



**THIRD SPACE
LEARNING**

Math Intervention Pack

Evaluating areas of composite
shapes

Grade 7

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

7.G.B.6 - Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Key Mathematical Ideas

1. Decompose composite shapes into common shapes, including identifying all necessary dimensions.
2. Find the area of composite shapes.

Overview

Terminology

- **Composite shape:** A shape composed of two or more common shapes.
- **Area:** Number of square units needed to cover a surface.
- **Semi-circle:** Half of a circle.
- **Trapezoid:** A quadrilateral with exactly one set of parallel sides.
- **Parallelogram:** A quadrilateral whose opposite sides are parallel.

Sentence Stems

- The shape is made up of...
- When solving, we subtract these parts, because...
- When solving, we add all the parts, because...

Overview

Common Misconceptions

| Common Misconceptions | Tutoring Strategies | Checks for Understanding |
|--|---|--|
| Making mistakes when calculating area. | Write out clear equations when solving, referencing the formulas when necessary. | Ask students to write out the equations they are using to solve and explain how they wrote them. |
| Confusing whether the individual areas need to be added or subtracted. | Whether the problem requires adding the individual areas or subtracting areas from each other, always model how to make this decision and what equation to use. | Ask students to explain whether the individual areas need to be added or subtracted and how they know. |

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

NOTE: All Answers are calculated with 3.14 as π . Check student's work with a calculator if they use a different value for pi.

Prior Learning

If stuck

- Review vocabulary words of a circle (diameter, radius, circumference, area)
- Use a calculator for calculations if necessary, since computation by hand is not a focus for this lesson.
- Note that circles are not drawn to scale, which is why they are similar in size, but not actual areas.

Let's Learn

If stuck

- Use different colors to outline each shape separately.
- Use a calculator for calculations if necessary, since computation by hand is not a focus for this lesson.

Questions: First slide

- a) Where do you see the trapezoid and the rectangle? (The rectangle is the shape along the bottom and the trapezoid is sitting on top.)
- b) How can you find the length of the longest base on the trapezoid? (The total side length is 417 cm. The rectangle part is 213 cm, since the opposite side is 213 cm. To find missing part solve $x + 213 = 417$.)
- b) Why is 236 cm the height of the trapezoid? (The height is always the perpendicular line that connects the two bases, so no matter the orientation of the shape, this dimension is the height.)
- c) What is the formula for the area of a trapezoid? ($\frac{1}{2}(b_1 + b_2)h$)
- c) Why do we add the areas together? (The total area is the trapezoid and the rectangle combined.)

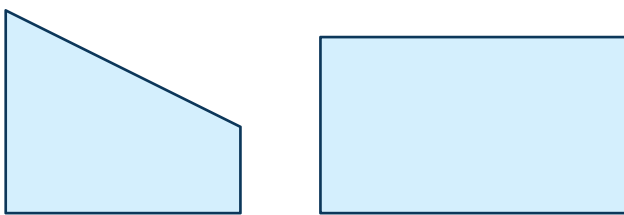
Questions: Second slide

- a) Where do you see the triangles and the rectangle? (The larger rectangle is the shape along the bottom and the smaller rectangle is sitting on top. Then on top of the smaller rectangle is the right triangle.)
- a) Are there other ways to decompose this shape? (Yes...
 - two rectangles and one triangle;
 - the long trapezoid and narrow rectangle;
 - the overall rectangle minus the triangle and other rectangle;
 - the overall rectangle minus the skinny trapezoid and small rectangle.)
- b) How can you find the length of the longest base on the trapezoid? (The total side length is 417 cm. The larger rectangle part is 213 cm, since the opposite side is 213 cm. The smaller rectangle part is 85 cm, since the opposite side is 85 cm. To find missing part solve $x + 213 + 85 = 417$.)
- c) What is the formula for the area of a triangle? ($\frac{1}{2} \times \text{base} \times \text{height}$)
- c) Why do we add the areas together? (The total area is the triangle and the rectangles combined.)

Watch out for

- Students who make calculation errors.

Answers

- a) 

Trapezoid
Rectangle

- b)

| | | |
|-----------------|---|-----------|
| base 1: 204 cm | } | Trapezoid |
| base 2: 85 cm | | |
| height: 236 cm | | |
| | | |
| length : 213 cm | } | Rectangle |
| width : 382 cm | | |

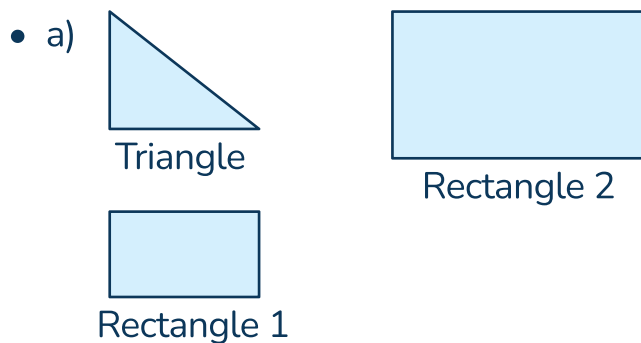
Let's Learn

Answers

- c) Trapezoid : $\frac{1}{2} (b_1 + b_2) h = \frac{1}{2} (204 + 85) \times 236$
 $= 34,102 \text{ cm}^2$

Rectangle : $l \times w = 382 \times 213$
 $= 81,366 \text{ cm}^2$

$$34,102 + 81,366 = 115,468 \text{ cm}^2$$



- b) $\left. \begin{array}{l} \text{base : } 236 \text{ cm} \\ \text{height : } 119 \text{ cm} \end{array} \right\} \text{ Triangle}$
 $\left. \begin{array}{l} \text{length : } 85 \text{ cm} \\ \text{width : } 236 \text{ cm} \end{array} \right\} \text{ Rectangle 1}$
 $\left. \begin{array}{l} \text{length : } 213 \text{ cm} \\ \text{width : } 382 \text{ cm} \end{array} \right\} \text{ Rectangle 2}$

- c) Trapezoid : $\frac{1}{2} b \times h = \frac{1}{2} \times 236 \times 119$
 $= 14,042 \text{ cm}^2$

Rectangle 1 : $l \times w = 85 \times 236$
 $= 20,060 \text{ cm}^2$

Rectangle 2 : $l \times w = 213 \times 382$
 $= 81,366 \text{ cm}^2$

$$14,042 + 20,060 + 81,366 = 115,468 \text{ cm}^2$$

Follow me

Modeling prompts

- Identify the common shapes that make up the composite shape.
- Solve for the area of each part.
- Add the areas of the parts for the total area.
- Discuss other ways to solve. For example, finding the area of the entire circle and then multiplying it by $\frac{3}{4}$ or finding the area of the entire circle and subtracting the quarter circle.

Answers

Using $\pi = 3.14$,

- a) Semi-circle : $\frac{1}{2} \times \pi \times \left(\frac{8.2}{2}\right)^2 = 26.3917\text{m}^2$

Quarter circle : $\frac{1}{4} \times \pi \times \left(\frac{8.2}{2}\right)^2 = 13.19585\text{m}^2$

- b) $26.3917 + 13.19585 = 39.58755\text{m}^2$

Your turn

If stuck

- Use a calculator for calculations if necessary, since computation by hand is not a focus for this lesson.
- Use similar guidance given in the Modeling prompts.

