Math 10 Lecture Videos

Section 2.6:
Problem-Solving in Geometry

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OBJECTIVE:

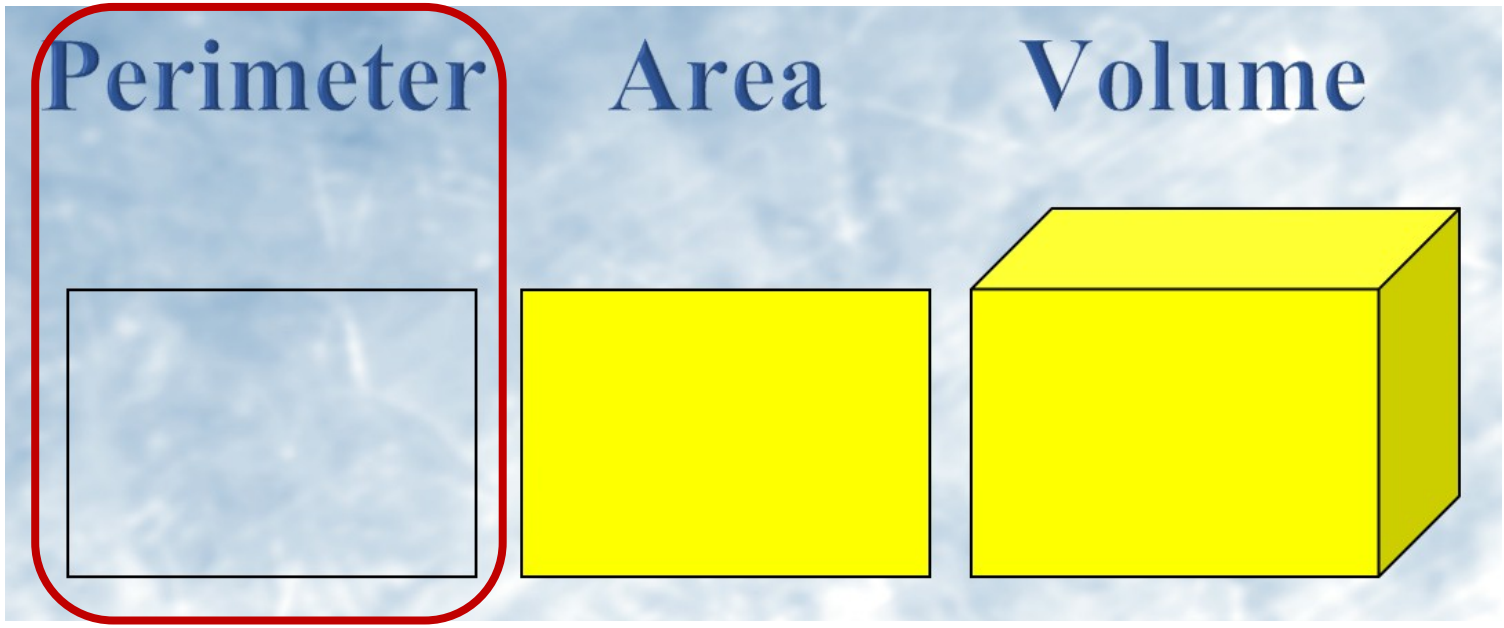
1. Solve problems using formulas for perimeter and area.
2. Solve problems using formulas for circle's area and circumference.
3. Solve problems using formulas for volume.
4. Solve problems Involving the angles of triangle.
5. Solve problems involving complementary and supplementary angles.

GEOMETRY

Geometry is about the space you live in and the shapes that surround you.

