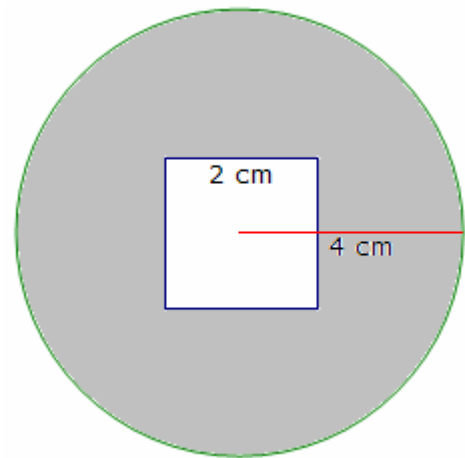


CHAPTER 8: Measurement Relationships
 8.2 Perimeter and Area of Composite Figures
 Determining the Area and Perimeter of Composite Figures

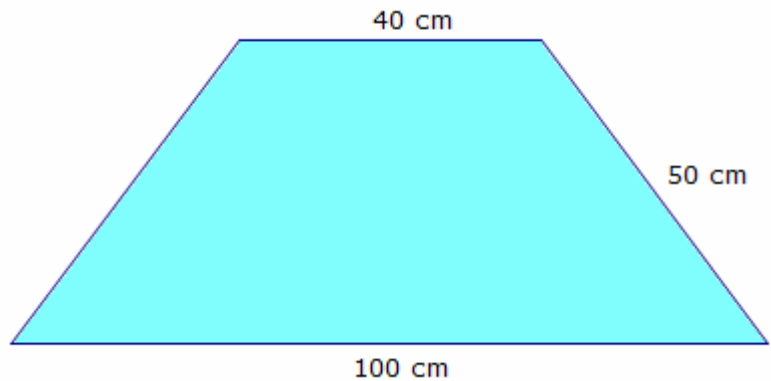
Example:

a) An engine seal is circular in shape, with a square cutout to fit over a shaft, as shown. Find the area of rubber required to make the seal.



b) The inside and outside edges of the seal have an embedded steel wire to add strength. How much wire is needed?

c) Ducts are made by cutting shapes from sheet metal, and then, bending them. One such shape is shown. What area of metal is required to make the shape?



Solution:

a) The area of the circle is

$$\begin{aligned} A &= \pi r^2 \\ &= \pi(4)^2 \\ &= 50.3 \text{ cm}^2 \end{aligned}$$

The area of the square is

$$\begin{aligned} A &= lw \\ &= 2 \times 2 \\ &= 4 \text{ cm}^2 \end{aligned}$$

The area of the seal is $50.3 - 4 = 46.3 \text{ cm}^2$.

b) The perimeter of the circle is

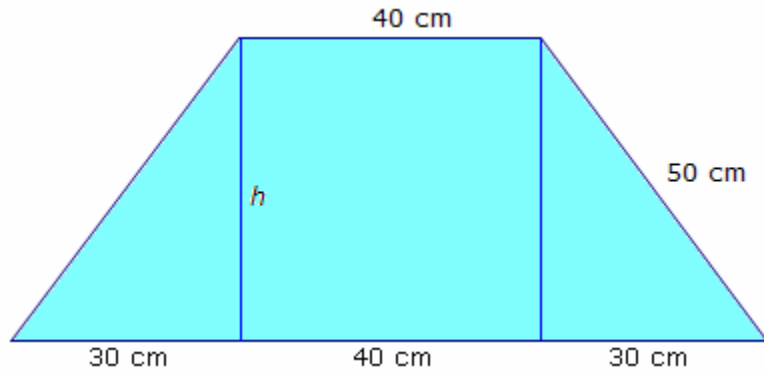
$$\begin{aligned} P &= 2\pi r \\ &= 2\pi(4) \\ &= 25.1 \text{ cm} \end{aligned}$$

The perimeter of the square is

$$\begin{aligned} P &= 4s \\ &= 4(2) \\ &= 8 \text{ cm} \end{aligned}$$

The length of wire required is $25.1 + 8 = 33.1 \text{ cm}$.

c) Draw vertical line segments to divide the shape as shown. The base of each triangle is 30 cm, while the height is unknown. The centre is a rectangle or a square.



