needed.

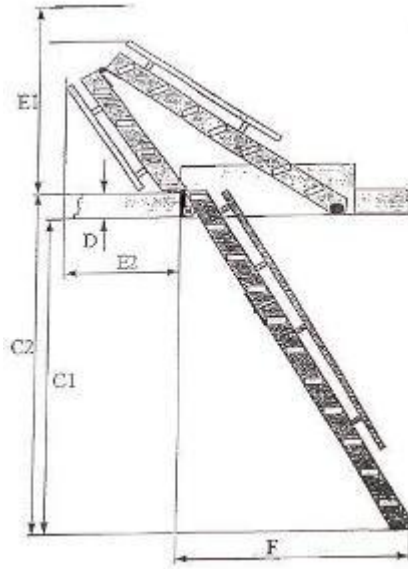
	
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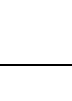




Does the angle the ladder makes with the horizontal depend on the height of the object it is leaning up against? Explain your answer.

A large grid of graph paper, consisting of 20 columns and 20 rows of small squares, intended for writing an answer to the question above.

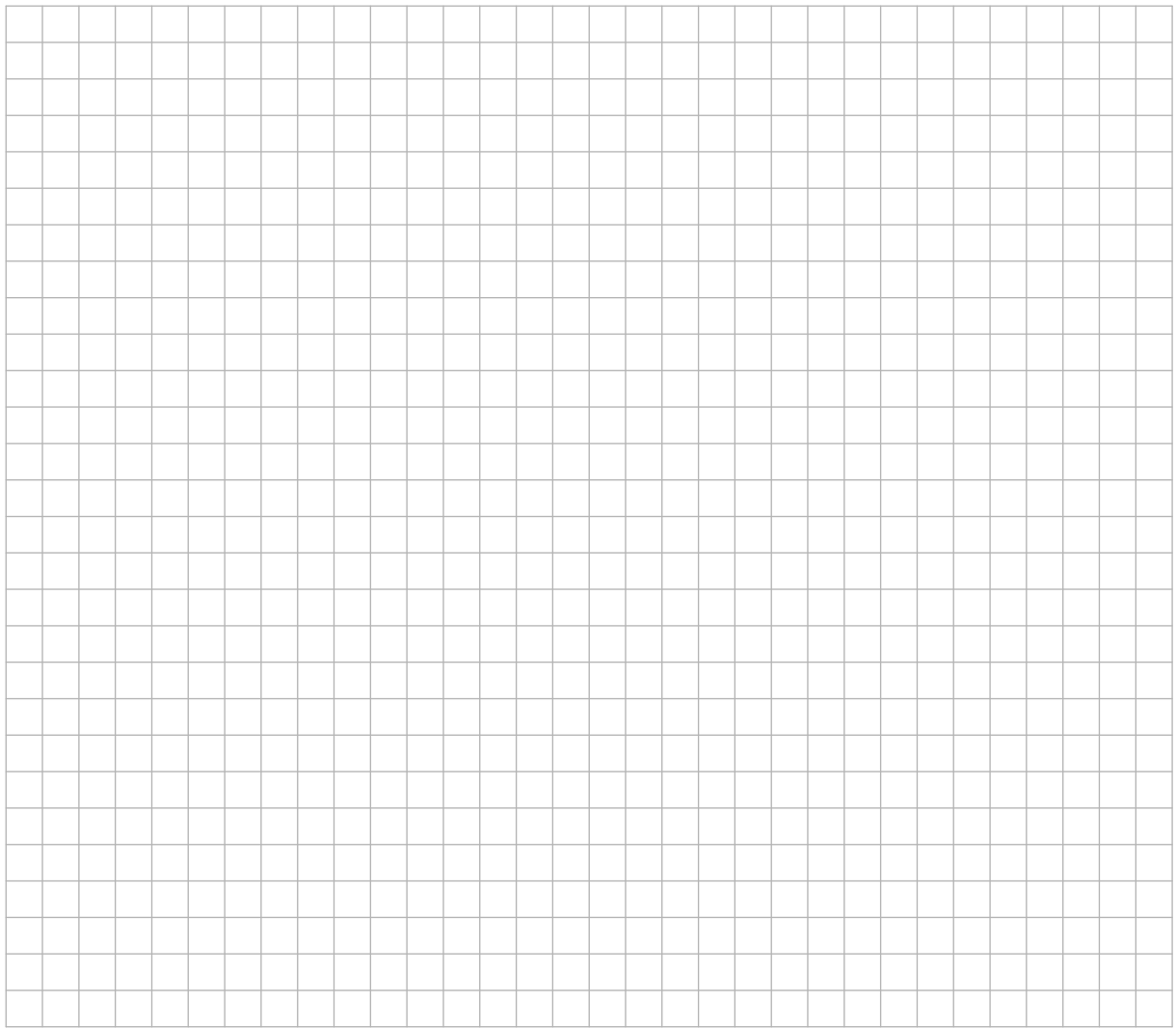
Task 9: JCHL

An installation guide for the *Sandringham Electric Attic ladder* is shown below

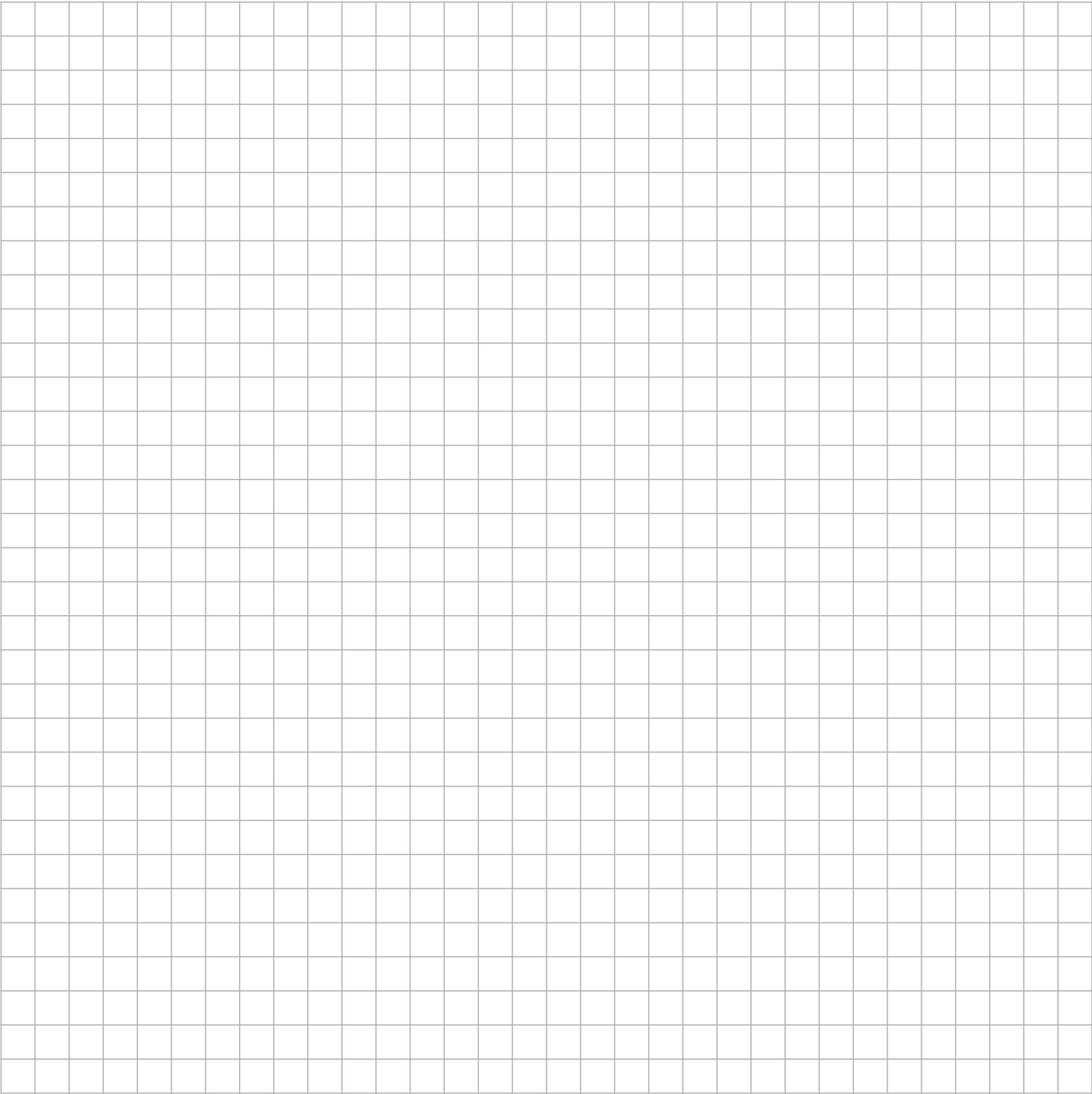


Ladder Size	Floor to Floor Height C_2	Storage swing and Height	Horizontal Distance F
	250cm	145cm	159cm
Length  cm	260cm	155cm	166cm
	270cm	 cm	173cm
	280cm	175cm	180cm
Length 150cm	 cm	146cm	166cm
	280cm	166cm	 cm