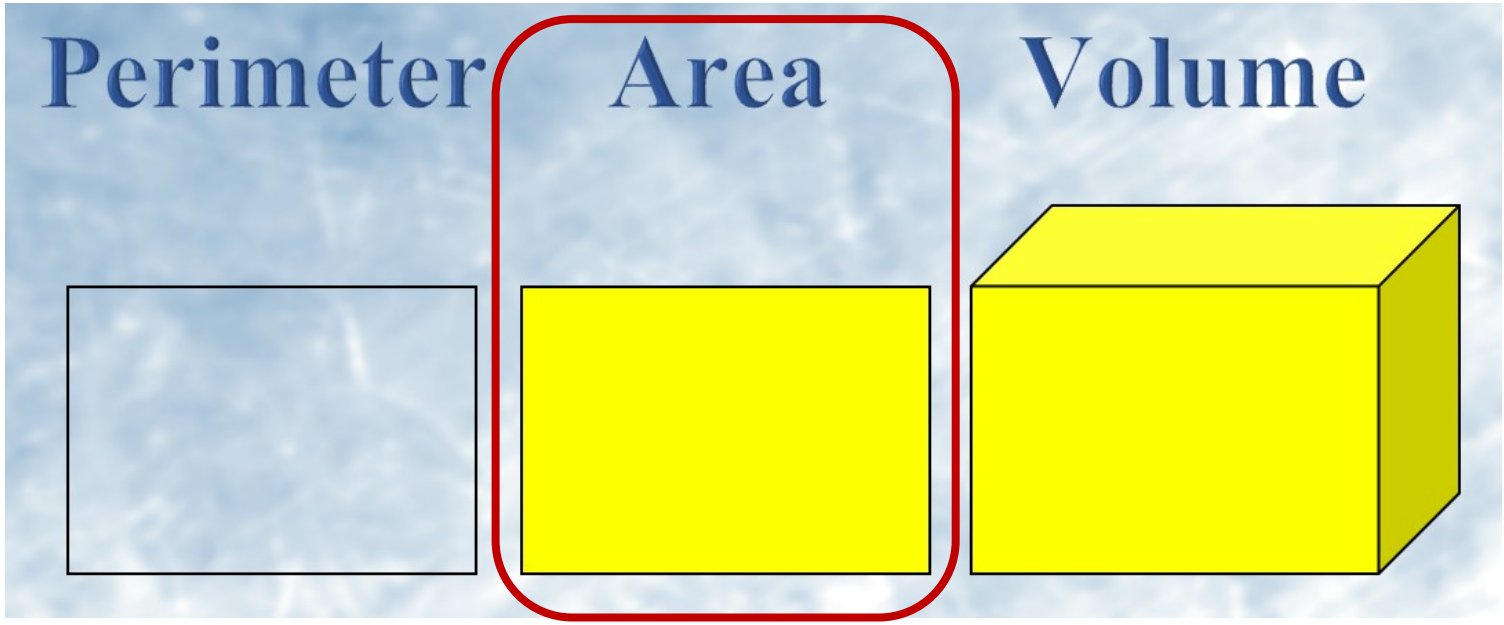
In this section, we will look at some basic geometric formulas for **perimeter**, **area**, and **volume**.

