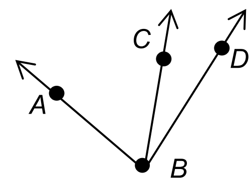
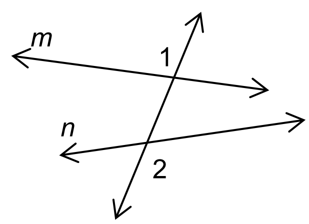
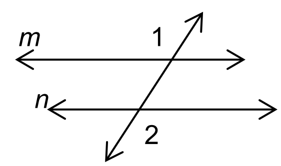
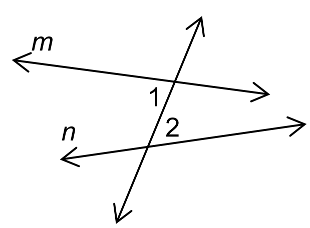
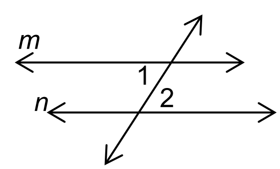
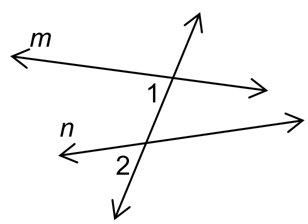
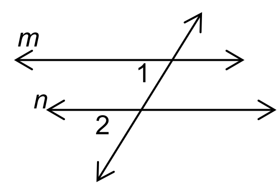
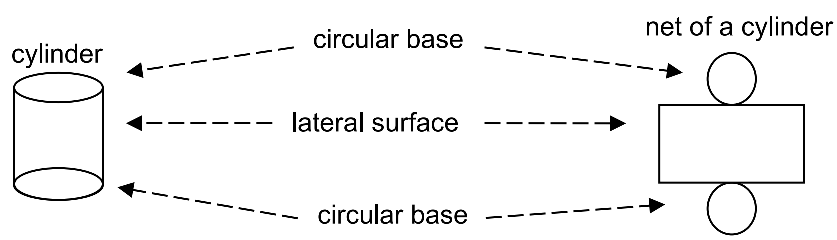
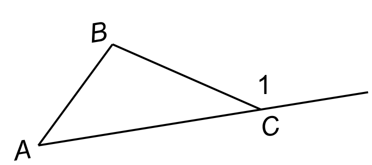
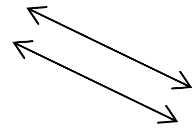
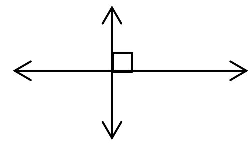
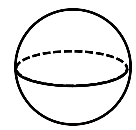
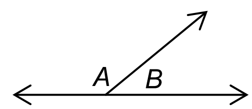
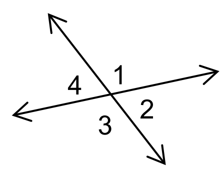
STUDENT RESOURCES

Word or Phrase	Definition
adjacent angles	Two angles are adjacent if they have the same vertex and share a common ray, and they lie on opposite sides of the common ray. $\angle ABC$ and $\angle CBD$ are adjacent angles. 
alternate exterior angles	When two lines in a plane are cut by a transversal, two angles on opposite sides of the transversal and outside the two lines are referred to as alternate exterior angles. When parallel lines are cut by a transversal, alternate exterior angles have the same measure. Line *m* is not parallel to line *n*.  $\angle 1$ and $\angle 2$ are alternate exterior angles. Line *m* is parallel to line *n*.  $\angle 1$ and $\angle 2$ are alternate exterior angles. $\lvert\angle 1\rvert = \lvert\angle 2\rvert$
alternate interior angles	When two lines in a plane are cut by a transversal, two angles on opposite sides of the transversal and between the two lines are referred to as alternate interior angles. When parallel lines are cut by a transversal, alternate interior angles have the same measure. Line *m* is not parallel to line *n*.  $\angle 1$ and $\angle 2$ are alternate interior angles. Line *m* is parallel to line *n*.  $\angle 1$ and $\angle 2$ are alternate interior angles. $\lvert\angle 1\rvert = \lvert\angle 2\rvert$
complementary angles	Two angles are complementary if the sum of their measures is 90°. Two angles that measure 30° and 60° are complementary.