Questions

- a) What is the formula for the area of a semi-circle? ($\frac{1}{2} \times \pi \times radius^2$)
- a) What is the diameter measurement? (The diameter is part of the rectangle. The top side is 28.25 ft. The sum of the parts on the opposite side is equivalent. To find missing part solve $x + 3.55 + 13.3 = 28.25$.)
- a) What is the radius measurement? (5.7 ft, which is half the diameter, 11.4 ft.)
- b) Does the area of the shape represent the combined area of the semi-circle and the rectangle or the difference? (It represents the difference, because the semi-circle is missing from the rectangle. So to solve, we use subtraction.)
- b) Is there another way to decompose the composite shape? (No, it is clearly a semi-circle and a rectangle.)

Watch out for

- Students who make calculation errors.
- Students who use incorrect formulas.

Answers

Using $\pi = 3.14$,

- a) Semi-circle : $\frac{1}{2} \times \pi \times (5.7)^2 = 51.0093 \text{ ft}^2$

Rectangle : $l \times w = 11.3 \times 28.25 = 319.225 \text{ ft}^2$

- b) $319.225 - 51.0093 = 268.2157 \text{ ft}^2$

You do

If stuck

- Use a calculator for calculations if necessary, since computation by hand is not a focus for this lesson.
- Use the Support slide for question 3.

Questions

- 1a) Where do you see the trapezoid and the triangle? (The trapezoid is the larger shape on the right and the triangle is on the left.)
- 1b) How can you find the length of the longest base on the trapezoid? (The height of the triangle is 15.8 mm and the rest of the trapezoid is 20.4 mm, so add to find the total side length.)
- 1b) Why is 22.3 cm the height of the trapezoid? (The height is always the perpendicular line that connects the two bases, so no matter the orientation of the shape, this dimension is the height.)
- 1c) What is the formula for the area of a trapezoid? ($\frac{1}{2}(b_1 + b_2)h$)
- 1c) What is the formula for the area of a triangle? ($\frac{1}{2} \times base \times height$)
- 1c) Why do we add the areas together? (The total area is the trapezoid and the rectangle combined.)
- 1c) Are there other ways to decompose this shape? (Yes...
 - two triangle and one rectangle;
 - a trapezoid across the bottom and a triangle on top;
 - the overall rectangle minus the triangle and trapezoid;
 - the overall rectangle minus two triangles and a rectangle.)

Questions: Second slide

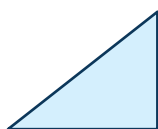
- 2a) What is the formula for the area of a circle? ($\pi \times radius^2$)
- 2a) What is the diameter measurement? (15.3 cm)
- 2a) What is the radius measurement? (Divide the diameter by 2: $15.3 \div 2 = 7.65$)
- 2a) What do the arrows on the edge of the shape mean? (They indicate that the opposite sides are parallel.)
- 2a) What is the formula for the area of a parallelogram? (base \times height)
- 2b) Does the area of the shape represent the combined area of the semi-circle and the rectangle or the difference? (It represents the difference, because the circle is missing from the parallelogram. So to solve, we use subtraction.)
- 2b) Is there another way to decompose the composite shape? (No, it is clearly a circle and a parallelogram.)

Watch out for

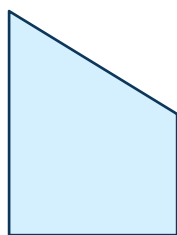
- Students who make calculation errors.
- Students who use incorrect formulas.

Answers

- 1a)



Triangle



Trapezoid

- b)

| | | |
|-----------------|---|-----------|
| base 1: 36.2 mm | } | Trapezoid |
| base 2: 15.8 mm | | |
| height: 22.3 mm | | |

| | | |
|-----------------|---|----------|
| base : 13.1 mm | } | Triangle |
| height: 15.8 mm | | |

Answers

- c) Trapezoid : $\frac{1}{2} (b_1 + b_2)h = \frac{1}{2} (36.2 + 15.8) \times 22.3$
 $= 579.8 \text{ mm}^2$

Triangle: $\frac{1}{2} b \times h = \frac{1}{2} \times 13.1 \times 15.8$
 $= 103.49 \text{ mm}^2$

$$579.8 + 103.49 = 683.29 \text{ mm}^2$$

Using $\pi = 3.14$,

- 2a) Circle : $\pi \times \left(\frac{15.3}{2} \right)^2 = 183.76065 \text{ cm}^2$

Parallelogram : $l \times h = 32.5 \times 15.3 = 497.25 \text{ cm}^2$

- b) $497.25 - 183.76065 = 313.48935 \text{ cm}^2$

- 3) Semicircle : $\frac{1}{2} \times \pi \times \left(3 \frac{1}{5} \div 2 \right)^2 = 4.0192 \text{ ft}^2$

Rectangle 1 : $\left(\left(3 \frac{1}{5} - 1 \frac{3}{5} \right) \div 2 \right) \times 4 = 3 \frac{1}{5} \text{ ft}^2$

Rectangle 2 : $\left(\left(3 \frac{1}{5} - 1 \frac{3}{5} \right) \div 2 \right) \times 4 = 3 \frac{1}{5} \text{ ft}^2$

$$4.0192 + 3 \frac{1}{5} + 3 \frac{1}{5} = 10.4192 \text{ ft}^2$$

Go further

If stuck

- Remind students the definitions of a semi-circle and a parallelogram.
- Remind students that the shapes can be combined or one can be subtracted from the other.
- Remind students that corresponding measurements should be equivalent.

Questions

- How did you solve? (Answers will vary.)
- Watch out for
- Students who make calculation errors.
- Students who use incorrect formulas.

Check your Understanding

Correct answer:

32.55 inches²

*rounded

Support for Slide(s)

Questions: First slide

- a) What do the tick marks on the rectangle mean? (They indicate which sides are equivalent.)
- c) How do we find the width of a rectangle, x ? (The two widths, $2x$, and the blank center, 1.6 ft, are all equal to the opposite side, which is 3.2 ft.)
- c) How do you solve for x ? (First, isolate the variable and then divide by 2 to find the value of one x .)

Questions: First slide

- f) What is the formula for the area of a semi-circle? ($\frac{1}{2} \pi \times radius^2$)
- g) Why do we add the individual areas? (The total composite shape is made up of two rectangles and one semi-circle. Nothing is being covered or removed.)
- g) Is there another way to decompose the composite shape? (Yes, you can find the area of the large rectangle and subtract the missing piece - the white rectangle. Then add the area of the semi-circle.)

Support for Slide(s)

Answers

- a) Shapes A and C have four right angles and the opposite sides are parallel.

They are rectangles.

- b) The length for A and C is 4 ft.

- c) $3\frac{1}{5} - 1\frac{3}{5} = 2x$

$$1\frac{3}{5} = 2x$$

$$x = \frac{4}{5}$$

- d) $(4 \times \frac{4}{5}) \times 2 = 6\frac{2}{5} \text{ ft}^2$

- e) Shape B has a radius of $1\frac{3}{5}$ ft which is half the diameter of $3\frac{1}{5}$ ft. It is a semi-circle.

