

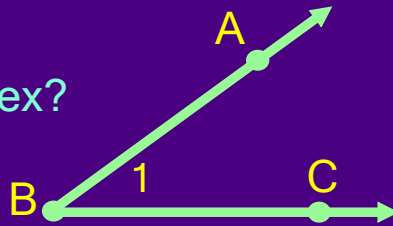
# 1.4 Angles & Their Measures

An **angle** consists of two rays with the same endpoint.

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

What is the vertex?

B



What are the names of the sides?

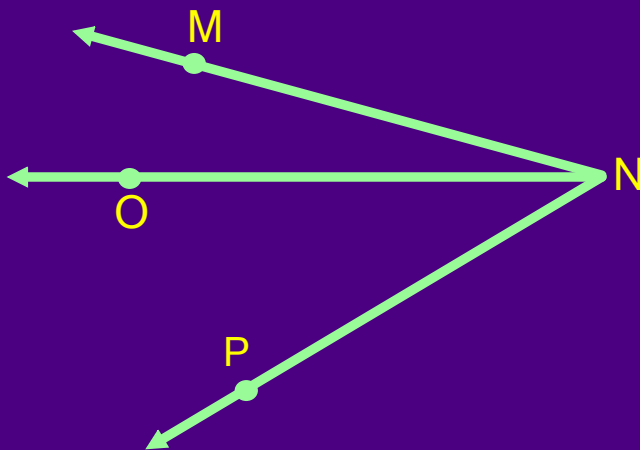
$\overrightarrow{BA}$  &  $\overrightarrow{BC}$

How would you name this angle?

$\angle B$ ,  $\angle ABC$ ,

$\angle CBA$ ,  $\angle 1$

Name the angles in the diagram.



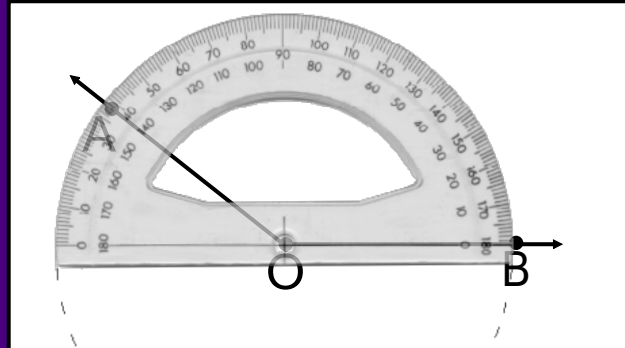
You should only name an angle by a single letter when there is no chance of confusion.

How do we measure angles?

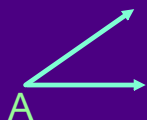
degrees

## Postulate 3: PROTRACTOR POSTULATE

The measure of  $\angle AOB$  is equal to the **absolute value** of the difference between the numbers for  $\overrightarrow{OA}$  and  $\overrightarrow{OB}$ .



## CLASSIFYING ANGLES



**Acute**

$m\angle A$  is  
between  $0^\circ$   
and  $90^\circ$



**Right**

$m\angle A = 90^\circ$



**Obtuse**

$m\angle A$  is  
between  $90^\circ$   
and  $180^\circ$

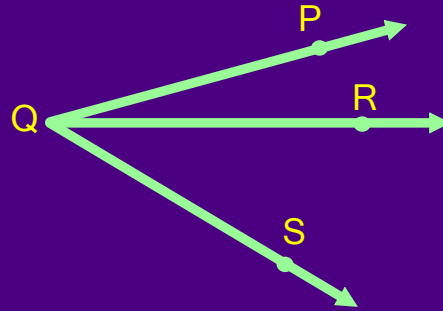


**Straight**

$m\angle A = 180^\circ$

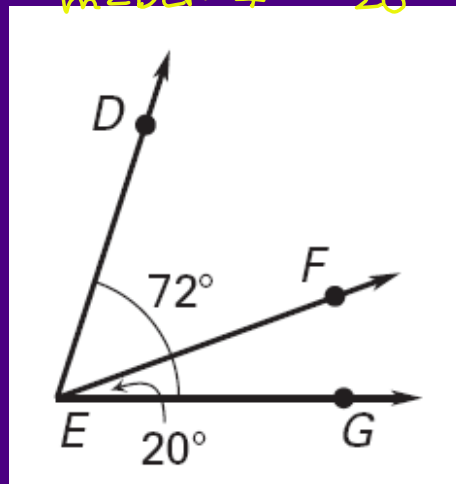
## Postulate 4: ANGLE ADDITION POSTULATE

If R is in the interior of  $\angle PQS$ ,  
then  $m\angle PQR + m\angle RQS = m\angle PQS$ .



