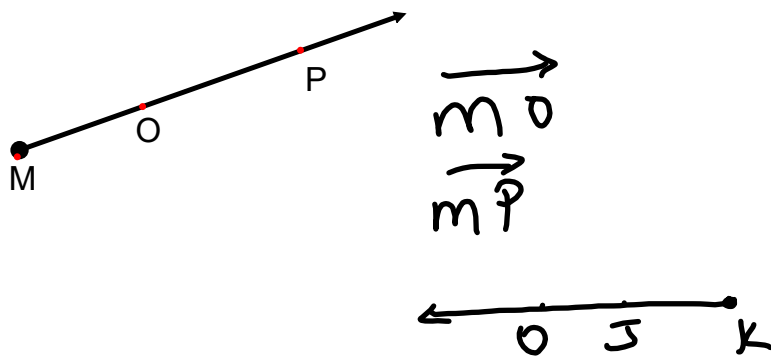


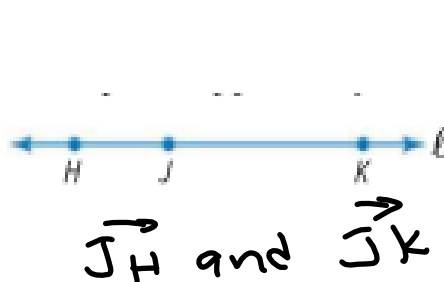
Section 1-4 Angle Measures

Measuring and Classifying Angles

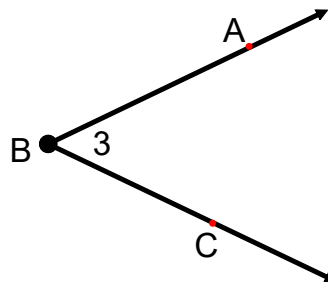
A **ray** is a part of a line. It has one endpoint and extends indefinitely in one direction. Rays are named by stating the endpoint first and then any other point on the ray.



Opposite Rays are two rays with the same endpoint and are collinear.



An **angle** is formed by two non-collinear rays that have a common endpoint. The rays are called **sides** of the angle. The common endpoint is the **vertex**.



When you name an angle using three letters, the vertex must be the second of the three letters.

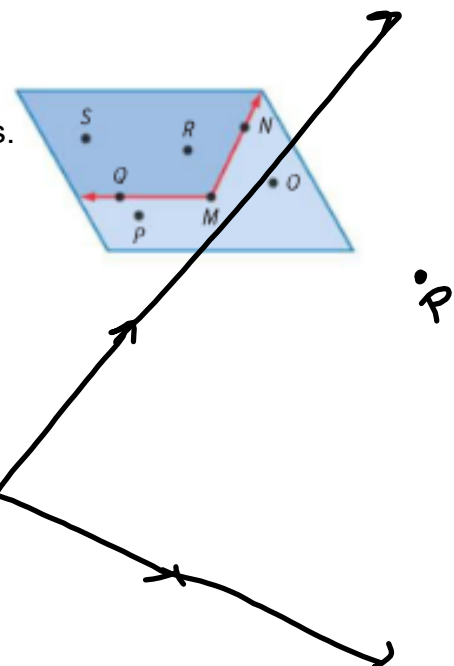
$\angle ABC$ or $\angle CBA$

You can name an angle using a single letter, the vertex**** $\angle B$

Or you can name an angle by a number. $\angle 3$

An angle divides a plane into three distinct parts.

- . Points Q, M and N lie on the angle.
- . Points S and R lie in the **interior** of the angle.
- . Points P and O lie in the **exterior** of the angle.



Example: Use the map of the high school shown.



a. Name all angles that have B as a vertex.

$\angle 1, \angle 2$

b. Name the sides of $\angle 3$.

\vec{CE} \vec{CB}

c. What is another name for $\angle GHL$?

$\angle 7$

d. Name a point in the interior of $\angle DBK$.

$\cdot E$

e. What is the vertex of $\angle 5$?

