

# Angles

Geometry CP

Name: \_\_\_\_\_



## Classifying Angles

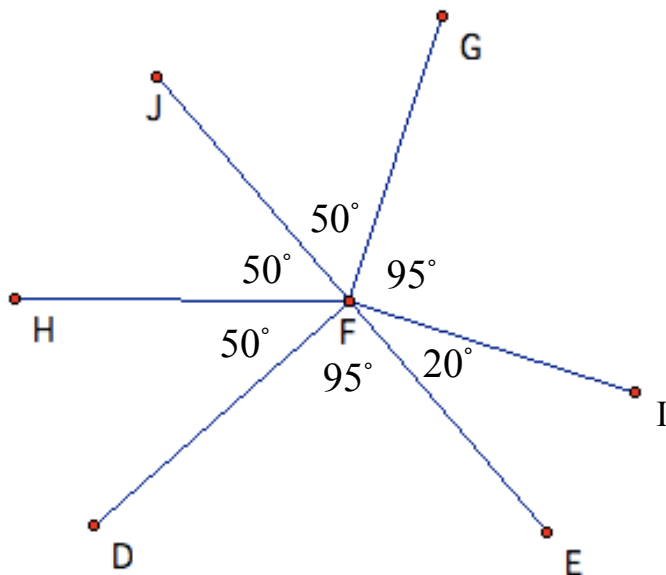
Date:

### Warm-Up:

- a. Draw a diagram where M is between R and S.  
If RM is 7 and RS is 10, what is SM?
  
- b. Draw non-collinear points A, B, C, and D. Then draw  $\overrightarrow{AC}$ ,  $\overrightarrow{BD}$ , and  $\overrightarrow{CD}$

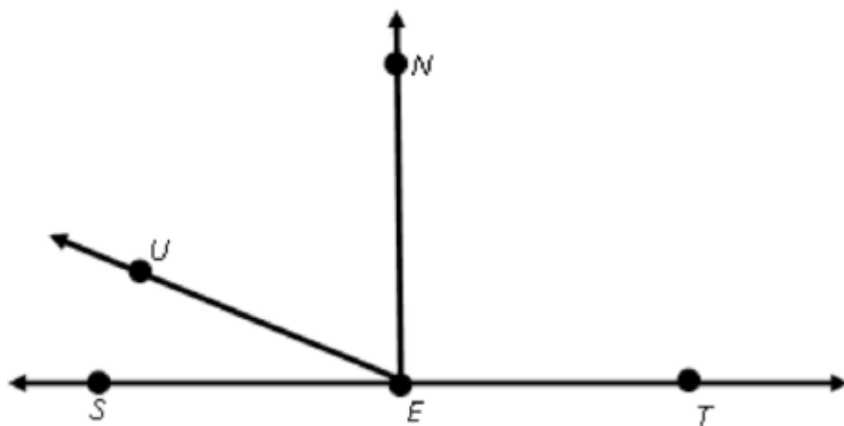
Word	Definition	Picture/Symbol/Example
Angle		
Acute Angle		
Right Angle		
Obtuse Angle		
Straight Angle		
Congruent Angles		

**Example 1:** Name all congruent angles using a congruence statement.  
Then, mark the congruent angles in the diagram.



Word	Definition	Picture/Symbol/Example
Adjacent Angles		

**Example 2:** In the diagram below, name a pair of adjacent angles.

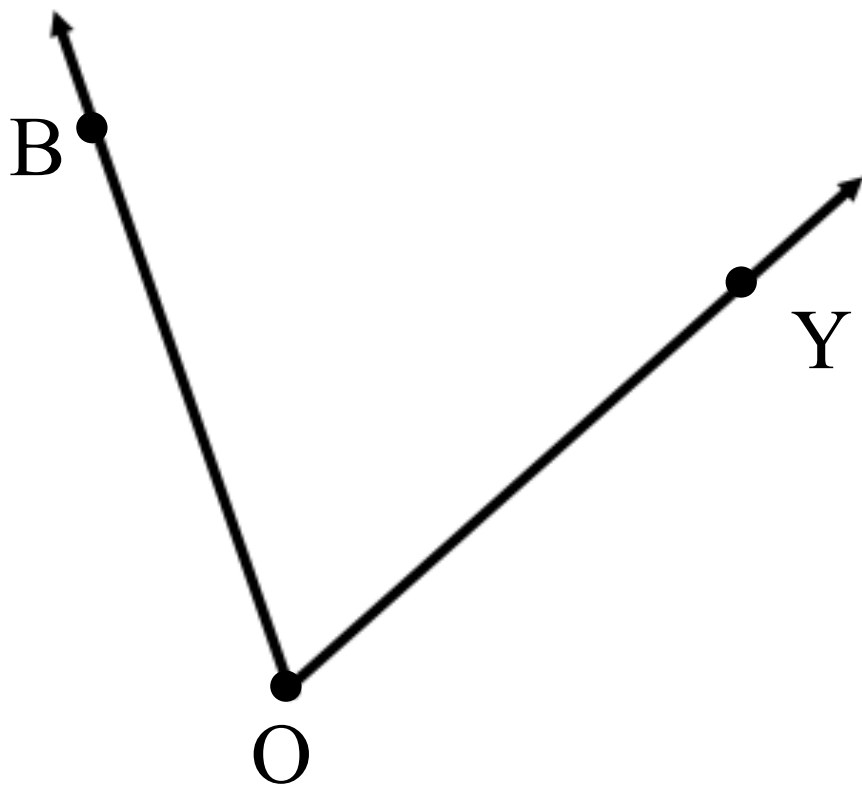
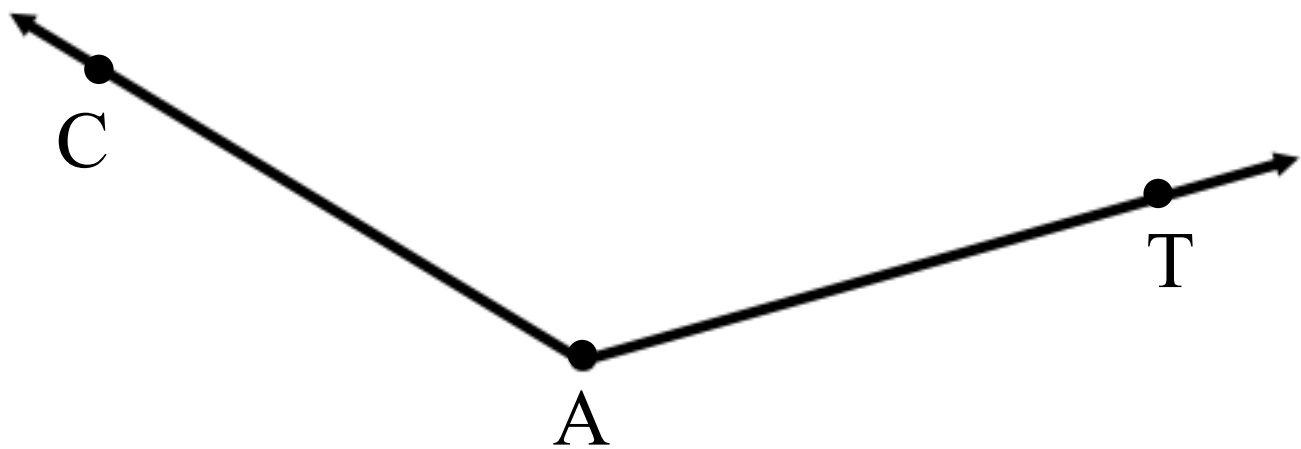


