

# 1-4 Measuring Angles

**Content Standard**  
**G.CO.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

**Objective** To find and compare the measures of angles

**Essential Understanding** You can use number operations to find and compare the measures of angles.

Take note

## Key Concept Angle

### Definition

An **angle** is formed by two rays with the same endpoint.

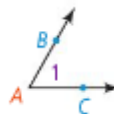
The rays are the **sides** of the angle. The endpoint is the **vertex** of the angle.

### How to Name It

You can name an angle by

- its vertex,  $\angle A$
- a point on each ray and the vertex,  $\angle BAC$  or  $\angle CAB$
- a number,  $\angle 1$

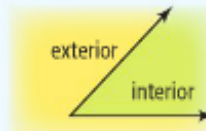
### Diagram



The sides of the angle are  $\overrightarrow{AB}$  and  $\overrightarrow{AC}$ .  
 The vertex is  $A$ .

When you name angles using three points, the vertex must go in the middle.

The *interior* of an angle is the region containing all of the points between the two sides of the angle. The *exterior* of an angle is the region containing all of the points outside of the angle.



## Problem 1 Naming Angles

What are two other names for  $\angle 1$ ?

$\angle JMK$

~~$\angle M$~~

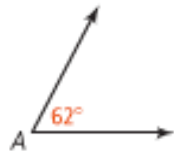
$\angle KMJ$

~~$\angle JKM$~~



$$m\angle A = 62^\circ$$

measure of



Take note

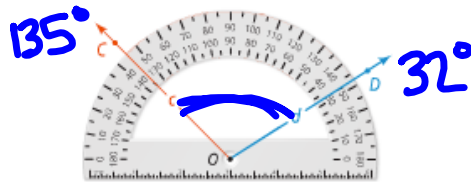
**Postulate 1-7 Protractor Postulate**

Consider  $\overrightarrow{OB}$  and a point  $A$  on one side of  $\overrightarrow{OB}$ . Every ray of the form  $\overrightarrow{OA}$  can be paired one to one with a real number from 0 to 180.



$$m\angle A + B \approx 125^\circ$$

What is the difference between the angles on these two protractors?

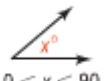

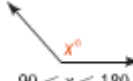
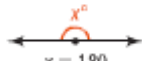


$$\begin{array}{r} 135 \\ - 32 \\ \hline 103 \end{array}$$

You can classify angles according to their measures.

**Take note**

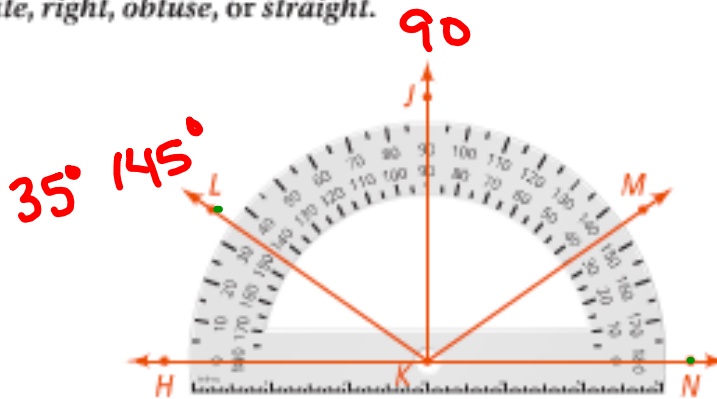
**Key Concept** Types of Angles

acute angle	right angle	obtuse angle	straight angle
			
$0 < x < 90$	$x = 90$	$90 < x < 180$	$x = 180$

The symbol  in the diagram above indicates a right angle.

**Problem 2** Measuring and Classifying Angles

What are the measures of  $\angle LKN$ ,  $\angle JKL$ , and  $\angle JKN$ ? Classify each angle as *acute*, *right*, *obtuse*, or *straight*.



$m\angle LKN = 145^\circ$

obtuse

$m\angle JKL = 145 - 90 = 55^\circ$

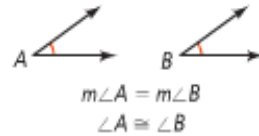
acute

$m\angle JKN = 90^\circ$

right

Angles with the same measure are **congruent angles**. This means that if  $m\angle A = m\angle B$ , then  $\angle A \cong \angle B$ . You can also say that if  $\angle A \cong \angle B$ , then  $m\angle A = m\angle B$ .

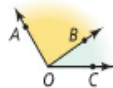
You can mark angles with arcs to show that they are congruent. If there is more than one set of congruent angles, each set is marked with the same number of arcs.



Take note

#### Postulate 1-8 Angle Addition Postulate

If point  $B$  is in the interior of  $\angle AOC$ , then  $m\angle AOB + m\angle BOC = m\angle AOC$ .



part + part = whole



#### Problem 4 Using the Angle Addition Postulate

**Algebra** If  $m\angle RQT = 155$ , what are  $m\angle RQS$  and  $m\angle TQS$ ?



$$\angle RQS + \angle TQS = \angle RQT$$

$$\underline{4x - 20} + \underline{3x + 14} = 155$$

$$7x - 6 = 155$$

$$7x = 161$$

$$x = 23$$

$$m\angle RQS = 4(23) - 20 = 72^\circ$$

$$m\angle TQS = 3(23) + 14 = 83^\circ$$

Name

1.4

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