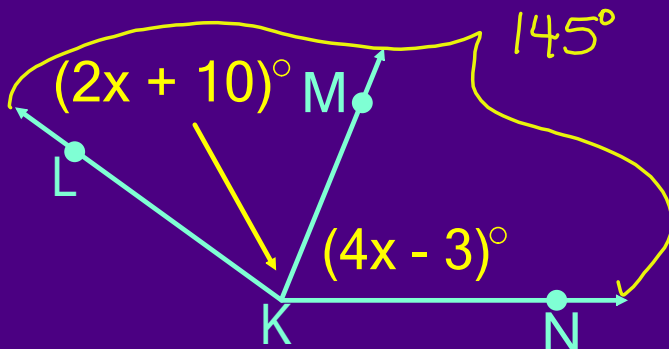
What is the measure of  $\angle DEF$ ?

$$\begin{aligned} m\angle DEF + m\angle GEF &= m\angle DEG \\ m\angle DEF + 20 &= 72 \end{aligned}$$



$$m\angle DEF = 52^\circ$$

Given that  $m\angle LKN = 145^\circ$ ,  
find  $m\angle LKM$  and  $m\angle MKN$ .



$$m\angle LKM = 2(23) + 10$$

$$m\angle LKM = 56^\circ$$

$$m\angle MKN = 4(23) - 3$$

$$m\angle MKN = 89^\circ$$

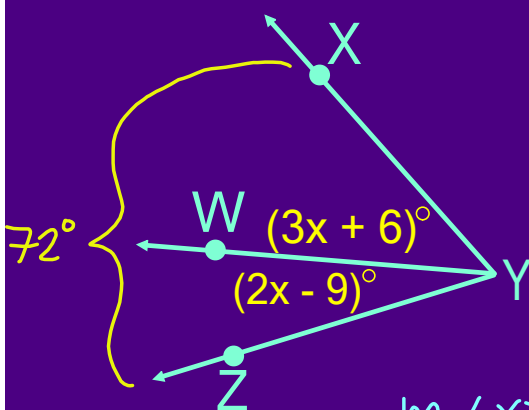
$$(2x + 10) + (4x - 3) = 145$$

$$6x + 7 = 145$$

$$\frac{6x}{6} = \frac{138}{6}$$

$$x = 23$$

If  $m\angle XYZ = 72^\circ$ ,  
find  $m\angle XYW$  and  $m\angle ZYW$ .



$$(3x + 6) + (2x - 9) = 72$$

$$5x - 3 = 72$$

$$+3 \quad +3$$

$$\frac{5x}{5} = \frac{75}{5}$$

$$x = 15$$

$$m\angle XYW = 3(15) + 6 = 51^\circ$$

$$m\angle ZYW = 2(15) - 9 = 21^\circ$$

Given that  $m\angle KLM$  is a straight angle, find  $m\angle KLN$  and  $m\angle NLM$ .

$$(4x+3) + (10x-5) = 180$$

$$\begin{array}{r} 14x - 2 = 180 \\ +2 \quad +2 \\ \hline 14x = 182 \\ x = 13 \end{array}$$

$$m\angle KLN = 10(13) - 5 = 125^\circ$$

$$m\angle NLM = 4(13) + 3 = 55^\circ$$

Given that  $m\angle EFG$  is a right angle, find  $m\angle EFH$  and  $m\angle HFG$ .

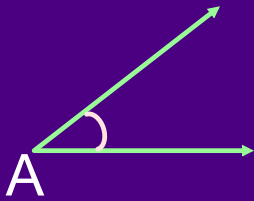
$$(2x+2) + (x+1) = 90$$

$$\begin{array}{r} 3x + 3 = 90 \\ -3 \quad -3 \\ \hline 3x = 87 \\ \frac{3x}{3} = \frac{87}{3} \\ x = 29 \end{array}$$

$$m\angle EFH = 2(29) + 2 = 60^\circ$$

$$m\angle HFG = 29 + 1 = 30^\circ$$

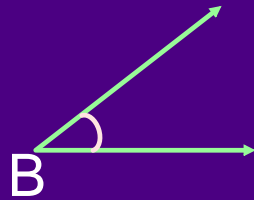
Two angles are **congruent angles** if they have the same measure.



Angle measures are equal.

$$m\angle A = m\angle B$$

↑  
"is equal to"

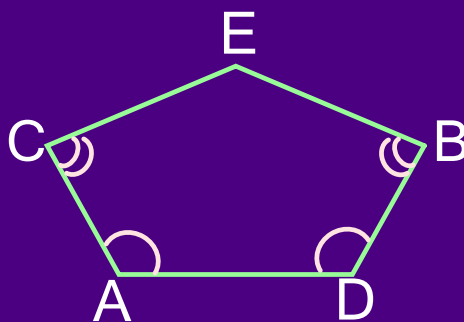


Angles are congruent.

$$\angle A \cong \angle B$$

↑  
"is congruent to"

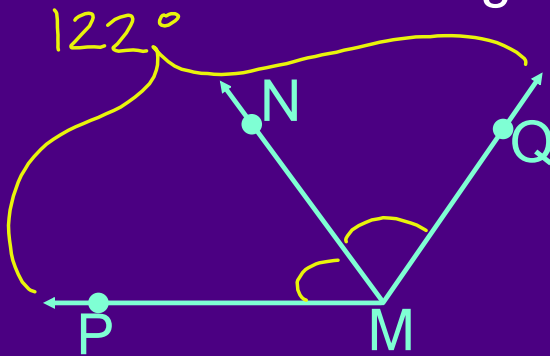
Identify all pairs of **congruent angles** in the diagram.



$$\angle A \cong \angle D$$

$$\angle B \cong \angle C$$

An **angle bisector** is a ray that divides an angle into two congruent angles.



$\overrightarrow{MN}$  bisects  $\angle PMQ$ , and  $m\angle PMQ = 122^\circ$ .  
Find  $m\angle PMN$ .

$\downarrow$   
 $61^\circ$