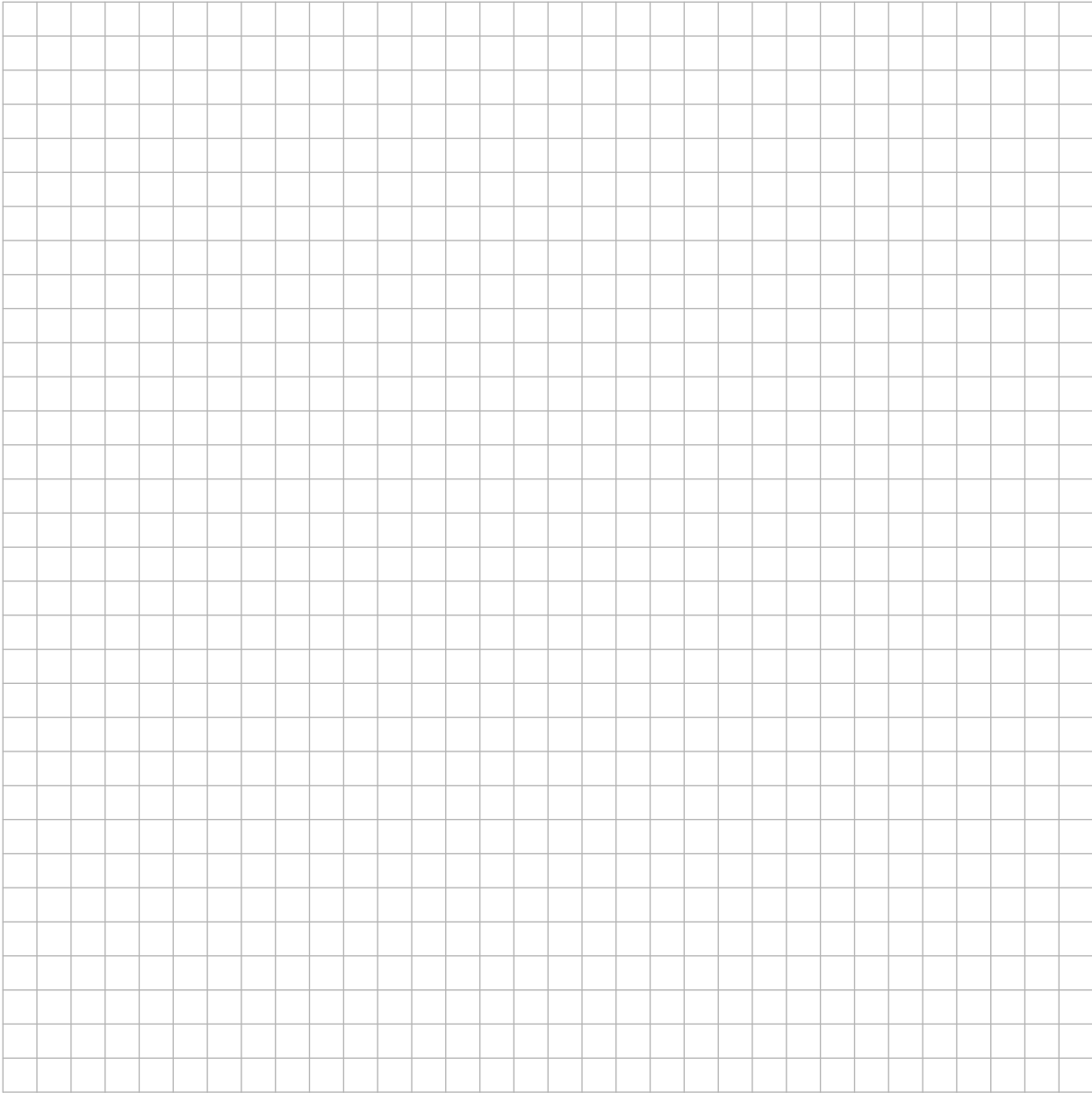
Some ink has spilled on the table. Use your mathematics to find the lengths covered by the ink blots. If you are unable to calculate a particular missing length, explain why you are unable to do so.



Prove that the shape you have made on the grid has those properties.



Prove that the shape you have made on the grid has those properties



Task 11: JCFL

Say which of the following is true by ticking the correct box

In the diagram below:

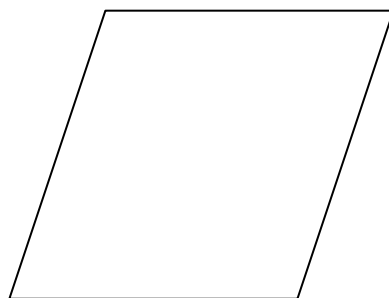
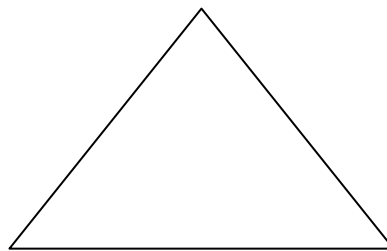
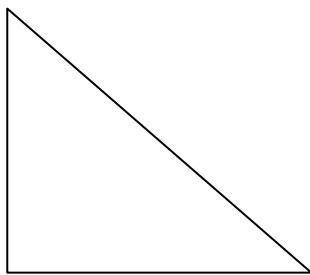
One **F** is the image of the other after an axial symmetry