GEOMETRY



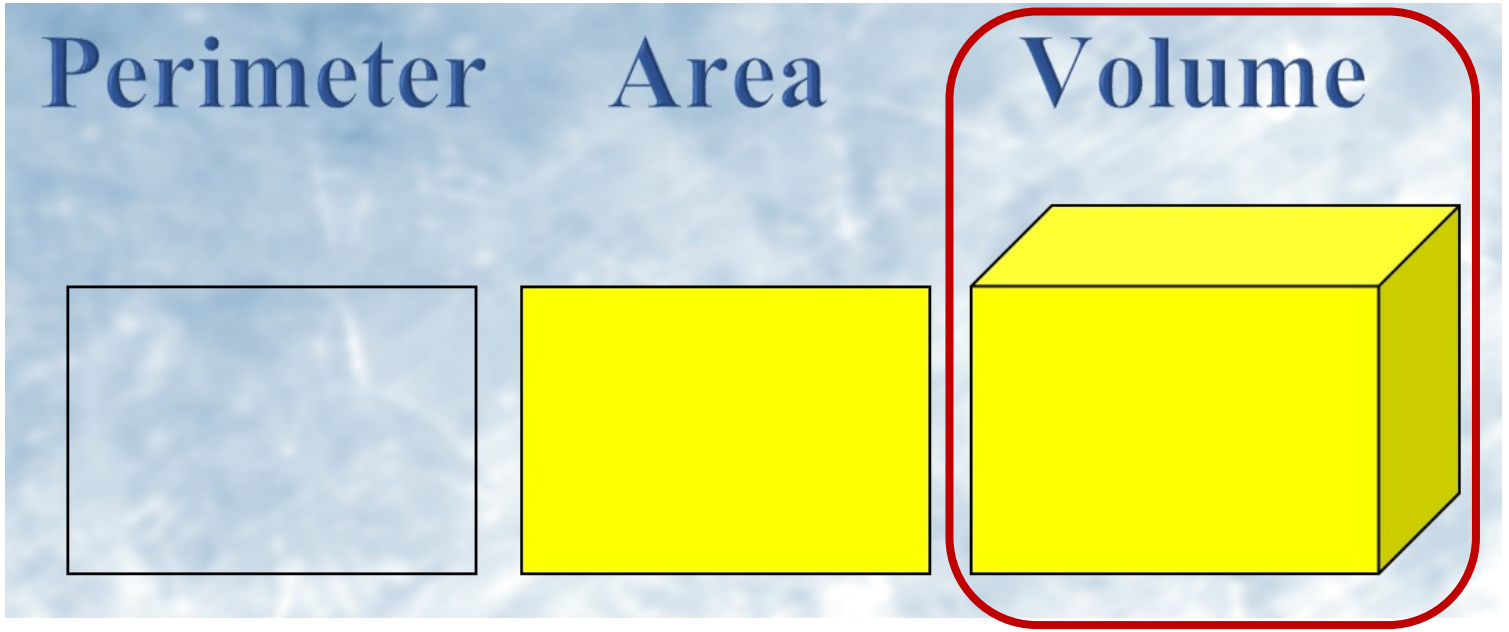
Perimeter is a linear measure, that is, a measure of length. It will be measured in units such as feet, miles, or meters.

GEOMETRY



Area is a measure of square units and it will be measured in units such as square feet, square miles, or square meters.

