Angles and Shapes Summary

KEY TERMS

- Triangle Inequality Theorem
- Triangle Sum Theorem
- parallelogram
- variable
- trapezoid
- composite figure

LESSON 1

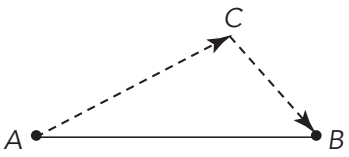
Consider Every Side

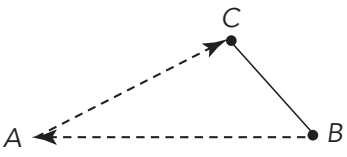
Triangles are congruent when all of their corresponding angle measures and corresponding side lengths are the same. When given information can be used to construct congruent triangles, the information is said to define a unique triangle.

The **Triangle Inequality Theorem** states that the sum of the lengths of any two sides of a triangle is greater than the length of the third side.

$AC + CB > AB$

$BA + AC > BC$





When given two line segments, it is possible to construct an infinite number of triangles. When given three line segments, it is possible to either construct a unique triangle, or no triangle.

LESSON 2

Turning a One-Eighty!

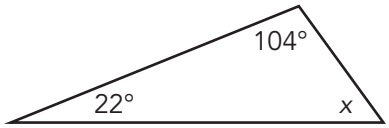
The **Triangle Sum Theorem** states that the sum of the measures of the interior angles of a triangle is 180°. The longest side of a triangle is opposite the interior angle with the greatest measure and the shortest side is opposite the interior angle with the least measure.

The Triangle Sum Theorem can be used to determine the measure of the third angle of a triangle when two angle measures of the same triangle are given.

$x + 22 + 104 = 180$
$x + 128 = 180$
$x = 52$

The measure of the third angle in this triangle is 52°.

$22° + 104° + 52° = 180°$



LESSON 3

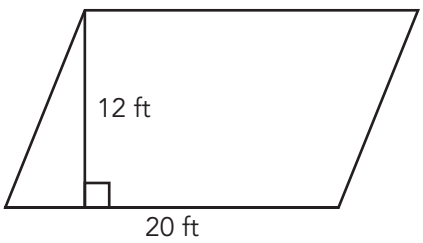
All About That Base . . . and Height

A **parallelogram** is a four-sided figure with two pairs of parallel sides, with each pair equal in length.

In a parallelogram, the height is the perpendicular distance from the base to the opposite side. The area of a parallelogram is equal to $b \cdot h$, where the variable b represents the base and h represents the height. A **variable** is a letter that is used to represent a number.

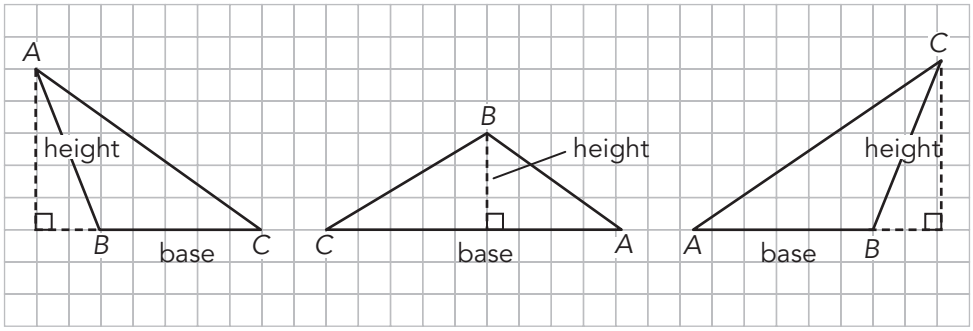
For example, in this parallelogram, the base, b, is 20 feet and the height, h, is 12 feet.

$$\begin{aligned} \text{Area of a parallelogram} &= bh \\ &= (20)(12) \\ &= 240 \text{ square feet} \end{aligned}$$

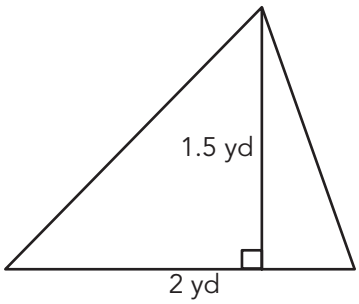


The area of a triangle is equal to $\frac{1}{2}bh$. The base of a triangle can be any of its sides.

The height of a triangle is the length of a line segment drawn from a vertex of the triangle to the opposite side so that it forms a right angle with the opposite side.



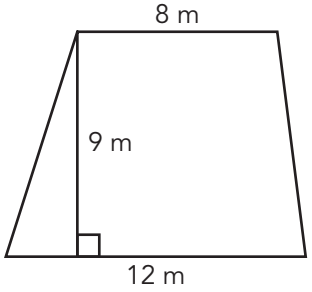
For example, in this triangle, the base, b, is equal to 2 yards and the height, h, is equal to 1.5 yards.



$$\begin{aligned}\text{Area of a triangle} &= \frac{1}{2}bh \\ &= \frac{1}{2}(2)(1.5) \\ &= 1.5 \text{ square yards}\end{aligned}$$

A **trapezoid** is a quadrilateral with two bases, often labeled b_1 and b_2. The bases are parallel to each other. The height is the perpendicular distance between the bases. The area of a trapezoid is equal to $\frac{1}{2}(b_1 + b_2)h$.

For example, in this trapezoid, one of the bases is 8 meters and the other base is 12 meters. The altitude, or height, h, of the trapezoid is 9 meters.



$$\begin{aligned}\text{Area of trapezoid} &= \frac{1}{2}(b_1 + b_2)h \\ &= \frac{1}{2}(8 + 12)(9) \\ &= \frac{1}{2}(20)(9) \\ &= 90 \text{ square meters}\end{aligned}$$

LESSON
4

Slicing and Dicing

A **composite figure** is a figure that is made up of more than one geometric figure.

Area is additive. The area of a composite figure can be determined by decomposing it into familiar shapes and then adding together the areas of those shapes.

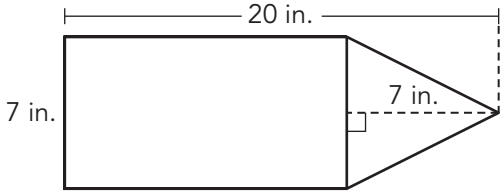
The composite figure shown is composed of a rectangle and a triangle.

Area of composite figure = Area of Rectangle + Area of Triangle

$$= (7)(13) + \frac{1}{2}(7)(7)$$

$$= 91 + 24\frac{1}{2}$$

$$= 115\frac{1}{2}$$



The area of the composite figure is $115\frac{1}{2}$ square inches.