One **F** is the image of the other after a central symmetry

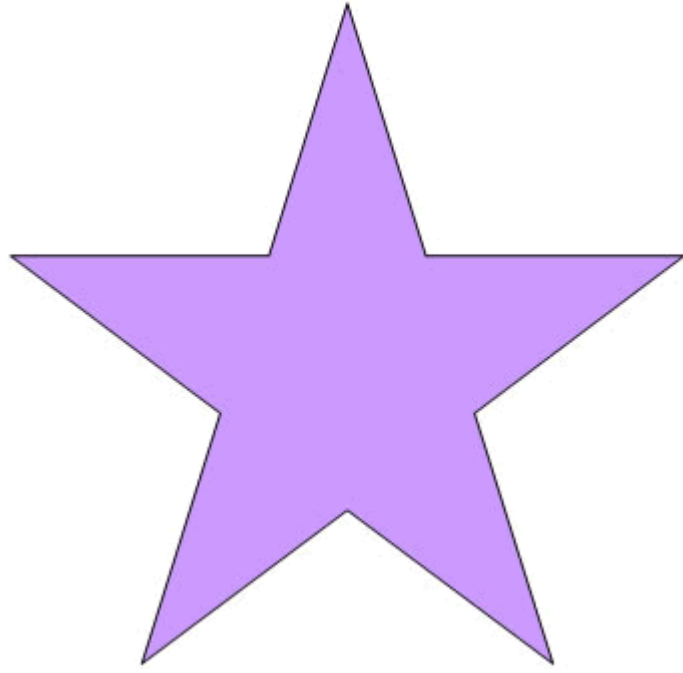
One **F** is the image of the other after a translation



Draw as many lines as symmetry as possible for each figure below.



Use tracing paper or fold the shape to help find the lines of symmetry. Look for patterns or properties of these lines.