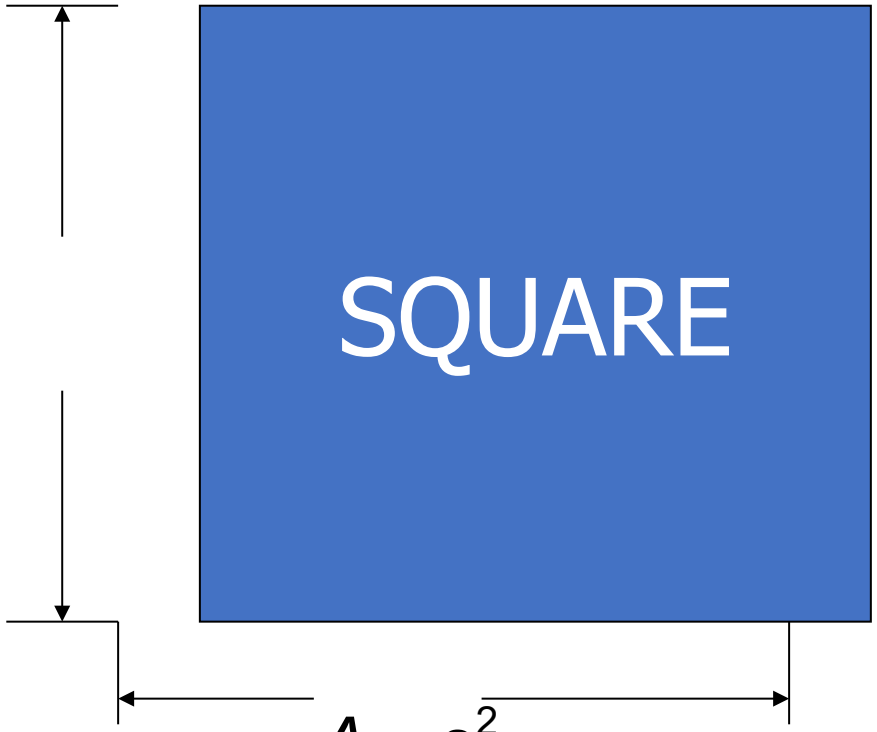
GEOMETRY



Volume is a measure of cubic units. It measures the number of cubic units in a three dimensional object or rather the amount of space occupied by the figure.

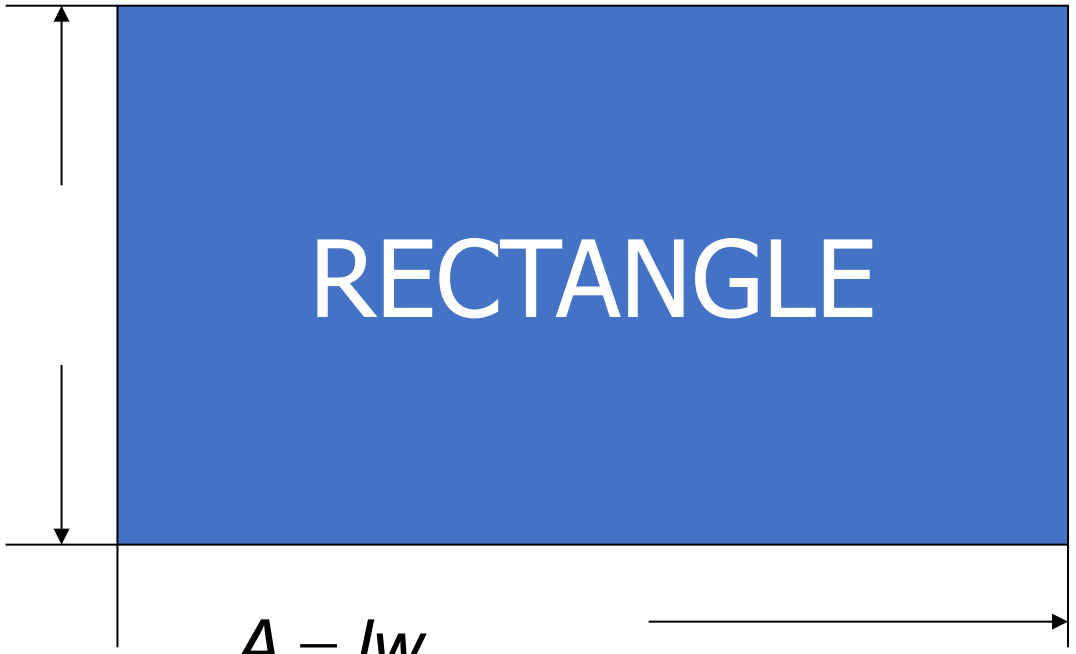
Objective 1: Solve problems using formulas for perimeter and area

