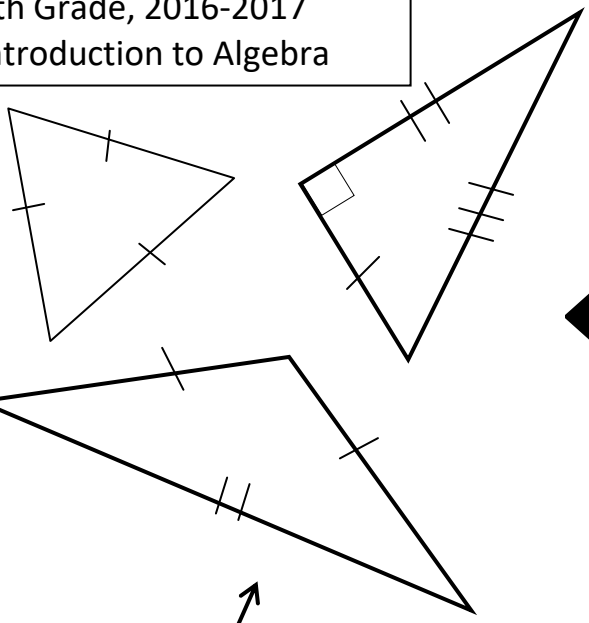
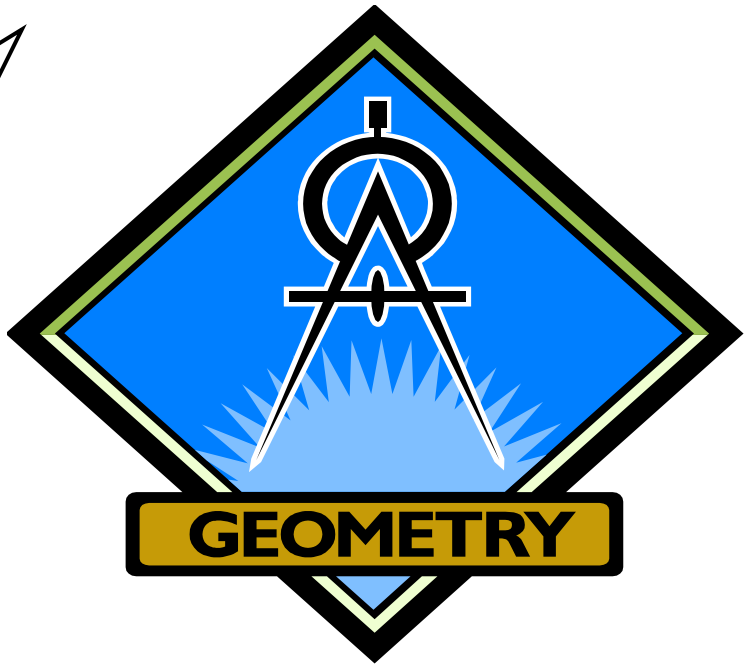
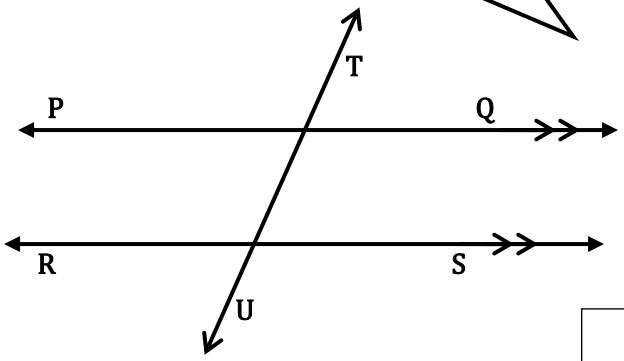
Unit 8
Beaumont Middle School
8th Grade, 2016-2017
Introduction to Algebra

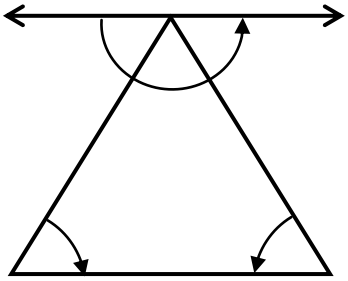
Name: _____

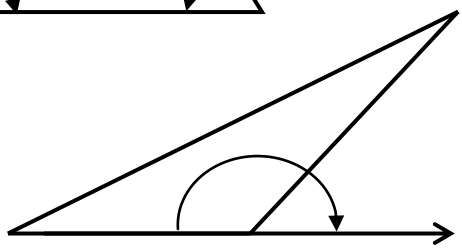




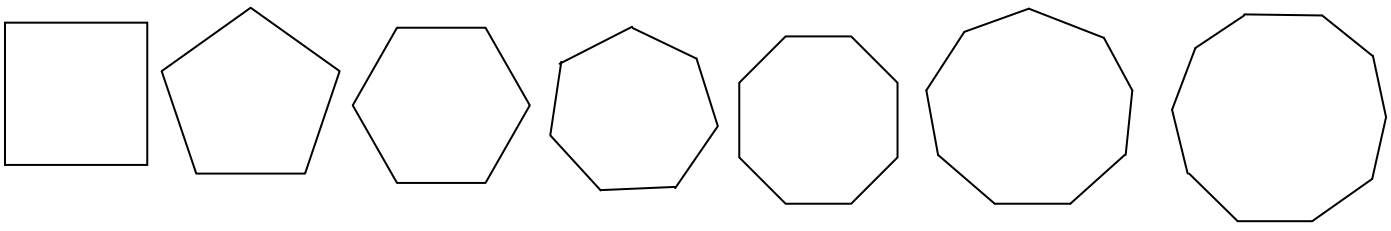
LINES, ANGLES, TRIANGLES, AND MORE







- I can define key terms and identify types of angles and adjacent angles.
- I can measure angles.
- I can identify vertical, supplementary and complementary angles.
- I can determine the measure of an interior angle of a triangle given two angle measurements.
- I can determine an interior angle of a triangle given an interior and exterior angle measurement.
- I can use the angle relationships involving parallel lines and transversals to determine the measures of corresponding angles, alternate interior angles, alternate exterior angles.



Lines Segments, and Rays

Draw the diagram that goes with each geometric term below, and then write a definition.

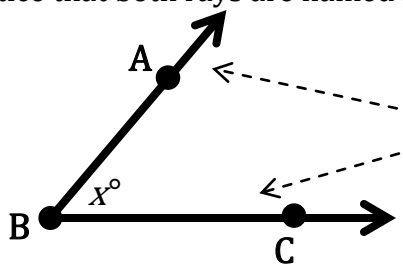
Angle		
Diagonal line segment		
Horizontal line segment		
Intersecting line segments		
Line		
Line segment		
Parallel		
Perpendicular		
Point		
Ray		
Skew		
Vertex (Vertices is plural)		
Vertical line segment		

Angles

Angles are made up of two rays with a common endpoint, called the vertex. Rays are named starting with the endpoint and then another point on the ray. Ray $\overrightarrow{BA}$ and ray $\overrightarrow{BC}$ share a common endpoint (B). Notice that both rays are named starting with B.

Point **B** is called the:

_____



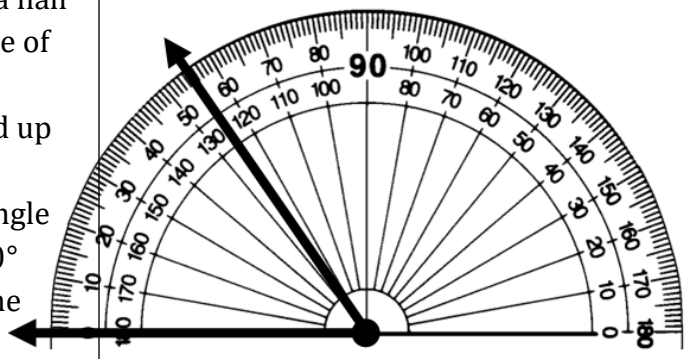
The sides of the angle are:

_____ and _____

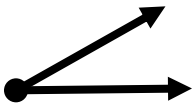
Angles are usually named by three capital letters. The middle letter names the _____. If only one angle is located at a vertex, then the angle can be named using the vertex letter alone. And if there is a lower case letter between the two sides, the angle can also be referred to using the lower case letter.

The angle above can be named: _____ _____ _____ _____

ANGLE MEASURES A protractor is used to measure angles. The protractor is divided evenly into a half circle of 180 degrees (180°). When the middle of the bottom of the protractor is placed on the vertex, and one of the rays of the angle is lined up with 0°, the other ray of the angle crosses the protractor at the measure of the angle. The angle below has the ray pointing left lined up with 0° (the outside numbers), and the other ray of the angle crossed the protractor at 55°.

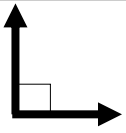


Types of Angles



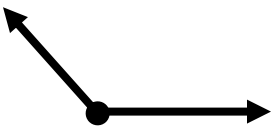
Type _____

Measure



Type _____

Measure



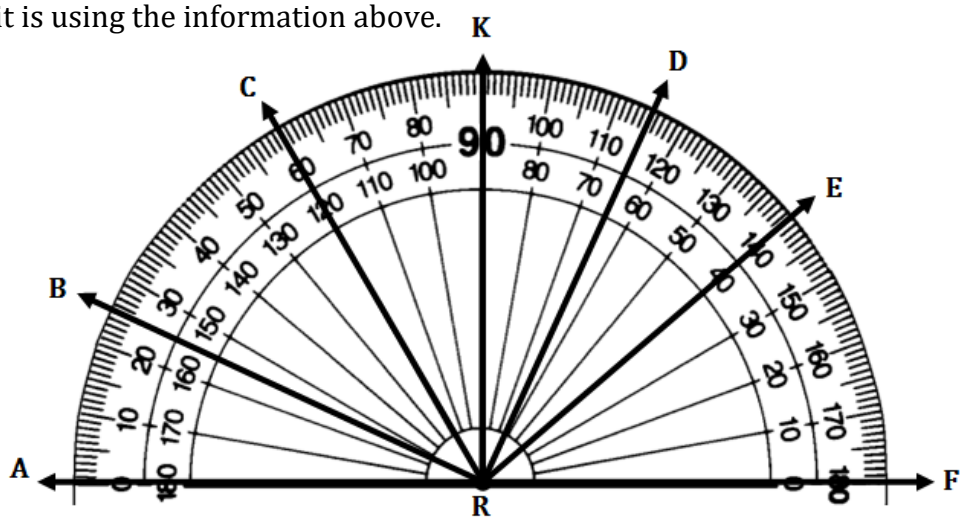
Type _____

Measure

Type _____

Measure

Using the protractor below, find the measure of the following angles. Then, tell what type of angle it is using the information above.



#	Question	Measure	Type of Angle
1	What is the measure of ∡ARF?		
2	What is the measure of ∡CRF?		
3	What is the measure of ∡DRF?		
4	What is the measure of ∡ARD?		

Adjacent Angles

Adjacent Angles - Adjacent angles are two angles that have the same vertex and share one ray as a side. They *do not* share space inside the angles.

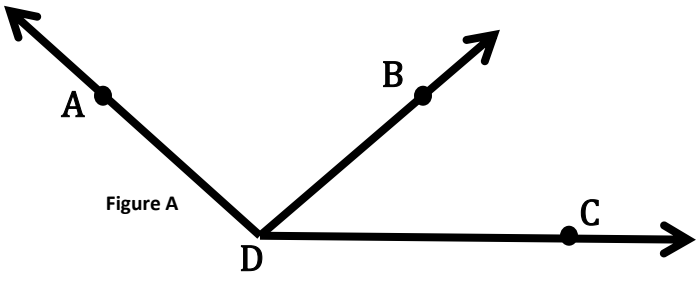


Figure A

A) ∡ADB is adjacent to ∡BDC.

However, ∡ADB is **not** adjacent to ∡ADC because adjacent angles *do not* share any space inside the angle.

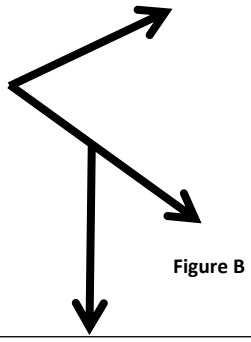


Figure B

B) These two angles are not adjacent. They share a common ray but do not share the same vertex.