Using $\pi = 3.14$

- f) $\frac{1}{2} \times \pi \times (1\frac{3}{5})^2 = 4.0192$

- g) $4.0192 + 6\frac{2}{5} = 10.4192 \text{ ft}^2$

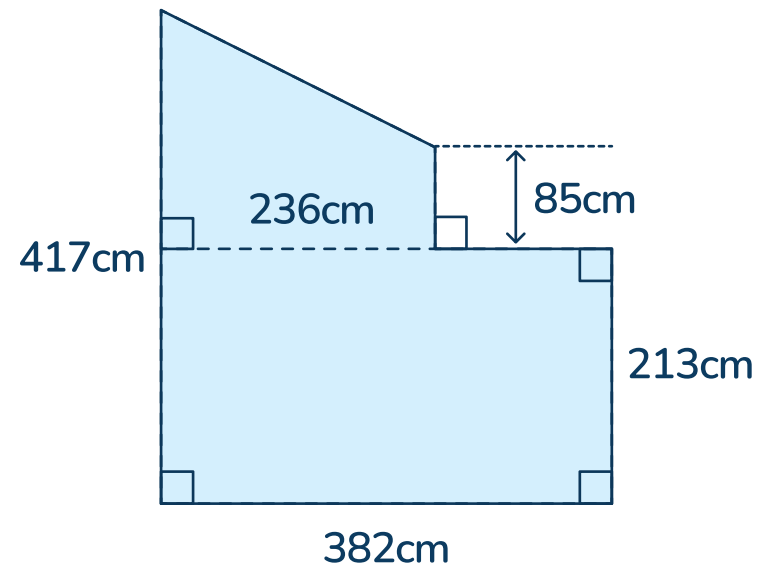
Today you will learn about

Evaluating areas of composite shapes



Learning Goal

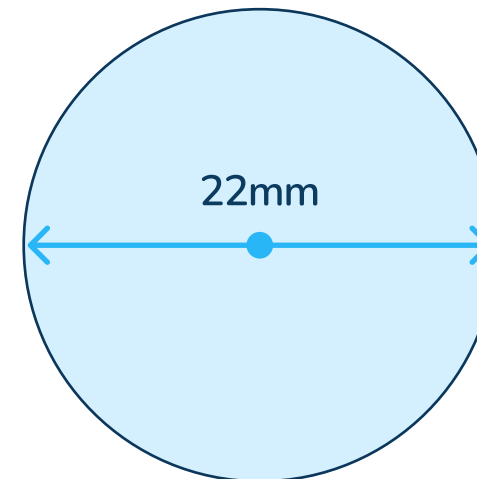
Calculate the area of the composite figure.



.....

Prior Learning

Calculate the area of the circle.

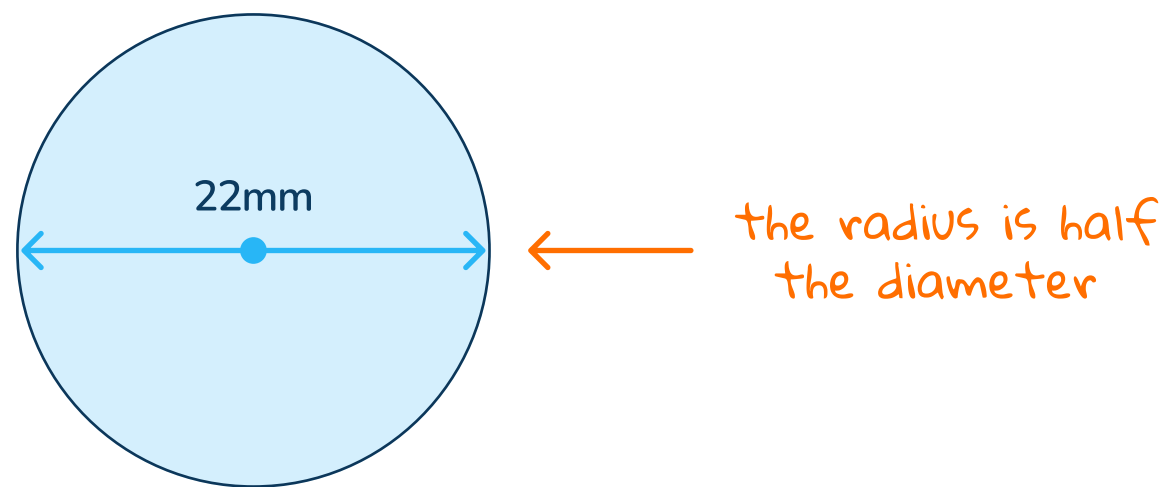


.....

Prior learning

Before evaluating the area of composite shapes, let's review how to find the **area of a circle**.

To find the area of a circle, use the formula : $A = \pi r^2$



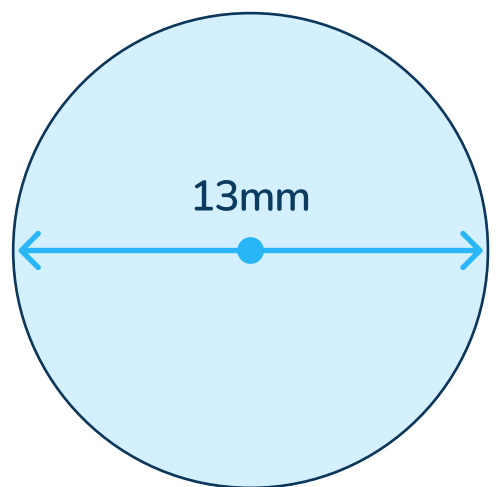
Substitute the radius into the formula and solve.

..... × = ← Always include the units

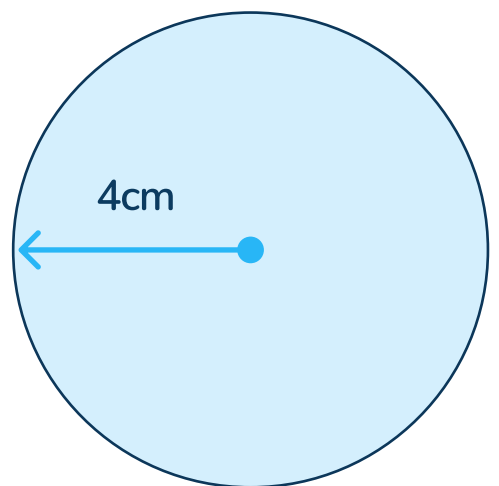
Use the calculator button for π or estimate and use 3.14

Now you try!

a Find the area of the circle.
.....