a. Using the diagram above...If  $m\angle SEU = 30^\circ$  and  $m\angle SEN = 95^\circ$ , what is  $m\angle UEN$ ?

b. Using the diagram above...If  $m\angle UEN = 40^\circ$  and  $m\angle NET = 90^\circ$ , what is  $m\angle UET$ ?

**Measuring Angles with a Protractor:**

- a. Is the angle acute or obtuse?
- b. Name the angle using 3 letters.
- c. Measure the angle using a protractor.



### On Your Own:

1. Plot the points  $A(1,1)$ ,  $B(-1,1)$ ,  $C(1,3)$ ,  $D(3,2)$ , and  $E(3,1)$ .

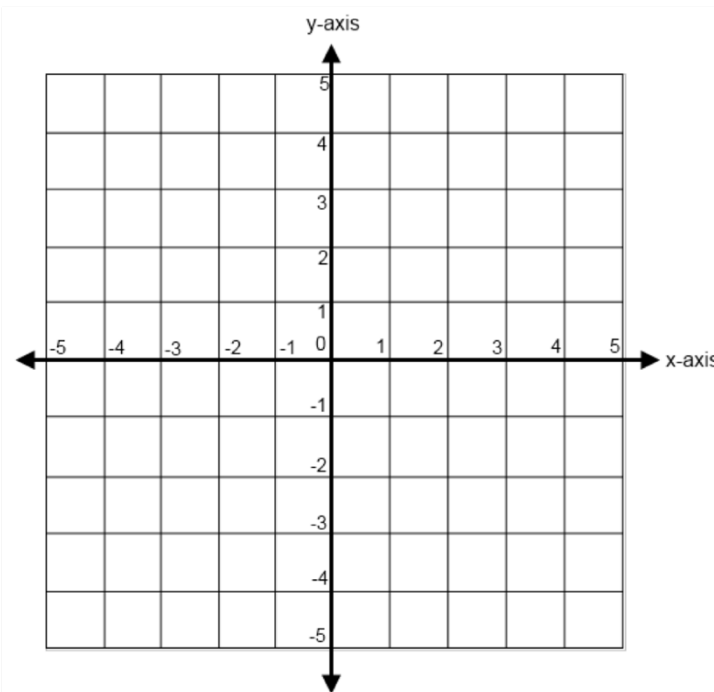
Then classify the following angles as acute, right, obtuse, or straight.  
Use different colors to draw the angles if you need.

a.  $\angle CAB$

b.  $\angle DAE$

c.  $\angle BAD$

d.  $\angle EAB$



**Classify the angle as acute, obtuse, right, or straight.**

2.  $m\angle A = 180^\circ$

3.  $m\angle B = 90^\circ$

4.  $m\angle C = 100^\circ$

5.  $m\angle D = 45^\circ$

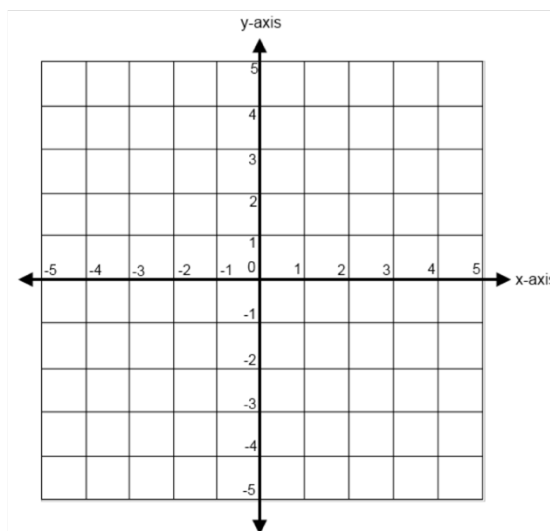
**In a coordinate plan, plot the points and then draw  $\angle ABC$ .**

6.  $A(3, -2)$ ,  $B(5, -1)$ , and  $C(4, -4)$ ,

a. Classify the angle.

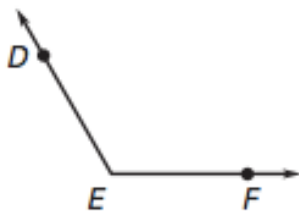
b. Name a coordinate point  $(x,y)$  that is in the interior of the  $\angle ABC$

c. Name a coordinate point  $(x,y)$  that is in the exterior of the  $\angle ABC$



Name each of the angles below. State the vertex.

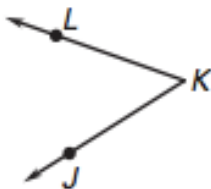
7.