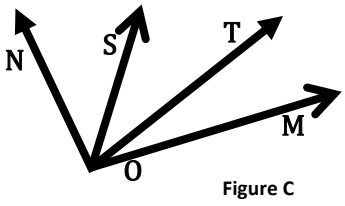
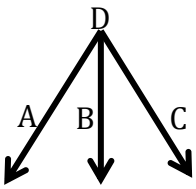


Figure C

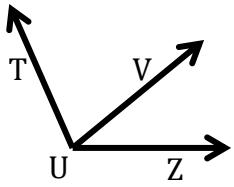
C) ∡NOT is not adjacent to ∡SOM. They share space inside the angles. (overlap)

For each diagram below, name the angle that is adjacent to it.



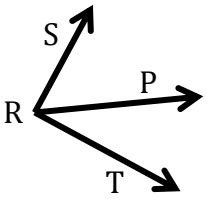
1)
∡CDB is adjacent

to ∡_____



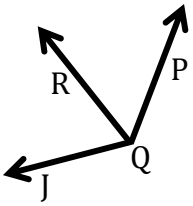
2)
∡TUV is adjacent

to ∡_____



3)
∡SRP is adjacent

to ∡_____



4)
∡PQR is adjacent

to ∡_____

Independent Practice

Part 1: Circle the correct choice for each question.

(1) Which of the following is not a point on $\overleftrightarrow{AC}$?

(Y) B (R) D (V) A

(2) Which of the following is not a correct name for this line?

(A) $\overleftrightarrow{PQ}$ (L) $\overleftrightarrow{QP}$ (G) $\overleftrightarrow{PQ}$

(3) Which of the following is not the name of a segment in this figure?

(O) $\overline{RS}$ (T) $\overleftarrow{ST}$ (H) $\overline{TR}$

(4) Which of the following is not the name of a ray in this figure?

(W) $\overrightarrow{EG}$ (S) $\overrightarrow{FG}$ (U) $\overrightarrow{FE}$

(5) Which of the following is not a correct name for this angle?

(I) $\angle ACB$ (Y) $\angle CBA$ (L) $\angle B$

(6) Which of the following is not the name of a line in this figure?

(G) $\overleftrightarrow{ZX}$ (R) $\overleftrightarrow{XY}$ (K) $\overleftrightarrow{YZ}$

(7) Which of the following is a segment that has B as an endpoint?

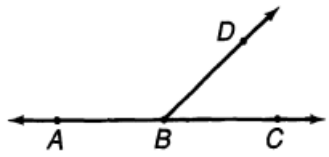
(N) $\overline{CD}$ (C) $\overline{AC}$ (T) $\overline{CB}$

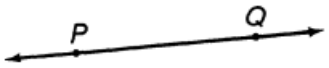
(8) Which of the following is *not* the name of a ray in this figure?

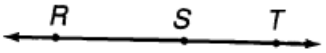
(H) $\overrightarrow{MO}$ (S) $\overrightarrow{LM}$ (P) $\overrightarrow{KO}$

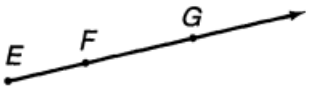
(9) Which of the following is not a correct name for an angle in this figure?

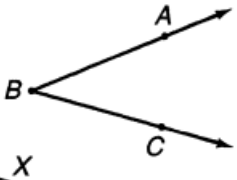
(M) $\angle H$ (A) $LGHF$ (D) $\angle EHG$

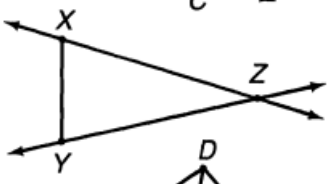


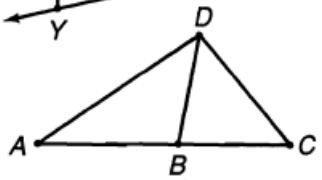


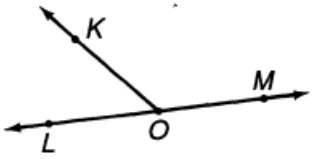


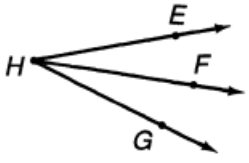


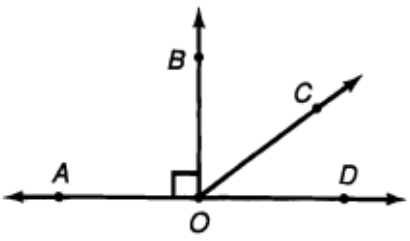








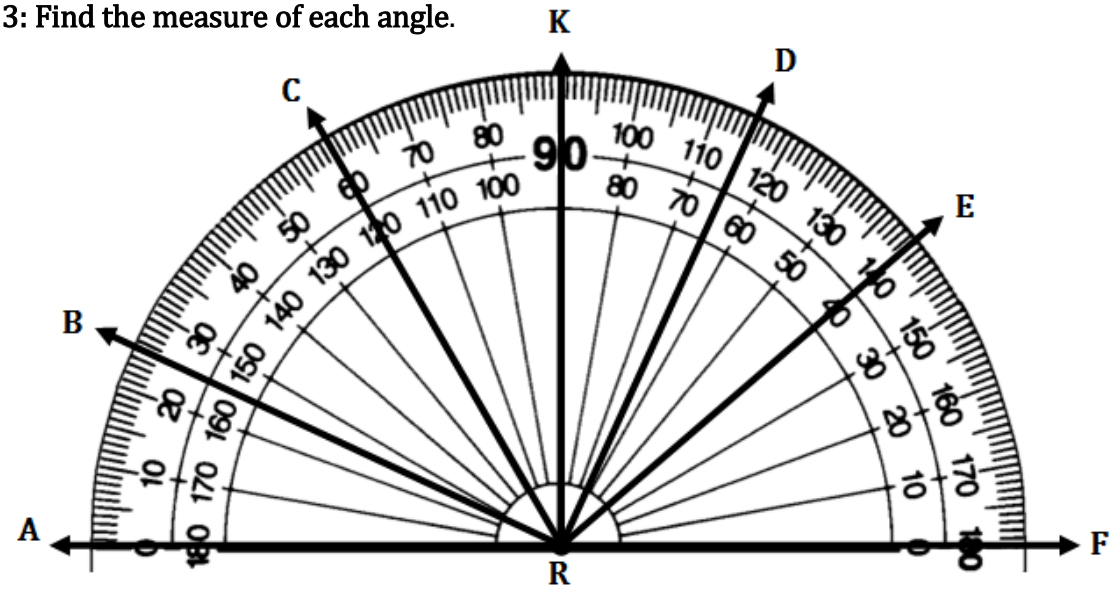




Part 2: Fill in the blanks with the correct geometric term.

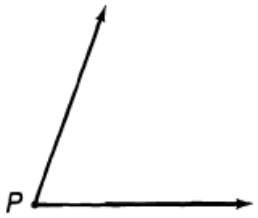
1) The figure formed by two rays from the same endpoint is an _____
2) The intersection of the two sides of an angle is called its _____
3) The vertex of $\measuredangle COD$ in the drawing above is point _____
4) The instrument used to measure angles is called a _____
5) The basic unit in which angles are measured is the _____
6) $\measuredangle AOB$ has a measure of 90° and is called a _____ angle.
7) An angle whose measure is between 0° and 90° is an _____ angle.
8) Two acute angles in the figure are $\measuredangle BOC$ and _____
9) An angle whose measure is between 90" and 180° is an _____ angle.
10) An obtuse angle in the figure is _____

Part 3: Find the measure of each angle.

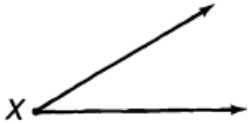


#	Question	Measure	Type of Angle
1	What is the measure of ∡BRF?		
2	What is the measure of ∡ERF?		
3	What is the measure of ∡ARB?		
4	What is the measure of ∡KRA?		
5	What is the measure of ∡CRA?		
6	What is the measure of ∡FRA?		

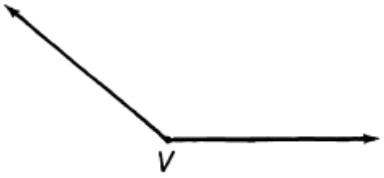
Part 4: For each angle, circle the best estimate.



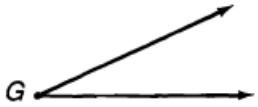
(1) $m\angle P$ is about
35° 70°



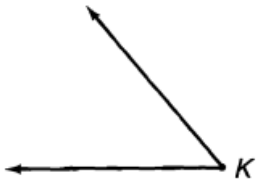
(2) $m\angle X$ is about
65° 30°



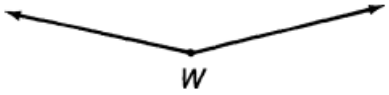
(3) $m\angle V$ is about
140° 95°



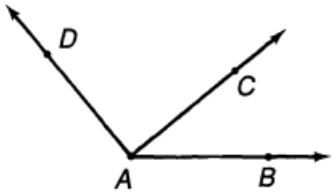
(4) $m\angle G$ is about
55° 25°



(5) $m\angle K$ is about
50° 80°



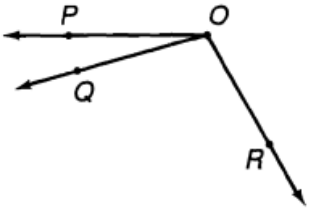
(6) $m\angle W$ is about
155° 110°



(7) $m\angle BAC$ is about
40° 15°

(8) $m\angle CAD$ is about
65° 90°

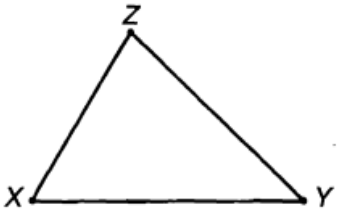
(9) $m\angle BAD$ is about
100° 130°



(10) $m\angle POR$ is about
160° 120°

(11) $m\angle POQ$ is about
40° 15°

(12) $m\angle QOR$ is about
105° 140°

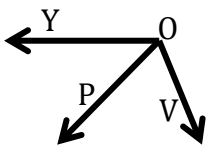


(13) $m\angle X$ is about
35° 60°

(14) $m\angle Y$ is about
45° 25°

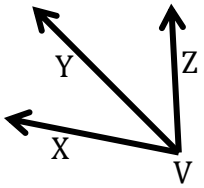
(15) $m\angle Z$ is about
75° 40°

Part 5: For each diagram below, name the angle that is adjacent to it.



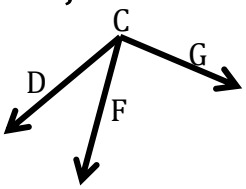
1)
∡YOP is adjacent

to ∡_____



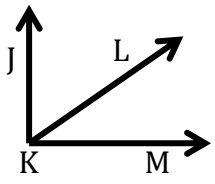
2)
∡XVY is adjacent

to ∡_____



3)
∡DCF is adjacent

to ∡_____



4)
∡JKL is adjacent

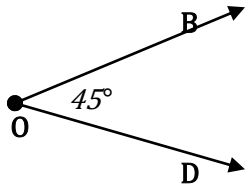
to ∡_____

Vertical Angles

When two lines intersect, **two pairs** of **VERTICAL ANGLES** are formed. Vertical angles are **not** adjacent. Vertical angles are located across from each other, they share a common vertex, and the sides of the angles are composed of opposite rays.

Use a straight edge.
Draw ray $\overrightarrow{OC}$ opposite to ray $\overrightarrow{OB}$, and then draw ray $\overrightarrow{OA}$ opposite to ray $\overrightarrow{OD}$.

Use what you've learned about the measure of straight angles to prove that the figure contains two pairs of congruent angles.



∡BOD ≅ ∡ _____	∡BOA ≅ ∡ _____

Pairs of vertical angles always have the same measure.

Vertical angles are _____ (symbol hint ≅)

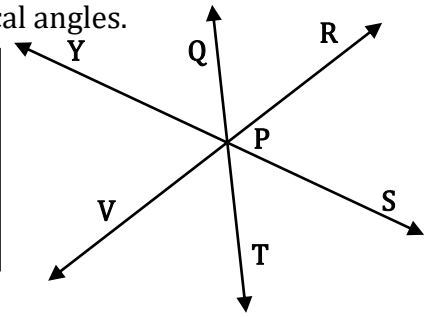
Congruent means they have the _____ _____.

Set A: In the diagram, name the second angle in each pair of vertical angles.