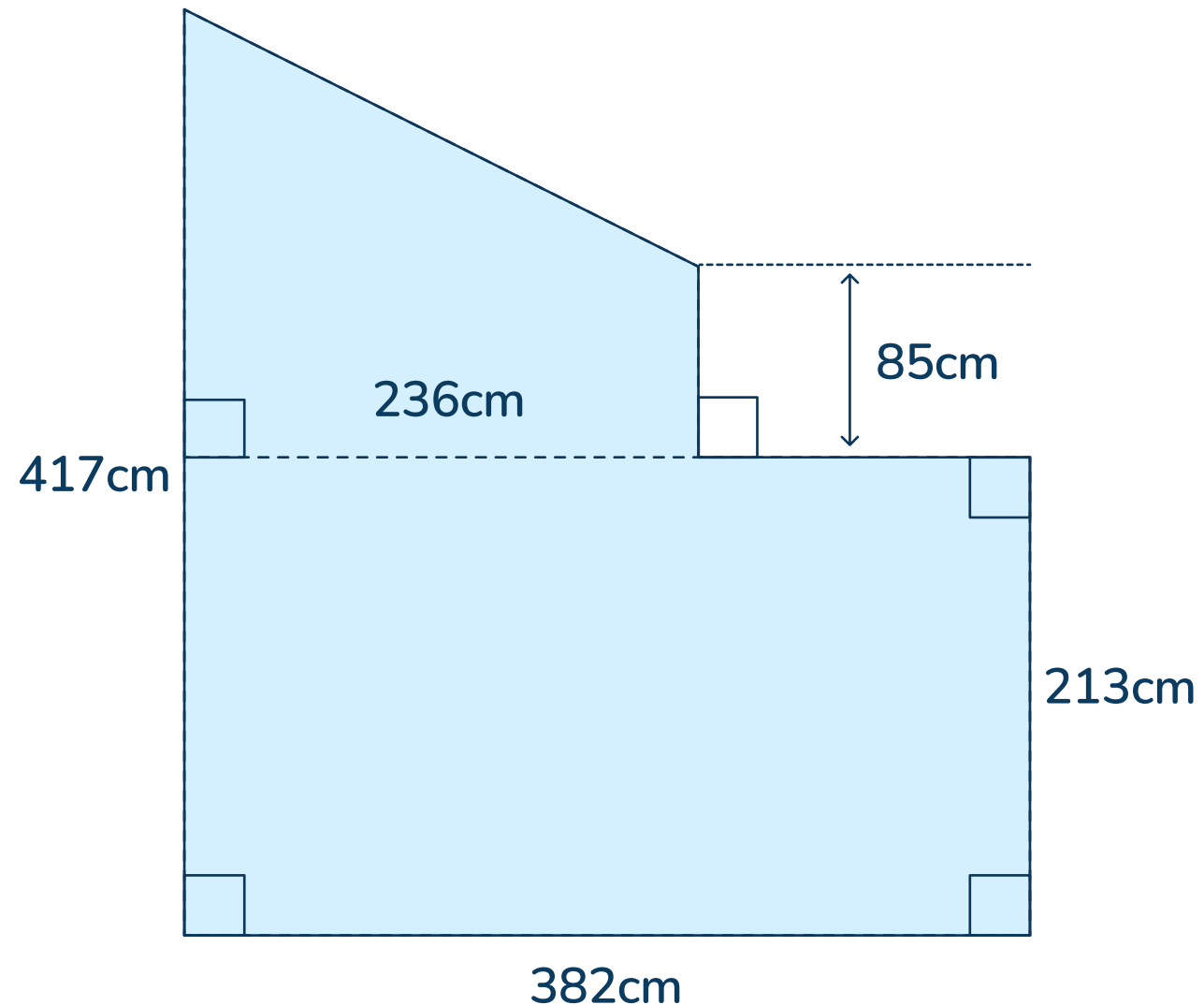


b Find the area of the circle.
.....



Let's learn

When calculating the **area of composite shapes**, we can use our knowledge of **finding the area of polygons** to help.



- a Decompose the composite shape into familiar shapes.
This composite shape is made up of a trapezoid and a rectangle.

- b Identify the dimensions needed for each area calculation.

Trapezoid

base 1: base 2: height:

Rectangle

length: width:

Area of a trapezoid
is $\frac{1}{2} (b_1 + b_2)h$.

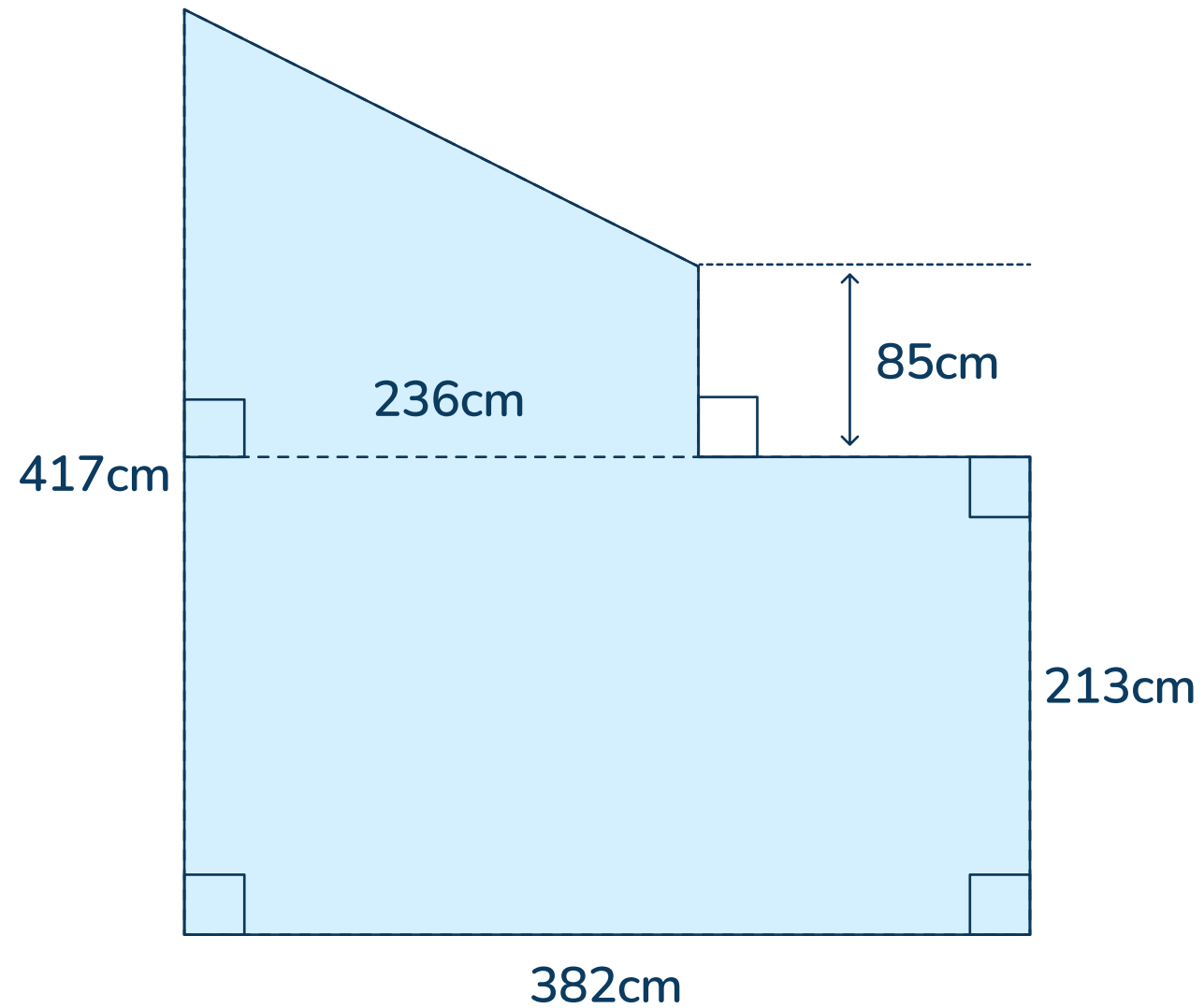
- c Decompose the composite shape into familiar shapes.
This composite shape is made up of a trapezoid and a rectangle.

..... + =

← Always include
the units

Let's learn

When calculating the **area of composite shapes**, sometimes there is **more than one way to solve**.



a Decompose the composite shape into familiar shapes.
This composite shape is made up of a two rectangles and a triangle.

b Identify the dimensions needed for each area calculation.

