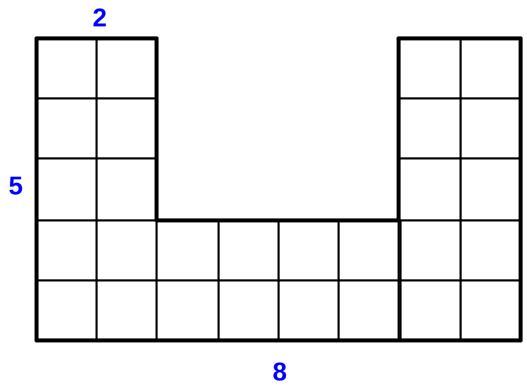
FORMULAE TELL THEIR STORY-1

To count or to measure (that it is not more than to count the number of units of measurement that there are in the measured thing) is a very habitual task. Whenever we have to count or measure something, we almost always have several ways to do it.

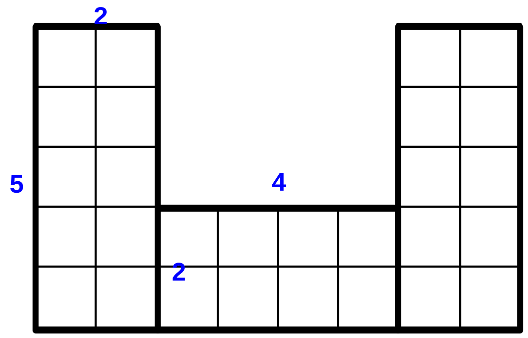
Thus, in order **to measure the surface** (to count the number of square units there are) in the following figure:



We can:

a. To count the units **one by one** (that is not practical at all), getting thus the result: 28 units (small squares)

b. **To divide the figure** in parts of known measurement. For instance, in the three rectangles of the following figure:



Therefore, the area would be:

$$A = 2 \cdot 5 \cdot 2 + 4 \cdot 2 = 28 \text{ units}$$

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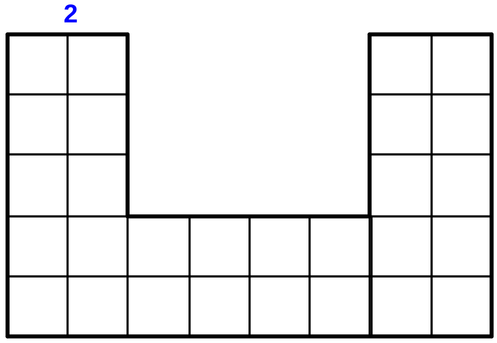

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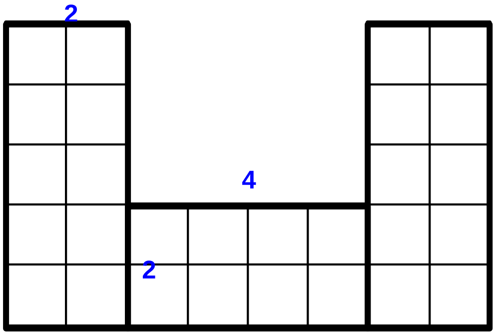
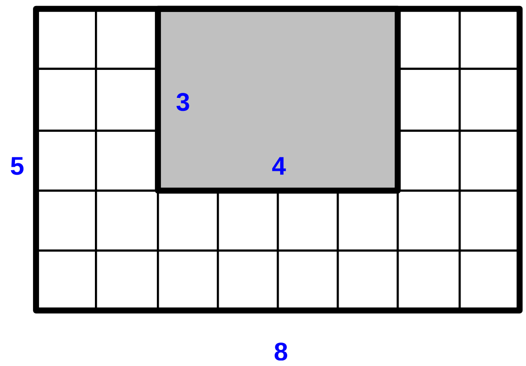


Therefore, the area would be:

$$A = 2 \cdot 5 \cdot 2 + 4 \cdot 2 = 28 \text{ units}$$

c. **To Add** a figure (or several) of known measurement, so that another figure, of known measurement as well, is completed. We can see it in the next figure:



