

# Geometry Lesson 3

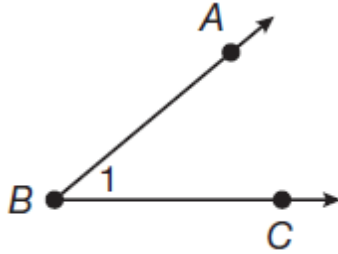
Objective: TSW know and understand angles.



A ray is a part of a line that starts at an endpoint and extends infinitely in one direction.

A ray is named by its endpoint and any other point on the ray. For example, the ray in the diagram is called ray AB which is read "ray AB."

Two rays that have a common endpoint and form a line are called opposite rays \_\_\_\_\_ and \_\_\_\_\_ are opposite rays.



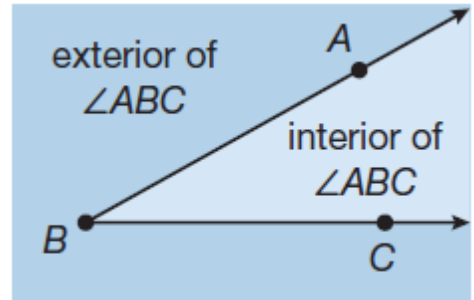
An angle is a figure formed by two rays with a common endpoint. The common endpoint is the angle's vertex. The rays are the sides of the angle. The sides of this angle are \_\_\_\_\_ and \_\_\_\_\_. The vertex is B.

An \_\_\_\_\_ can be named in several different ways: by its vertex, by a point on each ray and the vertex, or by a number. For example, the angle in the diagram could be called  $\angle B$ ,  $\angle ABC$ ,  $\angle CBA$ , or  $\angle 1$ .

### Caution

An angle can be named by its vertex only if it is clear that there is only one angle at the vertex.

The \_\_\_\_\_ of an angle is the set of all points outside the angle. The interior of an angle is the set of all points between the sides of an angle.



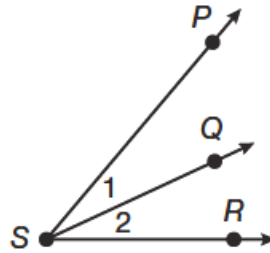
Example 1 Naming Angles and Rays

a. Name three rays in the diagram.

SOLUTION

b. Name three angles in the diagram.

SOLUTION



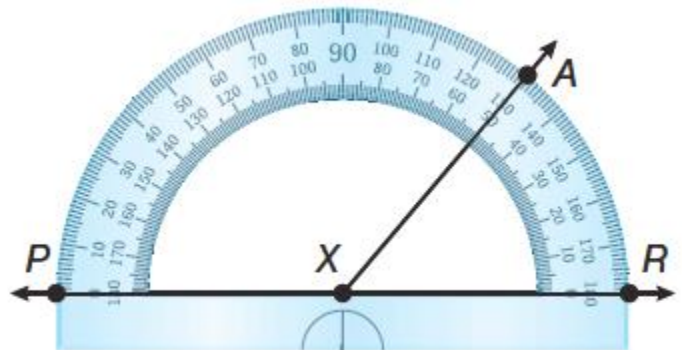
c. Could  $\angle PSQ$  also be referred to as  $\angle S$ ?

SOLUTION

A protractor is a tool used to measure angles. Unlike segments, angles are measured in degrees. One degree is a unit of angle measure that is equal to  $\frac{1}{360}$  of a circle.

*Postulate 3: Protractor Postulate - Given a point X on  $\overleftrightarrow{PR}$ , consider rays  $\overrightarrow{XP}$  and  $\overrightarrow{XR}$ , as well as all the other rays that can be drawn with X as an endpoint, on one side of  $\overleftrightarrow{PR}$ . These rays can be paired with the real numbers from 0 to 180 such that:*

1.  $\overrightarrow{XP}$  is paired with 0, and  $\overrightarrow{XR}$  is paired with 180.
2. If  $\overrightarrow{XA}$  is paired with number c and  $\overrightarrow{XB}$  is paired with a number d then  $m\angle AXB = |c - d|$ .



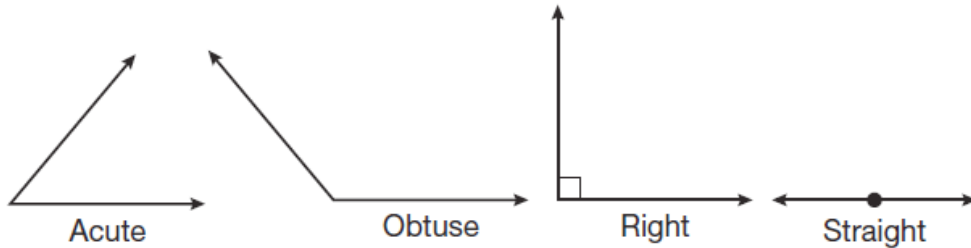
Angles are classified according to their angle measure.

An \_\_\_\_\_ angle measures greater than  $0^\circ$  and less than  $90^\circ$ .

An \_\_\_\_\_ angle measures greater than  $90^\circ$  and less than  $180^\circ$ .

A \_\_\_\_\_ angle measures exactly  $90^\circ$ . A box drawn at the vertex of an angle shows that it is a right angle, as shown in the diagram.

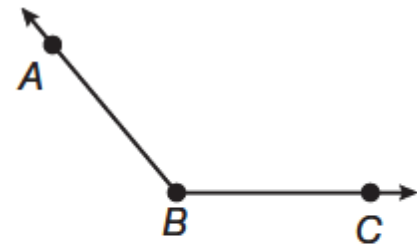
A \_\_\_\_\_ angle measures exactly  $180^\circ$ .