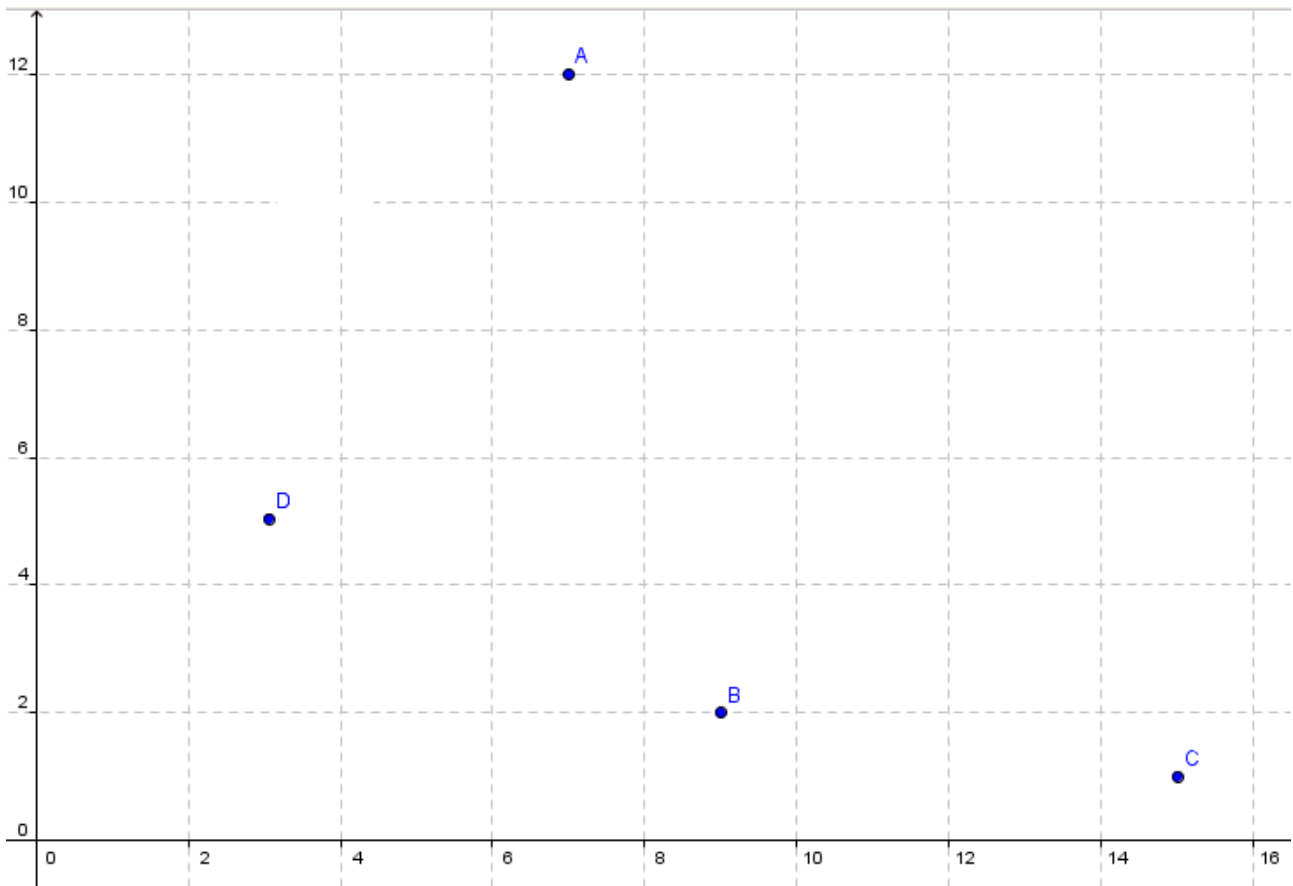
Task 12: JCHL



A monorail similar to the one shown was planned for an amusement park.

The original plans had the supports located as shown on the grid below.

A (7, 12) B (9, 2) C (15, 1) D (3, 5)

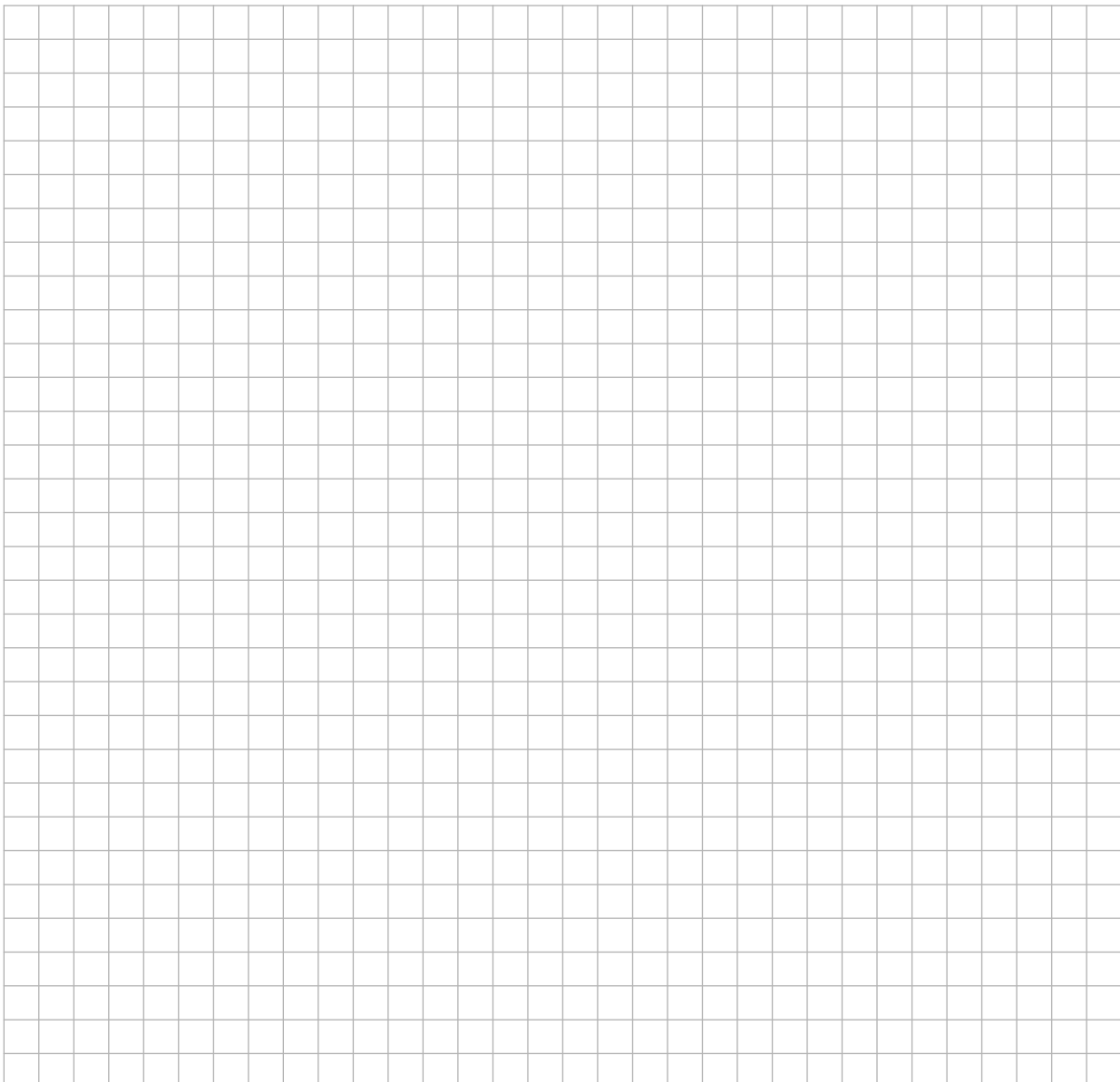


In order to make room for a car park, engineers have decided to demolish the supporting pillar C and relocate it.