$\cdot C$

f. Name a point in the exterior of $\angle CLH$

$\cdot E$

g. Write another name for $\angle EHC$.



A. Name all angles that have **B** as a vertex.

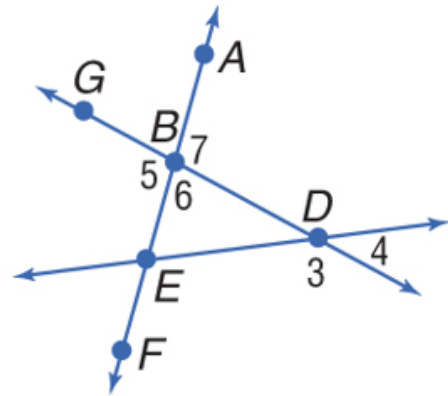
$\angle 5, \angle 6, \angle 7, \angle GBA$

B. Name the sides of $\angle 5$.

\vec{BG}, \vec{BE}

C. Write another name for $\angle 6$.

$\angle EBD$

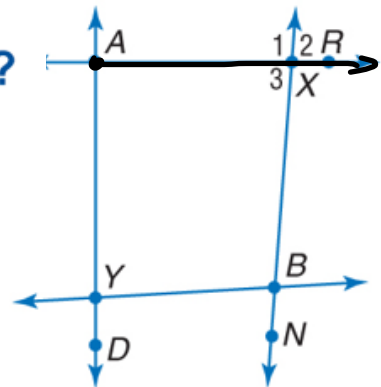


A. Which angle has point **X** as a vertex?

$\angle RXB$

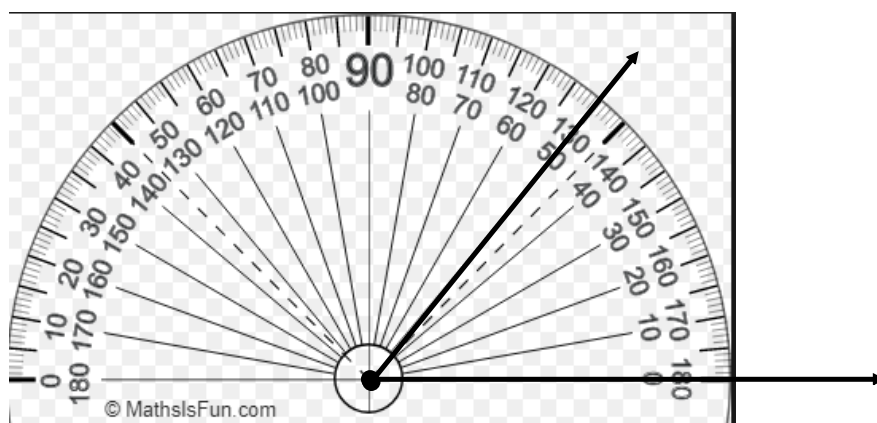
B. Which ray is a side of $\angle 3$?

