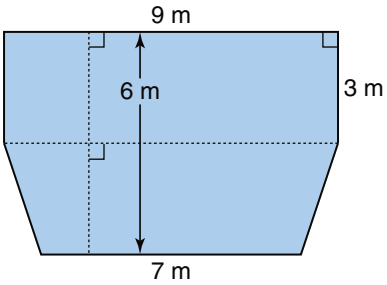
Connect the Ideas

A figure made up of other figures is called a **composite figure**.
This composite figure is made up of a rectangle and a trapezoid.



Determine the area of each part

The rectangle has dimensions 9 m by 3 m.
Its area is: $A = \ell w$
$= 9 \times 3$
$= 27$

The trapezoid has parallel sides of 9 m and 7 m.
The height of the trapezoid is: $6\text{ m} - 3\text{ m} = 3\text{ m}$
Its area is: $A = \frac{1}{2}(a + b)h$
$= \frac{1}{2}(9 + 7) \times 3$
$= \frac{1}{2} \times 16 \times 3$
$= 8 \times 3$
$= 24$

Determine the total area

Total area = Rectangle area + Trapezoid area
$= 27 + 24$
$= 51$

The area of the composite figure is 51 m^2.

Is the answer reasonable?

From the diagram, the area of the trapezoid is a little less than the area of the rectangle.
So, the total area should be less than twice the area of the rectangle. That is, less than $2 \times 27 = 54$

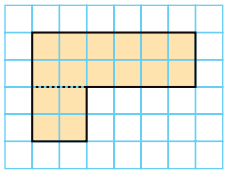
Since 51 is a little less than 54, the answer is reasonable.

Practice

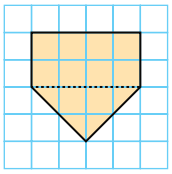
Assume the figures in questions 1 and 2 are drawn on 1-cm grid paper.

1. Determine the area of each composite figure.

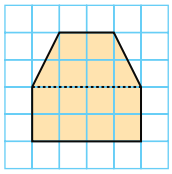
a)



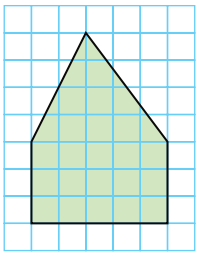
b)

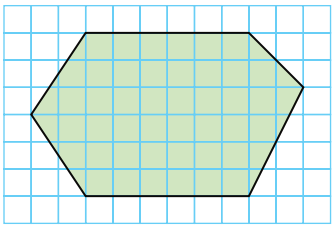


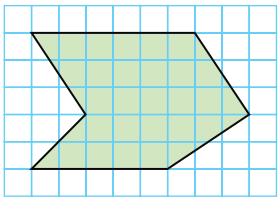
c)



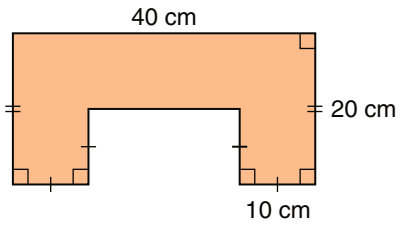
2. Determine the area of each composite figure.

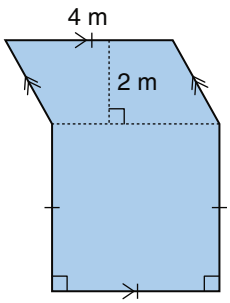
a) 

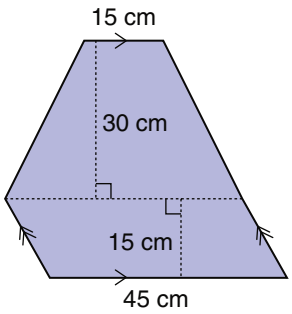
b) 

c) 

3. Determine the area of each composite figure.

a) 

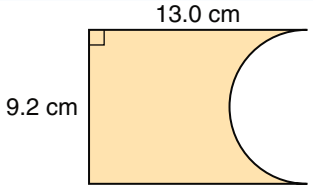
b) 

c) 

Another way to determine the area of a composite figure is to draw a figure around the composite figure first.

