



**THIRD SPACE
LEARNING**

Math Intervention Pack

Finding area of quadrilaterals
by decomposing into triangles
and rectangles

Grade 6

How To Use This Resource

1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

2. Prior Learning

Use this slide to review the knowledge that will be required to be successful in this lesson. If students feel confident on the prior learning section of the Title Slide then this slide can be skipped

3. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

4. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

5. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

6. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

How To Use This Resource

7. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

8. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

Standard

6.G.A.1 - Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Key Mathematical Ideas

1. Decompose a quadrilateral into rectangles and triangles.
2. Determine the dimensions of the shapes after decomposing a quadrilateral into rectangles and triangles.
3. Recognize the ability to decompose a quadrilateral into rectangles and triangles and then add the areas together in order to find the total area.

Overview

Terminology:

- **Area:** The size of a surface (a 2D shape) measured in square units. Area of a rectangle = length \times width or base \times height.
- **Decompose:** To break apart.
- **Quadrilateral:** A closed shape with 4 sides.
- **Triangle:** A three-sided shape.

2.2) Sentence stems:

- Area of the rectangle = $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$ square units
- Area of the triangle = $\frac{1}{2} \times \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$ square units

Overview

Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Students may decompose incorrectly.	Help students find where to decompose the shape.	Ask questions like.. <ul style="list-style-type: none">How can this quadrilateral be decomposed so that it is made up of rectangle(s) and/or triangle(s)?
Students may think they can multiply the base and height of the entire quadrilateral (when it's not a rectangle).	Draw a rectangle around the shape if students try to just multiply its base and height - point out the empty space that would be included in that miscalculation of area.	Ask questions like.. <ul style="list-style-type: none">What dimensions can we use to find each area?

Title Slide

If students...

get both sections correct:

- start at You do
- miss the learning goal section only:
 - start at Let's Learn
- miss the prior learning section:
 - start at Prior Learning

Prior learning

If stuck

- Help students write the equations, using the dimensions shown in each model.

Let's Learn

If stuck

- Make sure that students correctly label the sides when the shape is decomposed
e.g. the base of the trapezium is split into 5cm and 7cm.

Questions

- Why can't we get the area by multiplying the base and height of the entire shape (7×12)? (This only works when an entire shape is rectangular. Multiplying these 2 dimensions would include space that is not part of the shape - this missing triangle part on the top right).
- NOTE: This strategy will be correct if the missing triangular part is subtracted from the 7×12 calculation.
- **a) What are the dimensions of the rectangle part?** (5 cm and 7 cm.)
- **b) What dimensions are the base and height of the triangle?** (The height is the perpendicular line shown in orange. It runs from the base of the triangle to the opposite vertex. This makes the horizontal line along the bottom the base. Since the rectangle part of the base is 5 cm, the remaining part is $12 - 5 = 7$ cm.)

Watch out for

- Students who forget to multiply the triangle area by $\frac{1}{2}$.

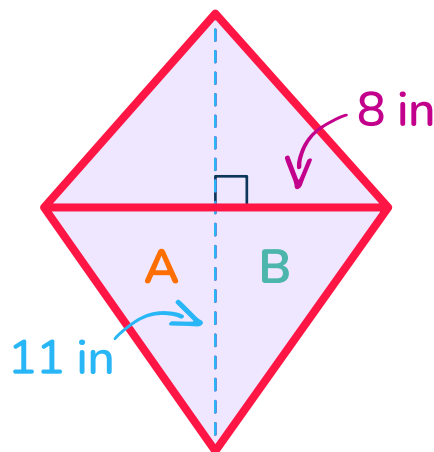
Answers

- a) $5 \times 7 = 35$
- b) $0.5 \times 7 \times 7 = 24.5$
- c) $35 + 24.5 = 59.5\text{cm}^2$

Follow me

Modeling prompts

- Point out that this quadrilateral (a kite) has been decomposed into two triangles which are labeled A and B. Shade each triangle in a different color, if necessary.
- Explain the dimensions that will be used for the base and height measurements.
- Calculate the individual areas and then the total area of the shape.
- Point out that the shape could have been decomposed into two different triangles (top/bottom) with a base of 16, if we had known the height of one of the triangles.



Answers

- a) See diagram above.
- b) $0.5 \times 8 \times 11 = 44 \text{ in}^2$
- $0.5 \times 8 \times 11 = 44 \text{ in}^2$
- c) $44 + 44 = 88 \text{ in}^2$

Your turn

If stuck

- Use similar guidance given in the Modeling prompts.
- Calculations are not the focus of this lesson. Let students use a calculator when necessary.