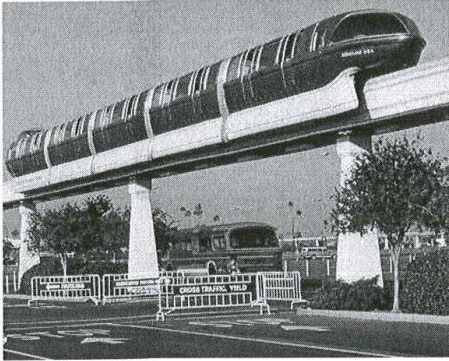
They have also decided that, on the plans, the new support pillars should be able to form a parallelogram

Plot the new location of the supporting pillar and write its coordinates. Label it C_1 .

Use the definition or properties of a parallelogram to verify that the new layout is a parallelogram. You must use the slopes of the sides, the lengths of the lines or both to verify your answer.



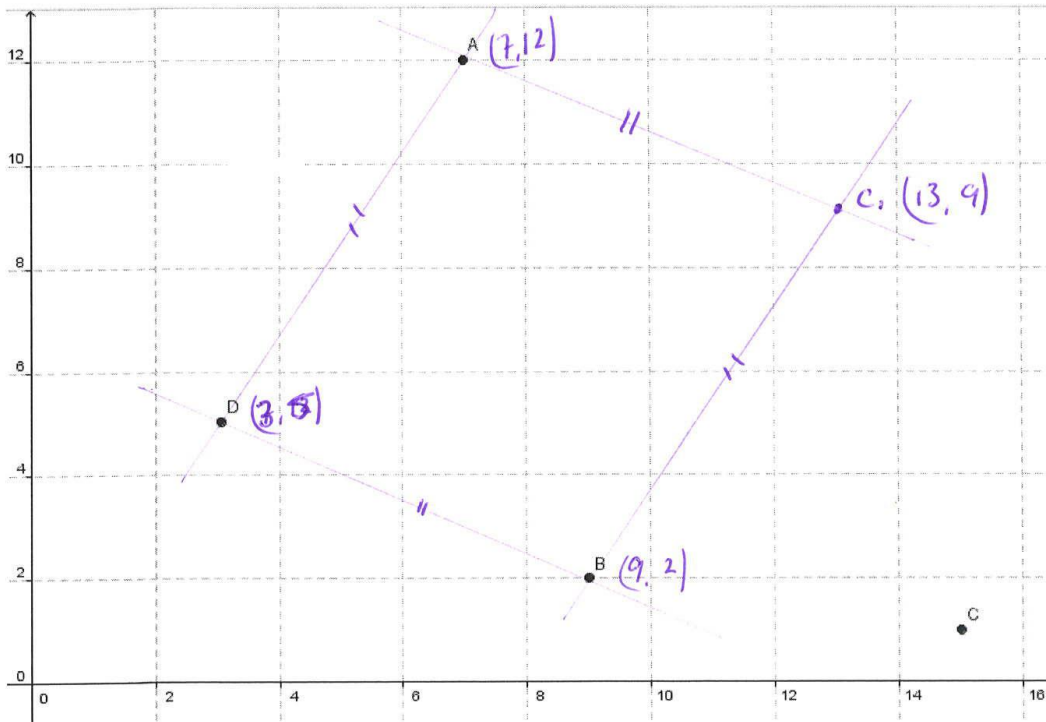
JCHL



A monorail similar to the one shown was planned for an amusement arcade.

The original plans had the supports located as shown on the grid below.

A (7,12) B(9,2) C (15,1) D (3,5)



2 pairs of \parallel sides
Opposite sides equal in length

Use the definition or properties of a parallelogram to verify that the new layout is a parallelogram. You must use the slopes of the sides, the lengths of the lines or both to verify your answer.