Common Formulas for Perimeter and Area



$A = s^2$

$P = 4s$



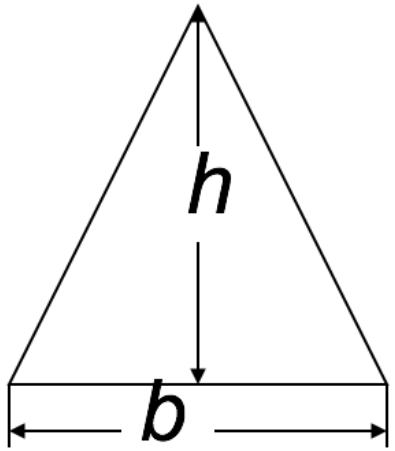
$A = lw$

$P = 2l + 2w$

Objective 1: Solve problems using formulas for perimeter and area

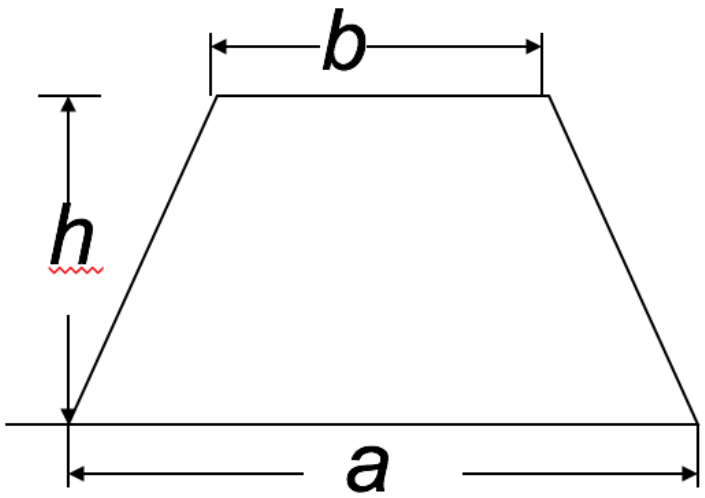
Common Formulas for Area

Triangle



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

Trapezoid



$$A = \frac{1}{2}h(a+b)$$

Example 1

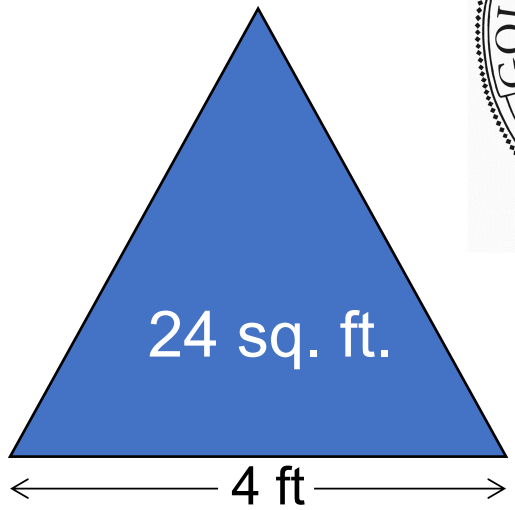
A rectangle has a width of 10 inches and a perimeter of 125 inches. Find the length.

Let l represent the unknown length.	l = length of rectangle
Represent other quantities in terms of l.	There are no other unknown quantities.
Write an equation in l that describes the condition, and solve.	$2l + 2w = P$ $2l + 2(10) = 125$ $2l + 20 = 125$ $2l + 20 - 20 = 125 - 20$ $2l = 105$ $l = 52.5$

Example 2

A sailboat has a triangular sail with an area of 24 square feet and a base that is 4 feet long. Find the height of the sail.

Use the formula $A = \frac{1}{2}bh$ where A =24 and b = 4.



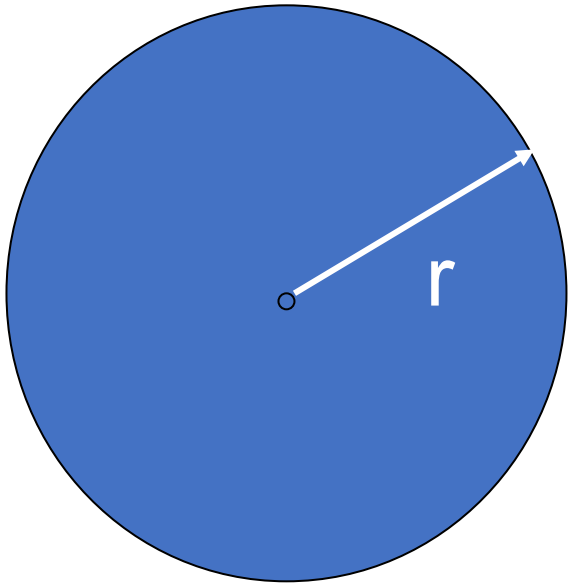
$$A = \frac{1}{2}bh$$

$$24 = \frac{1}{2} \cdot 4 \cdot h$$

$$24 = 2h$$

$$12 = h$$

Objective 2:
Solve problems using formulas for a circle's area and circumference.