Questions

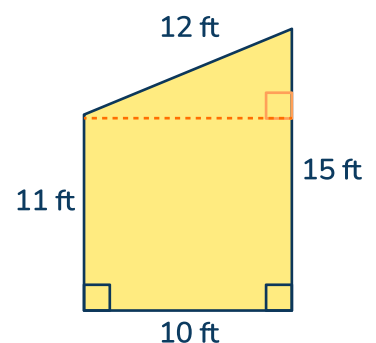
- b) **How did you determine the base and height of the triangle?** (The base needs to be perpendicular to the height and we need to have both of those measurements to calculate the area. The side shared with the rectangle and the perpendicular side of the triangle are the only given measurements we can use. It does not matter which of these two we label as the base or height. To calculate the missing side, solve $15 - 11 = 4$, since the entire height is 15 ft and 11 ft of that belongs to the rectangle.)
- b) **How did you determine the base and height of the rectangle?** (Both are given in the image.)
- b) **Is there another way we could have decomposed this shape?** (We could have decomposed it into two triangles or found the area of the border rectangle and subtracted the missing triangle.)

Watch out for

- Students who incorrectly identify dimensions in the decomposed shapes.

Answers

- a) See diagram to the right.
- b) $0.5 \times (15 - 11) \times 10 = 20 \text{ ft}^2$
- $11 \times 10 = 110 \text{ ft}^2$
- $20 + 110 = 130 \text{ ft}^2$



You do

If stuck

- Use the Support slide for question 3.
- Calculations are not the focus of this lesson. Let students use a calculator when necessary.

Questions

- **1a) How did you determine the base and height of the triangle?** (The base needs to be perpendicular to the height and we need to have both of those measurements to calculate the area. The side shared with the square and the perpendicular side of the triangle are the only given measurements we can use. It does not matter which of these two we label as the base or height.)
- **1b) How did you determine the side length of the square?** (It is given in the image.)
- **1c) Is there another way we could have decomposed this shape?** (We could have found the area of the border rectangle and subtracted the two missing triangles.)
- **2) What shapes can you decompose the arrow into?** (A rectangle and a triangle.)
- **2) How did you determine the base and height of the triangle?** (The base needs to be perpendicular to the height and we need to have both of those measurements to calculate the area. The two sides labeled 6 cm fit this requirement. It does not matter which of these two we label as the base or height.)
- **2) How did you determine the base and height of the rectangle?** (Both are given in the image.)
- **2) Is there another way we could have decomposed this shape?** (Possible a much more complex way, but decomposing it into a rectangle and triangle is the simplest strategy.)

Watch out for

- Students who forget to multiply the triangle area by $\frac{1}{2}$.
- Students who incorrectly identify dimensions in the decomposed shapes.
- Students who calculate the parallelogram's area as 5×7 .

Go further

If stuck

- Help students create the equations using each strategy.

Questions

- **Why does Kala's strategy work?** (Kala decomposes the entire shape into two triangles, each of which have a clear base and height measurement, making it possible to calculate the areas of each and then the total area.)
- **Why does Dorian's strategy work?** (The trapezoid has two right angles, so it can also be thought of as a rectangle with a missing corner. Since we know the base and height of the missing triangular corner, we calculate the total area using this strategy.)
- **Is there another way the trapezoid could have been decomposed?** (Yes, into a rectangle and a right triangle.)

Watch out for

- Students may decompose incorrectly.
- Students may try to multiply the base and height of the entire shape instead of decomposing it first.

Answers

- Kala: $0.5 \times 12 \times 18 = 108 \text{ ft}^2$, $0.5 \times 24 \times 12 = 144 \text{ ft}^2$, $108 + 144 = 252 \text{ ft}^2$
- Dorian: $24 \times 12 = 288 \text{ ft}^2$, $0.5 \times (24-18) \times 12 = 36 \text{ ft}^2$, $288 - 36 = 252 \text{ ft}^2$
- Explanation: Both answers are the same and both answers are correct. Kala and Dorian decomposed the shape in different ways, but their strategies still calculated the area for the entire trapezoid.

Support for Slide(s)

If stuck

- Walk students through the process of decomposing the parallelogram and “moving” the triangle from one side to the other.
- Show students how they can count the unit squares to find the area.

Questions

- Do you think this strategy is easier than finding the areas separately? Why or why not? (Answers may vary.)