Name:

Vertex:

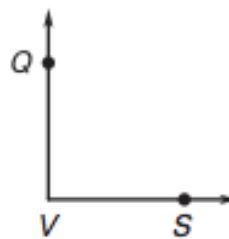
8.



Name:

Vertex:

9.



Name:

Vertex:

Classify the angle with the given measure as *acute*, *obtuse*, *right*, or *straight*.

10.  $m\angle A = 115^\circ$

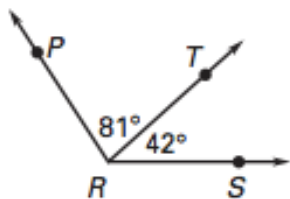
11.  $m\angle A = 85^\circ$

12.  $m\angle A = 90^\circ$

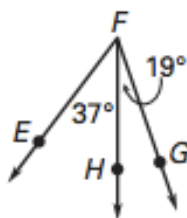
13.  $m\angle A = 170^\circ$

Find the indicated angle measure in each of the following diagrams.

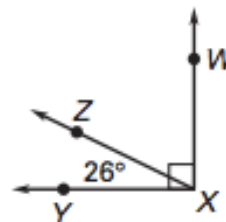
14.  $m\angle PRS =$  \_\_\_\_\_



15.  $m\angle EFG =$  \_\_\_\_\_



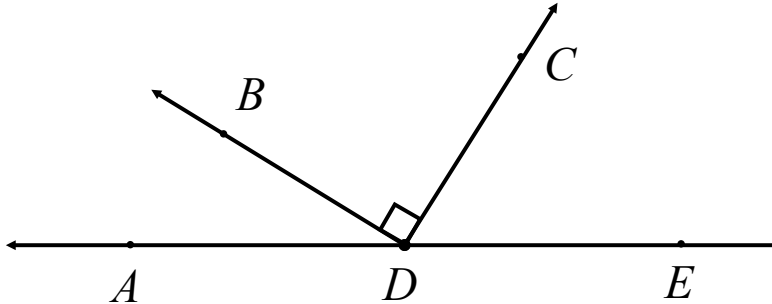
16.  $m\angle WXZ =$  \_\_\_\_\_



# Angle Addition Postulate

Date:

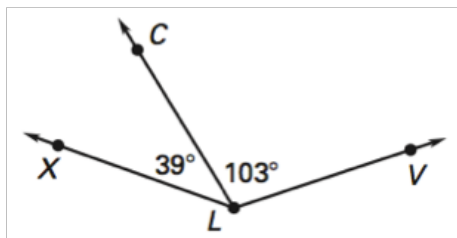
**Warm-Up:** Use the diagram to answer each of the questions below.



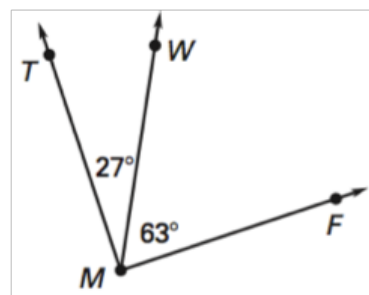
- Name two acute angles. \_\_\_\_\_
- Name one right angle. \_\_\_\_\_
- Name one straight angle. \_\_\_\_\_
- Name two obtuse angles. \_\_\_\_\_
- Name a pair of adjacent angles. \_\_\_\_\_

Use each of the following diagrams to determine the measure of the indicated angle.

1. Find  $m\angle XLV =$  \_\_\_\_\_



2. Find  $m\angle TMF =$  \_\_\_\_\_

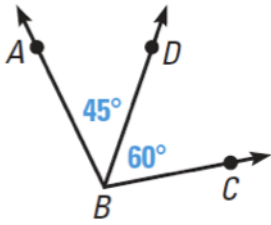


Word	Definition	Picture/Symbol/Example
Angle Addition Postulate		

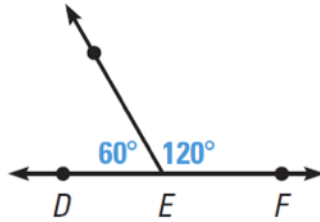


**Examples:** Use the angle addition postulate to find the measure of the unknown angle.

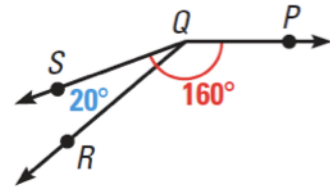
3.  $m\angle ABC = \underline{\hspace{2cm}}$



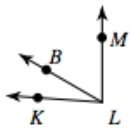
4.  $m\angle DEF = \underline{\hspace{2cm}}$



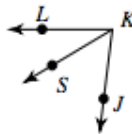
5.  $m\angle PQR = \underline{\hspace{2cm}}$



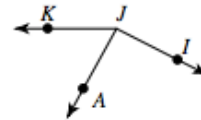
6. Find  $m\angle KLM$  if  $m\angle KLB = 26^\circ$  and  $m\angle BLM = 60^\circ$ .



7. Find  $m\angle JKL$  if  $m\angle SKL = 31^\circ$  and  $m\angle JKS = 52^\circ$ .



8. Find  $m\angle IJA$  if  $m\angle AJK = 61^\circ$  and  $m\angle IJK = 153^\circ$ .



### On Your Own:

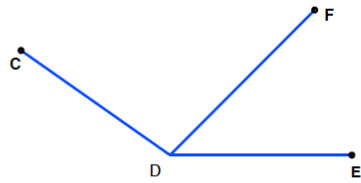
9. Draw a large obtuse angle  $\angle XYZ$  in the space provided.  
Draw point  $F$  in the interior of your angle. Draw  $\overrightarrow{YF}$ .

- State a pair of adjacent angles:  $\underline{\hspace{2cm}}$
- Using a protractor measure...
  - $m\angle XYF = \underline{\hspace{2cm}}$
  - $m\angle FYZ = \underline{\hspace{2cm}}$
  - $m\angle XYZ = \underline{\hspace{2cm}}$

What do you notice?

Find the missing angle measurement using the angle addition postulate.