Triangle

base : height:

Rectangle 1

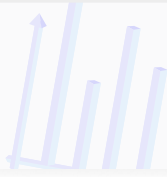
length: width:

Rectangle 2

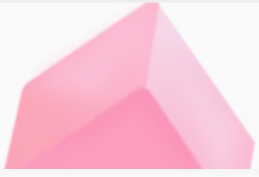
length: width:

c Calculate the individual areas and then solve for the final area.

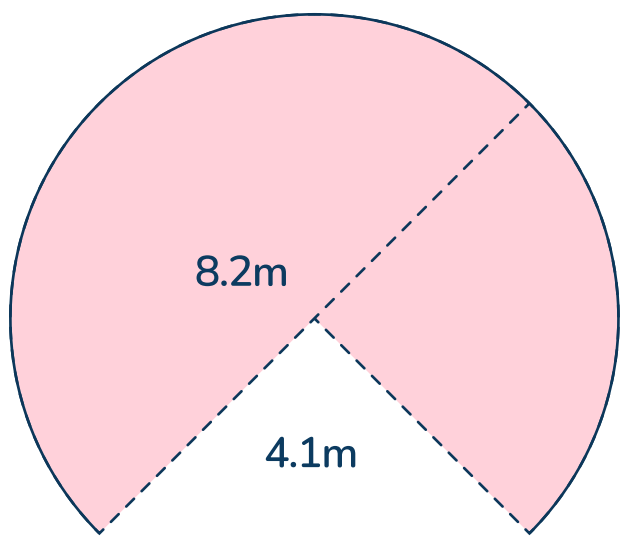
..... + + =



Follow me



Sometimes composite shapes are familiar shapes that are missing a part.



a Calculate the area of the semi-circle and the quarter circle.

Semi-circle: $\frac{1}{2} \times \dots \times \dots = \dots$

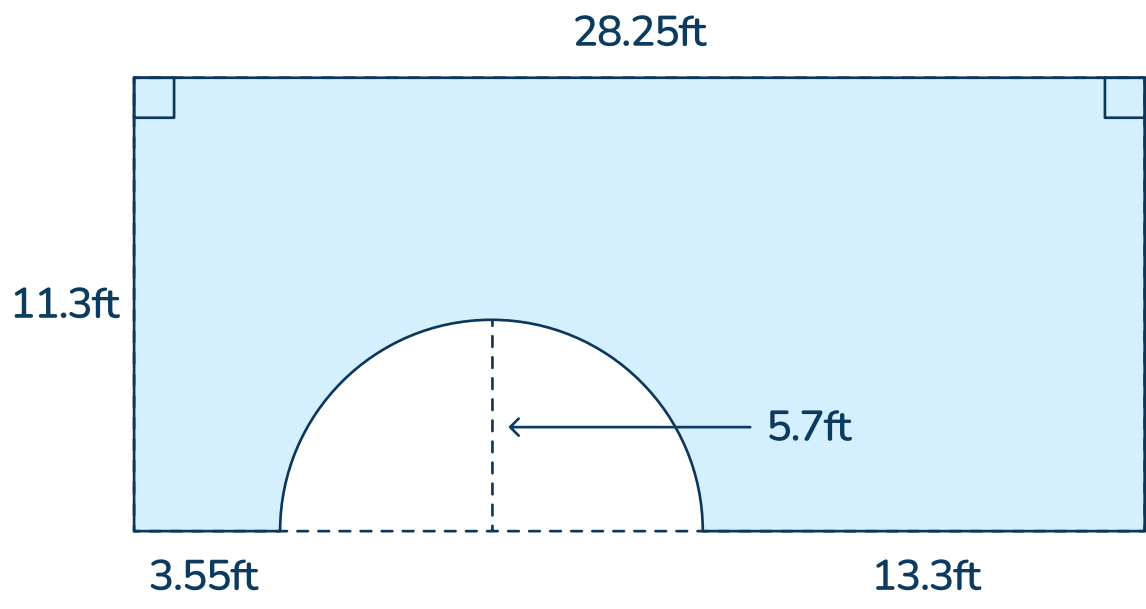
Quarter circle: $\frac{1}{4} \times \dots \times \dots = \dots$

b Calculate the final area of the composite shape.

$\dots + \dots = \dots$



Your turn



a Calculate the area of the semi-circle and the rectangle.

Semi-circle \dots

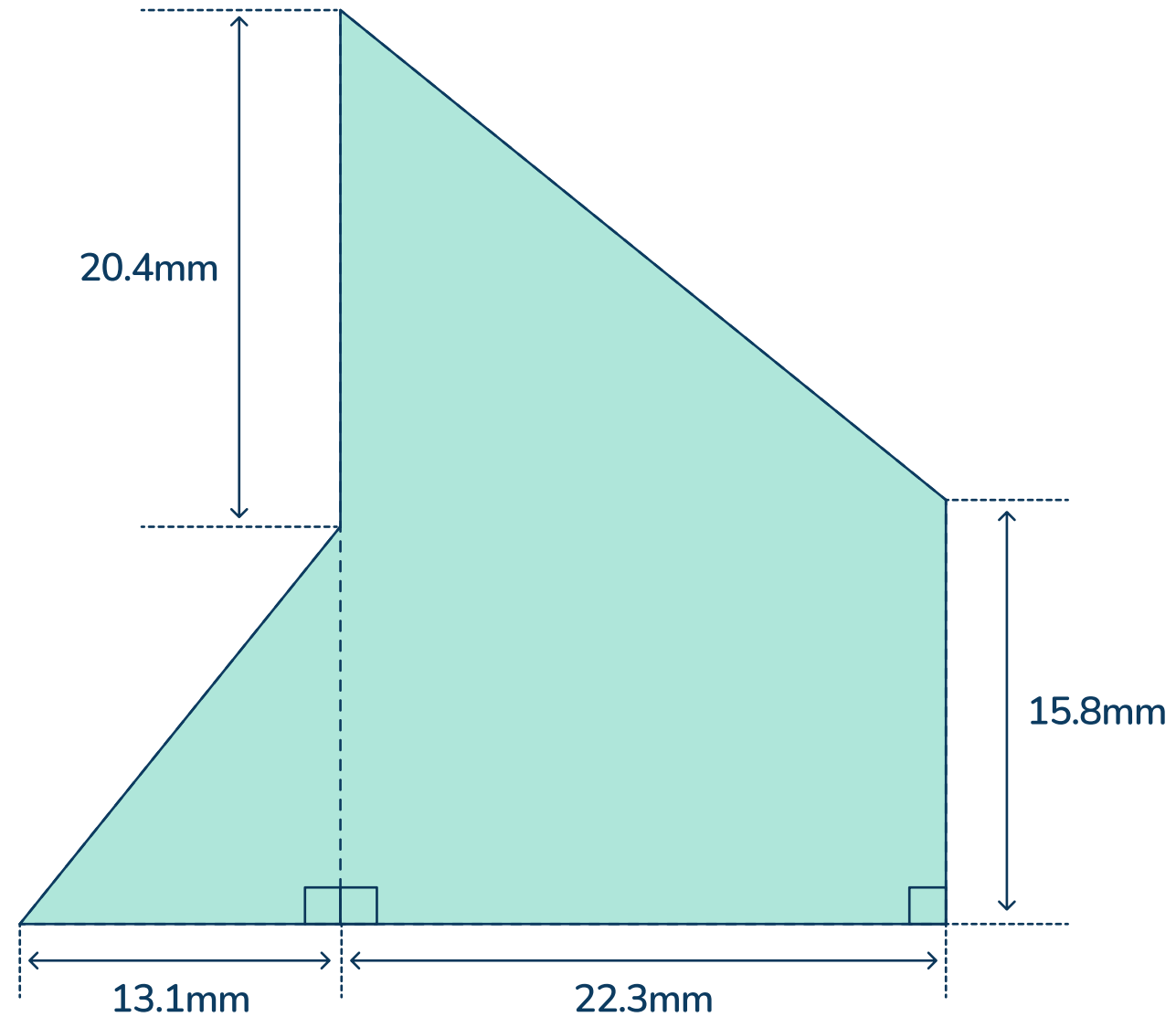
Rectangle \dots

b Calculate the final area of the composite shape.