Answers

- a) Rectangle
- b) 28 m^2

Assessment question:

Correct answer:

48 in^2

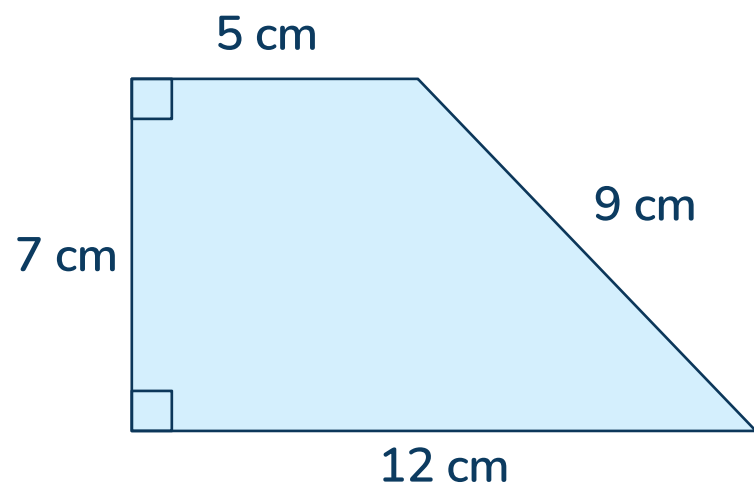
Today you will learn about

Finding area of quadrilaterals by decomposing into triangles and rectangles



Learning Goal

What is the area of the quadrilateral?



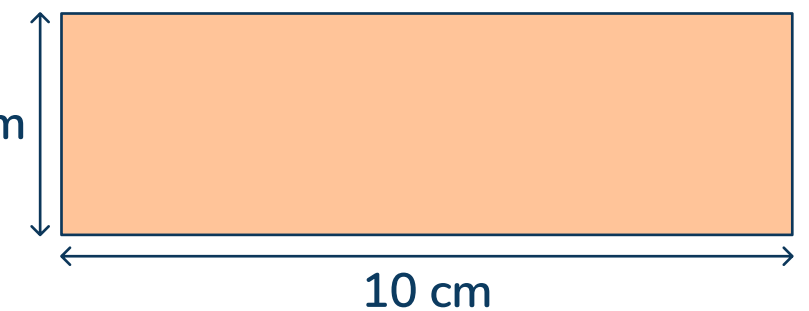
.....

Prior Learning

a

What is the area of this rectangle?

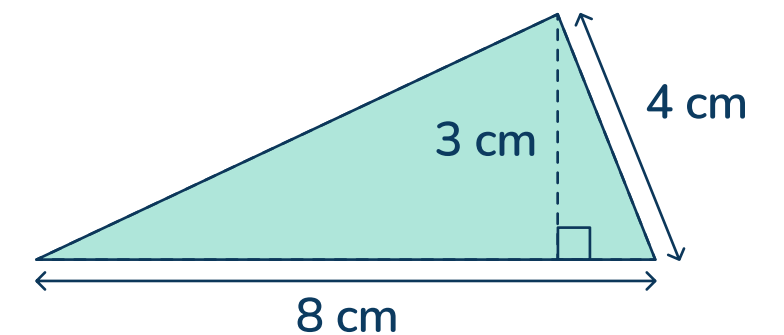
3 cm



.....

b

What is the area of this triangle?



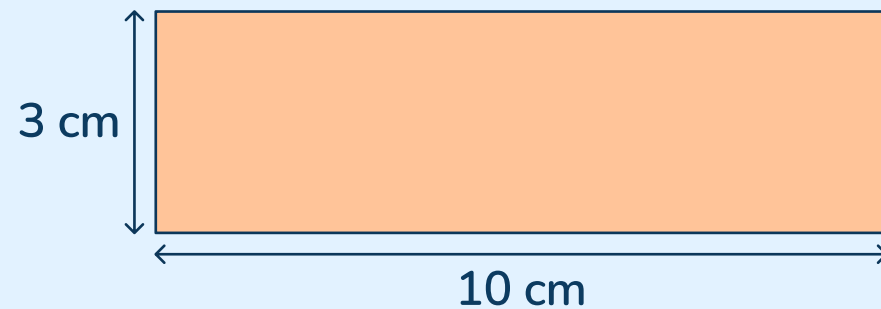
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Prior learning

Before we can find the **area of quadrilaterals** by decomposing into triangles and rectangles, we need to be able to find the **area of triangles and rectangles**.