1)

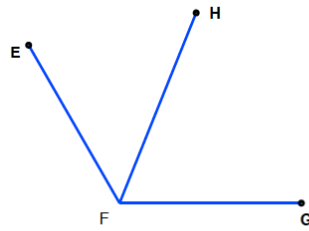


$$\angle CDF = 100^\circ$$

$$\angle FDE = \underline{\hspace{2cm}}$$

$$\angle CDE = 145^\circ$$

2)

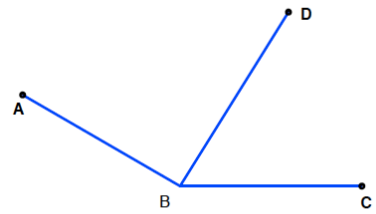


$$\angle EFH = \underline{\hspace{2cm}}$$

$$\angle HFG = 68^\circ$$

$$\angle EFG = 120^\circ$$

3)



$$\angle ABD = 92^\circ$$

$$\angle DBC = 58^\circ$$

$$\angle ABC = \underline{\hspace{2cm}}$$

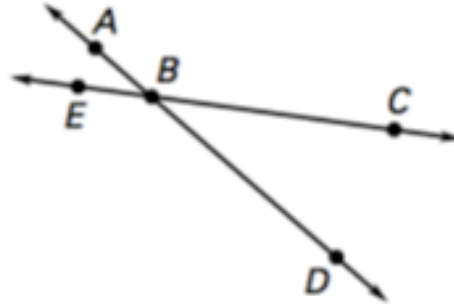
## Complementary & Supplementary Angles

Date:

### Warm-Up:

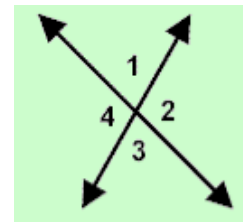
Name an example of each type of angle from the given figure.

- a. Obtuse
- b. Acute
- c. Straight
- d. A pair of adjacent angles



Complete each of the following statements.

- a. An angle that measure  $90^\circ$  is called a(n) \_\_\_\_\_ angle.
- b. An acute angle is any angle whose measure is less than \_\_\_\_\_.
- c. Angles \_\_\_\_\_ and \_\_\_\_\_ in the picture at the right are adjacent angles.
- d. Angles \_\_\_\_\_ and \_\_\_\_\_ in the picture at the right are not adjacent angles.



Word	Definition	Picture/Symbol/Example
Complementary Angles		
Supplementary Angles		

**Examples:**

1.  $\angle P$  and  $\angle N$  are complementary angles. If  $m\angle P = 65^\circ$ , then  $m\angle N =$ \_\_\_\_\_.
2. The complement of  $12^\circ$  is \_\_\_\_\_.
3.  $\angle P$  and  $\angle T$  are supplementary angles. If  $m\angle P = 65^\circ$ , then  $m\angle T =$ \_\_\_\_\_.
4. The supplement of  $12^\circ$  is \_\_\_\_\_.

**Assume  $\angle A$  and  $\angle B$  are complementary and  $\angle A$  and  $\angle C$  are supplementary.**

5. If  $m\angle A = 42^\circ$ , then  $m\angle B =$ \_\_\_\_\_, and  $m\angle C =$ \_\_\_\_\_.
6. If  $m\angle A = 17^\circ$ , then  $m\angle B =$ \_\_\_\_\_, and  $m\angle C =$ \_\_\_\_\_.

**Assume  $\angle A$  and  $\angle B$  are complementary.**

7. If  $m\angle A = 20^\circ$  and  $m\angle B = (x + 3)^\circ$ , find  $x$ .
8. If  $m\angle A = (x + 2)^\circ$  and  $m\angle B = (x - 12)^\circ$ , find  $x$ .

**Assume  $\angle A$  and  $\angle B$  are supplementary.**

9. If  $m\angle A = 120^\circ$  and  $m\angle B = (3x + 10)^\circ$ , find  $x$ .

**On Your Own:**

**Assume  $\angle A$  and  $\angle B$  are complementary.**

1. If  $m\angle A = 10^\circ$  and  $m\angle B = (2x - 6)^\circ$ , find  $x$ .

**Assume  $\angle A$  and  $\angle B$  are supplementary.**

2. If  $m\angle A = 50^\circ$  and  $m\angle B = (5x)^\circ$ , find  $x$ .
3. If  $m\angle A = (2x + 2)^\circ$  and  $m\angle B = (2x + 18)^\circ$ , find  $x$ .

**Find the complement and supplement of the given angles.**

4.  $63^\circ$

Complement of  $63^\circ = \underline{\hspace{2cm}}$

5.  $124^\circ$

Supplement of  $124^\circ = \underline{\hspace{2cm}}$

6.  $135^\circ$

Supplement of  $135^\circ = \underline{\hspace{2cm}}$

7.  $13^\circ$

Complement of  $13^\circ = \underline{\hspace{2cm}}$

8.  $154^\circ$

Supplement of  $154^\circ = \underline{\hspace{2cm}}$

9.  $28^\circ$

Supplement of  $28^\circ = \underline{\hspace{2cm}}$

10.  $32^\circ$

Complement of  $32^\circ = \underline{\hspace{2cm}}$

11.  $51^\circ$

Complement of  $51^\circ = \underline{\hspace{2cm}}$

## Vertical Angles & Linear Pairs

Date:

### Warm-Up:

Two angles are complementary and one of them is  $31^\circ$ . What is the measure of the other angle?

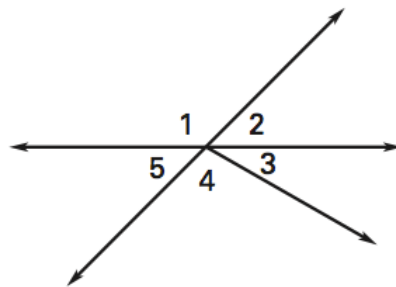
Two angles are supplementary and one of them is  $127^\circ$ . What is the measure of the other angle?

Two angles are supplementary and one of them is three times as big as the other.  
What is the size of the smaller angle?

