

**Points, Lines, and Planes.**

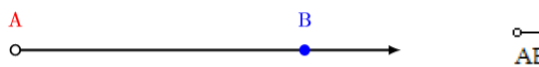
The fundamentals of geometry are points, lines, and planes. A point is a location represented by a dot. A line is a collection of infinitely many points that extends in both directions. A line that only extends in one direction is called a half line or a ray. A plane is an infinite two-dimensional surface like a sheet of paper that goes on forever.

**Points and Lines**

Line  $AB$



Half Line  $AB$



Ray  $AB$



Line Segment  $AB$



Half Open line segment  $AB$



**Intersection ( $\cap$ ) and Union ( $\cup$ )**

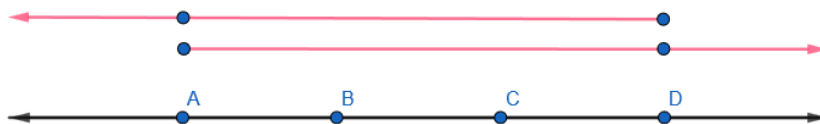
A line is a set of points so we can find the intersection (what they have in common) and the union (all together without repeats) between two lines/segments.

*Intersection of  $\overrightarrow{AD}$  and  $\overrightarrow{DA}$*

These two rays have the line segment  $AD$  in common.  $\overrightarrow{AD} \cap \overrightarrow{DA} = \overline{AD}$

*Union of  $\overrightarrow{AD}$  and  $\overrightarrow{DA}$*

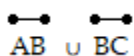
These two rays put together make up the line  $AD$ .  $\overrightarrow{AD} \cup \overrightarrow{DA} = \overleftrightarrow{AD}$



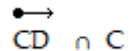
**Example 1:**

Using the line  $AD$ , determine

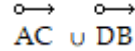
a.



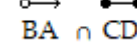
b.



c.



d.



**Planes**

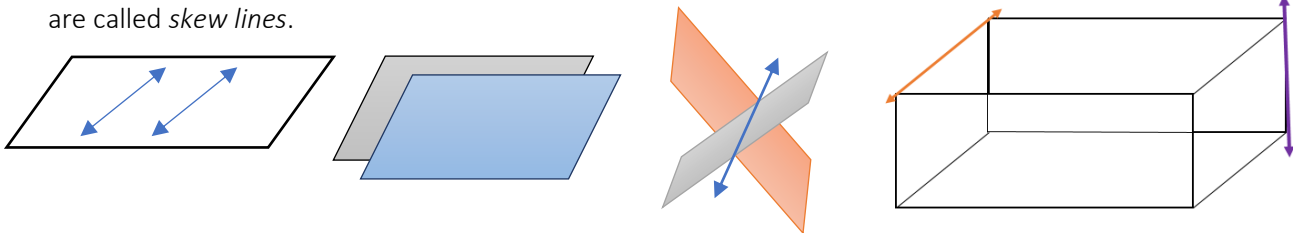
We will be studying a type of geometry known as Euclidean Geometry or Plane Geometry.

*Parallel lines* are two lines on the same plane that do not intersect.

*Parallel planes* are two planes that do not intersect.

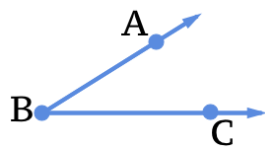
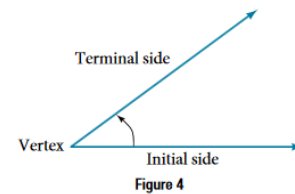
The intersection of any two distinct planes is a line.

Two lines that do not lie in the same plane and do not intersect are called *skew lines*.



**Angles**

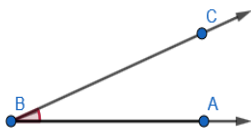
An angle is the union of two rays having a common endpoint. The endpoint is called the vertex of the angle, and the two rays are the sides of the angle. An angle is the measure for the amount of turn or rotation from the initial side to the terminal side.



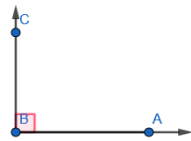
There are several ways to identify an angle like the one to the right. Some common notations are  $\sphericalangle ABC$ ,  $\sphericalangle CBA$ , or  $\sphericalangle B$

The unit of measurement typically used for angles is called degrees. There are 360 degrees in a full circle.

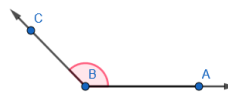
**Acute Angle**  
 $0^\circ < B < 90^\circ$



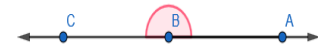
**Right Angle**  
 $B = 90^\circ$



**Obtuse Angle**  
 $90^\circ < B < 180^\circ$



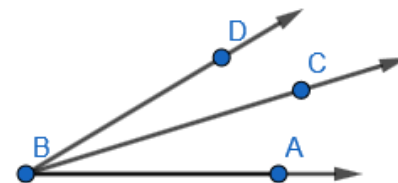
**Straight Angle**  
 $B = 180^\circ$



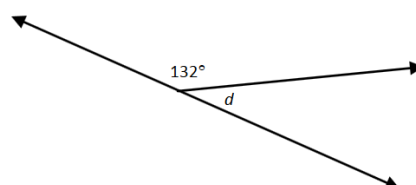
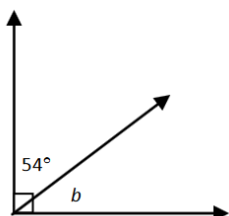
Two angles in the same plane are adjacent angles when they have a common vertex and a common side but no common interior points.