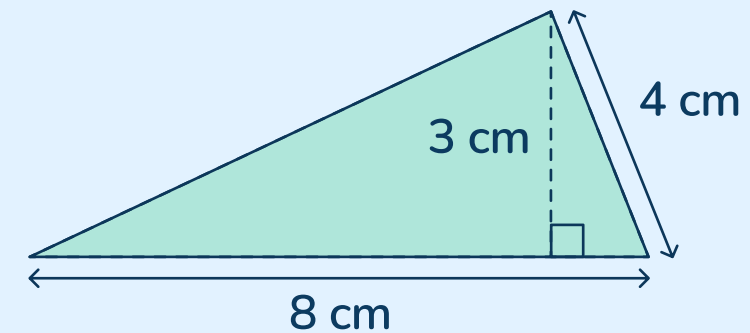
We can use a formula to find the area of each shape.

Area of a rectangle = **length x width**



Area = cm²

Area of a triangle = $\frac{1}{2}$ x **base x height**

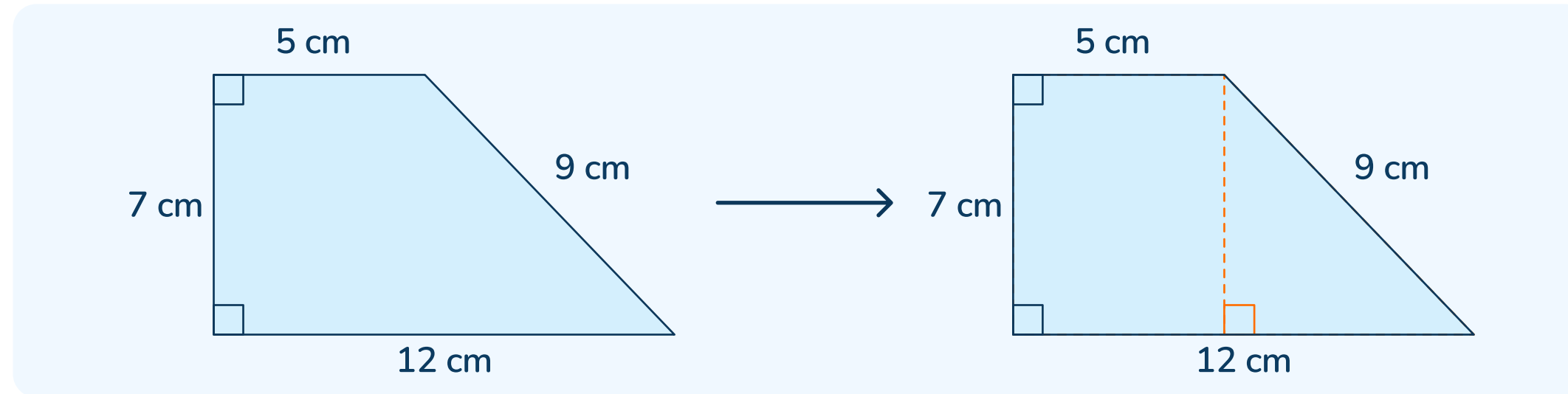


Area = cm²

Let's learn

When calculating the **area of quadrilaterals**, we can decompose them into triangles and rectangles.

To find the area of the trapezoid, we can decompose it into a triangle and a rectangle.



Then, we find the area of the rectangle and the area of the triangle and add them together.

a What is the area of the rectangle?

Area = length x width

..... cm²

b What is the area of the triangle?

Area = $\frac{1}{2}$ x base x height

..... cm²

c What is the total area of the trapezoid?

Area of quadrilateral =
Area of rectangle + area of triangle

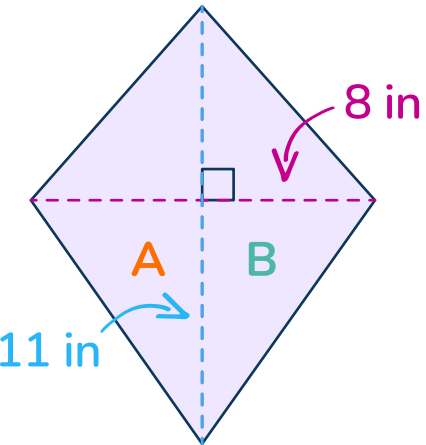
..... cm²

Follow me



Let's find the area of the quadrilateral.

- a We can decompose the quadrilateral into 2 triangles.



- b Find the area of each triangle using the formula.

Area of triangle A : $\frac{1}{2} \times \dots \times \dots = \dots$ in²

Area of triangle B : $\frac{1}{2} \times \dots \times \dots = \dots$ in²

- c Add the areas together.