\dots

You do

1



- a Decompose the composite shape into familiar shapes.
This composite shape is made up of a trapezoid and a triangle.

- b Identify the dimensions needed for each area calculation.

Trapezoid

base 1: base 2: height:

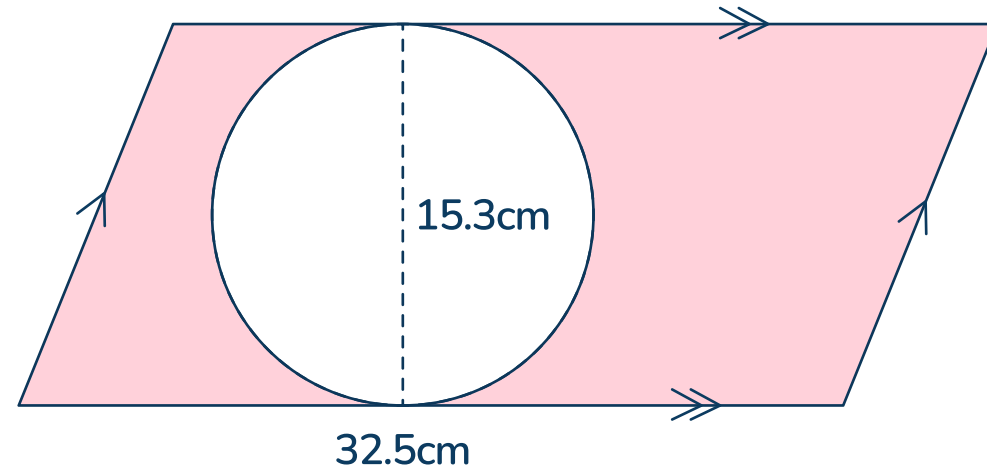
Triangle

base: height:

- c Calculate the individual areas and then add them together.

$$\text{.....} + \text{.....} = \text{.....}$$

2



a Calculate the area of the circle and the parallelogram.

Circle

.....

Parallelogram

.....

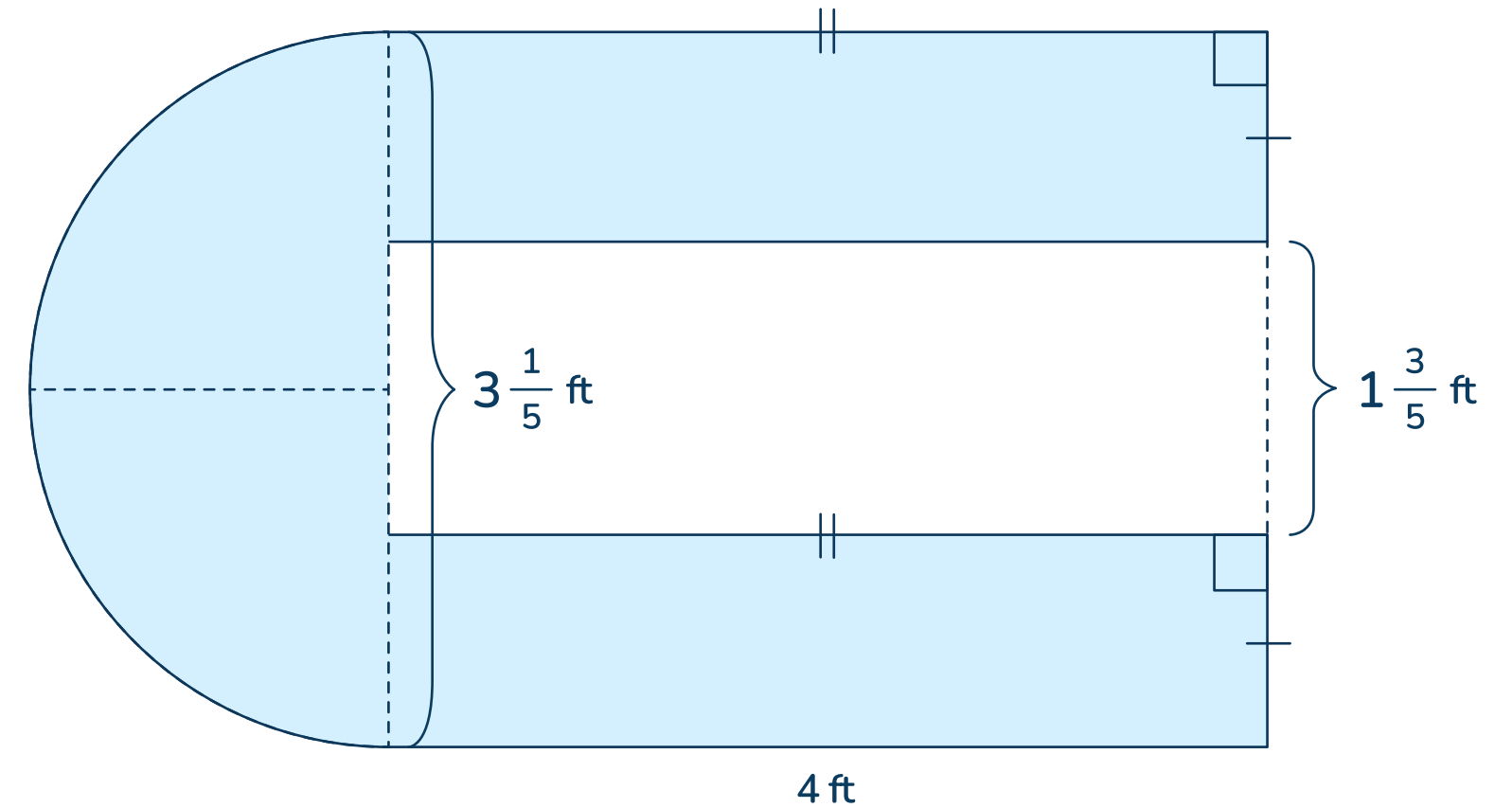
b Calculate the final area of the composite shape.

.....

