Concepts
Perimeter and Area of Quadrilaterals

Based on power point presentations by Pearson Education, Inc.
Revised by Ingrid Stewart, Ph.D.

Learning Objectives

1. Memorize the units of perimeters and areas.
2. Memorize and use the perimeter and area formula of rectangles.
3. Memorize and use the perimeter and area formula of squares.
4. Memorize and use the perimeter and area formula of parallelograms.
5. Memorize and use the perimeter and area formula of trapezoids.
6. Memorize and use the perimeter and area formula of triangles.

NOTE: This lesson contains some examples. You can find more examples in the "Examples" document also located in the appropriate MOM Learning Materials folder.

1. Introduction to Perimeters and Areas of Quadrilaterals

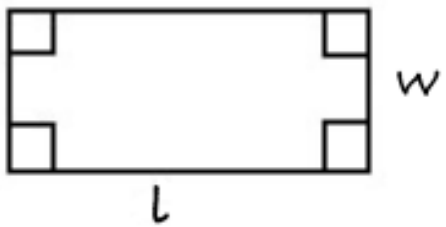
The *perimeter* is the sum of the lengths of the sides of a figure. **Perimeters are measured in linear units, such as *inches (in)*, *feet (ft)*, *yards (yd)*, *centimeters (cm)*, *meters (m)*, *kilometers (km)*, etc.**

Area is the amount of space occupied by a two-dimensional figure. **Areas are measured in square units, such as in^2, ft^2, yd^2, cm^2, m^2, km^2, etc.**

2. Perimeter and Area Formulas of Rectangles (1 of 2)

In a rectangle, both pairs of opposite sides are parallel, and each pair has the same measure. All interior angles are right angles.

Let l be the length of the rectangle and $\boldsymbol{w}$ its width.



Perimeter Formula: $P = l + l + w + w = 2l + 2w$

Area Formula: $A = l \cdot w = l\,w$

Perimeter and Area Formulas of Rectangles (2 of 2)

Example 1:

Find the perimeter and area of a rectangle whose length l is 14 ft and whose width w is 9 ft.

Required formulas: $P = 2l + 2w$ and $A = l \cdot w = l\ w$

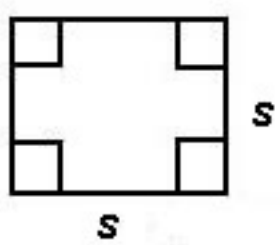
$P = 2(14) + 2(9) = 28 + 18 = 46$

$A = 9(14) = 126$

The perimeter of the rectangle is 46 ft and the area is 126 ft^2. **Please note that the area units are squared.**

3. Perimeter and Area Formulas of Squares

The square is a special rectangle in which all sides are of equal length. We can certainly call one side l and width ***w*** and use the formulas for rectangles. However, usually we give all sides the same letter, namely ***s***.



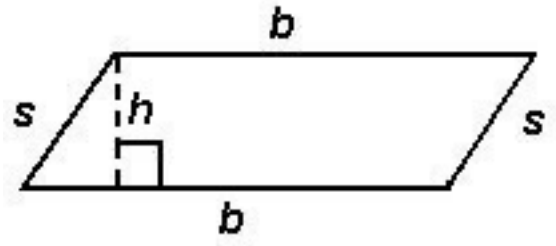
Accordingly, the perimeter and area formulas are written as follows:

Perimeter: $P = s + s + s + s = 4s$

Area: $A = s \cdot s = s^2$

4. Perimeter and Area Formulas of Parallelograms (1 of 2)

The parallelogram is a special rectangle in which the right and left side ***s*** are parallel and of equal length and the top and bottom ***b*** are also parallel and of equal length. However, no interior angle is a right angle.



The height ***h*** makes a 90^o angle with the base ***b***. It is not the length of a side!

Perimeter Formula: $P = s + s + b + b = 2s + 2b$

Area Formula: $A = b \cdot h = bh$

Perimeter and Area Formulas of Parallelograms (2 of 2)

Example 2:

Find the area of a parallelogram with base b = 30 ft and height is h = 18 ft.

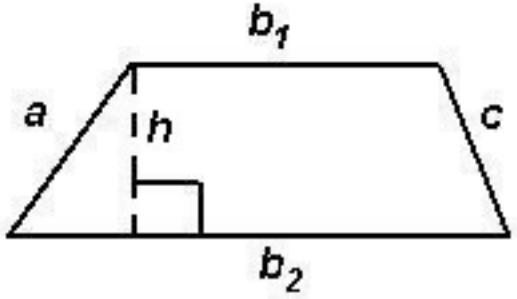
Required formula: $A = bh$, where ***h*** is the height and ***b*** is the base

$A = 30(18) = 540$

The area of the parallelogram is 540 ft^2. **Please note that the area units are squared.**

5. Perimeter and Area Formulas of Trapezoids (1 of 2)

The trapezoid is a quadrilateral in which exactly two lines are parallel. The sides ***a*** and ***c*** can be of equal length, but it is not mandatory. The top and bottom b_1 and b_2 are parallel.



The height ***h*** makes a 90° angle with base b_1 and b_2. It is not the length of a side!

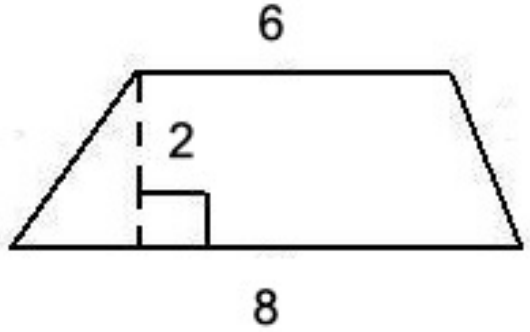
Perimeter Formula: $P = a + c + b_1 + b_2$

Area Formula: $A = \frac{1}{2} \cdot h \cdot (b_1 + b_2) = \frac{1}{2} h (b_1 + b_2)$

Perimeter and Area Formulas of Trapezoids (2 of 2)

Example 3:

Find the area of the given trapezoid. The unit of measure is yards.



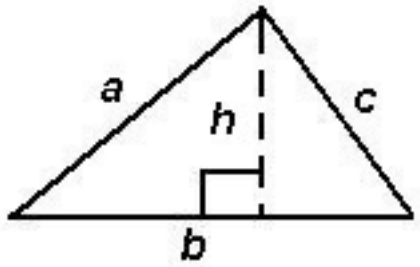
Required formula: $A = \frac{1}{2}h\,(b_1 + b_2)$

$A = \frac{1}{2}(2)(6 + 8) = 14$

The area of the trapezoid is 14 yd^2. **Please note that the area units are squared.**

6. Perimeter and Area Formulas of Triangles (1 of 2)

The triangle is a 3-sided polygon and the sum of the measures of its three interior angles is 180°. We name the sides ***a***, ***b***, and ***c***.



The line drawn from ANY vertex to the opposite side is called the altitude or height ***h*** of the triangle. It makes a 90° angle with this side which we call base ***b***.

Perimeter Formula: $P = a + b + c$

Area Formula: $A = \frac{1}{2} \cdot b \cdot h = \frac{1}{2} bh$

Perimeter and Area Formulas of Triangles (2 of 2)

Example 4:

A parking lot is in the shape of a triangle with base 6.2 m and height 10 m. What is the area of the parking lot?

Required formula: $A = \frac{1}{2}bh$

$A = \frac{1}{2}(6.2)(10) = 31$

The area of the triangular parking lot is 31 m^2. **Please note that the area units are squared.**