1-5 Using Formulas in Geometry

Warm Up

Evaluate. Round to the nearest hundredth.

1. 12^2 144
2. 7.6^2 57.76
3. $\sqrt{64}$ 8
4. $\sqrt{54}$ 7.35
5. $3^2(\pi)$ 28.27
6. $(3\pi)^2$ 88.83

Objective

Apply formulas for perimeter, area, and circumference.

Vocabulary

perimeter	diameter
area	radius
base	circumference
height	pi

The **perimeter** *P* of a plane figure is the sum of the side lengths of the figure.

The **area** *A* of a plane figure is the number of non-overlapping square units of a given size that exactly cover the figure.

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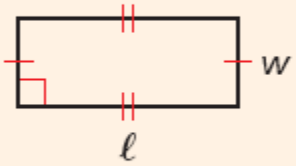
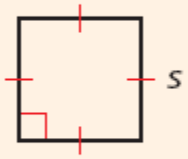
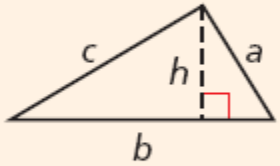
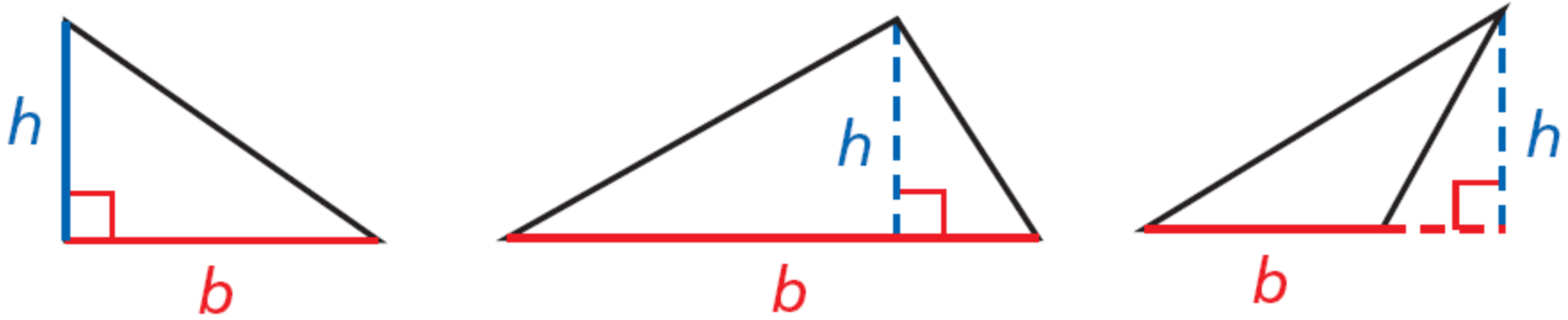
Perimeter and Area

RECTANGLE	SQUARE	TRIANGLE
		
$P = 2\ell + 2w$ or $2(\ell + w)$ $A = \ell w$	$P = 4s$ $A = s^2$	$P = a + b + c$ $A = \frac{1}{2}bh$ or $\frac{bh}{2}$

The **base** ***b*** can be any side of a triangle. The **height** ***h*** is a segment from a vertex that forms a right angle with a line containing the base. The height may be a side of the triangle or in the interior or the exterior of the triangle.

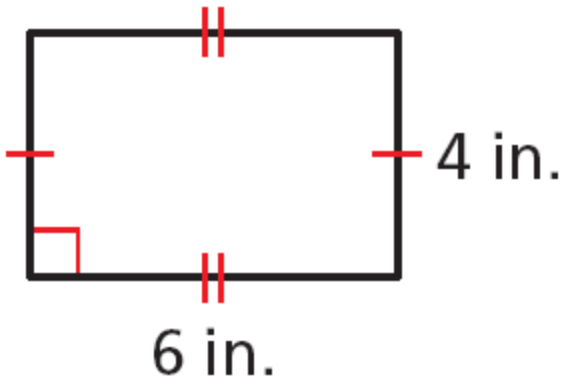


Remember!

Perimeter is expressed in linear units, such as inches (in.) or meters (m). Area is expressed in square units, such as square centimeters (cm^2).

Example 1A: Finding Perimeter and Area

Find the perimeter and area of each figure.



$P = 2\ell + 2w$

$= 2(6) + 2(4)$

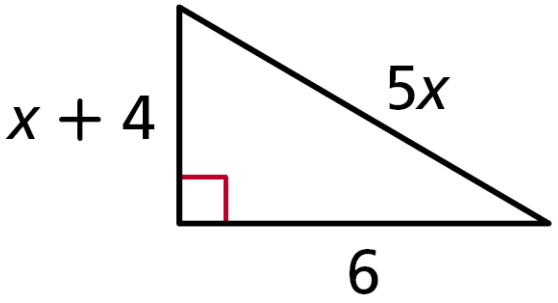
$= 12 + 8 = 20$ in.

$A = \ell w$

$= (6)(4) = 24$ in^2

Example 1B: Finding Perimeter and Area

Find the perimeter and area of each figure.



$P = a + b + c$

$= (x + 4) + 6 + 5x$

$= 6x + 10$

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

$= \frac{1}{2}(6)(x + 4)$

$= 3x + 12$

Check It Out! Example 1

Find the perimeter and area of a square with s = 3.5 in.