Word	Definition	Picture/Symbol/Example
Vertical Angles		
Linear Pair of Angles		

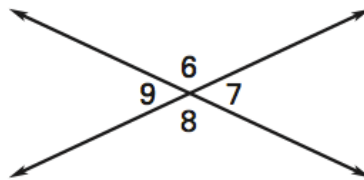
Use the figure at the right.

1. Are  $\angle 1$  and  $\angle 2$  adjacent?
2. Are  $\angle 1$  and  $\angle 2$  a linear pair?
3. Are  $\angle 3$  and  $\angle 4$  a linear pair?
4. Are  $\angle 2$  and  $\angle 5$  vertical angles?
5. Are  $\angle 1$  and  $\angle 4$  vertical angles?
6. Are  $\angle 3$  and  $\angle 5$  vertical angles?



Use the figure at the right. Each question is independent from the one above it.

7. If  $m\angle 6 = 78^\circ$ , then  $m\angle 7 =$  \_\_\_\_\_
8. If  $m\angle 8 = 94^\circ$ , then  $m\angle 6 =$  \_\_\_\_\_
9. If  $m\angle 9 = 124^\circ$ , then  $m\angle 8 =$  \_\_\_\_\_
10. If  $m\angle 7 = 47^\circ$ , then  $m\angle 9 =$  \_\_\_\_\_
11. If  $m\angle 8 = 158^\circ$ , then  $m\angle 9 =$  \_\_\_\_\_
12. If  $m\angle 7 = 15^\circ$ , then  $m\angle 6 =$  \_\_\_\_\_

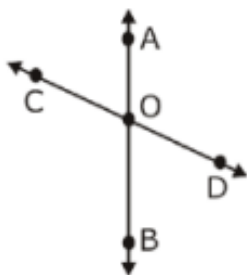


### On Your Own:

#### Naming Angle Pairs

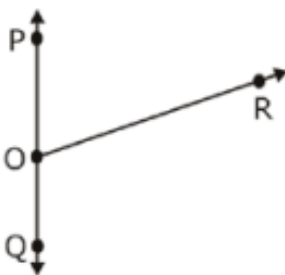
Name the (supplementary, adjacent, complementary, and vertical) pair of angles.

1.



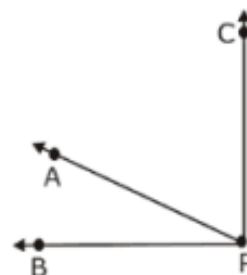
Name a pair of supplementary angles

2.



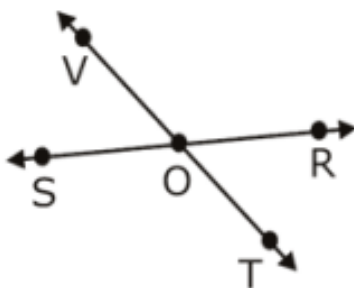
Name a pair of adjacent angles

3.



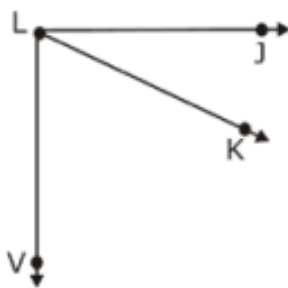
Name a pair of complementary angles

4.



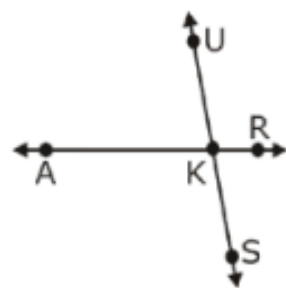
Name a pair of vertical angles

5.



Name a pair of complementary angles

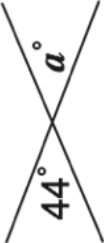


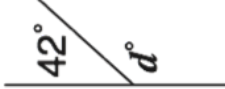

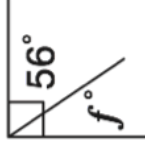
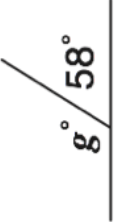
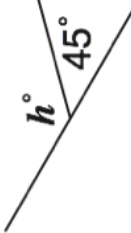


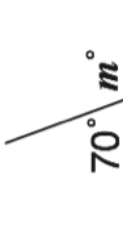

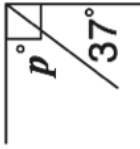

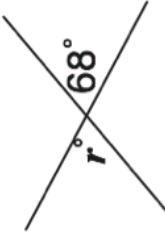


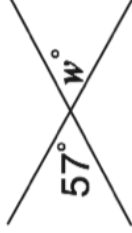


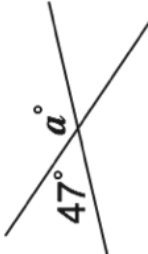
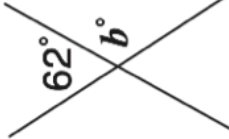


6.



Name a pair of adjacent angles

Determine the measure of each missing angle.

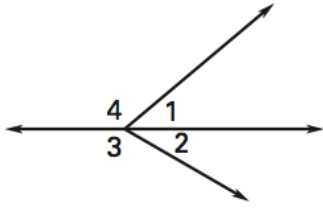
Size of Angle



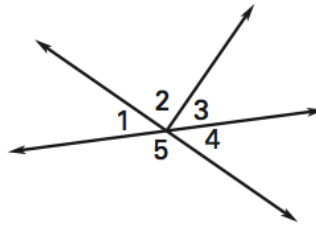
Use the figure to answer the questions.

1.



- Are  $\angle 1$  and  $\angle 2$  a linear pair?
- Are  $\angle 1$  and  $\angle 3$  vertical angles?
- Are  $\angle 1$  and  $\angle 4$  a linear pair?
- Are  $\angle 2$  and  $\angle 4$  vertical angles?