Use the Pythagorean theorem to find the value of h .

$$\begin{aligned}
 c^2 &= a^2 + b^2 \\
 50^2 &= 30^2 + h^2 \\
 2500 &= 900 + h^2 \\
 2500 - 900 &= 900 + h^2 - 900 \\
 1600 &= h^2 \\
 40 &= h
 \end{aligned}$$

The height of each triangle is 40 cm.

The area of each triangle is

$$\begin{aligned}
 A &= \frac{1}{2}bh \\
 &= \frac{1}{2} \times 30 \times 40 \\
 &= 600 \text{ cm}^2
 \end{aligned}$$

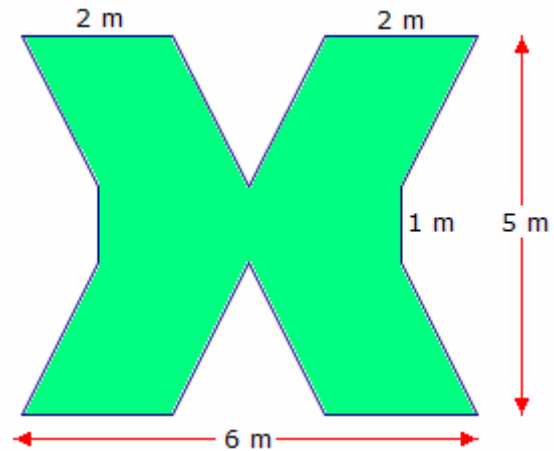
The area of the square is

$$\begin{aligned}
 A &= lw \\
 &= 40 \times 40 \\
 &= 1600 \text{ cm}^2
 \end{aligned}$$

The area of the shape is $600 + 1600 + 600 = 2800 \text{ cm}^2$.

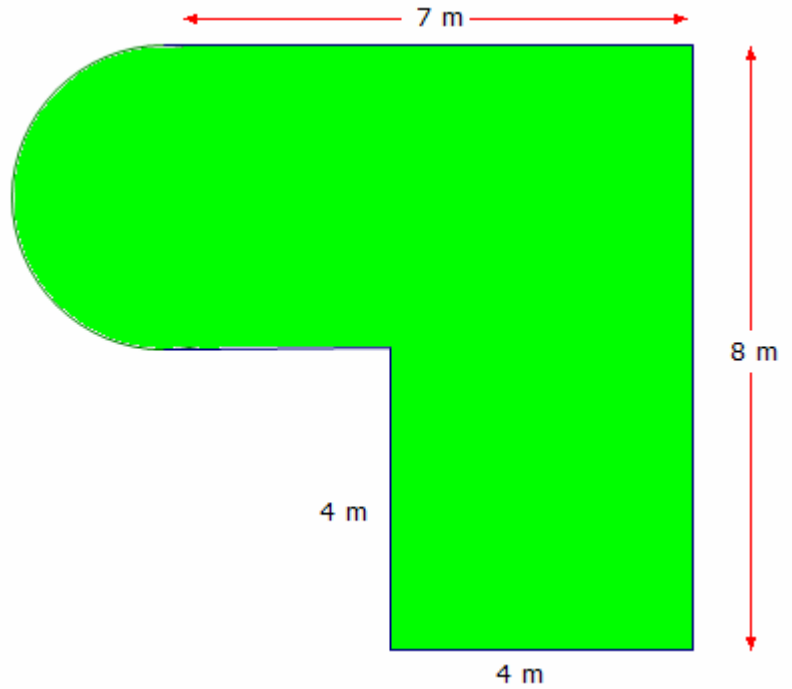
Practice:

1. a) The Planet X theme restaurant will have a large X placed on the roof, as shown. Find the area of plastic required to make the X.



b) One of the holes for a miniature golf course has the shape shown. What area of artificial turf is required for the hole?

c) The edges of the hole in part b) will be made of treated lumber. What length of lumber will be required?



Answers:

1. a) 20 m^2 b) 50.3 m^2 c) 32.3 m