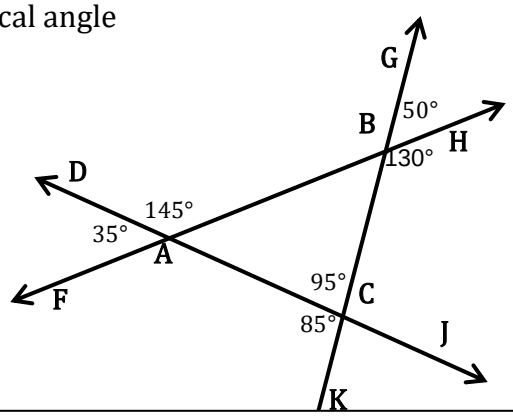
1) ∡YPV _____ 4) ∡VPT _____

2) ∡QPR _____ 5) ∡RPT _____

3) ∡SPT _____ 6) ∡VPS _____



Set B: Use the information given in the diagram to find the measure of each unknown vertical angle



Set B Questions

1) m∡ CAF = _____

2) m∡ ABC = _____

3) m∡KCJ = _____

4) m∡ABG = _____

5) m∡BCJ = _____

6) Figure ABC above is a _____

7) The proper notation for the figure is _____

8) The sum of the angles in figure ABC is _____ + _____ + _____ = _____

Complementary and Supplementary Angles

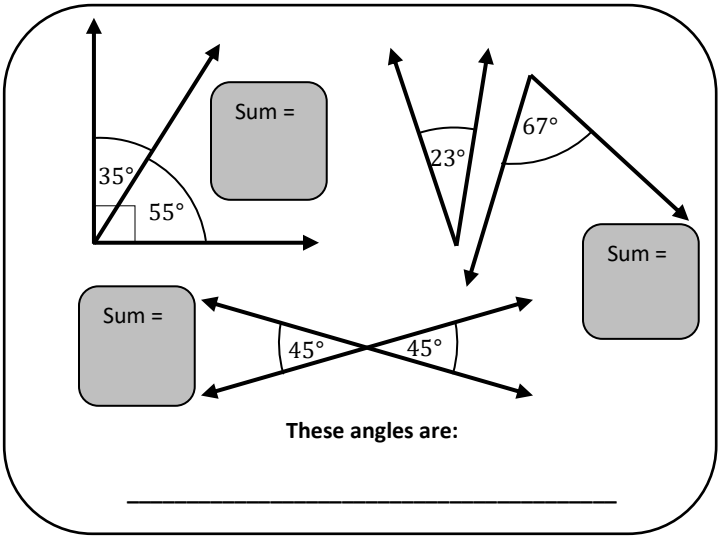
Two angles are **complementary** if the sum of their angles measure 90°.

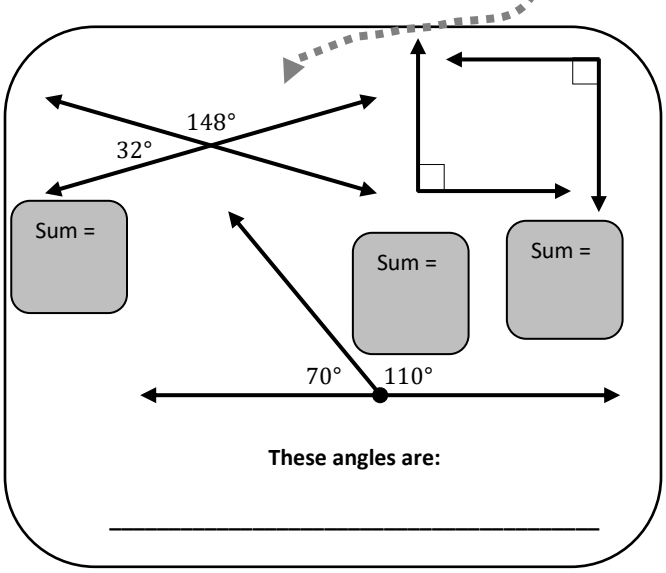
Two angles are **supplementary** if the sum of their angles measure 180°.

Complementary and supplementary angle pairs *may be* adjacent, but *do not need to be*.

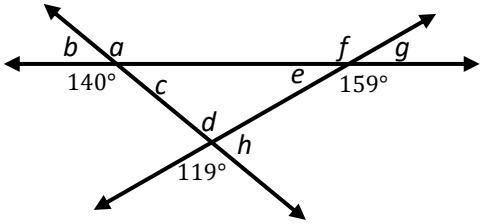
A **linear pair** is a pair of <u>adjacent angles</u> that are supplementary.
Below, the angles marked 32° and 148° are a linear pair.

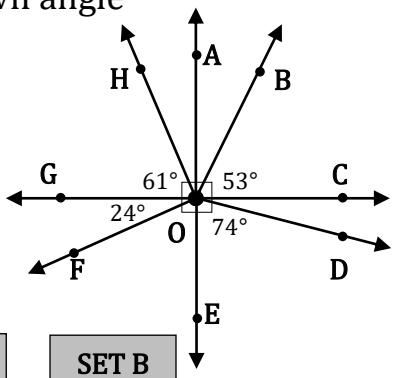
Together, these angle pairs form a _____ _____.





<u>PRACTICE:</u> Calculate the measure of each unknown angle





The sum of all the central angles =

SET A	The sum of angles e + d + c =

1) m∡ *a* = _____ 5) m∡ *e* = _____

2) m∡ *b* = _____ 6) m∡ *f* = _____

3) m∡ *c* = _____ 7) m∡ *g* = _____

4) m∡ *d* = _____ 8) m∡ *h* = _____

SET B

9) m∡ AOB = _____

10) m∡ COD = _____

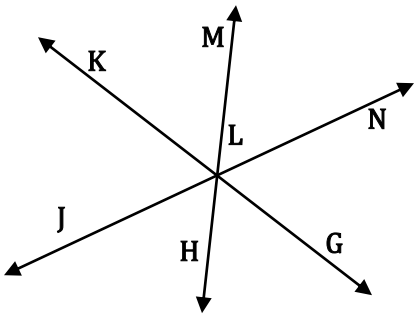
11) m∡ EOF = _____

12) m∡ AOH = _____

Independent Practice

Part 1: In the diagram below, name the second angle in each pair of vertical angles.

Set A



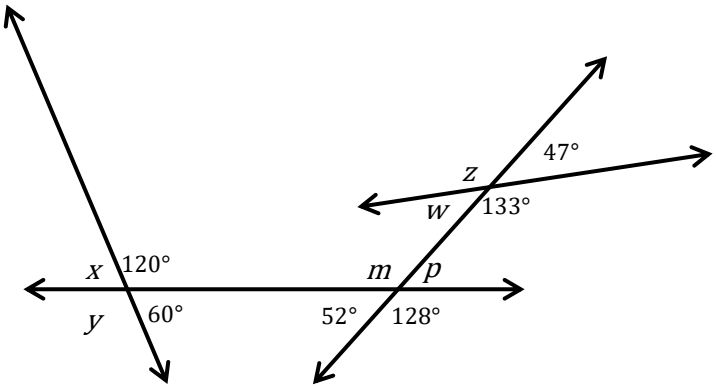
1) ∡MLN _____ 4) ∡GLM_____

2) ∡KLH _____ 5) ∡KLM _____

3) ∡GLN_____ 6) ∡HLG _____

Use the information given in the diagram to find the measure of each unknown vertical angle.

Set B



7) m∡ x = _____

8) m∡ y = _____

9) m∡ z = _____

10) m∡ w = _____

11) m∡ m = _____

12) m∡ p = _____

13) ∡x + ∡y = _____

14) ∡m + ∡p = _____

15) ∡w + ∡z = _____

16) Each of the angle pairs in questions 13-15 above are _____ angles because their sum is _____.

17) The sum of the **four** angles located around every point in the figure above = _____

Part 2:

I. Complete each statement.

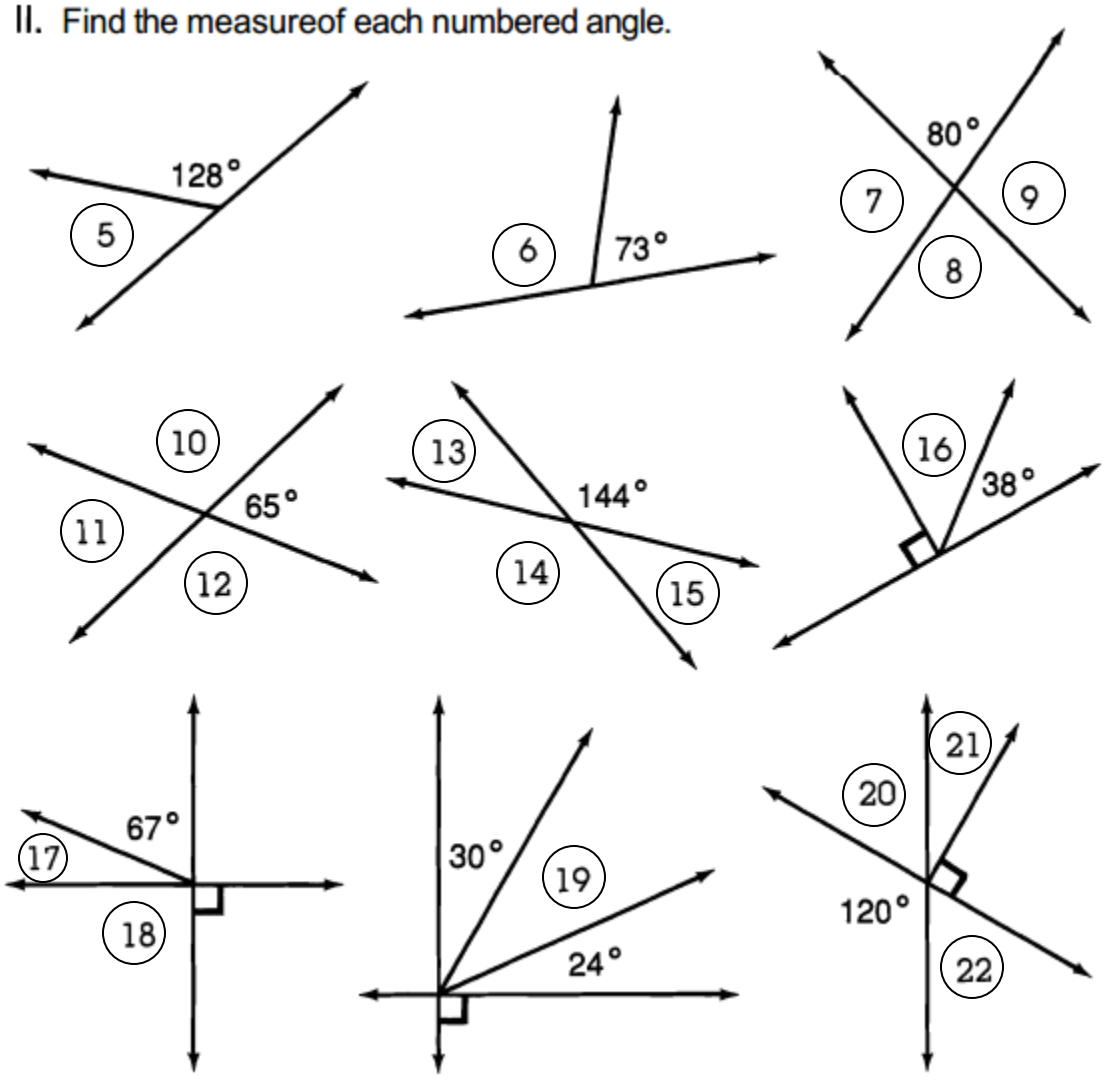
(1) Two angles are ***complementary*** if the sum of their measures is _____.

(2) Two angles are ***supplementary*** if the sum of their measures is _____.

(3) The ***complement*** of a 30° angle has a measure of _____.

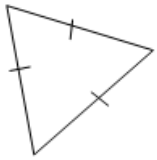
(4) The ***supplement*** of a ***65°*** angle has a measure of _____.

II. Find the measureof each numbered angle.

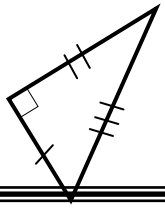


Review: Lines and Angles

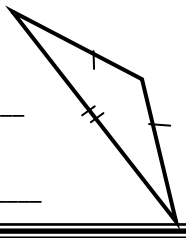
Notes: **Identify each type of triangle by its angles and by its sides**



By sides: _____
By angles: _____



By sides: _____
By angles: _____



By sides: _____
By angles: _____

Part 1: Find the measure of the angles below.