3

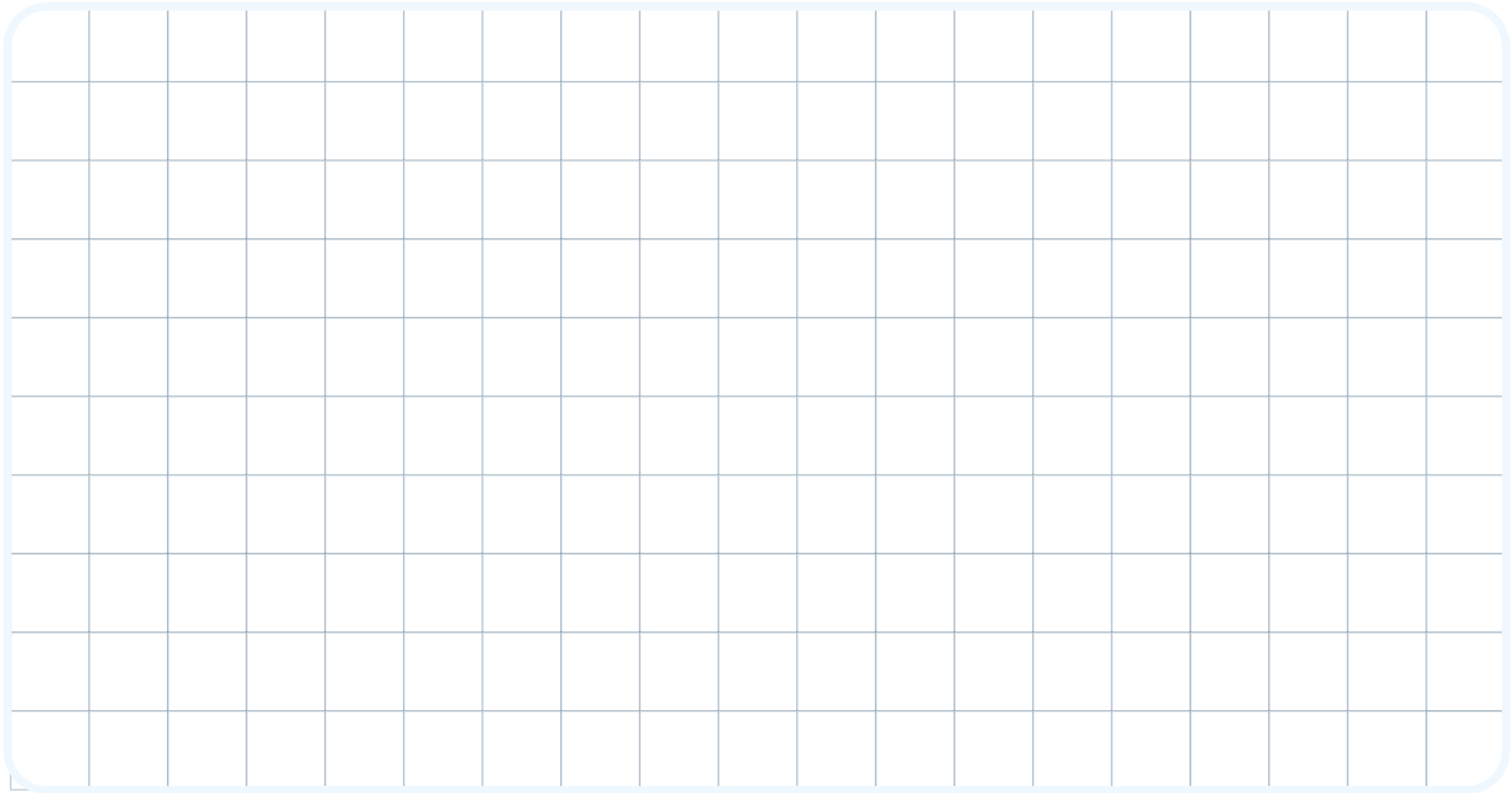
Calculate the area of the composite shape.

.....

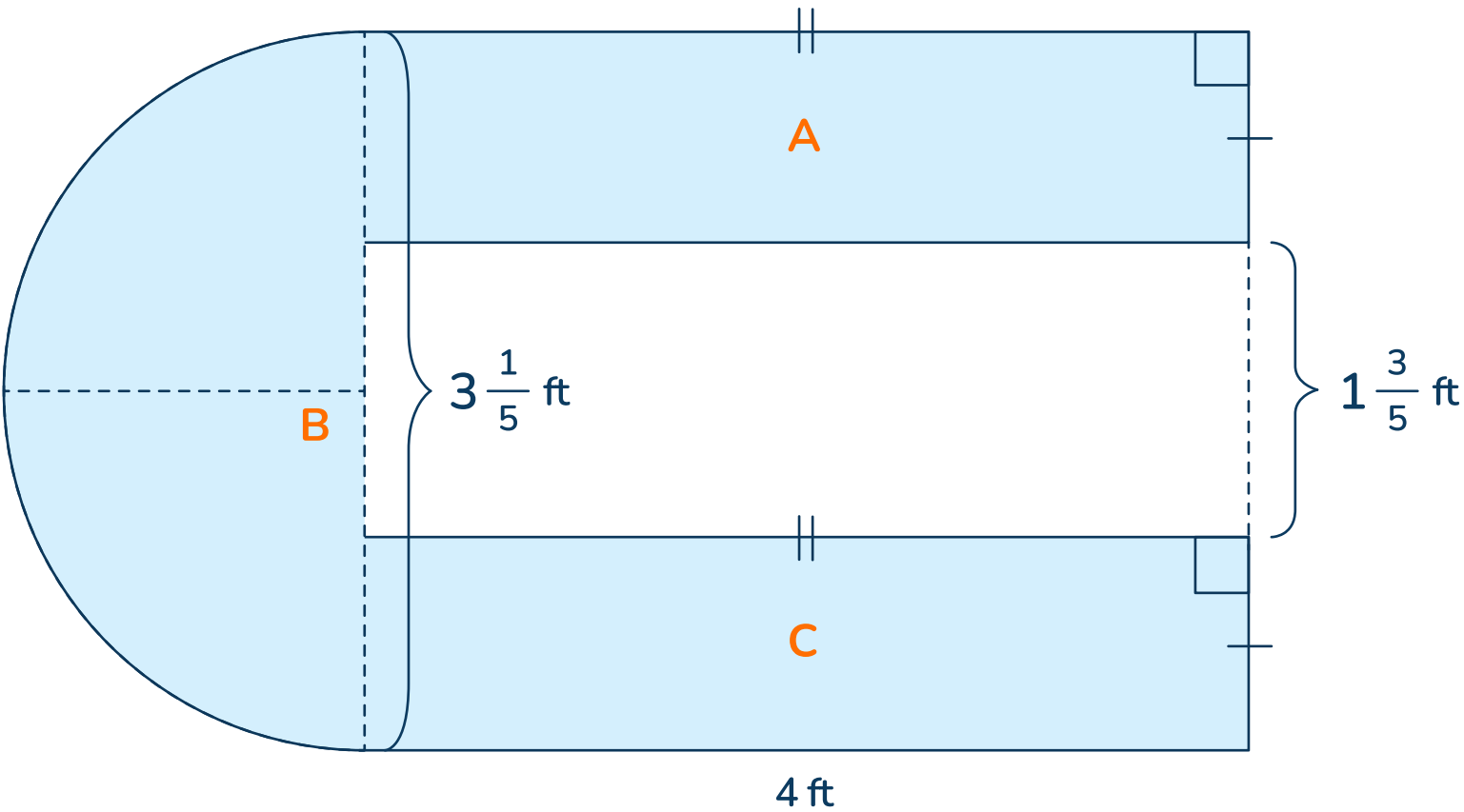


Go further

Draw a composite figure that has a parallelogram and semi-circle. Then calculate the area.



Let's look at this one more closely!



b The length for A and C is 4 ft.

c The width, x , for A and C is equal.
Write an equation to solve.

