Lesson 40

Finding Perimeters and Areas of Composite Figures

Composite Figure – A plane figure made up of simple shapes or a three-dimensional figure made up of simple three-dimensional figures.

The perimeter of a plane composite figure is the sum of the lengths of its sides.

Example 1 Finding Perimeters of Composite Figures

Find the perimeter of the composite figure.

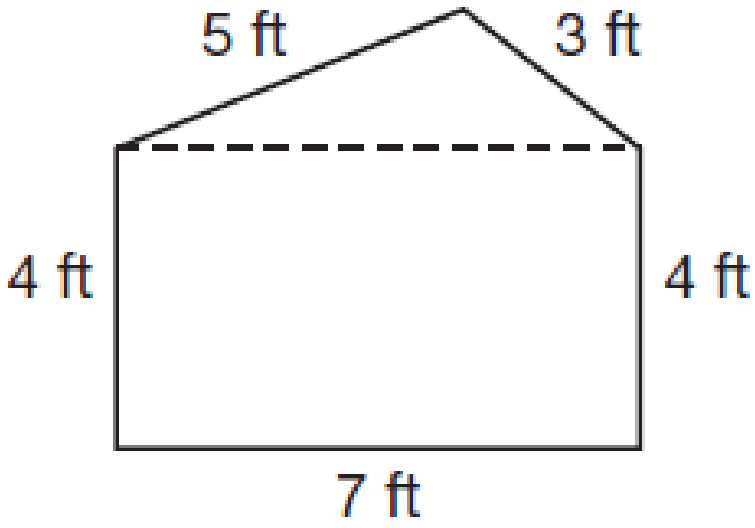
SOLUTION

Start at a vertex and move around the figure, adding the side lengths in order.

$P = 3 + 5 + 4 + 7 + 4$

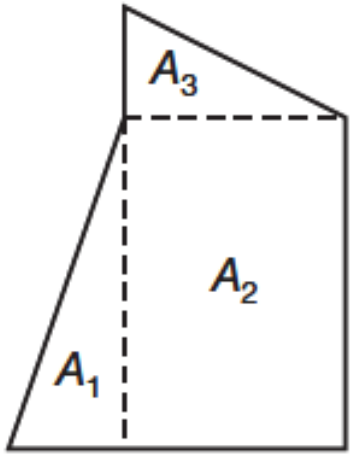
$= 23$ ft

The perimeter is 23 feet.



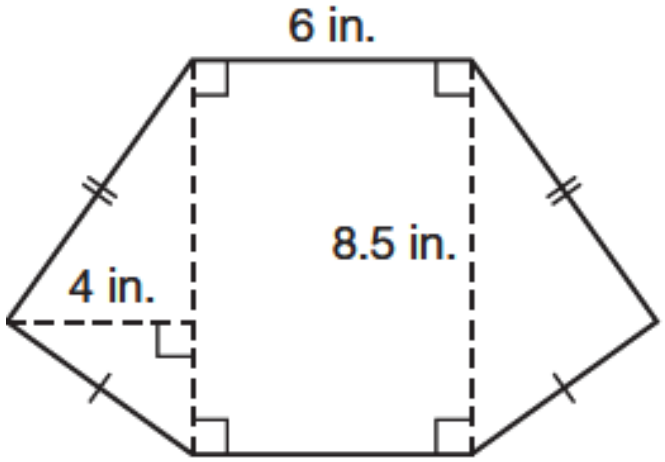
Postulate 19: Area Congruence Postulate – If two polygons are congruent, then they have the same area.

Postulate 20: Area Addition Postulate – The area of a region is equal to the sum of the areas of its nonoverlapping parts. In the diagram, $A = A_1 + A_2 + A_3$.



The Area Congruence Postulate and the Area Addition Postulate make it possible to find the area of complex composite figures by breaking them down into simpler shapes and finding the area of each shape.

Example 2 Finding Areas of Composite Figures



Find the area of this composite figure.

SOLUTION

Left triangle:	Rectangle:
$A_1 = \frac{1}{2}bh$	$A_2 = bh$
$A_1 = \frac{1}{2}(8.5)(4)$	$A_2 = (8.5)(6)$
$A_1 = 17in^2$	$A_2 = 51in^2$

Therefore, the area of the left triangle is $17in^2$ and the area of the rectangle is $51in^2$.

By the SSS Postulate, the two triangles in the figure are congruent. Therefore, by Postulate 19, the right triangle has the same area as the left triangle, 17 square inches. By the Area Addition Postulate, the area of the composite figure is $A = 17 + 51 + 17 = 85$ square inches.

Hint

Sometimes a figure will need to be divided into parts in order to find the area. Look for parts of the figure that appear to be rectangles or triangles and draw dotted lines to indicate how the figure should be divided.

Example 3 Finding Areas of Composite Figures by Subtracting

Find the area of the shaded region.

SOLUTION

Outer rectangle:

$A_1 = bh$

$A_1 = (16)(25)$

$A_1 = 390mm^2$

Therefore, the area of the outer rectangle is $390mm^2$.

"Missing" triangle:

$A_2 = \frac{1}{2}bh$

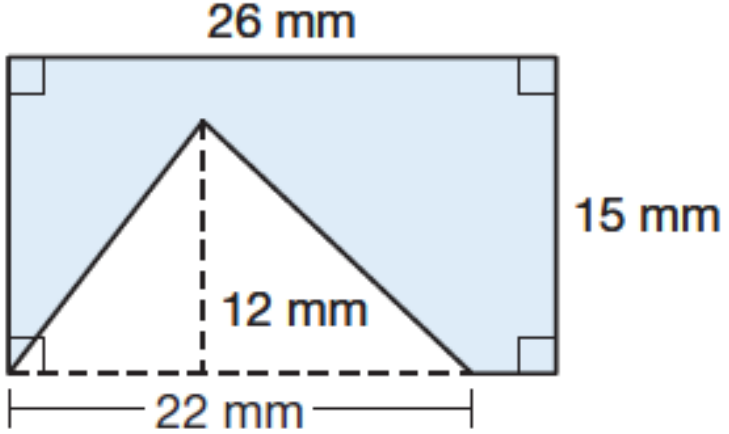
$A_2 = \frac{1}{2}(22)(12)$

$A_2 = 132mm^2$

Therefore, the area of the triangle $132mm^2$.