Formulas of Circle

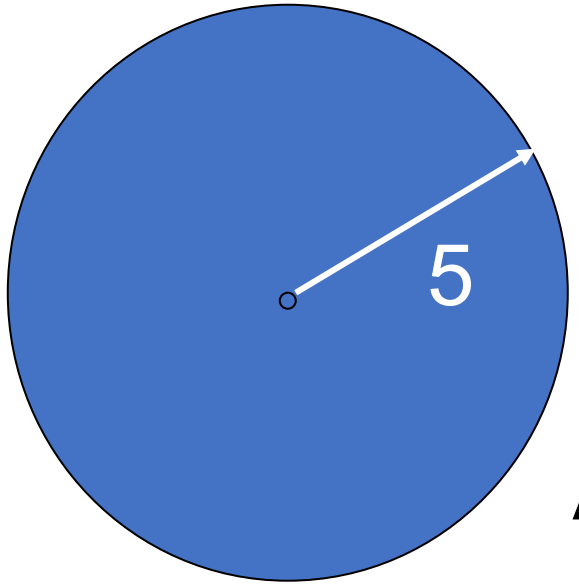
Radius – r

Area = A = πr^2

Circumference = $2\pi r$

The **circumference** of a circle is a measure of length. The circumference of a circle is the distance around it, or its perimeter.

Objective 2:
Solve problems using formulas for a circle's area and circumference.



Example 1:

Find the area and circumference of a circle with a radius of 5 inches.

$$\text{Area} = A = \pi r^2,\ r = 5$$

$$A = \pi(5)^2$$

$$A = 25\pi \approx 78.54 \text{ square inches}$$

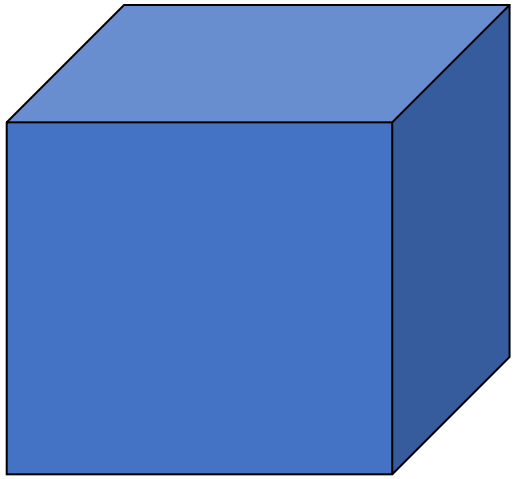
$$\text{Circumference} = C = 2\pi r$$

$$C = 2\pi(5)$$

$$C = 10\pi \approx 31.42 \text{ inches}$$

Objective 3: Solve problems using formulas for volume.

Cube



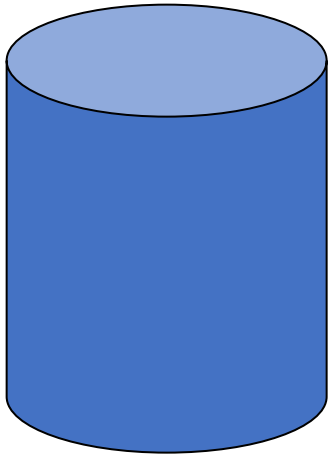
$V = S^3$

Rectangular Solid

$V = lwh$

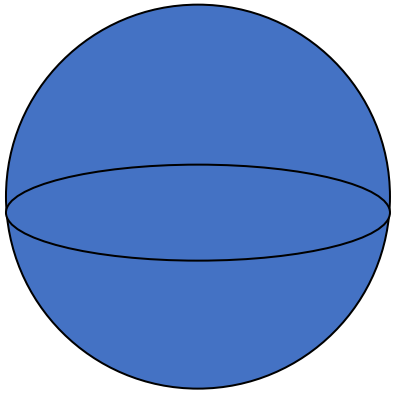
Objective 3: Solve problems using formulas for volume.