\vec{XA}, \vec{XB}

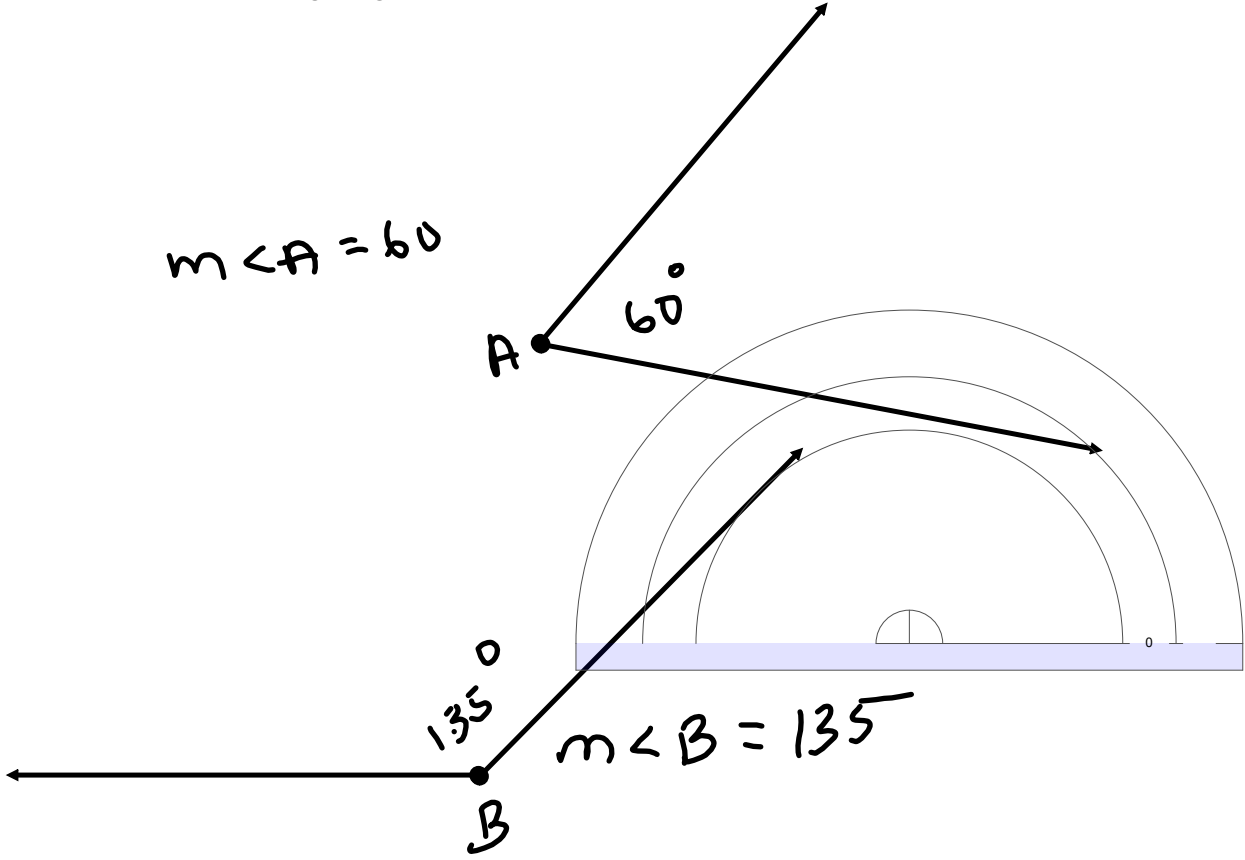


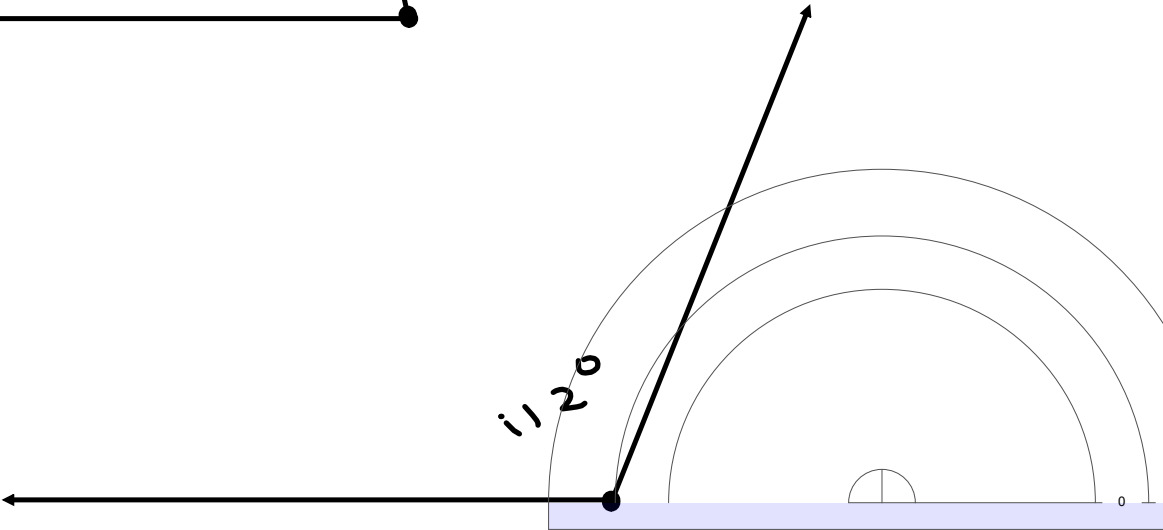
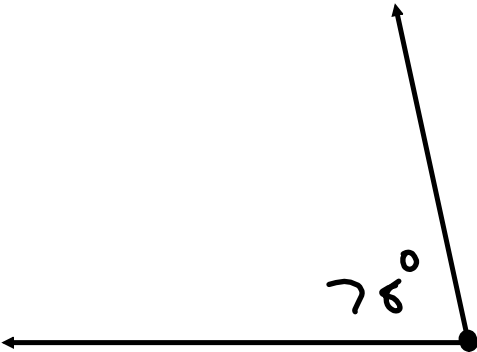
Angles are measured in units called degrees. The **degree** results from dividing the distance around a circle into 360 equal parts.