Word or Phrase	Definition
cone	A circular cone is a figure in space consisting of a circle in a plane (called the base of the cone), a point off the plane (called the vertex of the cone), and all the straight line segments joining the vertex to the base. If the line joining the vertex of the cone to the center of its base is perpendicular to the base, the cone is a right circular cone. Otherwise it is an oblique circular cone.  right circular cone oblique circular cone
corresponding angles	When two lines in a plane are cut by a transversal, two angles that appear on the same side of the transversal in the same relative location are referred to as corresponding angles. When parallel lines are cut by a transversal, corresponding angles have the same measure. Line *m* is not parallel to line *n*.  $\angle 1$ and $\angle 2$ are corresponding angles. Line *m* is parallel to line *n*.  $\angle 1$ and $\angle 2$ are corresponding angles. $\lvert\angle 1\rvert = \lvert\angle 2\rvert$
cylinder	A (right circular) cylinder is a figure in three-dimensional space that has two parallel circular bases. These circles are connected by a curved surface, called the lateral surface, which is a "rolled up" rectangle. Most soup cans have the shape of a right circular cylinder. 
exterior angle of a triangle	An exterior angle of a triangle is an angle formed by a side of the triangle and an extension of its adjacent side. $\angle 1$ is an exterior angle of ΔABC. 

Word or Phrase	Definition
parallel	Two lines in a plane are <u>parallel</u> if they do not meet. Two line segments in a plane are parallel if the lines they lie on are parallel. 
perpendicular	Two lines are <u>perpendicular</u> if they intersect at right angles. 
sphere	A <u>sphere</u> is a closed surface in three-dimensional space consisting of all points at a fixed distance (the radius) from a specified point (the center). 
supplementary angles	Two angles are <u>supplementary</u> if the sum of their measures is 180°. Any two right angles are supplementary, because the sum of their measures is 90° + 90° = 180°. Angles *A* and *B* are supplementary because they determine a straight line, or 180°. 
transversal	A <u>transversal</u> is a line that passes through two or more other lines.
vertical angles	Two angles are <u>vertical angles</u> if they are the opposite angles formed by a pair of intersecting lines. When two lines intersect at a point, they form two pairs of vertical angles with vertex at the point. $\angle 1$ and $\angle 3$ are vertical angles. $\angle 2$ and $\angle 4$ are vertical angles. 

Some Properties of Equality

Properties of equality govern the manipulation of equations (mathematical sentences).

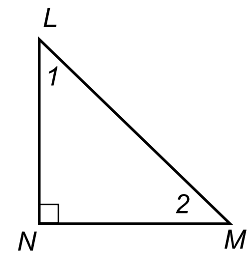
For any three numbers *a*, *b*, and *c*:

- ✓ Addition property of equality
  (Subtraction property of equality)
  If $a = b$ and $c = d$, then $a + c = b + d$.
- ✓ Multiplication property of equality
  (Division property of equality)
  If $a = b$ and $c = d$, then $ac = bd$
- ✓ Reflexive property of equality
  $a = a$
- ✓ Symmetric property of equality
  If $a = b$, then $b = a$
- ✓ Transitive property of equality
  (Substitution property)
  If $a = b$, and $b = c$, then $a = c$

Geometry Notation

Here are some geometry notations used in these lessons.

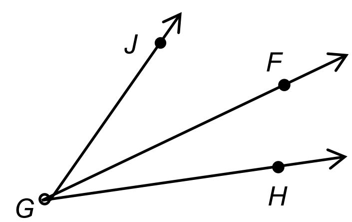
- Points are named by capital letters.
- The symbol for triangle is Δ.
- The symbol for angle is $\angle$.
- Absolute value signs are used to denote nonnegative quantities that measure the “size” of something, such as length or angle measure.



The measure of an angle called $\angle N$ is denoted by $|\angle N|$. The small square at N indicates that $\angle LNM$ is a right angle, that is, that $|\angle LNM|$ = 90°.

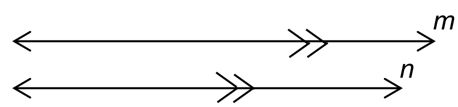
In naming a triangle, vertices may be listed in either a clockwise or counter - clockwise direction. For example, the triangle may be named ΔLMN or ΔLNM.

In naming an angle, vertices may be listed in either a clockwise or counterclockwise direction. In the triangle above, the angle at the top can be denoted by $\angle NLM$, $\angle MLN$, $\angle L$ or $\angle 1$.