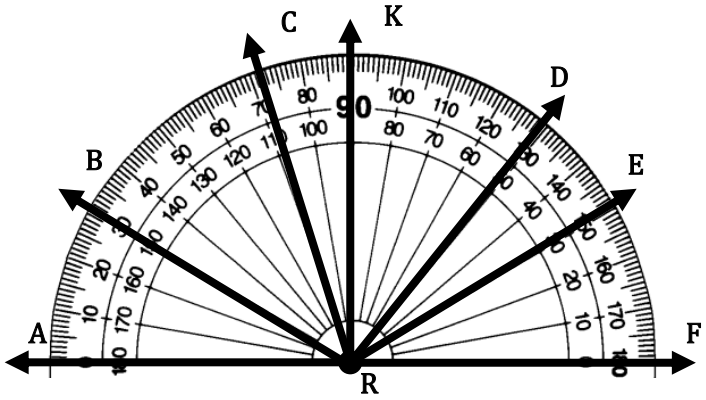
1) What is the measure of ∡DRA? _____

2) What is the measure of ∡CRF? _____

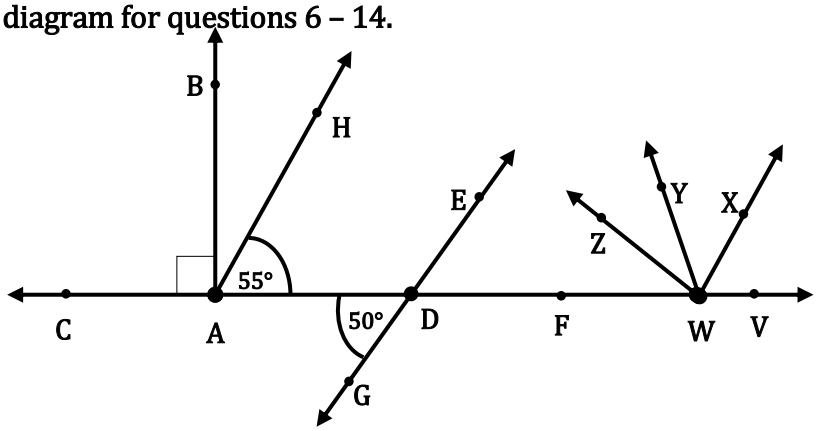
3) What is the measure of ∡ARB? _____

4) What is the measure of ∡CRB? _____

5) What is the measure of ∡KRC? _____



Use the following diagram for questions 6 – 14.



6) Which angle is supplementary angle to ∡EDF? _____

7) What is the measure of ∡GDF? _____

8) Which two angles are right angles? _____ and _____

9) What is the measure of ∡EDF? _____

10) Which angle is adjacent to ∡BAD? _____

11) Which angle is a complementary angle to ∡HAD? _____

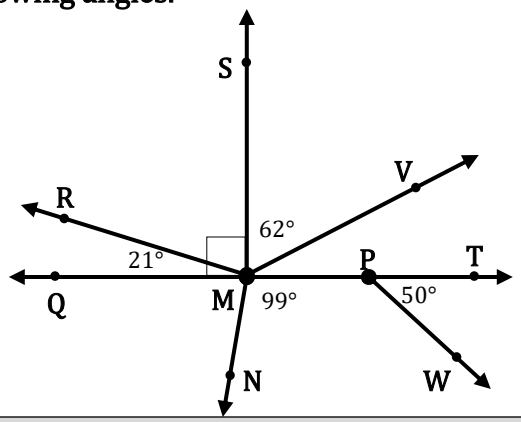
12) What is the measure of ∡HAB? _____

13) What is the measure of ∡CAD? _____

14) Which angles are adjacent to ∡EDA?

_____ and _____

Part 2: Use what you know about complementary and supplementary angles to find the measures of the following angles.



SET C

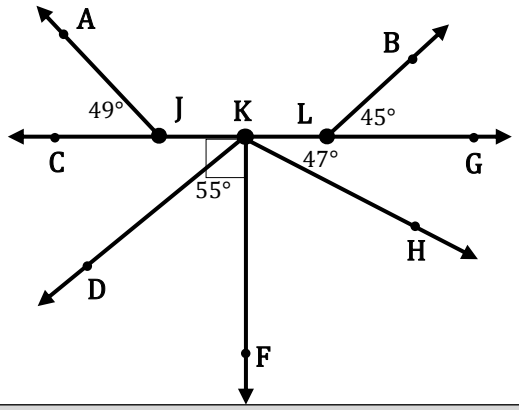
1) m∡ RMS = _____

2) m∡ VMT = _____

3) m∡ QMN = _____

4) m∡ WPQ = _____

The sum of angles located above $\overleftrightarrow{QT}$ = _____



SET D

5) m∡ AJK = _____

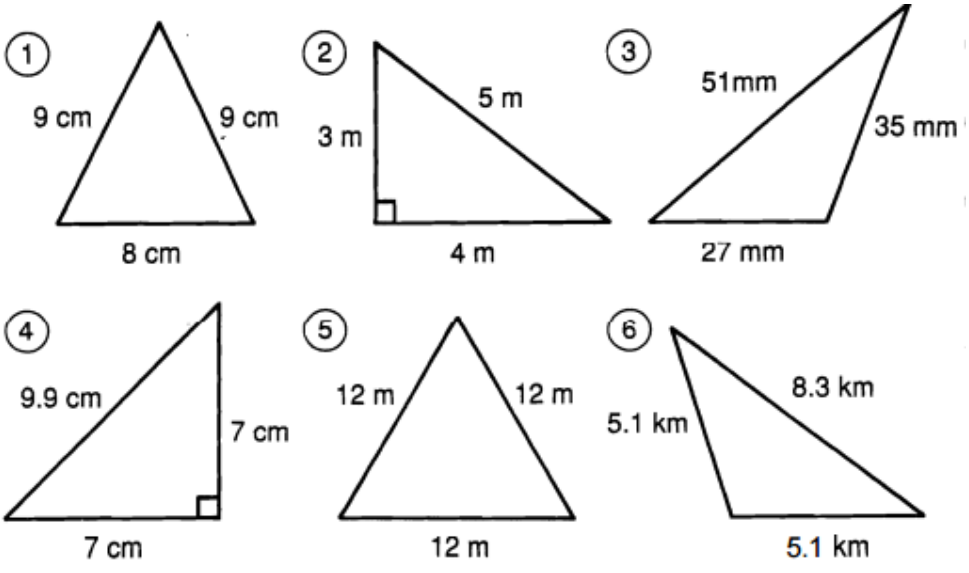
6) m∡ CKD = _____

7) m∡ FKH = _____

8) m∡ BLC = _____

The sum of angles located below $\overleftrightarrow{CG}$ = _____

Part 3: Classify each triangle two ways.



1) _____

_____

2) _____

_____

3) _____

_____

4) _____

_____

5) _____

_____

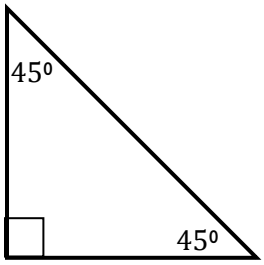
6) _____

_____

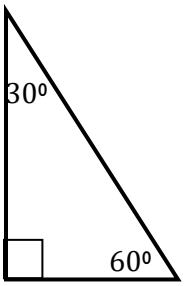
Interior Angles of a Triangle

FACT: The three interior angles of a triangle always add up to _____^{0}.

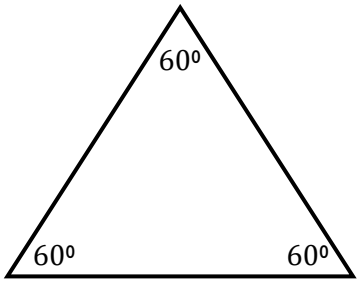
Example 1:



$45^0 + 45^0 + \_\_\_\_\_ = \_\_\_\_\_$

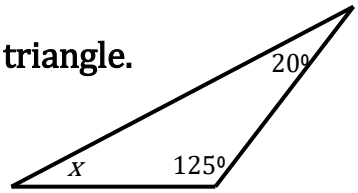


$30^0 + 60^0 + \_\_\_\_\_ = \_\_\_\_\_$



$60^0 + 60^0 + 60^0 = 3(\_\_\_\_\_) = \_\_\_\_\_$

Example 2: **Find the missing angle in the triangle.**



Solution:

Step 1: Write equation. $20^0 + 125^0 + \_\_\_\_\_ = \_\_\_\_\_$

Step 2: Combine like terms. $\_\_\_\_\_ + x = 180^0$

Step 3: Isolate x.

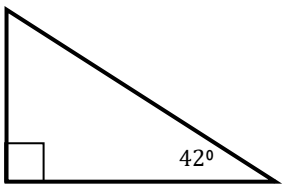
$$\begin{array}{r} 145^0 + x = 180^0 \\ -145 \quad\quad -145 \end{array}$$

Step 4: State the solution. $x = \_\_\_\_\_$

Step 5: Use solution to answer the original question.

The missing angle is _____

Example 3: **Find the missing angle in the triangle.**



_____

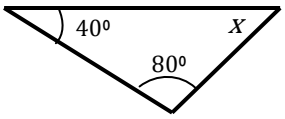
_____

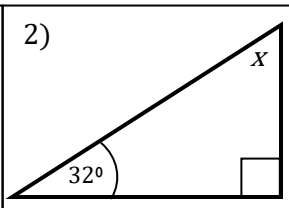
_____

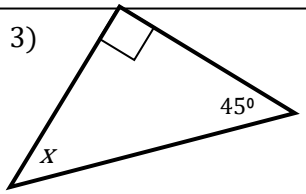
_____

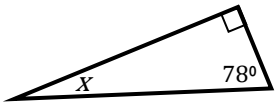
Independent Practice

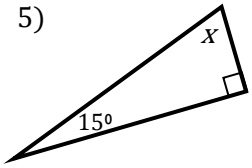
Find the missing angle in the triangles. For each problem, show an equation and solve.

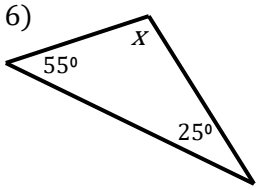
1) 

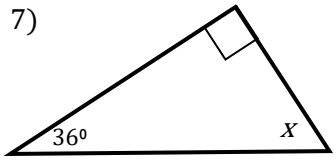
2) 

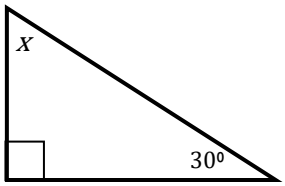
3) 

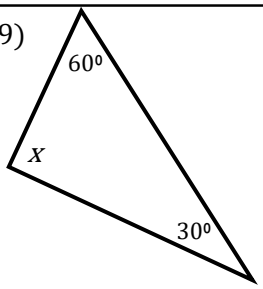
4) 

5) 

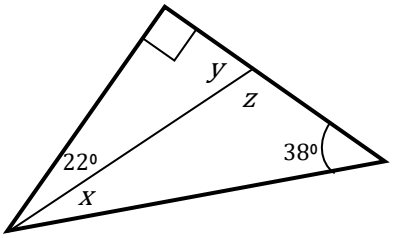
6) 

7) 

8) 

9) 

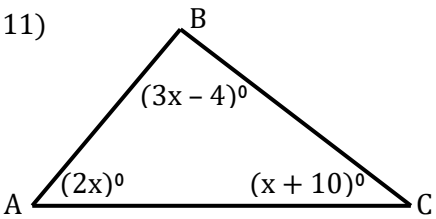
10) Two equations required



y: _____

z: _____

x: _____

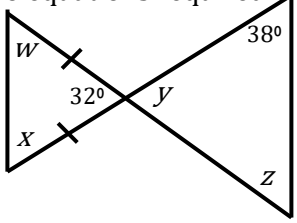
11) 

A: _____

B: _____

C: _____

12) Two equations required



w: _____

x: _____

y: _____

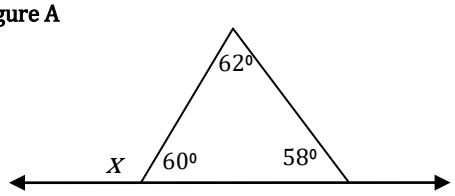
z: _____

Exterior Angles

The exterior angle of a triangle is always equal to the sum of the opposite interior angles.

Example 1: Examine the figures below. Find the measure of the missing angle.