Circular Cylinder



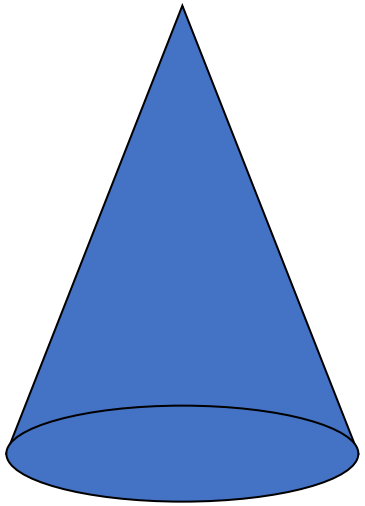
$$V = \pi r^2 h$$

Sphere



$$V = \frac{4}{3}\pi r^3$$

Cone

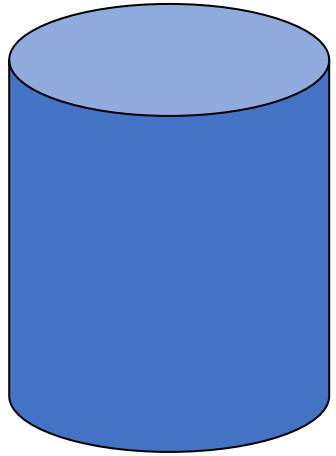


$$V = \frac{1}{3}\pi r^2 h$$

Objective 3: Solve problems using formulas for volume.

Example 1: Find the volume of a cylinder that ha
height of 4 feet and a radius of 5 feet.

Circular Cylinder



$V = \pi r^2 h$

$r = 5$

$h = 4$

$V = \pi(5)^2(4)$

$V = \pi(100)$

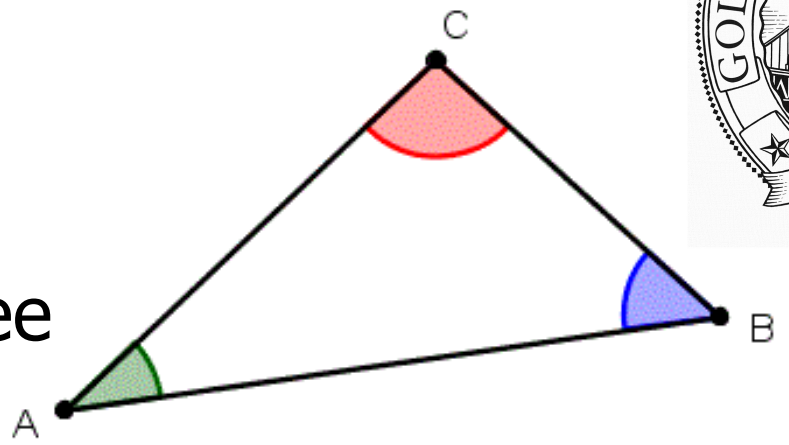
$V = 100\pi$ cubic feet ≈ 314.16 cubic feet

$V = \pi r^2 h$

Objective 4: Solve problems involving the angles of a triangle.

Fact about Angles of a Triangle

The sum of the measures of the three angles of any triangle is 180º.



$m\angle A + m\angle B + m\angle C = 180$

Example: One angle of a triangle is three times another. The measure of the third angle is 10º more than the smallest angle. Find the angles.

Step 1	Let *x* represent one of the quantities.	x = measure of the first angle

Objective 4: Solve problems involving the angles of a triangle.