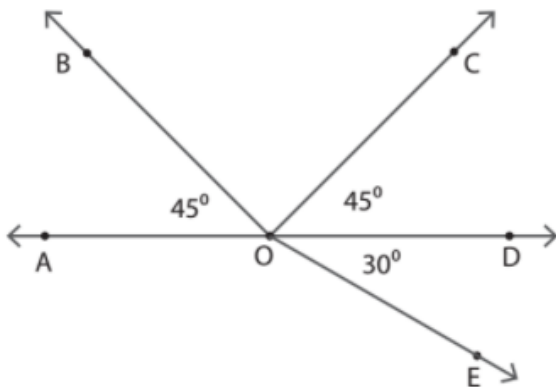
2.



- Are  $\angle 1$  and  $\angle 5$  a linear pair?
- Are  $\angle 1$  and  $\angle 2$  a linear pair?
- Are  $\angle 1$  and  $\angle 4$  vertical angles?
- Are  $\angle 3$  and  $\angle 5$  vertical angles?

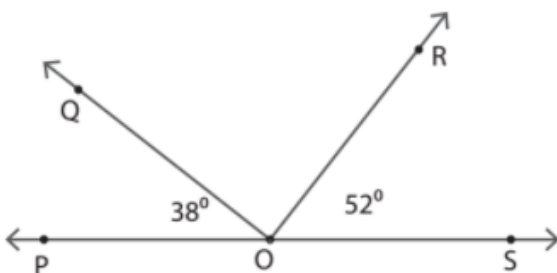
Use the provided diagram to answer each of the questions.

3.



- Name two angles that are complementary.
- Name the angle that is supplementary to  $\angle BOA$ .
- $\angle AOE$  and  $\angle DOE$  are supplementary.  
Find  $m\angle AOE$
- Name the angle adjacent to  $\angle BOC$

4.



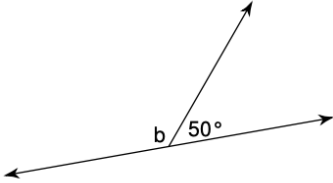
- Name any one pair of adjacent angles.
- Find  $m\angle QOR$
- Name the angle complementary to  $\angle ROS$
- Which angle forms a linear pair with  $\angle POQ$ ?

# Angle Relationships with Algebra

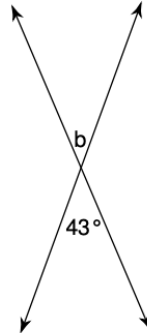
Date:

**Warm-Up:** Find the measurement of the missing angle

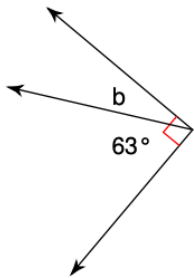
a.



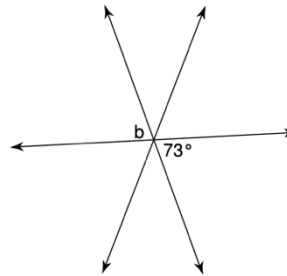
b.



c.



d.



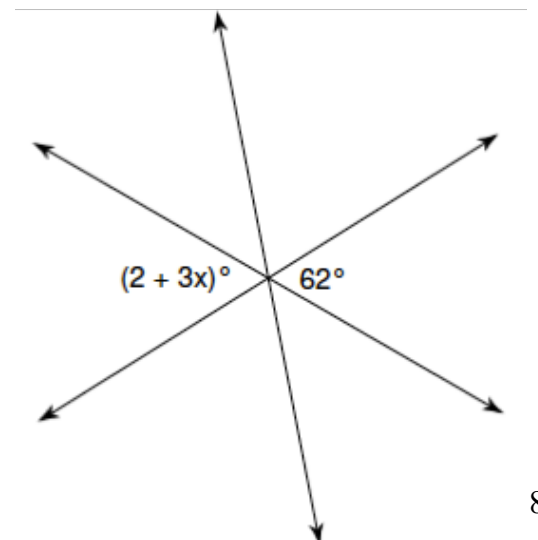
**Solve Linear equations to solve geometry problems:**

Step 1: Determine the relationship between the geometric figures

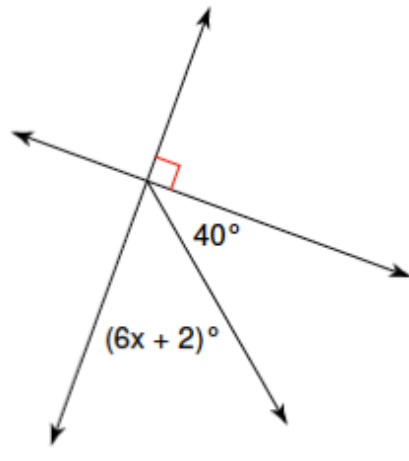
Step 2: Write an equation

Step 3: Solve for  $x$

1.



2.



**On Your Own:**

3.  $m\angle ABC = (3x + 7)^\circ$  and  $m\angle CBD = (7x + 13)^\circ$ .  $\angle ABC$  and  $\angle CBD$  form a linear pair.

a. If two angles form a linear pair, what do the two angles sum to?

b. Draw a diagram to model this situation.

c. Write and solve an equation to find the value of  $x$ .

d. Use your solution from part (c) to find  $m\angle ABC$ .

4.  $m\angle RST = (40x - 50)^\circ$  and  $m\angle QSV = (15x + 50)^\circ$ .

$\angle RST$  and  $\angle QSV$  form a pair of vertical angles.

a. If two angles form a pair of vertical angles, what is their relationship?

b. Draw a diagram to model this situation.

c. Write and solve an equation to find the value of  $x$ .

d. Use your solution from part (c) to find  $m\angle QSV$ .

5.  $m\angle CAT = (5x - 10)^\circ$  and  $m\angle DOG = (3x + 20)^\circ$ .

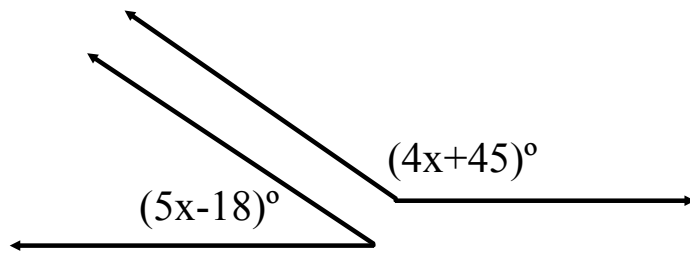
$\angle CAT$  and  $\angle DOG$  are complementary angles.

a. If two angles are complementary, what do the two angles sum to?

b. Write and solve an equation to find the value of  $x$ .

c. Use your solution from part (b) to find  $m\angle CAT$ .

