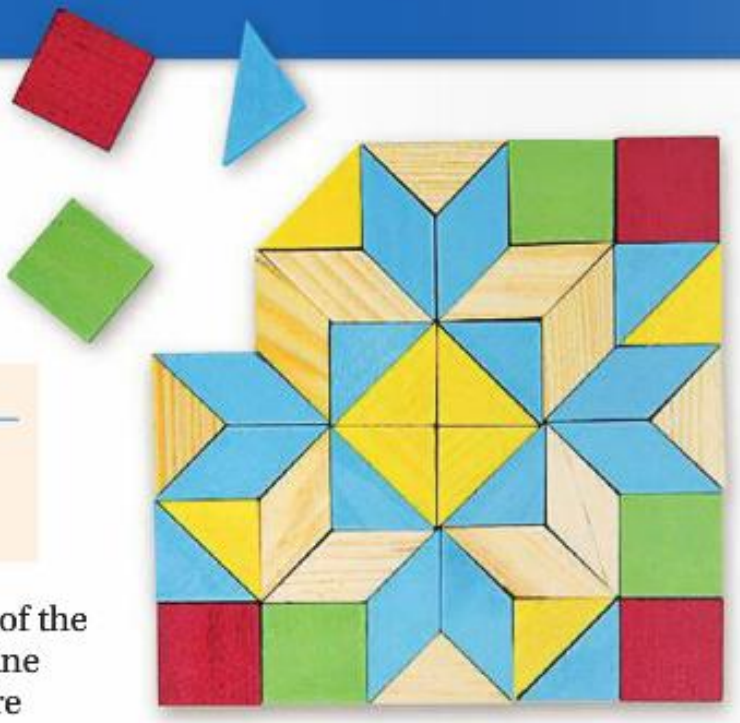
COMMON CORE

1-5 Using Formulas in Geometry

CC.9-12.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.* *Also* **CC.9-12.A.CED.4***



Objective

Apply formulas for perimeter, area, and circumference.

Vocabulary

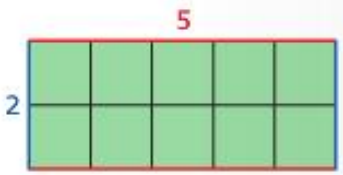
perimeter
area
base
height
diameter
radius
circumference
pi

Why learn this?

Puzzles use geometric-shaped pieces. Formulas help determine the amount of materials needed. (See Exercise 6.)

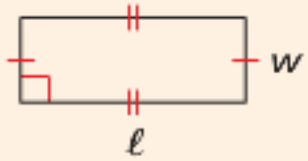
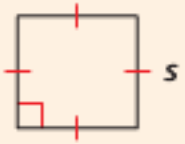
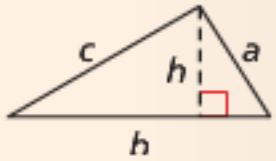
The **perimeter** P of a plane figure is the sum of the side lengths of the figure. The **area** A of a plane figure is the number of nonoverlapping square units of a given size that exactly cover the figure.

$$\text{area} = 2 \text{ units} \times 5 \text{ units}$$
$$= 10 \text{ square units}$$

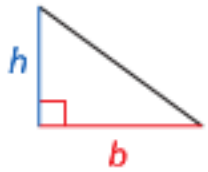


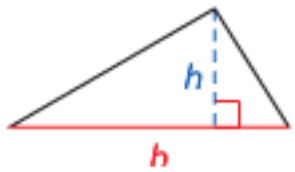
Know it! Note

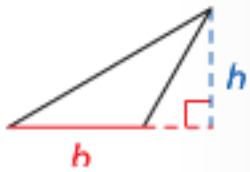
Perimeter and Area

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.







EXAMPLE 1 Finding Perimeter and Area

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).

Find the perimeter and area of each figure.

A rectangle in which $\ell = 17$ cm and $w = 5$ cm

$$P = 2\ell + 2w$$
$$= 2(17) + 2(5)$$
$$= 34 + 10 = 44 \text{ cm}$$

$$A = \ell w$$
$$= (17)(5) = 85 \text{ cm}^2$$

B triangle in which $a = 8$, $b = (x + 1)$, $c = 4x$, and $h = 6$

$$P = a + b + c$$
$$= 8 + (x + 1) + 4x$$
$$= 5x + 9$$

$$A = \frac{1}{2}bh$$
$$= \frac{1}{2}(x + 1)(6) = 3x + 3$$

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

EXAMPLE 2 Crafts Application

The Texas Treasures quilt block includes 24 purple triangles. The base and height of each triangle are about 3 in. Find the approximate amount of fabric used to make the 24 triangles.

The area of one triangle is

$$A = \frac{1}{2}bh = \frac{1}{2}(3)(3) = 4\frac{1}{2}\text{ in}^2.$$

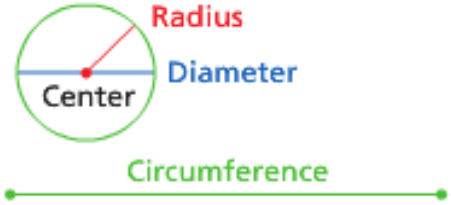
The total area of the 24 triangles is

$$24\left(4\frac{1}{2}\right) = 108\text{ in}^2.$$

CHECK IT OUT!

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

In a circle a **diameter** is a segment that passes through the center of the circle and whose endpoints are on the 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.



Know it! Note

Circumference and Area of a Circle

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

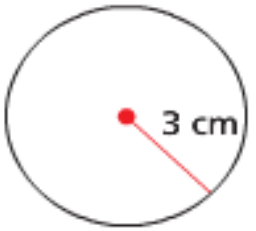
The area A of a circle is given by the formula $A = \pi r^2$.

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 the circle.

$$C = 2\pi r \qquad A = \pi r^2$$
$$= 2\pi(3) = 6\pi \qquad = \pi(3)^2 = 9\pi$$
$$\approx 18.8 \text{ cm} \qquad \approx 28.3 \text{ cm}^2$$



CHECK IT OUT!

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

MATHEMATICAL PRACTICES

THINK AND DISCUSS

1. Describe three different figures whose areas are each 16 in^2.

Know it! Note

2. GET ORGANIZED Copy and complete the graphic organizer. In each shape, write the formula for its area and perimeter.