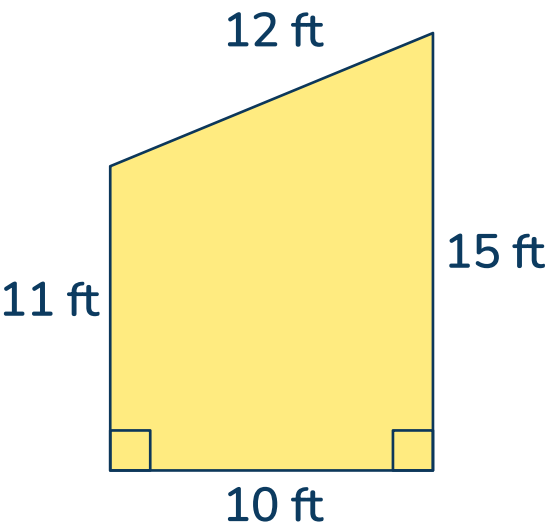
$\dots + \dots = \dots$ in²

Your turn



Find the area of the quadrilateral.

- a Decompose the quadrilateral into a triangle and a rectangle.



- b Find the area of the triangle and the rectangle using the formulae.

Area of the triangle : $\frac{1}{2} \times \dots \times \dots = \dots$ ft²

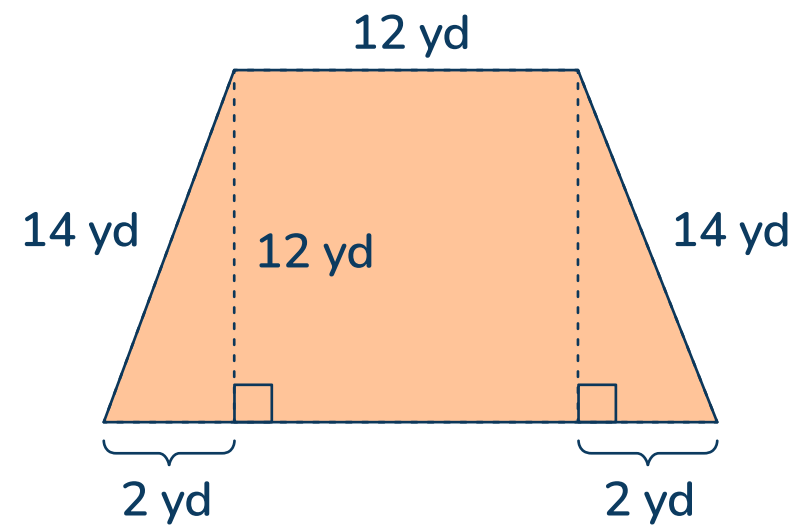
Area of the rectangle : $\dots \times \dots = \dots$ ft²

- c Add the areas together.

$\dots + \dots = \dots$ ft²

Find the area of each quadrilateral.