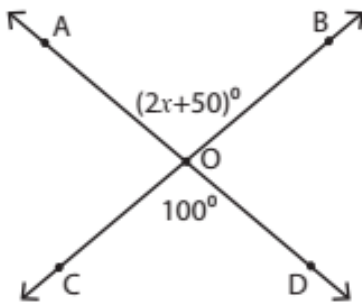
6. The angles shown below are supplementary.



- If two angles are supplementary, what do the two angles sum to?
- Write and solve an equation to find the value of  $x$ .
- Use your solution from part (b) to find the measure of each angle.

Write an solve an equation for each of the following diagrams.

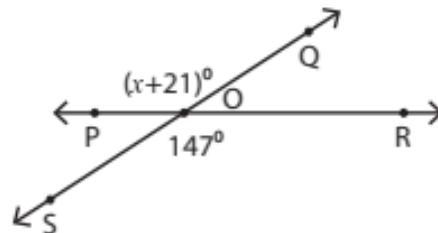
1)



$$x = \underline{\hspace{2cm}}$$

$$\angle BOD = \underline{\hspace{2cm}}$$

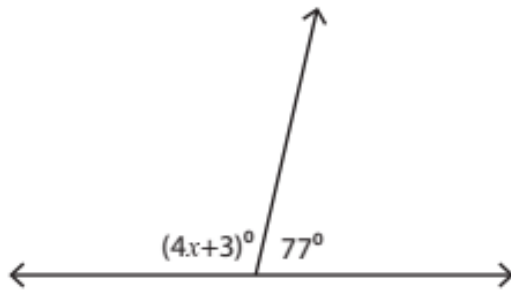
2)



$$x = \underline{\hspace{2cm}}$$

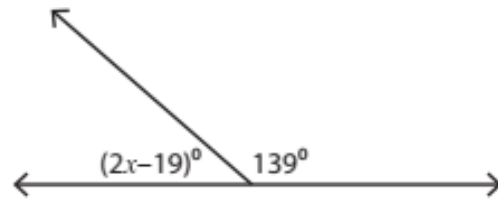
$$\angle POS = \underline{\hspace{2cm}}$$

3)



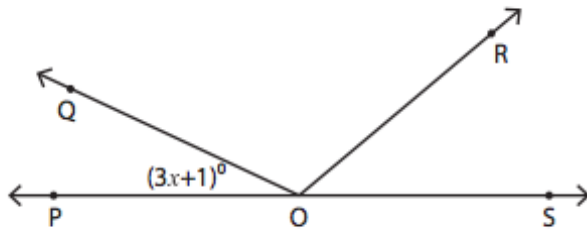
$$x = \underline{\hspace{2cm}}$$

4)



$$x = \underline{\hspace{2cm}}$$

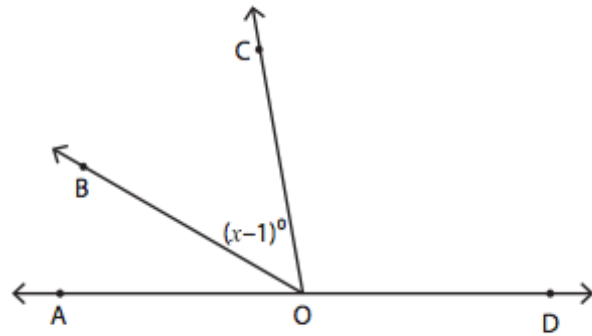
5)



$$\angle QOR = 115^\circ$$

$$\angle ROS = 40^\circ \quad x = \underline{\hspace{2cm}}$$

6)



$$\angle COD = 100^\circ$$

$$\angle AOB = 30^\circ \quad x = \underline{\hspace{2cm}}$$

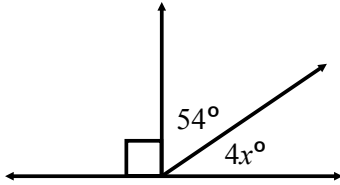
## Angle Bisectors

Date:

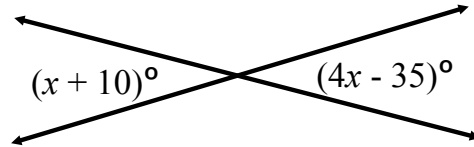
### Warm-Up:

Use the diagrams below and the angle relationships we have learned about to solve for  $x$ .

1.



2.



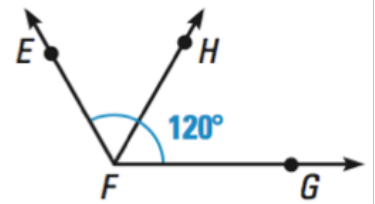
### Class Notes:

Word	Definition	Picture/Symbol/Example
Angle Bisector		

### Example 1:

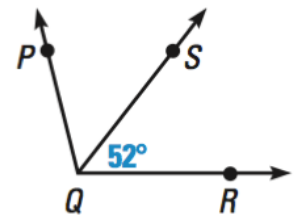
The ray  $\overrightarrow{FH}$  bisects the angle  $\angle EFG$ .

Given that  $m\angle EFG = 120^\circ$ , what are the measures of  $\angle EFH$  and  $\angle HFG$ ?



**Example 2:**

$\overrightarrow{QS}$  is the angle bisector of  $\angle PQR$ . Find the measures of  $\angle PQS$  and  $\angle PQR$ .

**Example 3:**

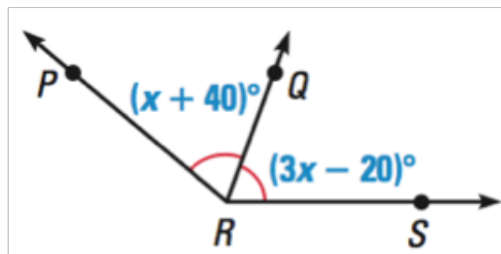
Suppose  $\angle JKL = 90^\circ$ . If the ray  $\overrightarrow{KM}$  bisects  $\angle JKL$ .