Figure A

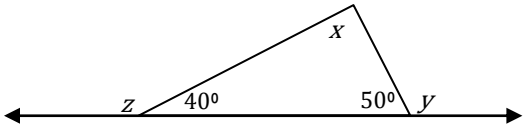


1) Sum ∡'s in triangle = _____

2) x = _____

3) Sum of interior angles opposite of angle "x"
= _____ + _____ = _____

Figure B



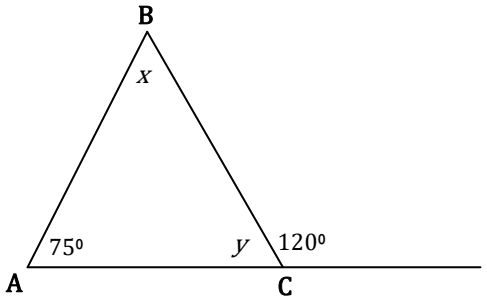
1) ∡ x = _____

2) ∡y = _____ ∡z = _____

3) Sum of interior angles opposite of angle "y" = _____

Sum of interior angles opposite of angle "z" = _____

Example 2: Find the measure of ∡x and ∡y.



Step 1: Use the rule for exterior angles to write equation.

$$120^0 = \measuredangle A + \measuredangle B$$
$$120^0 = 75^0 + x$$
$$45^0 = x$$

Step 2: The sum of the interior angles of a triangle equals 180⁰, and ∡BCA supplements ∡BCD, so either equation:

SUM of INTERIOR ANGLES

$$180^0 = 75^0 + 45^0 + y$$
$$180^0 = 75^0 + 45^0 + y$$
$$180^0 = 120^0 + y$$
$$60^0 = y$$

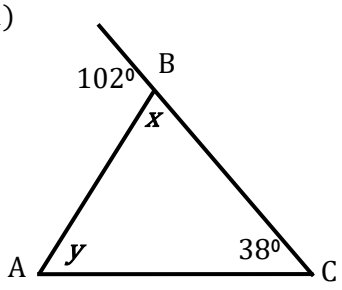
SUPPLEMENTAL ANGLES

$$180^0 = 120^0 + \measuredangle y$$
$$60^0 = y$$

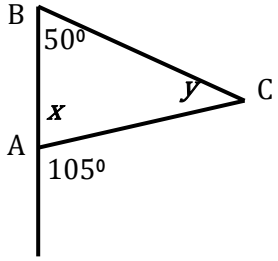
Independent Practice

Part 1: Find the measure of the missing angle measures. Show an equation for each angle.

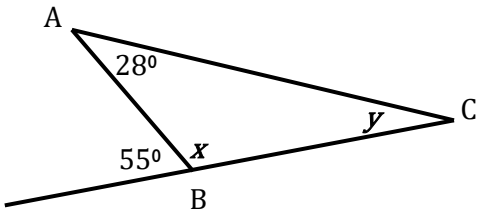
1)



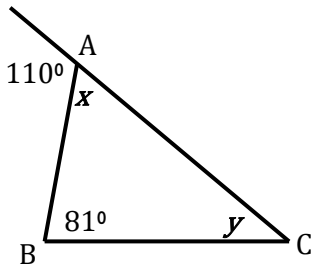
2)



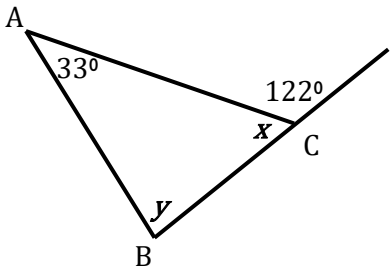
3)



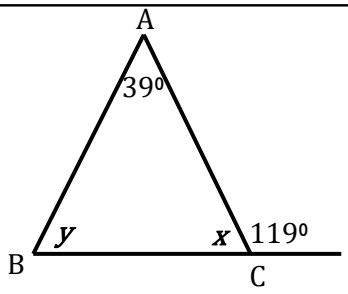
4)



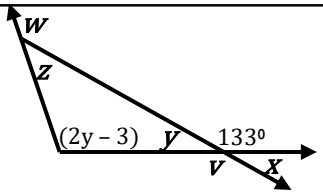
5)



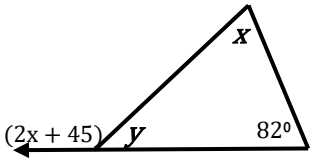
6)



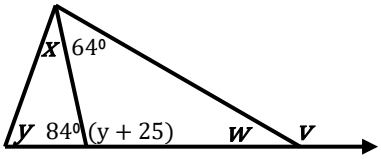
7)



8)

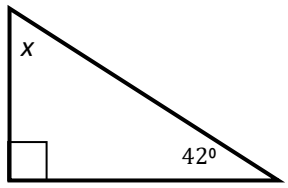


9)

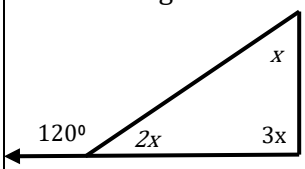


Follow-up, review assignment for homework after p19-22

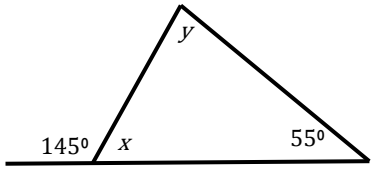
1) Find the missing angle.



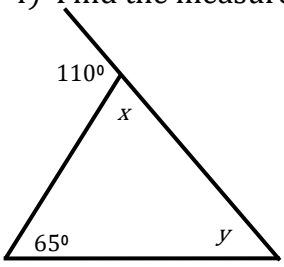
2) Solve for x. Then solve for each of the triangle's interior angles.

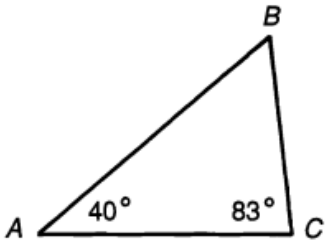


3) Find the measures for x and y.

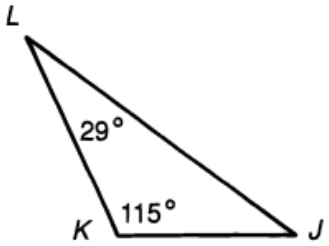


4) Find the measures for x and y.

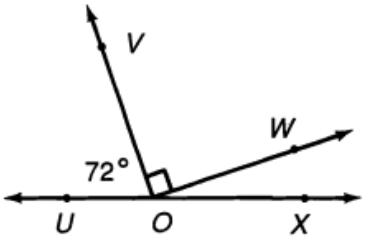




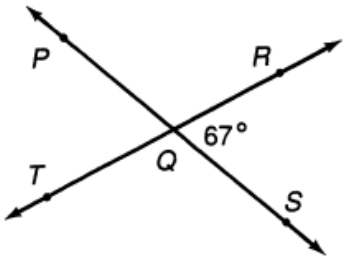
5) $m\angle B =$



6) $m\angle J =$

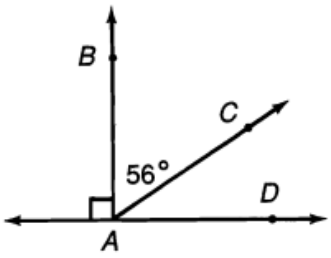


7) $m\angle WOX =$



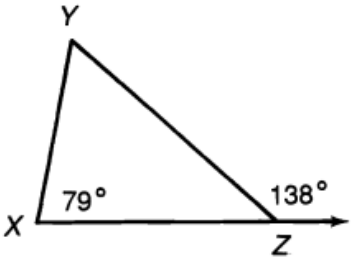
8) $m\angle PQR =$

9) $m\angle PQT =$



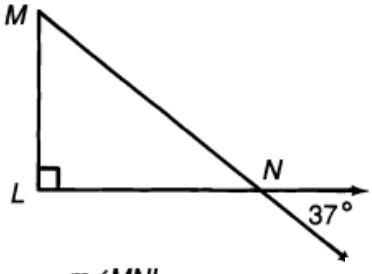
10) $m\angle DAB =$

11) $m\angle DAC =$



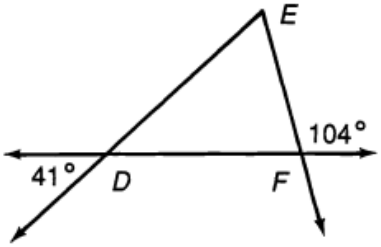
12) $m\angle XZY =$

13) $m\angle Y =$



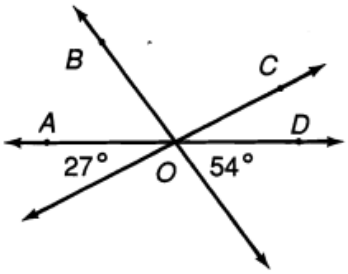
14) $m\angle MNL =$

15) $m\angle M =$



16) $m\angle EFD =$

17) $m\angle E =$



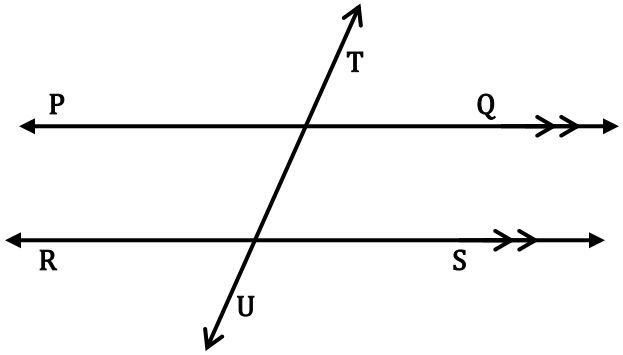
18) $m\angle AOB =$

19) $m\angle BOC =$

Corresponding, Alternate Interior, and Alternate Exterior Angles

If two parallel lines are intersected by another line, how many angles are formed?

Number them on the diagram.



$\overline{PQ} \parallel \overline{RS}$

$\overline{TU}$ *is a transversal*

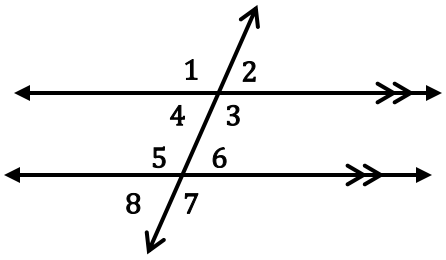
The extra arrows on two of the lines mean they are _____.

The line that intersects the two lines is called a _____.

The number of angles formed is _____.

The angles formed when parallel lines are cut by a transversal line have special relationships and are named according to those relationships with one another.

CORRESPONDING ANGLES



Definition:

Name the corresponding angles for the following.
1) ∡1 corresponds with ∡_____
2) ∡2 corresponds with ∡_____
3) ∡3 corresponds with ∡_____
4) ∡4 corresponds with ∡_____

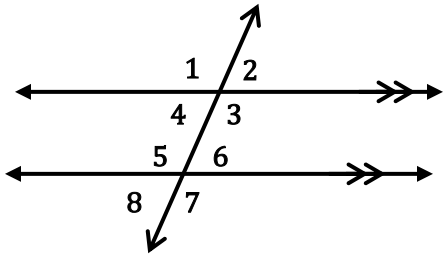
What do you notice about the angle pairs above?

Complete the sentence:

If two angles are ***corresponding*** angles,

then they are: _____

ALTERNATE INTERIOR ANGLES



Word attack
To **alternate** means

INterior means:

Definition:

Name the alternate interior angle for the following angles.
1) ∡3 is an alternate interior angle with ∡_____
2) ∡4 is an alternate interior angle with ∡_____

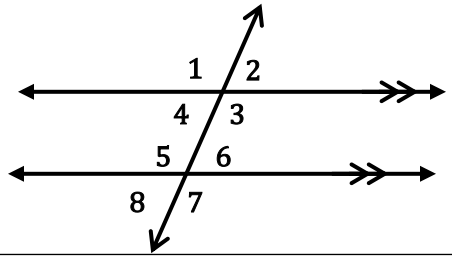
How many pairs of alternate interior angles are possible?

What do you notice about the angle pairs above?

Complete the sentence:
If two angles are ***alternate interior*** angles,

then they are: _____

ALTERNATE EXTERIOR ANGLES



Word attack
To **alternate** means

Exterior means:

Definition:

Name the alternate exterior angle for the following angles.
1) ∡1 is an alternate exterior angle with ∡_____
2) ∡2 is an alternate exterior angle with ∡_____

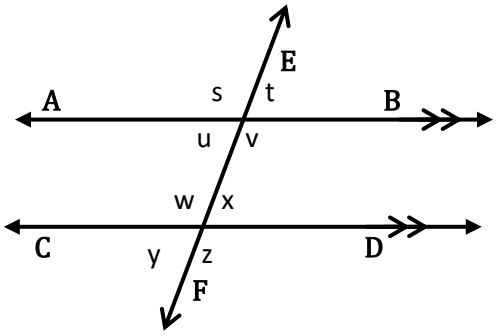
How many pairs of alternate exterior angles are possible?