Complementary angles sum to  $90^\circ$ .

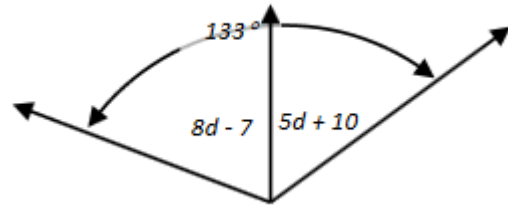
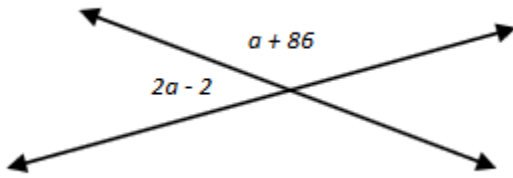
Supplementary angles sum to  $180^\circ$ .



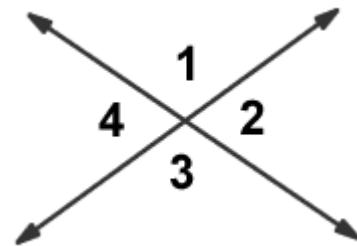
Example: Find the missing angle.



Examples: Solve for the variable indicated, then label the degrees for each angle.



Vertical Angles are formed when two lines intersect each other creating pairs of angles that are equal. In the figure  $\angle 2$  and  $\angle 4$  are equal and  $\angle 1$  and  $\angle 3$  are equal.



If you have two parallel lines cut by another line, called a transversal, this creates 8 angles some of which are equal to each other.

Alternate Interior Angles

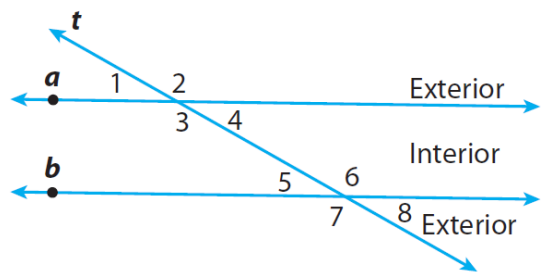
Interior angles on opposite sides of the transversal are equal.  $\angle 4$  and  $\angle 5$

Alternate Exterior Angles

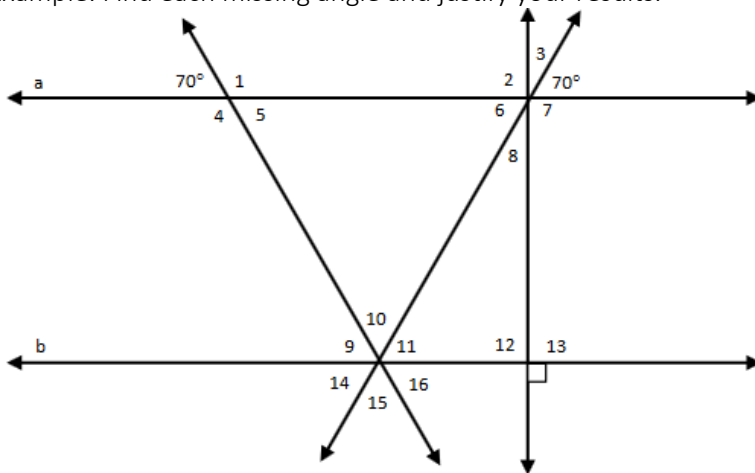
Exterior angles on opposite sides of the transversal are equal.  $\angle 1$  and  $\angle 8$

Corresponding Angles

Angles on the same side of the transversal, and the same side of their parallel line are equal.  $\angle 1$  and  $\angle 5$



Example: Find each missing angle and justify your results.



1 = \_\_\_\_\_°. Because \_\_\_\_\_.

2 = \_\_\_\_\_°. Because \_\_\_\_\_.

3 = \_\_\_\_\_°. Because \_\_\_\_\_.

4 = \_\_\_\_\_°. Because \_\_\_\_\_.

5 = \_\_\_\_\_°. Because \_\_\_\_\_.

6 = \_\_\_\_\_°. Because \_\_\_\_\_.

7 = \_\_\_\_\_°. Because \_\_\_\_\_.

8 = \_\_\_\_\_°. Because \_\_\_\_\_.

9 = \_\_\_\_\_°. Because \_\_\_\_\_.

10 = \_\_\_\_\_°. Because \_\_\_\_\_.

11 = \_\_\_\_\_°. Because \_\_\_\_\_.

12 = \_\_\_\_\_°. Because \_\_\_\_\_.

13 = \_\_\_\_\_°. Because \_\_\_\_\_.

14 = \_\_\_\_\_°. Because \_\_\_\_\_.

15 = \_\_\_\_\_°. Because \_\_\_\_\_.

16 = \_\_\_\_\_°. Because \_\_\_\_\_.