## New carpet for the library

### Annotation

Ben understands that the attribute of a shape to be measured is its area. He is able to mentally separate the shape into two rectangles and then combine the areas of both rectangles to calculate the total area. When asked to show the 20 square centimetres in the second rectangle, Ben is able to create the structure of an array in which he locates all units.

### Problem: New carpet for the library

The teacher shows the student a shape and asks:

*What is the area of this shape in square centimetres?*

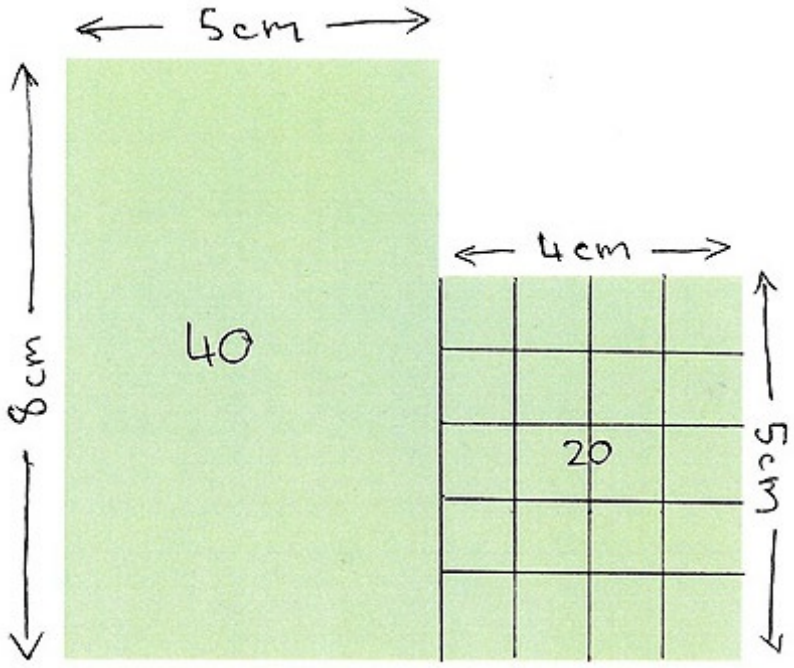
Then the teacher asks the student to measure the shape to check the accuracy of his estimation.

### Student Response

Ben places his fingertip repeatedly along the sides of the shape.

| | |
|---|---|
| **Ben:** | I estimate the area of the shape to be 62 square centimetres. |
| **Teacher:** | Now can you work out the area to check your estimate? |

Ben splits the shape into two rectangles and measures and records the side lengths of each rectangle. He then writes 40 in one rectangle and 20 in the other.




**Ben:** It's 60 square centimetres.

**Teacher:** Could you draw the 20 square centimetres on this rectangle for me?

Ben draws a 4 by 5 array in the rectangle labelled "20".

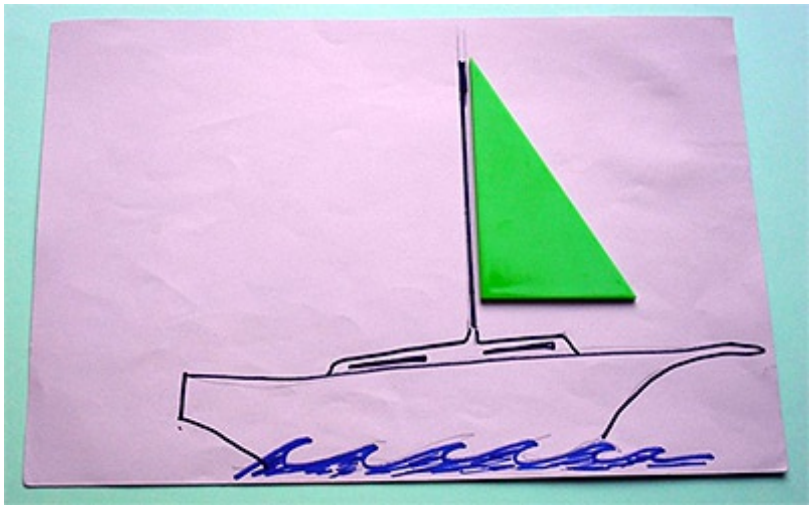
## Sail for the yacht

### Annotation

Mari understands that two right-angled triangles will combine to form a rectangle. She uses this knowledge to determine the area of one triangle by calculating the area of the rectangle and dividing that area by 2. She has "discovered" this relationship and is able to describe her understanding in words: she is not applying a memorised formula.  Mari appropriately writes cm squared as the unit in her answer.