What do you notice about the angle pairs above?

Complete the sentence:
If two angles are ***alternate exterior*** angles,

then they are: _____

Look at the diagram below. For each pair of angles, state whether they are corresponding (C), alternate interior (I), alternate exterior (E), vertical (V), or supplementary (S).



1) ∡u, ∡x _____
2) ∡w, ∡s _____
3) ∡t, ∡y _____
4) ∡s, ∡t _____
5) ∡w, ∡y _____
6) ∡t, ∡x _____
7) ∡w, ∡z _____
8) ∡v, ∡w _____
9) ∡v, ∡z _____
10) ∡s, ∡z _____
11) ∡t, ∡u _____
12) ∡w, ∡x _____
13) ∡w, ∡s _____
14) ∡s, ∡v _____
15) ∡x, ∡z _____

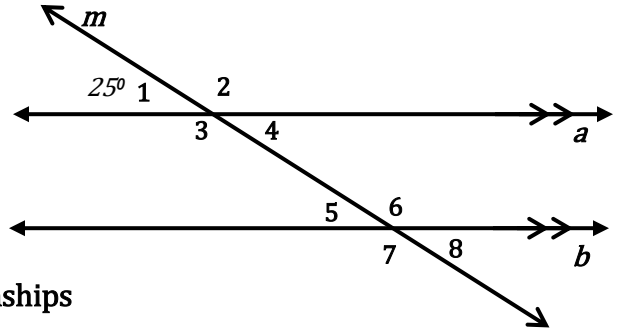
16) If m ∡s = 110°, find the measure of the remaining angles.

m∡v = _____ m∡t = _____ m∡u = _____ m∡w = _____m∡x = _____ m∡y = _____ m∡z = _____

Parallel Lines Cut by a Transversal

As explained in the previous section, when two parallel lines are intersected, or "cut," by a transversal, eight angles are formed. Any two angles are either congruent or supplementary! Given the measure of just one of the eight angles, the other seven can be determined.

Example: Lines *a* and *b* are parallel. Line *m* intersects both line *a* and *b*. The eight resulting angles are labeled 1 – 8, and $m\measuredangle 1$ is given to be 25^0. Find all angle measures.



Step 1: Notice the relationships

$\measuredangle 1$ and $\measuredangle 4$ are vertical angles and therefore $\cong$, so $m\measuredangle 4 = 25^0$.
Other pairs of vertical angles are $\measuredangle 2$ and $\measuredangle 3$, $\measuredangle 5$ and $\measuredangle 8$, $\measuredangle 6$ and $\measuredangle 7$.

$\measuredangle 1$ is supplementary to $\measuredangle 2$; so the $m\measuredangle 2 = 180^0 - \measuredangle 1 = 180 - 25^0 = 155^0$.
$\measuredangle 1$ is also supplementary to $\measuredangle 3$; so the $m\measuredangle 3$ is also 155^0.
Notice that $\measuredangle 2$ and $\measuredangle 3$are vertical angles, and would have to be $\cong$ to each other.

Step 2: Corresponding angles have the same relative position, like $\measuredangle 1$ and $\measuredangle 5$ are both in the upper left section of the intersecting lines. Corresponding angles are always congruent, so $m\measuredangle 1$and $m\measuredangle 5$are both 25^0. $\measuredangle 5$ and $\measuredangle 8$ are vertical angles, so $m\measuredangle 8 = 25^0$.

$\measuredangle 6$ and $\measuredangle 8$ form a linear pair, so $m\measuredangle 6 = 180^0 - 25^0 = 155^0$.
$\measuredangle 6$ and $\measuredangle 7$ are vertical angles, so $m\measuredangle 7$ is also 155^0.

Answer:

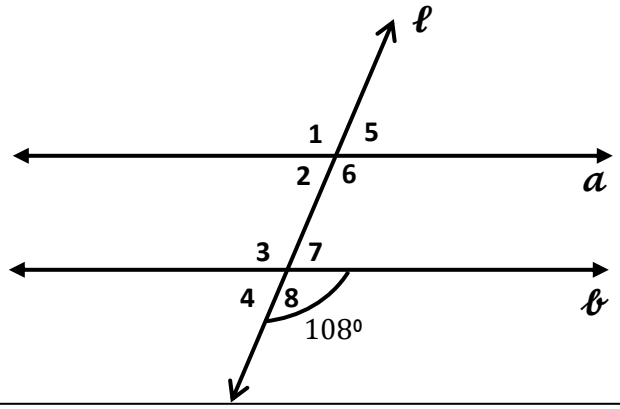
$m\measuredangle 1$, $m\measuredangle 4$, $m\measuredangle 5$ and $m\measuredangle 8$ (all) = _____ and are _____ angles

$m\measuredangle 2$, $m\measuredangle 3$, $m\measuredangle 6$ and $m\measuredangle 7$ (all) = _____ and are _____ angles

INDEPENDENT PRACTICE

Part 1:

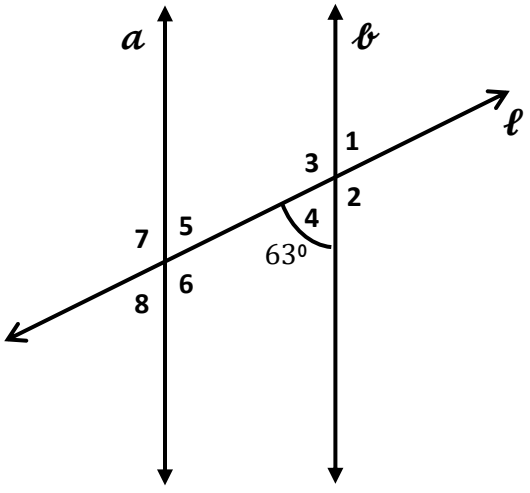
1) Parallel lines a and b when cut by transversal ℓ form eight angles, as shown in the diagram below. Use the diagram to find the measures of each of the angles.



1) m∠1 = _____ 3) m∠3 = _____ 5) m∠5 = _____ 7) m∠7 = _____

2) m∠2 = _____ 4) m∠4 = _____ 6) m∠6 = _____ 8) m∠8 = __108⁰___

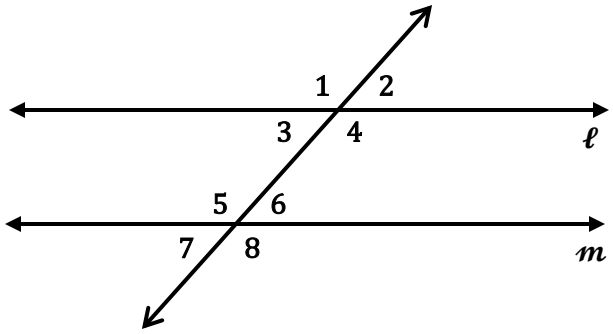
2) Parallel lines a and b when cut by transversal ℓ form eight angles, as shown in the diagram below. Use the diagram to find the measures of each of the angles.



9) m∠1 = _____ 11) m∠2 = _____ 13) m∠3 = _____ 15) m∠4 = __63⁰___

10) m∠5 = _____ 12) m∠6 = _____ 14) m∠7 = _____ 16) m∠8 = _____

Part 2: For each pair of angles, state whether they are corresponding (C), alternate interior (I), alternate exterior (E), vertical (V), or supplementary (S) angles.



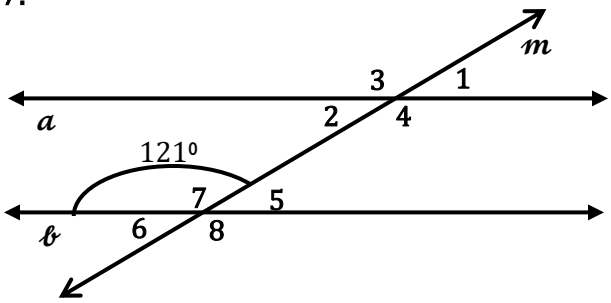
$\ell \parallel m$

1) ∠1 and ∠4 _____	6) ∠6 and ∠5 _____	11) ∠3 and ∠6 _____
2) ∠2 and ∠6 _____	7) ∠2 and ∠7 _____	12) ∠4 and ∠8 _____
3) ∠1 and ∠3 _____	8) ∠1 and ∠2 _____	13) ∠1 and ∠5 _____
4) ∠5 and ∠8 _____	9) ∠4 and ∠5 _____	14) ∠2 and ∠3 _____
5) ∠5 and ∠7 _____	10) ∠6 and ∠8 _____	15) ∠6 and ∠7 _____

Parallel lines a and b when cut by transversal m form eight angles, as shown in the diagram below. Use the diagram below for problems 16 and 17.

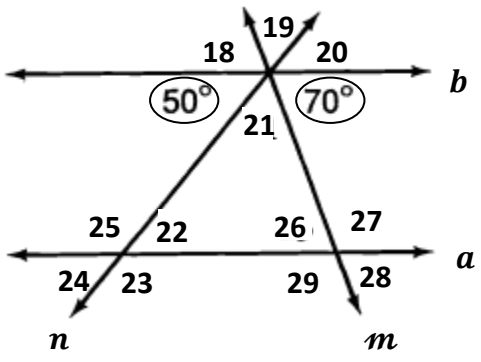
16) m ∠2 = _____

17) m ∠4 = _____



Parallel lines a and b when cut by transversals m and n. Find all of the unknown angle measures.

18) m ∠18 = _____	19) m ∠19 = _____
20) m ∠20 = _____	21) m ∠21 = _____
22) m ∠22 = _____	23) m ∠23 = _____
24) m ∠24 = _____	25) m ∠25 = _____
26) m ∠26 = _____	27) m ∠27 = _____
28) m ∠28 = _____	29) m ∠29 = _____

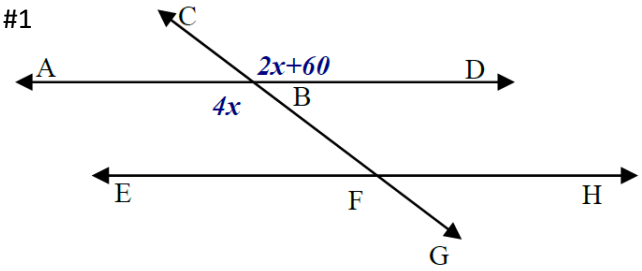


Finding Unknown Angle Measures

We will use the angle relationships that are formed when two parallel lines are intersected by a transversal to find the measures of missing angles. All of the angle relationships will either be supplementary or congruent.

Example A: The pair of angles are either vertical angles, alternate interior angles, alternate exterior angles, or corresponding angles; so they are **congruent**. All you have to do is set up and solve an equation where the expressions are congruent. Once you have solved for x, substitute that value back into each expression to find the measure of each angle.

#1



$x =$ _____ $\measuredangle ABG =$ _____ $\measuredangle CBD =$ _____

Relationship: _____

Equation: _____

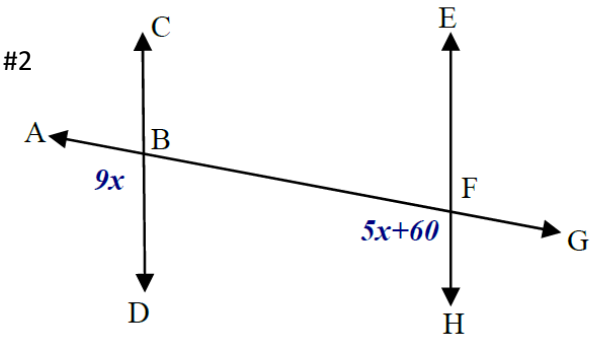
_____

_____

_____

_____

#2



$x =$ _____ $\measuredangle ABD =$ _____ $\measuredangle HFA =$ _____

Relationship: _____

Equation: _____

_____

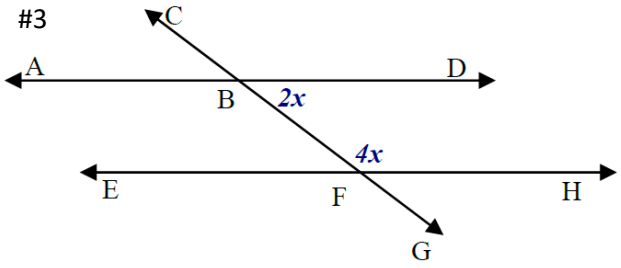
_____

_____

_____

Example B: Each pair of angles are **supplementary** to each other, which means the angles add up to 180°. All you have to do is set up and solve an equation where the expressions add up to equal 180°. Once you have solved for x, substitute that value back into each expression to find the measure of each angle.