1

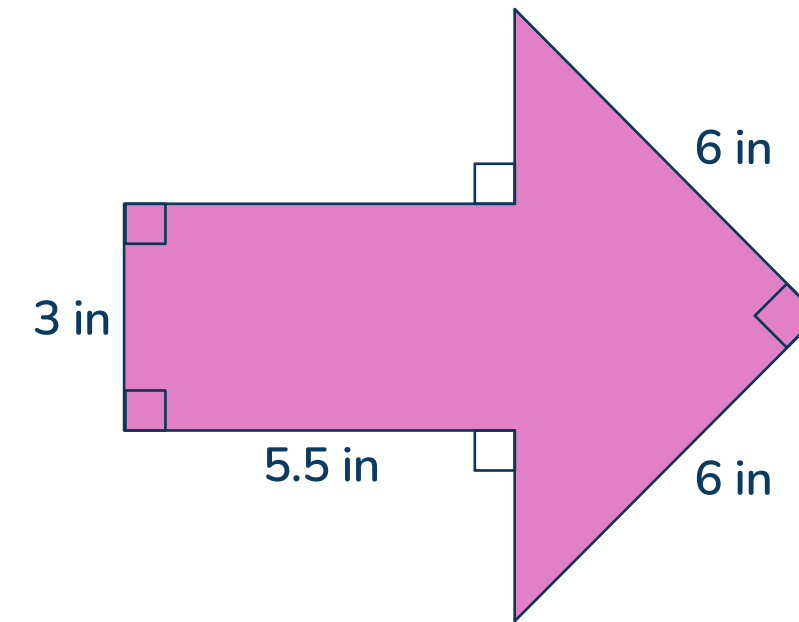


a What is the area of one triangle? yd^2

b What is the area of the square? yd^2

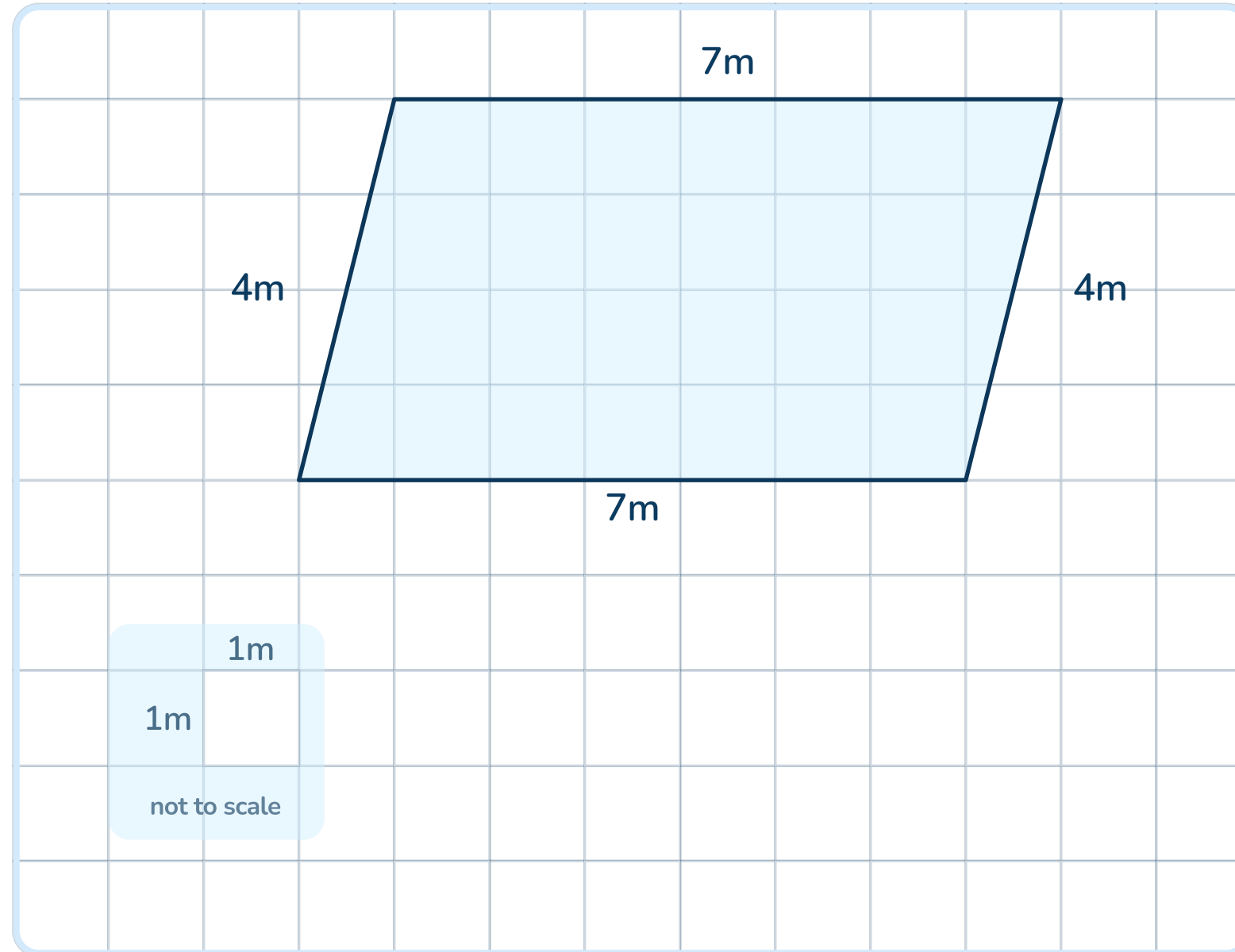
c What is the area of the trapezoid? yd^2