Example 2 Measuring and Classifying Angles

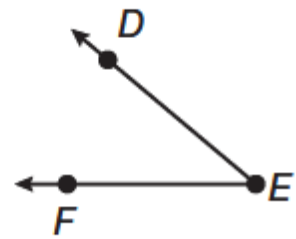
a. Use a protractor to measure  $\angle ABC$ , then classify the angle.

SOLUTION



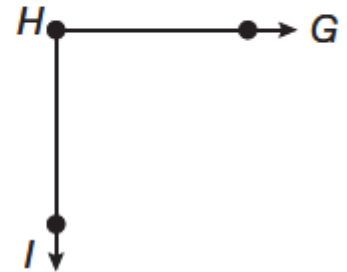
b. Use a protractor to measure  $\angle DEF$ , then classify the angle.

SOLUTION



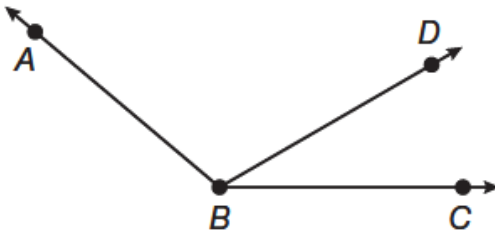
c. Use a protractor to measure  $\angle GHI$ , then classify the angle.

SOLUTION



Angles can be added in the same way that segments are added.

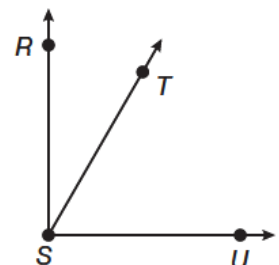
Postulate 4: The Angle Addition Postulate - If point  $D$  is in the interior of  $\angle ABC$ , then \_\_\_\_\_



Example 3 Using the Angle Addition Postulate

The measure of  $\angle RST = 22^\circ$  and  $m\angle TSU = 69^\circ$ . Find  $m\angle RSU$ . Classify the angle.

SOLUTION

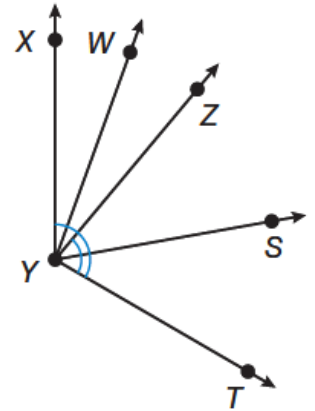


To \_\_\_\_\_ a figure is to divide it into two congruent parts.

An angle \_\_\_\_\_ is a ray that divides an angle into two congruent angles.

Congruent angles have the same \_\_\_\_\_.

They are marked with arc marks, as shown in the diagram.

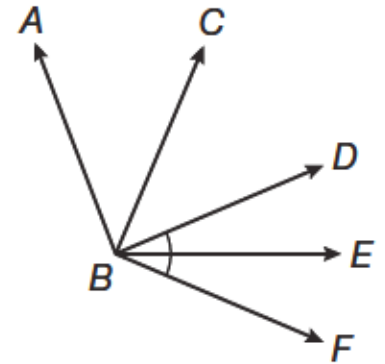


Example 4 Using Angle Bisectors and Congruence Marks

The measure of  $\angle ABC = 44^\circ$ .  $\overrightarrow{BC}$  bisects  $\angle ABD$ .

The measure of  $\angle EBF = 23^\circ$ . Find the measure of  $\angle CBE$ .

SOLUTION

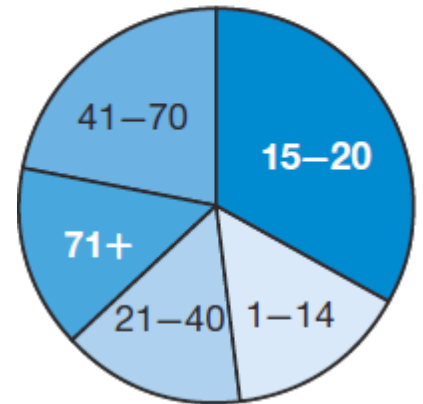


Example 5 Application: Interpreting Statistics

Louis runs a restaurant. He knows that he has about 900 customers a day. The circle graph in the diagram shows what percentage of his customers fall into the given age brackets. He wants to know exactly how many of his customers are between ages 15 and 20. Use a protractor to measure the angle and find the number of Louis's customers that fall into the 15–20 age bracket.

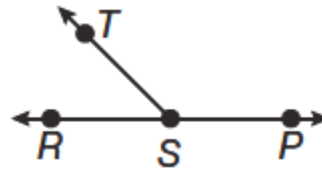
SOLUTION

Customers by Age



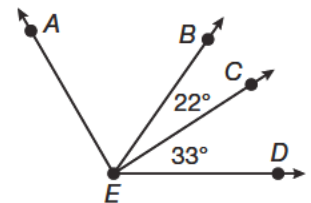
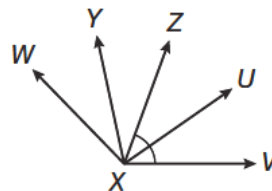
You Try!!!!

a. Name three rays and three angles in the diagram.



c. Determine  $m\angle AEB$  if  $m\angle AED = 120^\circ$ .

d. The measure of  $\angle WXY = 32^\circ$ .  $\overrightarrow{XY}$  bisects  $\angle WXZ$ . The measure of  $\angle UXV = 35^\circ$ . Find the measure of  $\angle YXU$ .



e. A survey shows that 10% of students in a class did not eat lunch. What would be the degree measure of an angle indicating these students on a circle graph?