Example: One angle of a triangle is three times another. The measure of the third angle is 10º more than the smallest angle. Find the angles.

Step 2	Represent other quantities in terms of *x*.	3x = measure of the second angle 10 + x = measure of third angle

Step 3	Write an equation in *x* that describes the conditions.	x + 3x + 10 + x = 180º

Objective 4: Solve problems involving the angles of a triangle.

Example: One angle of a triangle is three times another. The measure of the third angle is 10º more than the smallest angle. Find the angles.

Step 4	Solve the equation and answer the question.	$x + 3x + 10 + x = 180$ $5x + 10 = 180$ $5x + 10 - 10 = 180 - 10$ $5x = 170$ $x = 34^\circ$ (first angle) Second angle $= 3(34^\circ)$ $= 102^\circ$ Third angle $= x + 10 =$ $34 + 10 = 44^\circ$

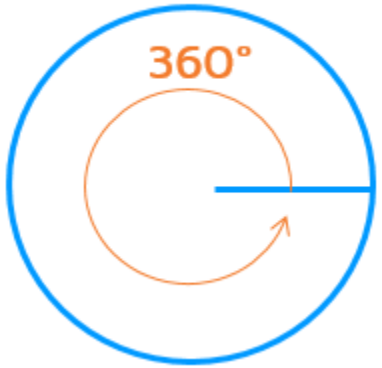
Objective 5: Solve problems involving complementary and supplementary angles.

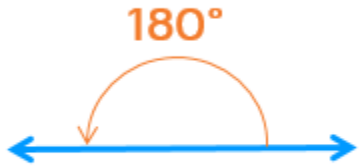
Complementary Angles:

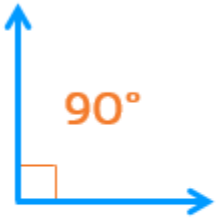
Two angles whose sum is 90º.

Supplementary Angles:

Two angles whose sum is 180º.







Objective 5: Solve problems involving complementary and supplementary angles.

Algebraic Expressions for Angle Measures

1. Measure of an angle: x
2. Measure of the angle's complement: $90^\circ - x$
3. Measure of the angle's supplement: $180^\circ - x$

Objective 5: Solve problems involving complementary and supplementary angles.

Example 1: Find the measure of an angle that is 12º less than its complement.

Recall:

Measure of an angle: x

Measure of the angle's complement: 90º - x

Equation: x = (90º - x) - 12º

Solution:

$$x = (90 - x) - 12$$
$$x = 90 - x - 12$$
$$x = 78 - x$$
$$2x = 78$$
$$x = 39$$

Objective 5: Solve problems involving complementary and supplementary angles.

Example 1: Find the measure of an angle that is 12º less than its complement.

Measure of an angle: $x = 39º$

Measure of the angle's complement: $90º - x$
$= 90º - 39º$
$= 51º$

Objective 5: Solve problems involving complementary and supplementary angles.

Example 2: The measure of an angle is twice the measure of its complement. What is the angle's measure?

Recall:

Measure of an angle: x

Measure of the angle's complement: 90º - x

Equation: x = 2(90º - x)

Solution:

$$x = 2 \cdot (90 - x)$$
$$x = 180 - 2x$$
$$x + 2x = 180 - 2x + 2x$$
$$3x = 180$$
$$x = 60$$

Objective 5: Solve problems involving complementary and supplementary angles.

Example 2: The measure of an angle is twice the measure of its complement. What is the angle's measure?

Measure of an angle: $x = 60^o$

Measure of the angle's complement: $90^o - x$

$= 90^o - 60^o$

$= 30^o$

OBJECTIVE:

1. Solve problems using formulas for perimeter and area. ✓
2. Solve problems using formulas for circle's area and circumference. ✓
3. Solve problems using formulas for volume. ✓
4. Solve problems Involving the angles of triangle. ✓
5. Solve problems involving complementary and supplementary angles. ✓