The pair of adjacent angles to the right are $\angle FGJ$ and $\angle HGF$. Using $\angle G$ to name an angle is unclear They share the common ray $\overrightarrow{GF}$. The two adjacent angles together form the angle $\angle JGH$.

The arrows on the lines m and n indicate that they are parallel.

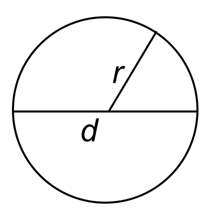


Formulas for Circles

Let r = radius of a circle.
Let d = diameter of a circle.

Circumference: $C = \pi d$ or $C = 2\pi r$

Area: $A = \pi r^2$



Volume Formulas

Here are some volume formulas from this unit.

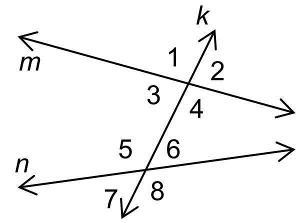
Volume of a Rectangular Prism	Volume of a Cylinder
Let ℓ = length and w = width of rectangular base. $V = Bh$ Area of base (B) = ℓw Therefore, $V = \ell wh$	Let r = radius of the circular base. $V = Bh$ Area of base (B) = πr^2 Therefore, $V = \pi r^2 h$

Volume of a Cone	Volume of a Sphere
Through experimentation, observe that the volume of a cone is $\frac{1}{3}$ of the volume of a cylinder with the same height and base. Let r = radius of the circular base $V = \frac{1}{3}Bh$ Area of base (B) = πr^2 Therefore, $V = \frac{1}{3}\pi r^2 h$	Through experimentation, observe that the volume of a sphere is $\frac{2}{3}$ of the volume of a cylinder whose diameter and height are the same as the diameter of the sphere. Use substitution to derive the formula of a sphere. Let r = radius of the sphere and cylinder Then height (h) of cylinder = $2r$ Volume of cylinder = $\pi r^2 (2r) = 2\pi r^3$ Observe that volume of sphere is $\frac{2}{3}$ of the volume of a cylinder. Therefore, $V_{sphere} = \frac{2}{3} \bullet 2\pi r^3 = \frac{4}{3}\pi r^3$

Transversals and Parallel Lines

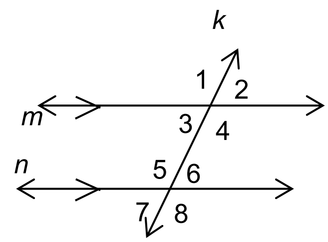
In this figure, line k is a transversal. Lines m and n are NOT parallel.

When two lines in a plane are cut (crossed) at two points by a transversal, eight angles are created. Some of these pairs of angles have special names.



corresponding angles		alternate interior angles	alternate exterior angles
$\angle 1$ and $\angle 5$	$\angle 2$ and $\angle 6$	$\angle 3$ and $\angle 6$	$\angle 1$ and $\angle 8$
$\angle 3$ and $\angle 7$	$\angle 4$ and $\angle 8$	$\angle 4$ and $\angle 5$	$\angle 2$ and $\angle 7$

Here are three important properties of the angles formed when a transversal cuts two parallel lines.



1. If two parallel lines are cut by a transversal, then alternate interior angles have the same measure.
   Example: $|\angle 3| = |\angle 6|$ and $|\angle 4| = |\angle 5|$

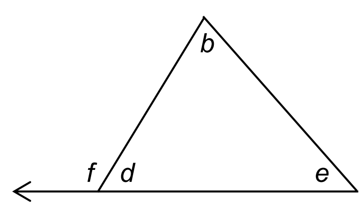
2. If two parallel lines are cut by a transversal, then alternate exterior angles have the same measure.
   Example: $|\angle 1| = |\angle 8|$ and $|\angle 2| = |\angle 7|$

3. If two parallel lines are cut by a transversal, then corresponding angles have the same measure.

Example: $|\angle 2| = |\angle 6|$ and $|\angle 4| = |\angle 8|$

Interior and Exterior Angles in Triangles

Here are two important facts about angle sums in triangles.



1. The sum of the measures of the angles in a triangle is equal to 180°.

   $|\angle d| + |\angle b| + |\angle e| = 180°$

2. The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

   $|\angle b| + |\angle e| = |\angle f|$