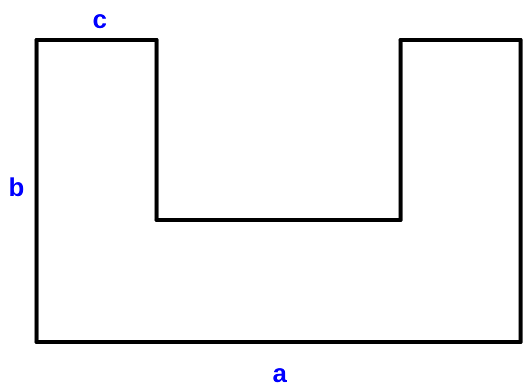
In this case, the area would be:

$$A = 5 \cdot 8 - 4 \cdot 3 = 28 \text{ units}$$

When we try to measure the area of all the figures of this type and to find **a general procedure**, that it is valid **whatever their measurements will be**, we obtain a **FORMULA** (general relation). For it, we have to identify in advance and to represent by means of a letter the measurements from which we will make the calculations (**variables**). With the obtained formula we will be able to calculate the area of any figure of that certain type, giving to the letters (variables) the concrete values they have.

Although the formula will be unique, we will be able to obtain it, in general, in different ways, since, as we have seen before, there are different ways to count.

Thus, for example, let's consider a figure identical to the previous one, but with **arbitrary measurements**:



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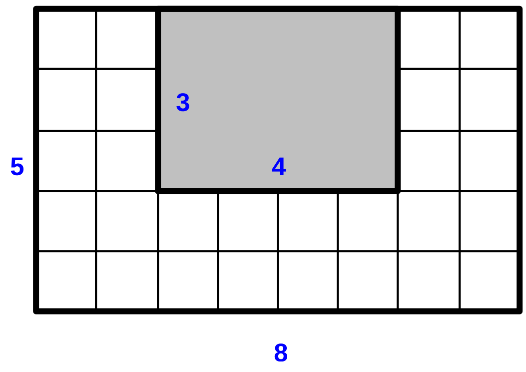

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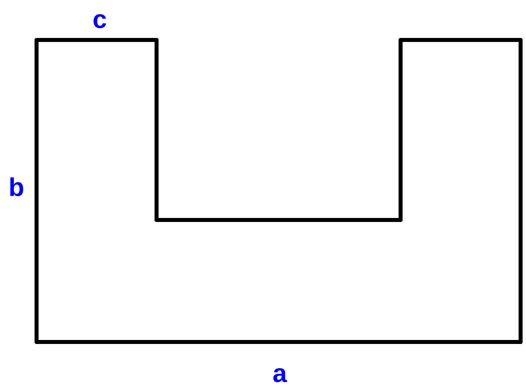

If we use the procedure described in the previous section b, the area of this figure would be:

$$A = 2bc + c(a - 2c)$$

The first addend represents the area of two rectangles of dimensions b and c, and the second the area of a rectangle of dimensions c and a-2c.

If we used the procedure described in the previous section c, then the area would be:

$$A = ab - (a - 2c)(b - c)$$

In this case the first term 'ab' represents the area of the rectangle of dimensions and b, and the second '(a-2c)(b-c)' represents the area of the rectangle that we added to the initial figure, and that therefore we have to subtract.

What we suggest you is to read the formulae intelligently, so that you discover the way used to count:

✍ Formulae tell us a story

In the case of a sum, it will indicate that the initial figure has been split into several parts; if it is a subtraction, that one or several figures of known measurements have been added to the initial figure, until obtaining another figure of also known measurement.

Could you explain how the following formula for the previous figure has been obtained?

$$A = 2bc + ac - 2c^2$$

YOU WILL NEED:

Pencil and paper

If we use the procedure described in the previous section b, the area of this figure would be:

$$A ? 2bc ? c?a ? 2c?$$

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