2



Area = in^2

3

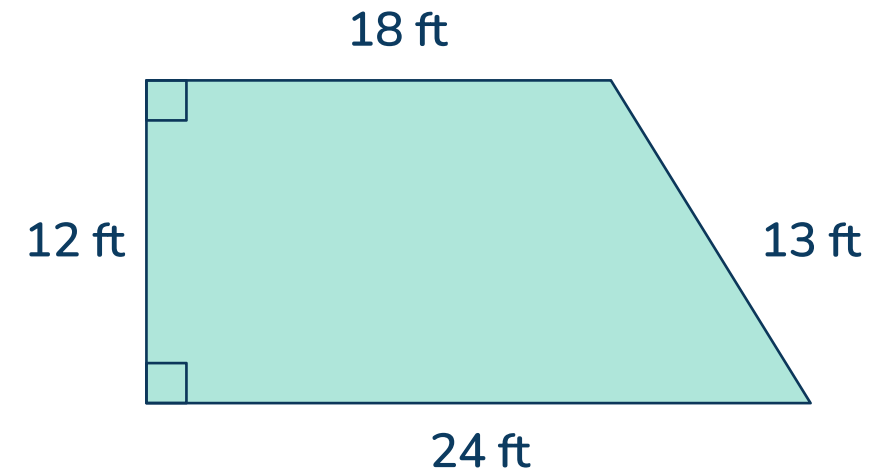


Area = m²

Go further

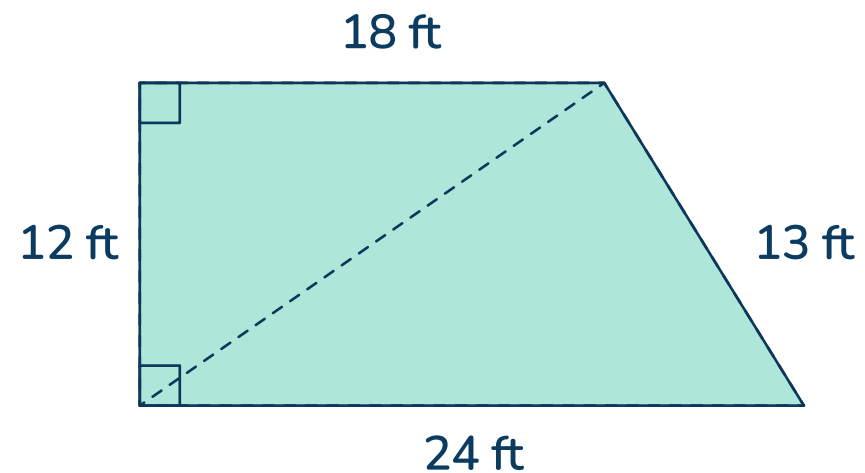
Millie's family is getting new carpet installed in the family room. The dimensions of the family room are shown to the right. How much carpet will they need to carpet the entire floor?

Kala and Dorian decomposed the shape in different ways. Complete their solving strategies, then explain which is correct.



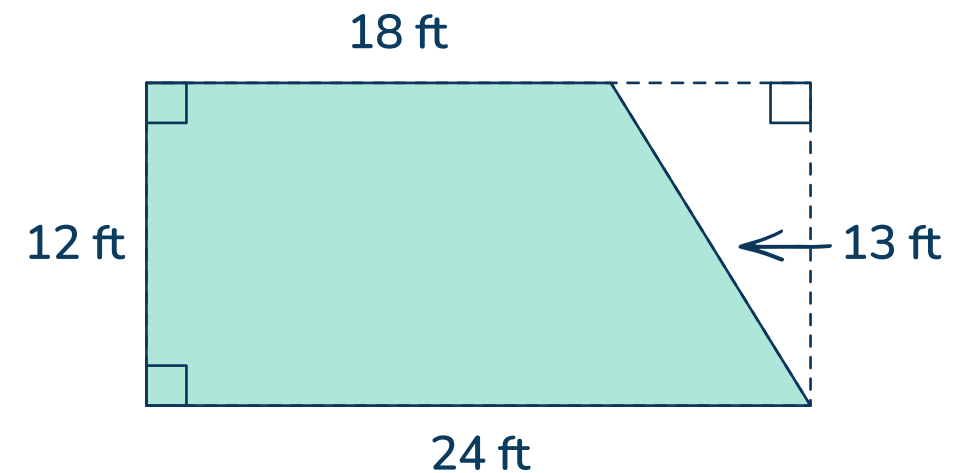
Kala

"I broke the trapezoid up into two triangles."



Dorian

"I found the area of the large rectangle and the missing triangle."



Support

We can decompose a parallelogram into a rectangle to find the area.