The Area Addition Postulate implies that the area of the rectangle is the area of the region we want to find plus the area of the triangle:

$$A_1 = A + A_2$$
$$390 = A + 132$$
$$A = 258mm^2$$



Example 4 Application: Architecture

The diagram shows the plan for a reflecting pool that will form part of a new downtown plaza.

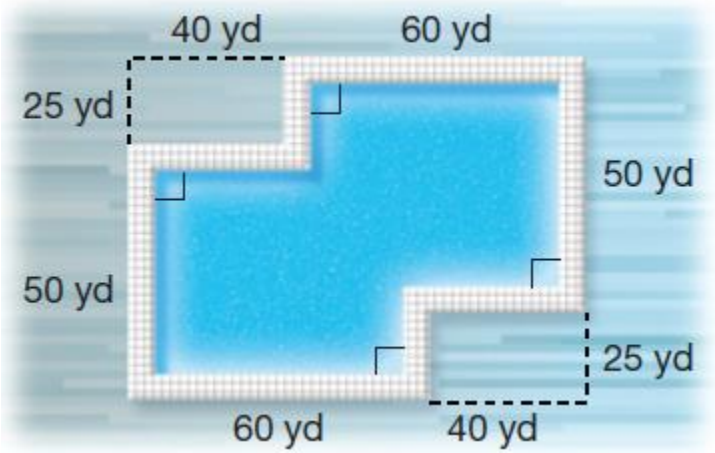
a. The edge of the pool needs to be tiled. What is the perimeter of the pool that will need tiling?

SOLUTION

$P = 25 + 40 + 50 + 60 + 25 + 40 + 50 + 60$

$P = 350$ yd

Therefore, the perimeter of the pool is 350 yards.



Example 4 Application: Architecture

The diagram shows the plan for a reflecting pool that will form part of a new downtown plaza.
b. What area of concrete will be needed for the bottom of the pool?

SOLUTION

Outer rectangle:

$A_1 = bh$

$A_1 = (40 + 60)(25 + 50)$

$A_1 = (100)(75)$

$A_1 = 7500yd^2$

Therefore, the area of the outer rectangle is $7500yd^2$.

Each "missing" rectangle:

$A_2 = bh$

$A_2 = (40)(25)$

$A_2 = 1000yd^2$

Therefore, the area of each "missing" rectangle is $1000yd^2$.

Let *A* be the area of the pool bottom. By the Area Addition Postulate,

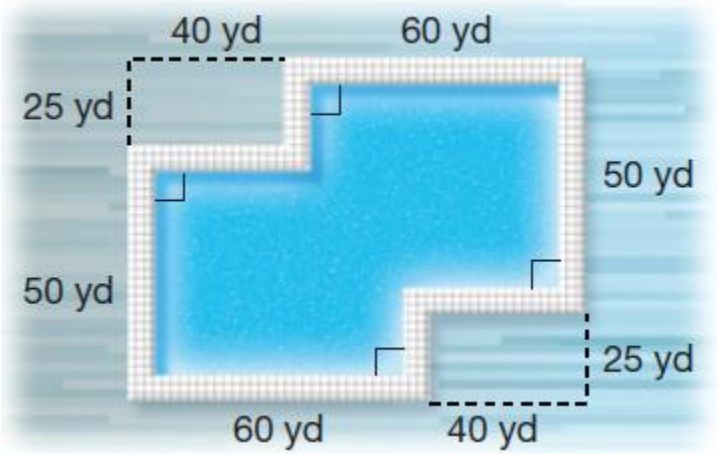
$$A_1 = A + A_2 + A_2$$

$$7500 = A + 1000 + 1000$$

$$7500 - 2000 = A$$

$$A = 5500yd^2$$

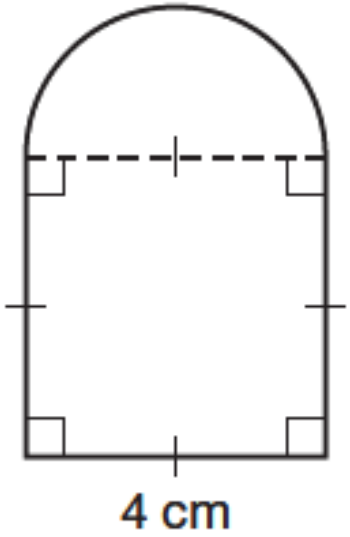
5500 square yards of concrete will be needed.



You Try!!!!!

Use this composite figure to answer problems b and c.

b. Determine the area of the figure. Express your answer in terms of π.



c. A rectangle with dimensions 3-by-1.5 centimeters is removed from the bottom left corner of the figure. Determine the area of the new figure. Express your answer in terms of π.

You Try!!!!!

d. A new office building has one side in the shape of a right triangle on top of a rectangle. The rectangle is 420 feet tall and 120 feet wide. The triangle's base is 120 feet long and its vertical leg is 160 feet long. What is the perimeter of this side of the building?

e. How much glass is needed to cover the side of the building in part d?

Assignment

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Lesson Practice (Ask Mr. Heintz)

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Practice 1-30 (Do the starred ones first)