$$AD \parallel BC, \text{ if slopes are equal}$$

$$\text{Slope } AD = \frac{12-5}{7-3} = \frac{7}{4} \quad \text{Slope } BC = \frac{9-2}{13-9} = \frac{7}{4}$$

$$DB \parallel AC, \text{ if slopes are equal}$$

$$\text{Slope } DB = \frac{2-5}{9-3} = \frac{-3}{6} = \frac{-1}{2} \quad \text{Slope } AC = \frac{9-12}{13-7} = \frac{-3}{6} = \frac{-1}{2}$$

$$|AD| = \sqrt{(12-5)^2 + (7-3)^2} = \sqrt{49 + 16} = \sqrt{65}$$

$$|BC| = \sqrt{(13-9)^2 + (9-2)^2} = \sqrt{16 + 49} = \sqrt{65}$$

$$|AC| = \sqrt{(13-7)^2 + (9-12)^2} = \sqrt{36 + 9} = \sqrt{45}$$

$$|DB| = \sqrt{(9-3)^2 + (2-5)^2} = \sqrt{36 + 9} = \sqrt{45}$$

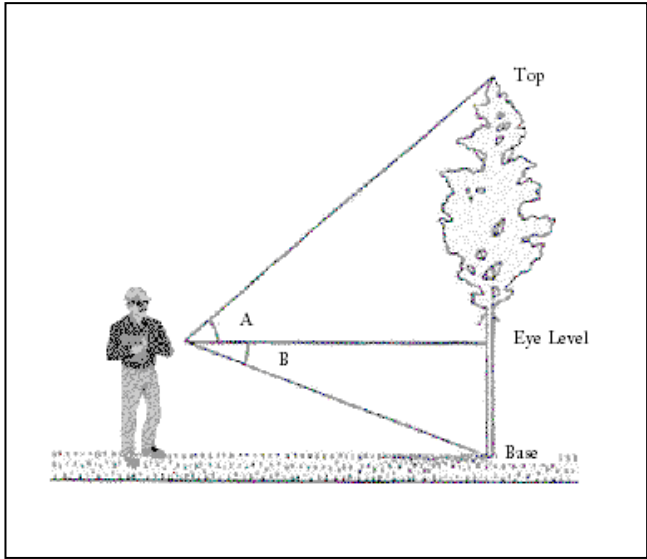
Foresters need to monitor the growth of trees. They measure their heights each year and can determine the **yearly tree growth**.

You can determine the tree's height by using trigonometry. If you measure the horizontal distance between yourself and the tree, and measure the angles leading to the tree's top and its base, using a simple instrument called a clinometer, you have enough information to calculate the tree's height.

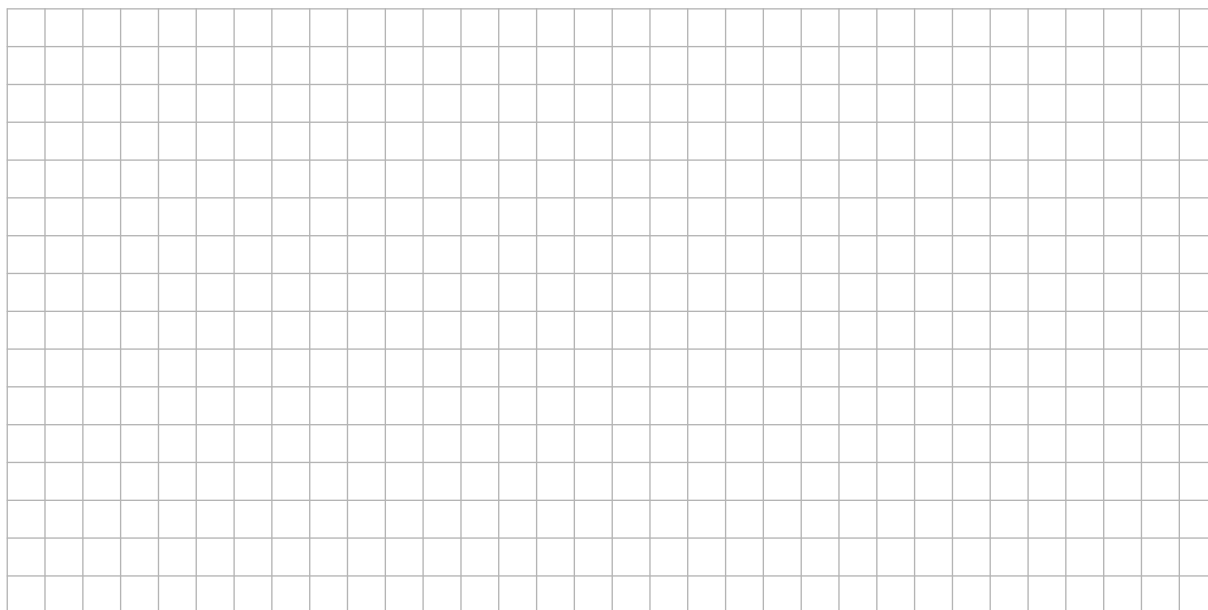


Linda used this technique and obtained the measurements in the table

Angle A	55°
Angle B	25°
Distance from Linda to Tree	2.5m



Use trigonometry to calculate the height of the tree.