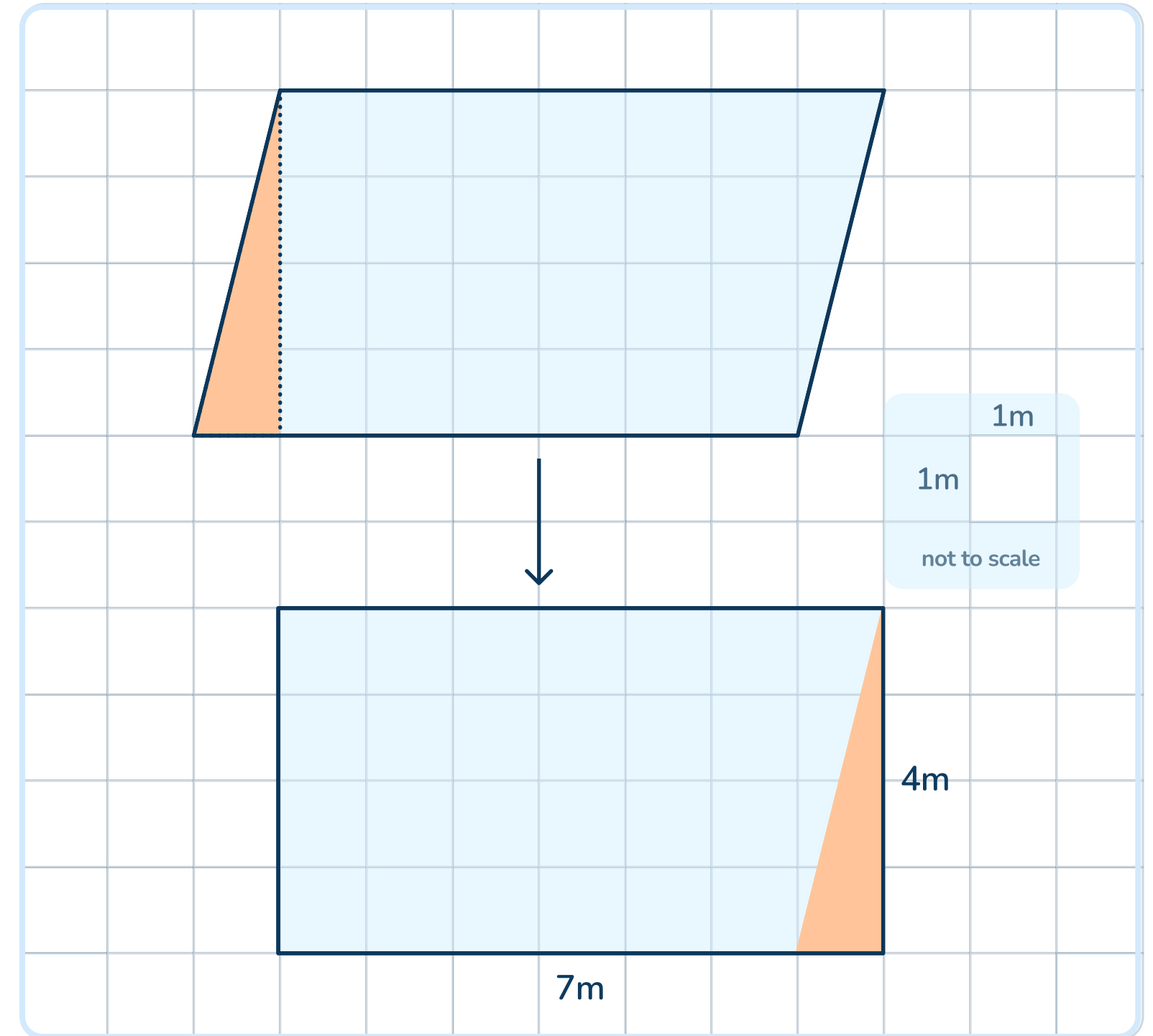
A **parallelogram** is a quadrilateral with 2 pairs of **parallel** lines.

- a First, we cut a right triangle off one end of the parallelogram and move it to the other end to create a

.....

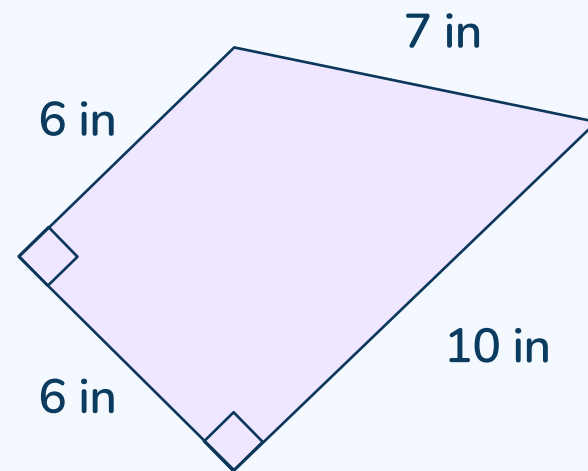
- b Multiply the length by the width to find the area of the rectangle. You can also count the total number of square units.

Area = m^2



Check your understanding

Find the area of the quadrilateral.






Why do I need to try this question on my own first?

- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing



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Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

Speak to us

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