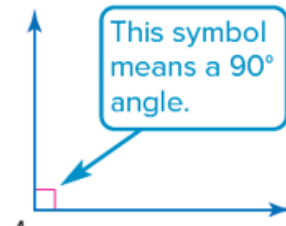
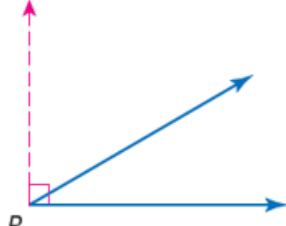
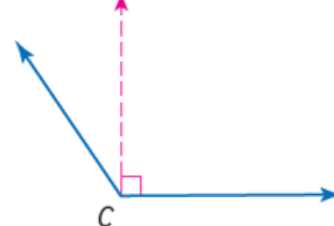
To measure an angle , you can use a **protractor**.

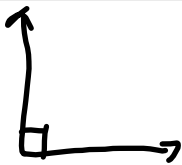


Measure the following angles.





 Key Concept Classify Angles		
right angle	acute angle	obtuse angle
 <p style="text-align: center;">$m\angle A = 90$</p>	 <p style="text-align: center;">$m\angle B < 90$</p>	 <p style="text-align: center;">$180 > m\angle C > 90$</p>

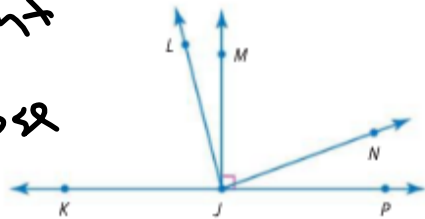


Classify each angle as right, acute or obtuse.

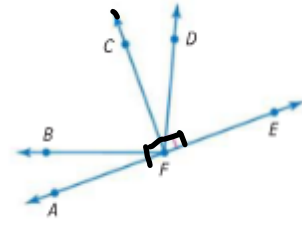
a. $\angle MJP$ *right*

b. $\angle LJP$ *obtuse*

c. $\angle NJP$ *acute*

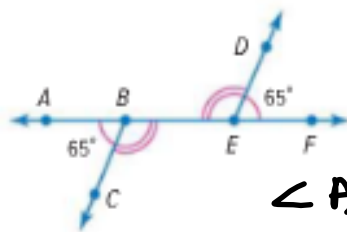


- a. $\angle AFB$ *acute*
- b. $\angle CFA$ *right*
- c. $\angle AFD$ *obtuse*
- d. $\angle CFD$ *acute*



Congruent Angles

Angles with the same measure are **congruent angles**.