- Draw a diagram.
- What are the measures of  $\angle JKM$  and  $\angle LKM$ ?

**Example 4:**

In the diagram at the right  $\overrightarrow{RQ}$  bisects  $\angle PRS$ .

- Write an equation and solve for  $x$ .



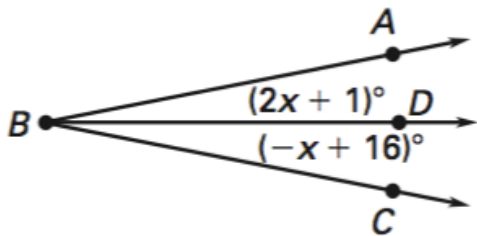
- What is the measure of  $\angle PRQ$ ?
- What is the measure of  $\angle PRS$ ?



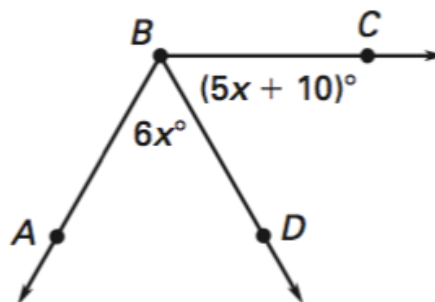
**On Your Own:**

**Problems 1 – 2:**  $\overrightarrow{BD}$  bisects  $\angle ABC$ . Find the value of  $x$ .

1.

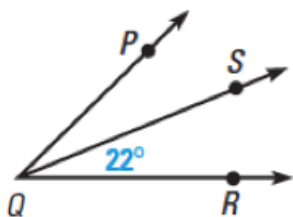


2.



**Problems 3 – 8:**  $\overrightarrow{QS}$  is the angle bisector of  $\angle PQR$ . Find the two angle measure not given in the diagram.

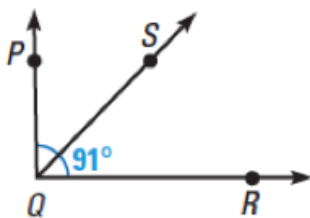
3.



$$m\angle PQS = \underline{\hspace{2cm}}$$

$$m\angle PQR = \underline{\hspace{2cm}}$$

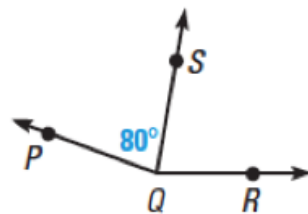
4.



$$m\angle PQS = \underline{\hspace{2cm}}$$

$$m\angle SQR = \underline{\hspace{2cm}}$$

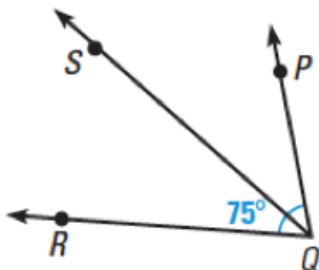
5.



$$m\angle SQR = \underline{\hspace{2cm}}$$

$$m\angle PQR = \underline{\hspace{2cm}}$$

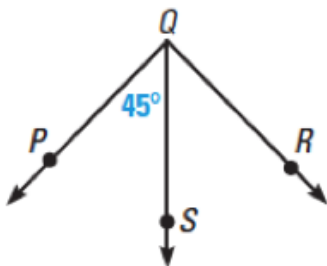
6.



$$m\angle PQS = \underline{\hspace{2cm}}$$

$$m\angle SQR = \underline{\hspace{2cm}}$$

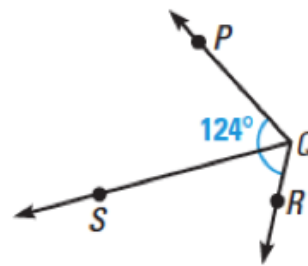
7.



$$m\angle SQR = \underline{\hspace{2cm}}$$

$$m\angle PQR = \underline{\hspace{2cm}}$$

8.

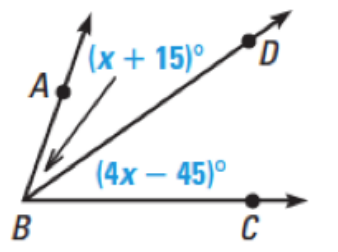


$$m\angle PQS = \underline{\hspace{2cm}}$$

$$m\angle SQR = \underline{\hspace{2cm}}$$

**Problems 9 – 12:**  $\overrightarrow{BD}$  bisects  $\angle ABC$ . Find the value of  $x$  and the value of all missing angles.

9.



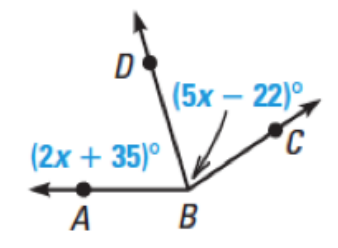
$$x = \underline{\hspace{2cm}}$$

$$m\angle ABD = \underline{\hspace{2cm}}$$

$$m\angle DBC = \underline{\hspace{2cm}}$$

$$m\angle ABC = \underline{\hspace{2cm}}$$

10.



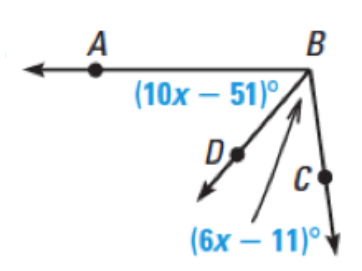
$$x = \underline{\hspace{2cm}}$$

$$m\angle ABD = \underline{\hspace{2cm}}$$

$$m\angle DBC = \underline{\hspace{2cm}}$$

$$m\angle ABC = \underline{\hspace{2cm}}$$

11.



$$x = \underline{\hspace{2cm}}$$

$$m\angle ABD = \underline{\hspace{2cm}}$$

$$m\angle DBC = \underline{\hspace{2cm}}$$

$$m\angle ABC = \underline{\hspace{2cm}}$$