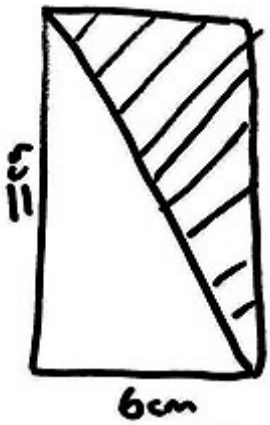
### Problem: Sail for the yacht

The teacher shows the student a line drawing of a yacht with a cardboard right-angled triangle forming a sail. The teacher tells the student that the yacht needs a second identical sail and asks the student to use the existing sail to calculate the area of the sail so that they can determine the amount of cloth required.



### Student Response

Mari draws around the cardboard sail then flips the cardboard sail over to form a rectangle and draws around its two remaining sides. She measures the two sides with a ruler.




$11 \times 6 = 66$

$66 \div 2 = 33cm^2$

I ~~had~~ added both triangles added together to make a rectangle and went 11 times 6 = 66 then took half of the rectangle away to make a triangle and ~~took~~ divided 66 by 2 to make $33cm^2$

## The volume of boxes

### Annotation

Molly knows that when she measures volume, she is measuring the amount of space that an object takes up. She understands that measurements of volume can be derived from measurements of length because one edge of 1 cubic centimetre is equal to 1 centimetre of length. To calculate the volume of a box, she measures the dimensions of length, width and height and records her answer in cubic centimetres.

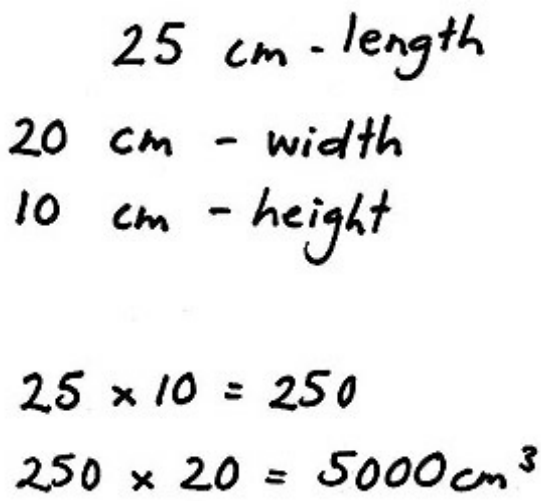
### Problem: The volume of boxes

The teacher gives the student a rectangular box that has whole-number dimensions of length, width and height and asks the student to measure the volume of the box.

### Student Response

| | |
|---|---|
| **Teacher:** | What are you measuring when you measure volume? |
| **Molly:** | The space that the box takes up. |
| **Teacher:** | What unit of measure do you use to measure volume? |
| **Molly:** | Cubic centimetres. They're 1 centimetre long by 1 centimetre wide by 1 centimetre deep. |

The teacher gives Molly a 30-centimetre ruler and asks her to calculate the volume of the box.




Molly measures the dimensions of length, width and height and records each measurement.

**Molly:** Its volume is 5000 cubic centimetres.

## Plastic buckets

### Annotation

Tom demonstrates that he is able to use the benchmark of a 2-litre container of milk as a mental image to support his estimation of the capacity of a plastic bucket. He has knowledge of the relationship between units in the metric system and knows that 1 litre of water weighs 1 kilogram.

### Problem: Plastic buckets

The teacher gives the student a plastic bucket and asks:

*Can you estimate how many litres of water this bucket would hold?*

Then the teacher asks:

*What is the weight of 9 litres of water?*

### Student Response

| | |
|---|---|
| **Tom:** | I think it would hold about 8 litres? |
| **Teacher:** | How did you estimate that? |
| **Tom:** | I thought of how many 2-litre containers of milk would fit in, and I thought it would be about four, so that's 8 litres. |
| **Teacher:** | That's close, but actually the bucket holds 9 litres of water. If it was full, how heavy would it be? |
| **Tom:** | It'd be 9 kilograms because 1 litre weighs 1 kilogram. |