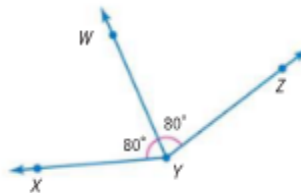


$$\angle ABC \cong \angle DEF$$

$$\angle CBE \cong \angle BED$$

A ray that divides an angle into two congruent angles is called an **angle bisector**.

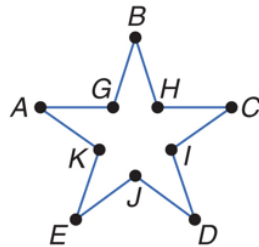
\overrightarrow{YW} is the angle bisector of $\angle XYZ$



The sum of the measures of the two smaller angles equals the measure of the largest angle.

$$m\angle XYW + m\angle WYZ = m\angle XYZ$$

INTERIOR DESIGN Wall stickers of standard shapes are often used to provide a stimulating environment for a young child's room. A five-pointed star sticker is shown with vertices labeled. Find $m\angle GBH$ and $m\angle HCI$ if $\angle GBH \cong \angle HCI$, $m\angle GBH = 2x + 5$, and $m\angle HCI = 3x - 10$.



Step 1 Solve for x .

$$\angle GBH \cong \angle HCI \quad \text{Given}$$

$$m\angle GBH = m\angle HCI \quad \text{Definition of congruent angles}$$

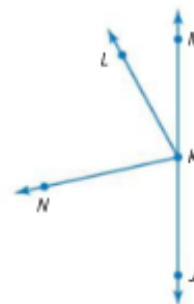
$$2x + 5 = 3x - 10 \quad \text{Substitution}$$

$$2x + 15 = 3x \quad \text{Add 10 to each side.}$$

$$15 = x \quad \text{Subtract } 2x \text{ from each side.}$$

Example

ALGEBRA In the figure, \overrightarrow{KJ} and \overrightarrow{KM} are opposite rays, and \overrightarrow{KN} bisects $\angle JKL$. If $m\angle JKN = 8x - 13$ and $m\angle NKL = 6x + 11$, find $m\angle JKN$.



Example

Suppose $m\angle JKL = 9y + 15$ and $m\angle JKN = 5y + 2$. Find $m\angle JKL$.

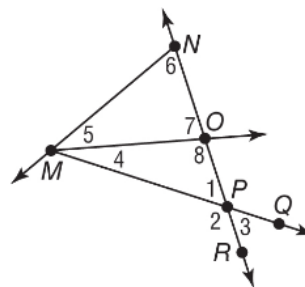
Quiz

Sec 1.1
to 1.4

NAME _____ DATE _____ PERIOD _____

1-4 Practice Angle Measure

For Exercises 1-10, use the figure at the right.



Name the vertex of each angle.

- 1. $\square 5$
- 2. $\square 3$
- 3. $\square 8$
- 4. $\square NMP$

Name the sides of each angle.

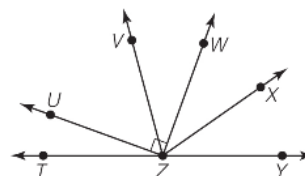
- 5. $\square 6$
- 6. $\square 2$
- 7. $\square MOP$
- 8. $\square OMN$

Write another name for each angle.

- 9. $\square QPR$
- 10. $\square 1$

Classify each angle as *right*, *acute*, or *obtuse*. Then use a protractor to measure the angle to the nearest degree.

- 11. $\square UZW$
- 12. $\square YZW$
- 13. $\square TZW$
- 14. $\square UZT$



ALGEBRA In the figure, \overrightarrow{CB} and \overrightarrow{CD} are opposite rays, \overrightarrow{CE} bisects $\angle DCF$, and \overrightarrow{CG} bisects $\angle FCB$.

- 15. If $m\angle DCE = 4x + 15$ and $m\angle ECF = 6x - 5$, find $m\angle DCE$.
- 16. If $m\angle FCG = 9x + 3$ and $m\angle GCB = 13x - 9$, find $m\angle GCB$.