#3



$x =$ _____ $\measuredangle FBD =$ _____ $\measuredangle HFB =$ _____

Relationship: _____

Equation: _____

_____

_____

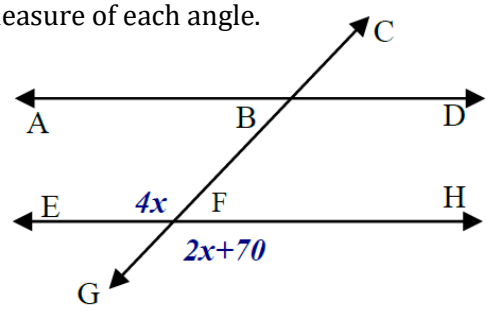
_____

_____

INDEPENDENT PRACTICE

Part 1: Find the measure of each missing angle in the parallel lines and transversals. Each pair of angles is either supplementary or congruent (vertical angles, alternate interior angles, alternate exterior angles, or corresponding angles). State the relationship, set up an appropriate equation and solve for x. Once you've solved for x, substitute that value back into each expression to find the measure of each angle.

1)

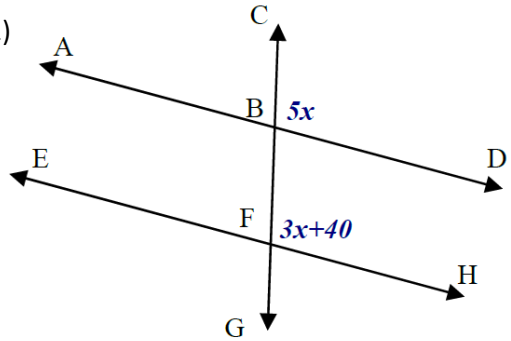


Relationship: _____

Equation: _____

$x =$ _____ $\measuredangle EFB =$ _____ $\measuredangle GFH =$ _____

2)

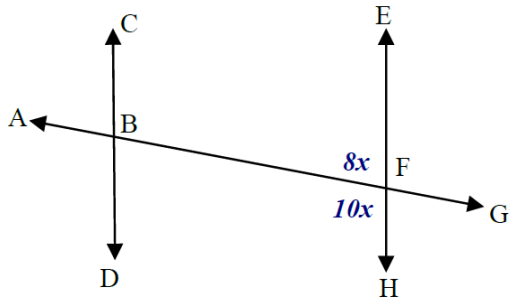


Relationship: _____

Equation: _____

$x =$ _____ $\measuredangle CBD =$ _____ $\measuredangle BFH =$ _____

3)

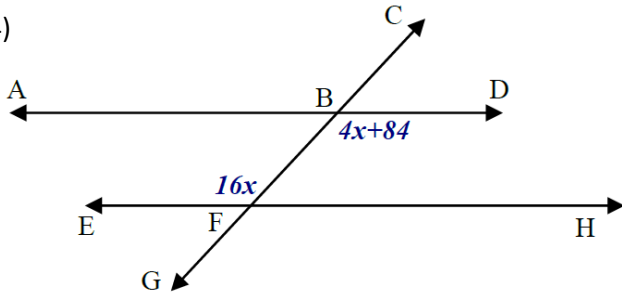


Relationship: _____

Equation: _____

$x =$ _____ $\measuredangle EFB =$ _____ $\measuredangle BFH =$ _____

4)

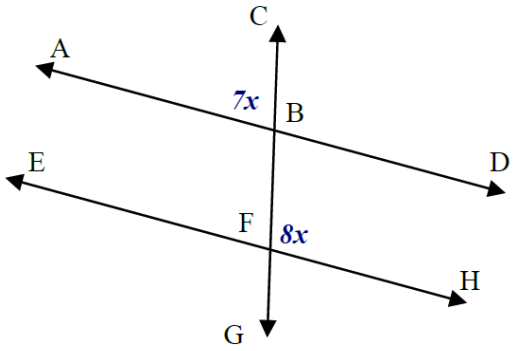


Relationship: _____

Equation: _____

$x =$ _____ $\measuredangle EFB =$ _____ $\measuredangle DBF =$ _____

5)



$x=$ _____ $\measuredangle CBA =$ _____ $\measuredangle BFH =$ _____

Relationship: _____

Equation: _____

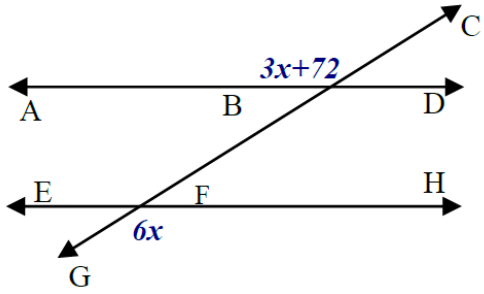
_____

_____

_____

_____

6)



$x=$ _____ $\measuredangle CBA =$ _____ $\measuredangle GFH =$ _____

Relationship: _____

Equation: _____

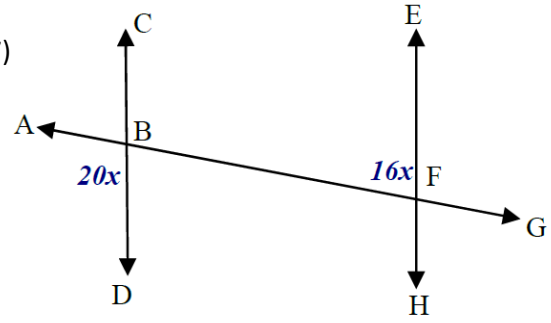
_____

_____

_____

_____

7)



$x=$ _____ $\measuredangle DBA =$ _____ $\measuredangle EFB =$ _____

Relationship: _____

Equation: _____

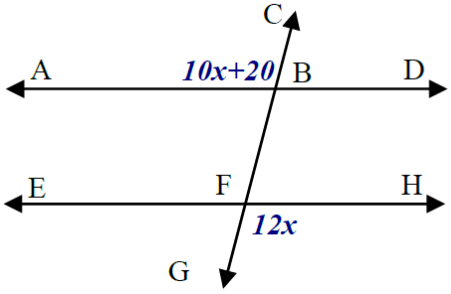
_____

_____

_____

_____

8)



$x=$ _____ $\measuredangle CBA =$ _____ $\measuredangle GFH =$ _____

Relationship: _____

Equation: _____

_____

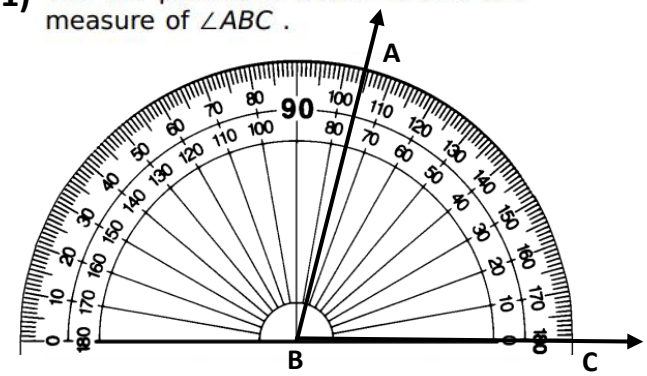
_____

_____

_____

Part 2: The following problems are multiple choice. Circle the letter indicating the best answer for each question.

1) Use the protractor below to find the measure of $\angle ABC$.

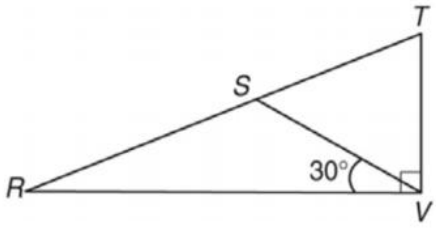


What appears to be the measure of angle $\angle ABC$?

A. 105° B. 80°

C. 75° D. 70°

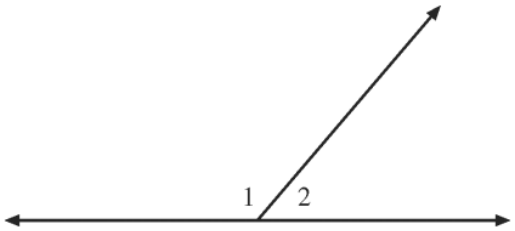
2) What is the measure, in degrees, of the angle that is complementary to $\angle RVS$?



A. 30° B. 60°

C. 90° D. 110°

3) Which is a true statement about angles 1 and 2 shown below?



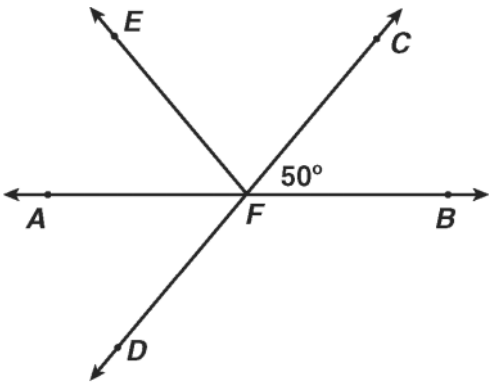
A. $\angle 1$ is complementary to $\angle 2$.

B. $\angle 1$ is supplementary to $\angle 2$.

C. Both angles are obtuse.

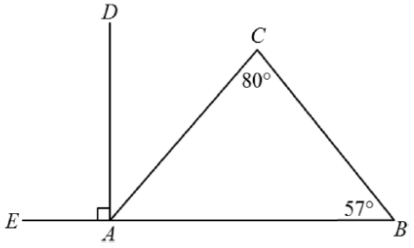
D. Both angles are acute.

4) In the figure below, $\overleftrightarrow{CD}$ intersects $\overleftrightarrow{AB}$ at F, $m\angle CFB = 50°$, and $\angle EFA \cong \angle AFD$. What is $m\angle EFC$?



A. 40° B. 50° C. 70° D. 80°

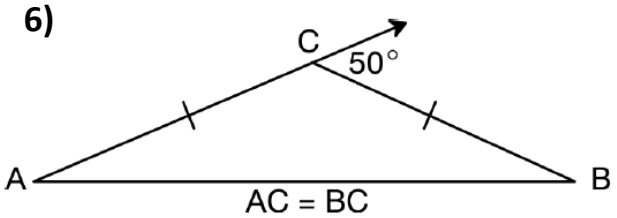
5) In the figure below, what is $m\angle DAC$?



A. 47° B. 57°

C. 90° D. 137°

6)

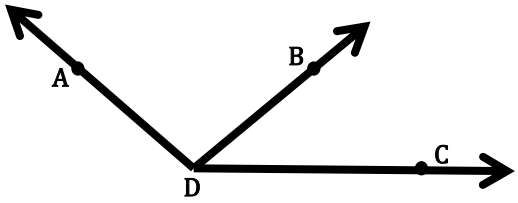


In $\triangle ABC$, the measure of $\angle A$ is

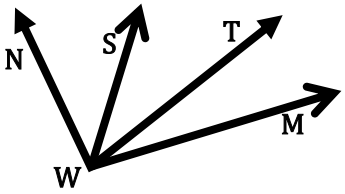
A. 25°. B. 40°. C. 45°. D. 50°.

Review for Unit Test

Part 1: Key Terms, Types of Angles, Measuring Angles and Adjacent Angles

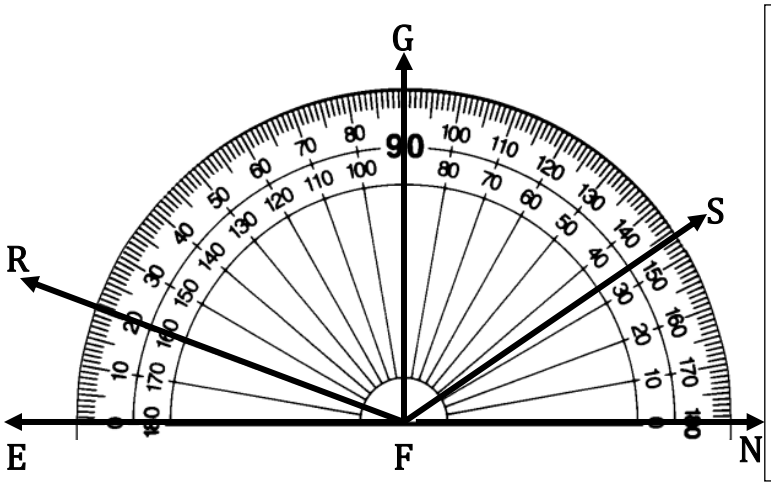


1) ∡CDB is adjacent to ∡_____



2) ∡NWS is adjacent to ∡_____

3) The vertex is: _____



Use the protractor to measure each angle. Indicate whether it is acute, obtuse, right, or straight.