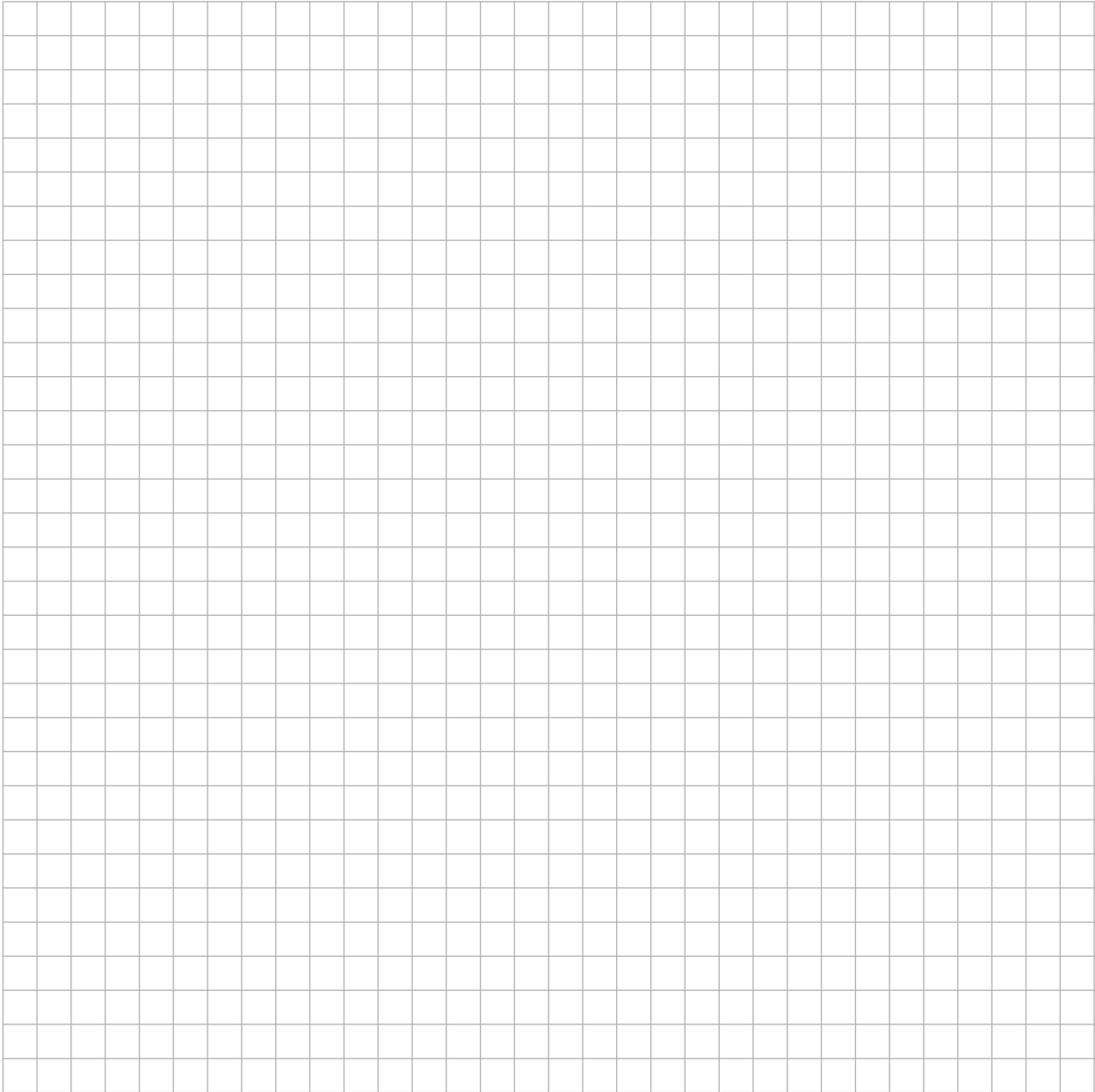
Linda wanted to compare the growth of trees on a tree farm with the growth of trees in a forest. The stem and leaf plot shows the yearly growth, in cm, of a selection of trees in both the tree farm and the forest.

Tree Farm		Forest
1	1	0 1 3
3 3	2	1 5 7
7 2 1	3	0 1 3 8 9 9
9 8 0	4	2 3 4 4 8
1 0	5	0 1 3 7

$$| 2 | 5 = 25\text{cm}$$

$$1 | 5 | = 51\text{cm}$$

Create a ratio that can be used to find the distance x across the lake. Use this ratio and the measurements given in the diagram to calculate x , the distance across the lake.



Task 19: JCHL

The JCDecaux advertising agency sought a building that was tall enough to accommodate an **18m** high rectangular billboard.

An employee of the company thought he had found a building that would work. He is 2m tall and, on the morning he examined the building, he cast a shadow 0.5m long. The building cast a shadow 4m long.

Determine whether or not the building will accommodate the billboard.

There are a number of ways to answer this. Visit the student tzone at www.ncca.ie/projectmaths and look at the multimedia presentations of how learners approach such problems.