$P = 4s$ $\qquad$ $A = s^2$

$P = 4(3.5)$ $\qquad$ $A = (3.5)^2$

$P = 14$ in. $\qquad$ $A = 12.25$ in^2

Example 2: Crafts Application

The Queens Quilt block includes 12 blue triangles. The base and height of each triangle are about 4 in. Find the approximate amount of fabric used to make the 12 triangles.

The area of one triangle is

$$A = \frac{1}{2}bh = \frac{1}{2}(4)(4) = 8 \text{ in}^2.$$

The total area of the 12 triangles is $12(8) = 96 \text{ in}^2$.

Check It Out! Example 2

Find the amount of fabric used to make four rectangles. Each rectangle has a length of $6\frac{1}{2}$ in. and a width of $2\frac{1}{2}$ in.

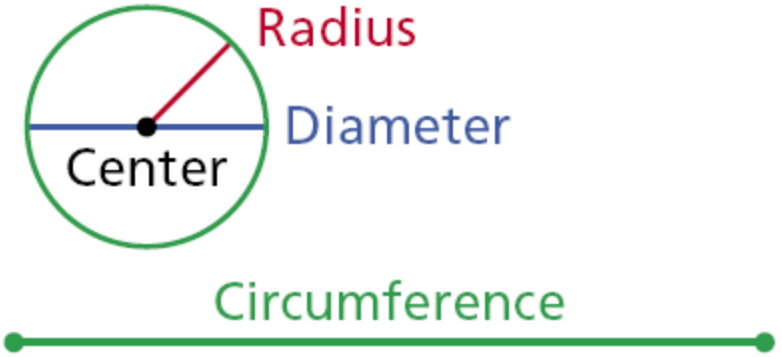
The area of one triangle is

$$A = \ell w = \left(6\frac{1}{2}\right)\left(2\frac{1}{2}\right) = 16\frac{1}{4} \text{ in}^2.$$

The amount of fabric to make four rectangles is

$$4\left(16\frac{1}{4}\right) = 65 \text{ in}^2.$$

In a circle a **diameter** is a segment that passes through the center of the circle and whose endpoints are on a circle. A **radius** of a circle is a segment whose endpoints are the center of the circle and a point on the circle. The **circumference** of a circle is the distance around the circle.



1-5 Using Formulas in Geometry

Circumference and Area of a Circle

The circumference C of a circle is given by the formula $C = \pi d$ or $C = 2\pi r$.

The area A of a circle is given by the formula $A = \pi r^2$.

The ratio of a circle's circumference to its diameter is the same for all circles. This ratio is represented by the Greek letter π (pi). The value of π is irrational. Pi is often approximated as 3.14 or $\frac{22}{7}$.

Example 3: Finding the Circumference and Area of a Circle

Find the circumference and area of a circle with radius 8 cm. Use the π key on your calculator. Then round the answer to the nearest tenth.

$C = 2\pi r$

$= 2\pi(8) = 16\pi$

≈ 50.3 cm

$A = \pi r^2$

$= \pi(8)^2 = 64\pi$

≈ 201.1 cm^2

Check It Out! Example 3

Find the circumference and area of a circle with radius 14m.

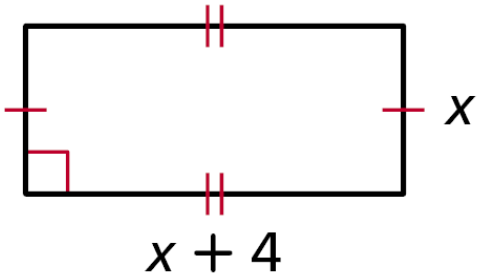
$$C = 2\pi r$$
$$= 2\pi(14) = 28\pi$$
$$\approx 88.0 \text{ m}$$

$$A = \pi r^2$$
$$= \pi(14)^2 = 196\pi$$
$$\approx 615.8 \text{ m}^2$$

Lesson Quiz: Part I

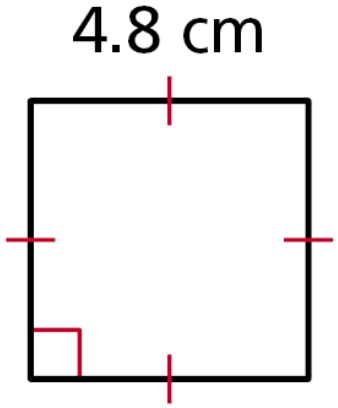
Find the area and perimeter of each figure.

1.



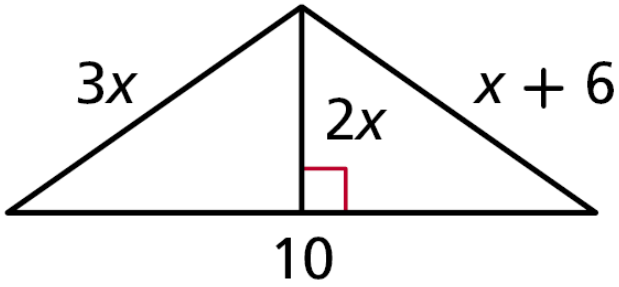
$x^2 + 4x$; $4x + 8$

2.



23.04 cm²; 19.2 cm

3.



$10x$; $4x + 16$

Lesson Quiz: Part II

Find the circumference and area of each circle. Leave answers in terms of π.

4. radius 2 cm 4π cm; 4π cm^2

5. diameter 12 ft 36π ft; 12π ft^2

6. The area of a rectangle is 74.82 in^2, and the length is 12.9 in. Find the width.

5.8 in