Example

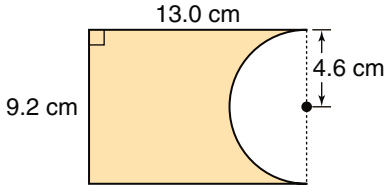
Determine the area of this composite figure. The curve is a semicircle.



Solution

The composite figure is a rectangle that measures 9.2 cm by 13.0 cm, with a semicircle removed.

- The diameter of the semicircle is 9.2 cm.
  So, the radius of the semicircle is:
  $\frac{9.2\text{ cm}}{2} = 4.6\text{ cm}$
  The area of a circle is: $A = \pi r^2$
  So, the area of the semicircle is:
  $A = \frac{1}{2}\pi r^2$
  Substitute: $r = 4.6$
  $A = \frac{1}{2} \times \pi \times (4.6)^2 \doteq 33.24$

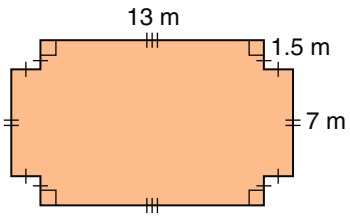


- The area of the rectangle is: $9.2 \times 13.0 = 119.6$
- Total area = Rectangle area − Semicircle area
  $\doteq 119.6 - 33.24$
  $= 86.36$

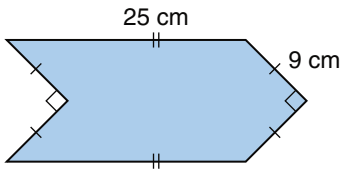
The area of the composite figure is about 86.4 cm^2.

4. Calculate the area of each figure.

a)

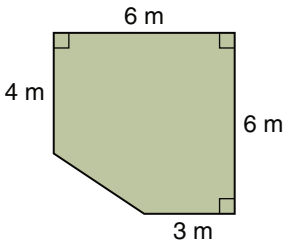


b)

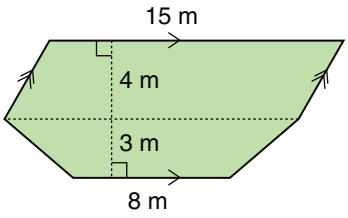


5. Kiren quotes for paving driveways based on the area to be paved.
Determine the area of each driveway. All curves are semicircles.
Is each result reasonable? Explain.

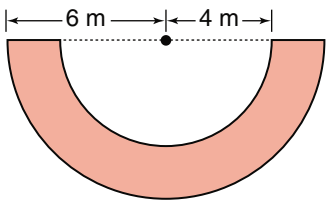
a)



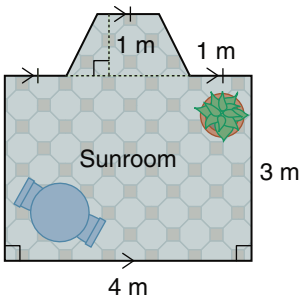
b)



c)



6. **Assessment Focus** The floor plan of a sunroom is shown.



a) What is the area of the floor of this sunroom?
b) There are 10 000 cm^2 in 1 m^2.
What is the area of the floor in square centimetres?
c) A square tile has side length 30 cm.
What is the area of 1 tile?
d) Estimate how many tiles are needed to cover the floor.
Justify your answer.

7. **Take It Further** One flowerbed has the shape of a trapezoid.
The parallel sides are 5 m and 7 m long.
The distance between the parallel sides is 4 m.
On the shorter parallel side, there is another flowerbed that has the shape of a rhombus, with side length 5 m and height 3 m.
a) Sketch the flowerbeds.
b) What is the area of the flowerbeds?
c) One bag of topsoil covers 0.25 m^2. How many bags are needed?
d) One bag of topsoil costs $2.29, including taxes.
How much will the topsoil in part c cost?

In Your Own Words

Sketch and label a composite figure.
Determine its area. Try to do this two different ways if possible.
Show your work.