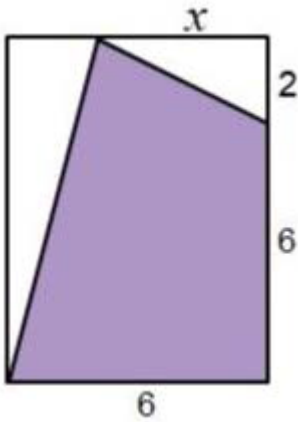


### USE AREA TO FIND $x$



Three quarters of the area of the rectangle has been shaded.  
What is the value of  $x$ ?

### Help

What is the total area of the rectangle?

What fraction of the rectangle is shaded (read the question)?

What fraction of the rectangle is unshaded?

Find the areas of the two unshaded (white) triangles in terms of the unknown  $x$ ?

Can you use this information to find  $x$ ?

If not, read the question again carefully. If you keep trying you will be able to work out the value of  $x$ .

### Extension

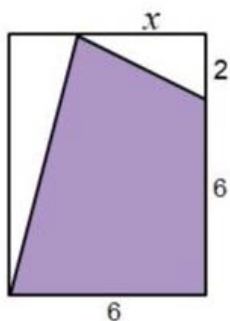
Calculate the area of the quadrilateral shaded purple in the diagram.

Make up a similar question and exchange your puzzle with a friend so you try to solve each other's puzzles.

## NOTES FOR TEACHERS

### SOLUTION

To find the unshaded areas, use the formula for the area of a triangle:  $\text{Area} = \frac{1}{2}(\text{base} \times \text{height})$



$$\begin{aligned} \text{Area unshaded} &= \frac{1}{2}(2 \times x) + \frac{1}{2} \times 8 \times (6 - x) \\ &= x + 24 - 4x \\ &= 24 - 3x \end{aligned}$$

The question tells you that  $\frac{3}{4}$  of the area of the rectangle has been shaded. So  $\frac{1}{4}$  of the area of the rectangle is unshaded.

The unshaded area is  $24 - 3x$  so this is  $\frac{1}{4}$  of the area of the rectangle.

$$\begin{aligned} \text{From the diagram the area of the rectangle} &= \text{length} \times \text{breadth} \\ &= 6 \times 8 \\ &= 48 \text{ square units.} \end{aligned}$$

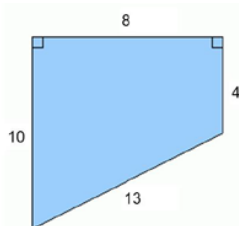
$$\begin{aligned} \text{So } (24 - 3x) &= \frac{1}{4} \times 48 \\ 24 - 3x &= 12 \\ 3x &= 12 \\ x &= 4 \end{aligned}$$

### Diagnostic Assessment

This should take about 5–10 minutes.

- Write the question on the board, say to the class:  
**“Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D”.**
- Notice how the learners responded. Ask a learner who gave answer A to explain why he or she gave that answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.
- Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.
- Ask the class again to vote for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.** It is important for learners to explain the reason for their answer otherwise many learners will just make a guess.
- If the concept is needed for the lesson to follow, explain the right answer or give a remedial task.

What is the area of this shape?



80 units<sup>2</sup>



3520 units<sup>2</sup>



56 units<sup>2</sup>



72 units<sup>2</sup>

The correct answer is **C**. The shape can be split into a rectangle of area 32 square units and a triangle of area 24 square units so the total area is 56 square units.

**A.** The student may have multiplied 8 times 10 as if this were a rectangle.

**B.** The student may have multiplied all of the lengths together.

**D.** The student may have attempted to estimate the area instead of calculating.

<https://diagnosticquestions.com>

### Why do this activity?

This activity encourages learners to apply knowledge from algebra, geometry and measure.

They first have to identify the two triangles within the rectangle and establish their dimensions from the diagram.

They must then use their prior knowledge on how to calculate the area of a triangle.

This involves algebraic fractions, which encourages learners to consolidate the basic rules of fractions. They also must remember how to multiply a bracket by a constant. Finally they must read the question carefully so that they realise that the area of the two triangles is one quarter of the area of the rectangle. Realising this fact then allows them to solve the problem.

## Learning objectives

In doing this activity students will have an opportunity to:

- Recognize two-dimensional shapes
- Calculate unknown lengths using information given
- Use the algebraic expressions to calculate the area of the triangles
- Use the information given in the question to establish the link with the area of the rectangle.
- Form an equation to find the value of  $x$ .

## Generic competences

- **think mathematically**, reason logically and give explanations;
- **visualize** and develop the skill of interpreting and creating visual images to represent concepts and situations;
- interpret and **solve problems**.

## Suggestions for teaching

Use the key questions below to help the learners attempt the question in a logical way. However give the learners time to think about the problem and come up with some suggestions themselves. Take the lead from the learners and use the key questions to guide them in the correct direction.

## Key questions

- What two-dimensional shapes can you see in the diagram?
- How do we calculate the area of a triangle?
- What are the dimensions of the two triangles?
- How can you calculate the areas of the triangles?
- What important fact is given in the question about the area of the triangles and the area of the rectangle?
- How does this help us?
- How do we calculate the area of the rectangle?
- **How can we use the facts you have established to write an equation involving the areas of the triangles and the area of the rectangle?**

## Follow up

Using area to understand multiplication <https://aiminghigh.aimssec.ac.za/grades-4-to-7-two-by-two-puzzle/>

A puzzle involving area: <https://aiminghigh.aimssec.ac.za/years-6-8-can-you-help-these-farmers/>

Investigating area and perimeter <https://aiminghigh.aimssec.ac.za/grades-5-to-8-wholesome-rectangles/>

**Note:** The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and up to Secondary 5 in East Africa. New material will be added for Secondary 6.

For resources for teaching A level mathematics see <https://nrich.maths.org/12339>

**Note:** The mathematics taught in Year 13 (UK) and Secondary 6 (East Africa) is **beyond** the school curriculum for Grade 12 SA.

	Lower Primary or Foundation Phase Age 5 to 9	Upper Primary Age 9 to 11	Lower Secondary Age 11 to 14	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6