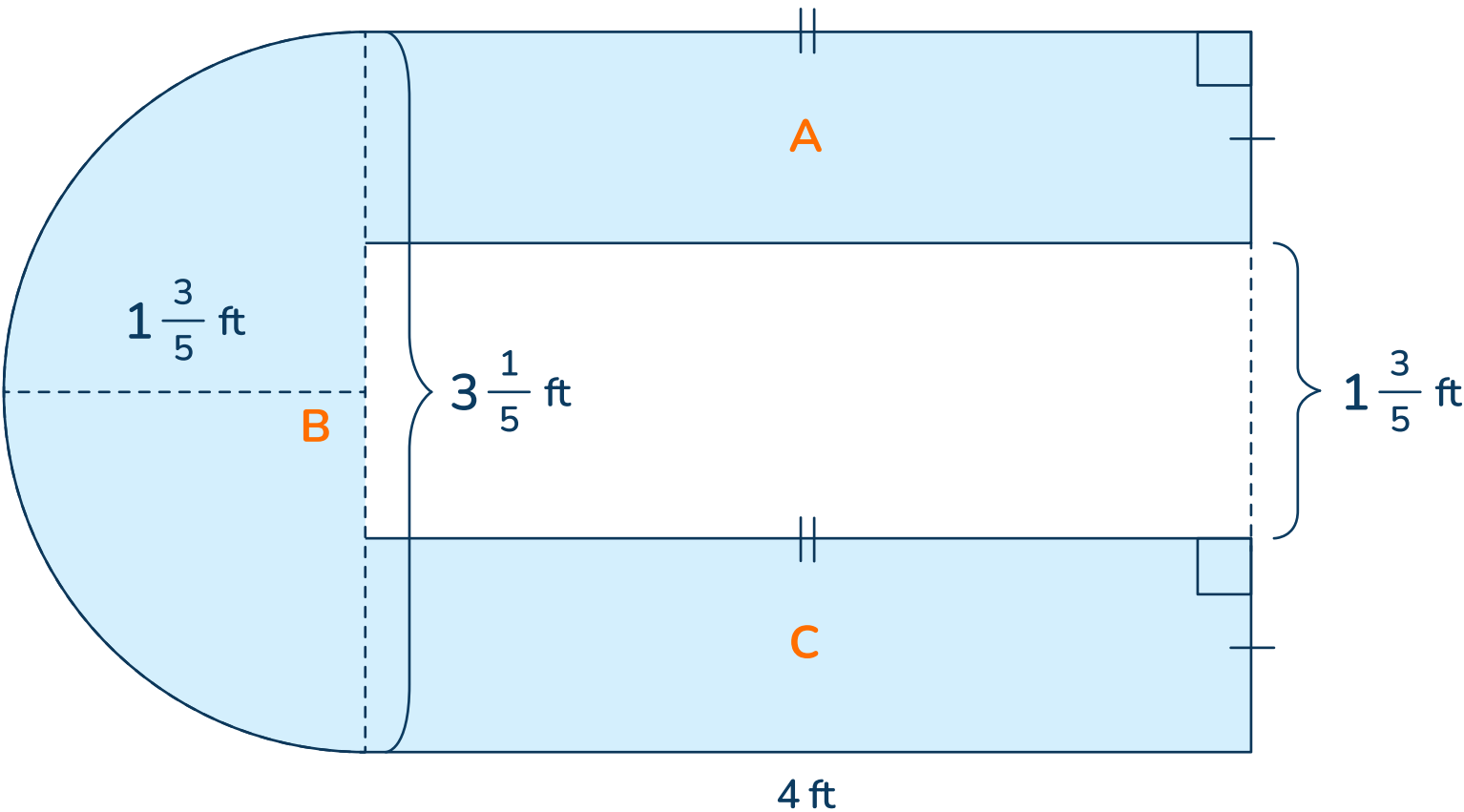
..... + =

$x =$

a Shapes A and C have four angles and the opposite sides are They are

d Calculate the area of both rectangles.

..... \times =



e Shape **B** has a of $1\frac{3}{5}$ ft which is half the of $3\frac{1}{5}$ ft. It is a

f Calculate the area of the semi-circle.

$\frac{1}{2} \times \dots \times \dots = \dots$

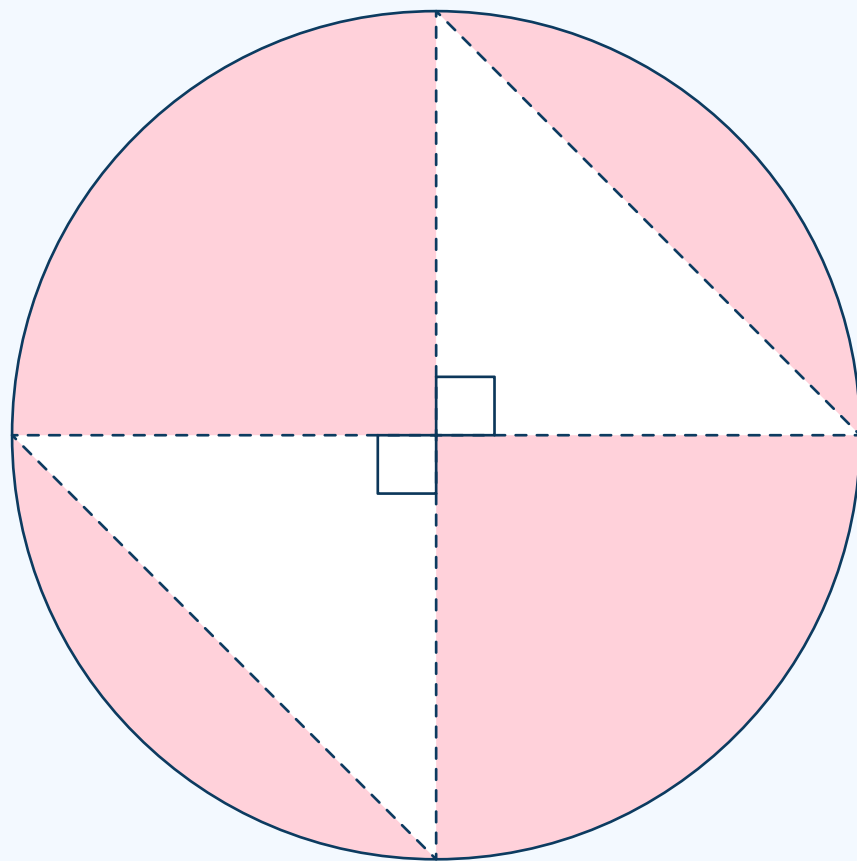
g Calculate the final area of the composite shape.

$\dots + \dots + \dots = \dots$

↑
Always include the Units

Check your understanding

The diameter of the circle is 7.8 inches.
Calculate the area of the shaded region.



.....

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



| Area | |
|---------------|-------------------------------|
| Triangle | $A = \frac{1}{2}bh$ |
| Rectangle | $A = bh$ |
| | $A = lw$ |
| Parallelogram | $A = bh$ |
| | $A = lw$ |
| Trapezoid | $A = \frac{1}{2}(b_1 + b_2)h$ |
| Circle | $A = \pi r^2$ |

Do you have a group of students who need a boost in math?

Each student could receive personalized lessons every week from our specialist one-on-one math tutors.




- ✓ Differentiated instruction for each student
- ✓ Aligned to your state's standards
- ✓ Scaffolded learning to close gaps

“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

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