4) $m\measuredangle EFG =$ _____; _____

5) $m\measuredangle NFR =$ _____; _____

6) $m\measuredangle EFS =$ _____; _____

7) $m\measuredangle EFN =$ _____; _____

8) $m\measuredangle SFN =$ _____; _____

The following questions are multiple choice. Circle the letter next to the best answer.

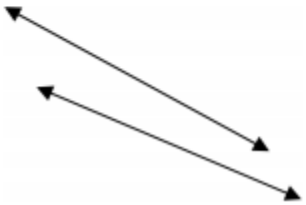
9) Which figure shows two lines that appear to be parallel?

A.

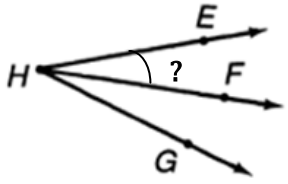
B.

C.

D.



10) Which of the following is a correct name for the angle indicated below with the question mark?



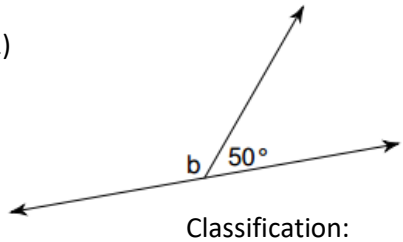
A. $\angle H$ **B.** $\angle FHE$

C. $\angle HEF$ **D.** $\angle GHE$

Part 2: Vertical, Supplementary and Complementary Angles

Find the measure of angle b and classify the angle relationship.

1)



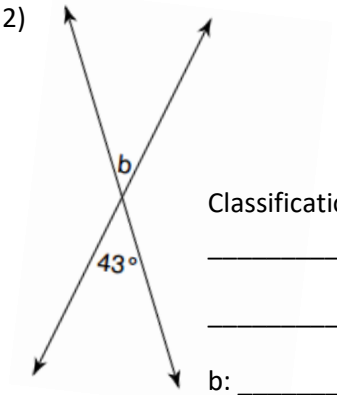
Classification:

_____

_____

b: _____

2)



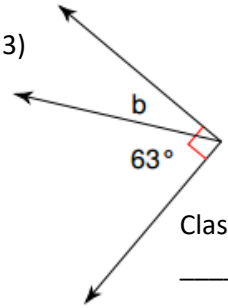
Classification:

_____

_____

b: _____

3)



Classification:

_____

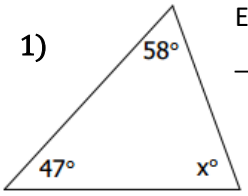
_____

b: _____

Part 3: Interior and Exterior Angles of a Triangle

Find the value of x in each of the following diagrams.

1)

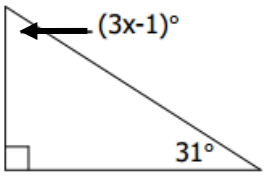


Equation:

_____

x: _____

2)

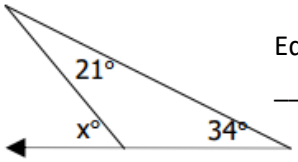


Equation:

_____

x: _____

3)

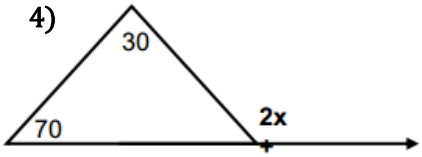


Equation:

_____

x: _____

4)

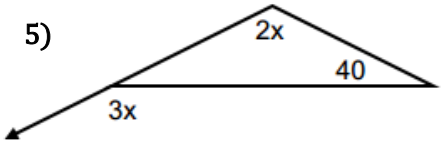


Equation:

_____

x: _____

5)



Equation:

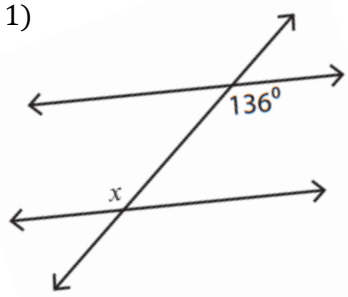
_____

x: _____

Part 5: Parallel Lines and Transversals [*Corresponding Angles*, *Alternate Interior Angles*, Alternate *Exterior Angles*]

Find the missing angle measurement. Identify the relationship of the angles. corresponding (C), alternate interior (I), alternate exterior (E), vertical (V), or supplementary (S) angles.

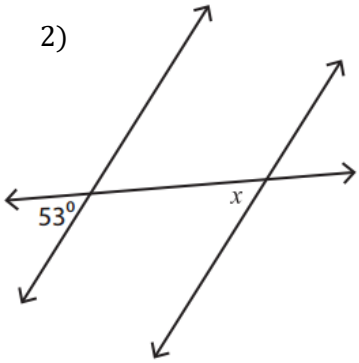
1)



x: _____

Relationship: ____

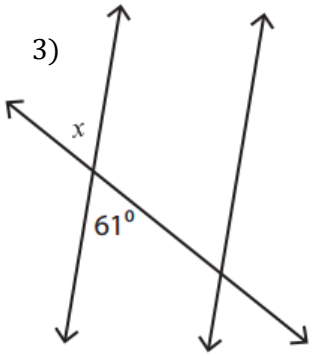
2)



x: _____

Relationship: ____

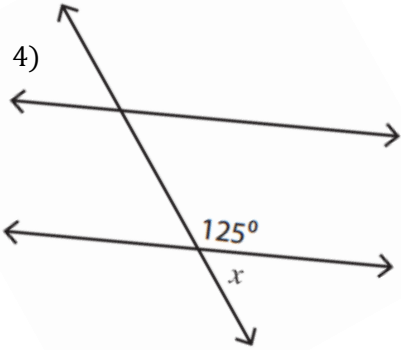
3)



x: _____

Relationship: ____

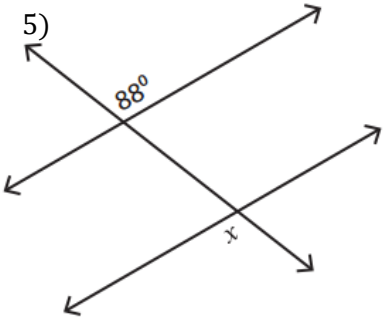
4)



x: _____

Relationship: ____

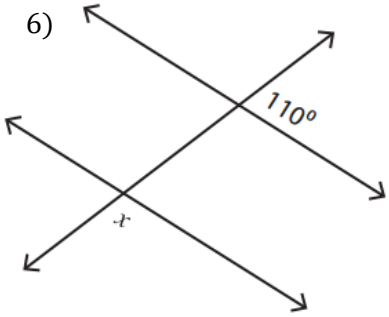
5)



x: _____

Relationship: ____

6)

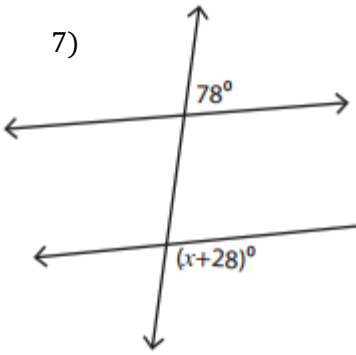


x: _____

Relationship: ____

Identify the relationship of the angles. corresponding (C), alternate interior (I), alternate exterior (E), vertical (V), or supplementary (S) angles. Write an equation to solve for x. Solve.

7)

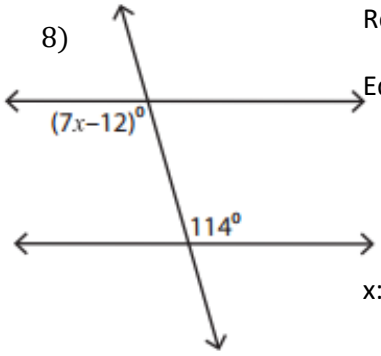


Relationship: ____

Equation _____

x: _____

8)



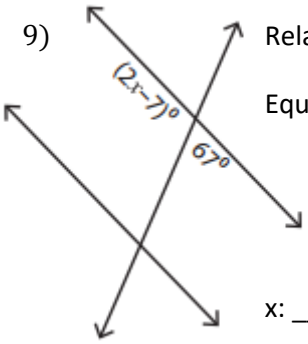
Relationship: ____

Equation _____

x: _____

Identify the relationship of the angles. corresponding (C), alternate interior (I), alternate exterior (E), vertical (V), or supplementary (S) angles. Write an equation to solve for x. Solve.

9)

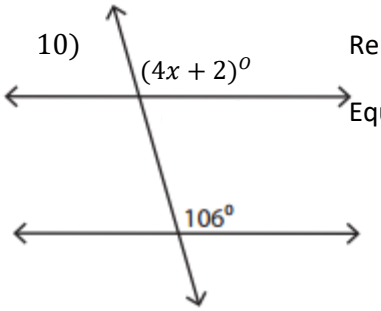


Relationship: ____

Equation _____

x: _____

10)



Relationship: ____

Equation _____

x: _____

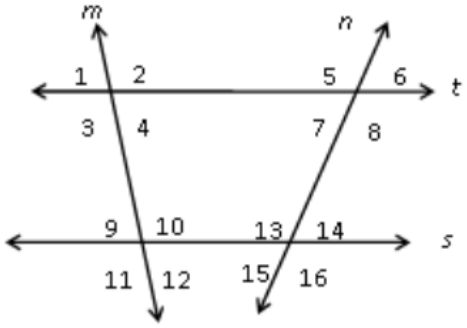
11) Identify the measures of the indicated angles.

m∠2 = 97° m∠6 = 83°

m∠ 3 = _____ m∠ 5 = _____

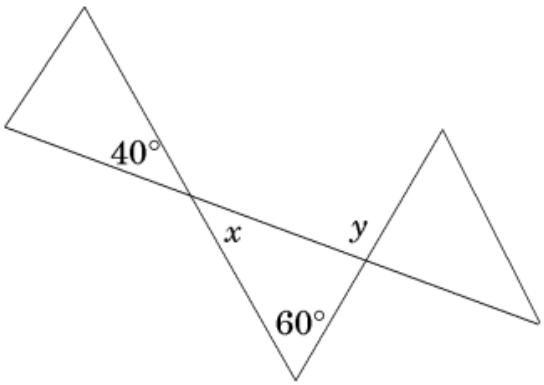
m∠10 = _____ m∠ 7 = _____

m∠ 9 = _____ m∠16 = _____



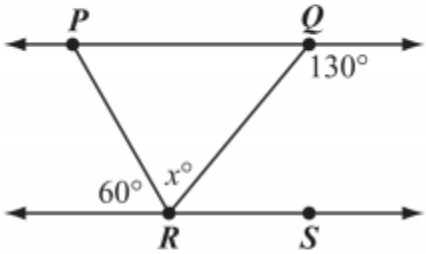
The following questions are multiple choice. Circle the letter next to the best answer.

12) In the drawing, what is the measure of angle *y*?



A. 40 B. 60 C. 80 D. 100

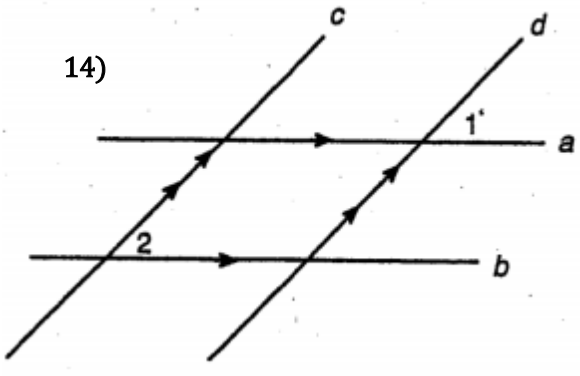
13) In the diagram below, $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ are parallel.



Based on the angle measures in the diagram, what is the value of *x*?

A. 70 B. 60 C. 50 D. 40

14)



Given: $a \parallel b$, $c \parallel d$

If $m\angle 1 = 2x + 16$ and $m\angle 2 = x + 14$, then what is the value of *x*?

A. −10 B. −2 C. 2 D. 10