Classifying Angles

Warm Up

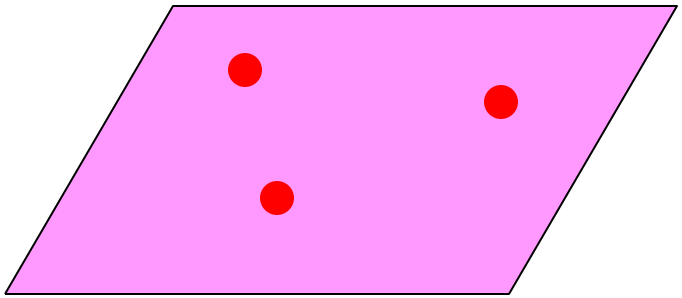
Draw each figure.

1. line segment

2. line

3. ray

4. plane



Classifying Angles

Module 11

Essential ?

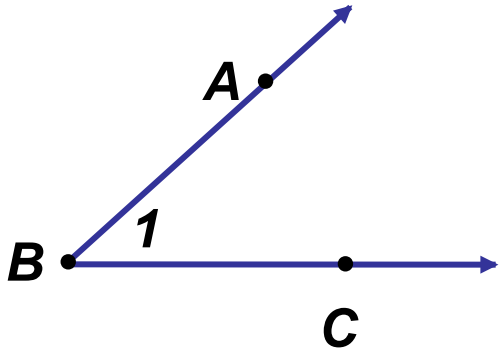
How can you use angles to identify lines, and find missing measures of angles?

Standard

MCC7.G.5: Use facts about supplementary, complementary, vertical, and adjacent angels in multi-step problem to write and solve simple equations for an unknown angle in a figure.

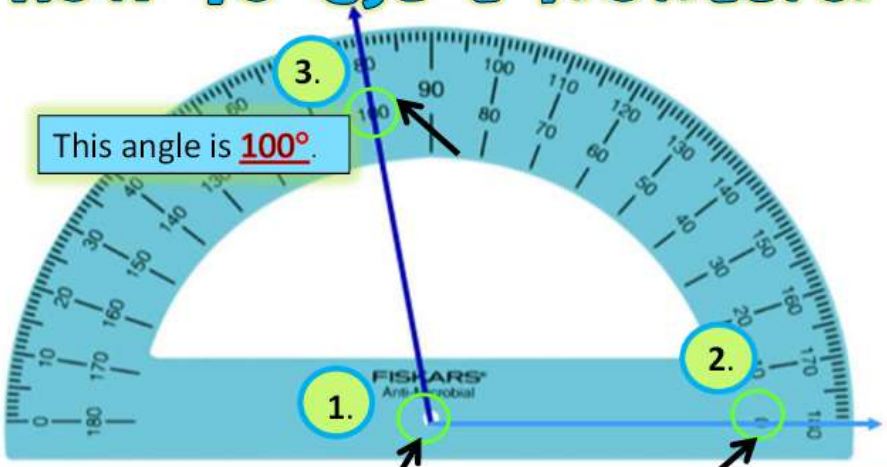
Classifying Angles

Reading Math



You can name this angle $\angle ABC$, $\angle CBA$, $\angle B$, or $\angle 1$.

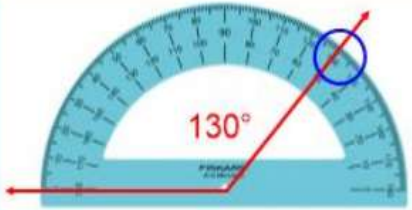
How To Use a Protractor



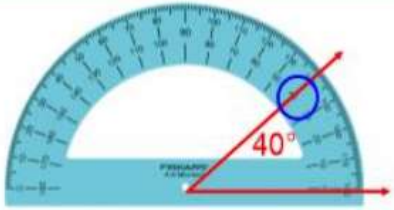
1. Place the center point of the protractor on the **vertex** of the angle.

2. Line up the **0 on the bottom line of the protractor** with the bottom ray of the angle.

3. To find the angle measure, **look at the number the second ray passes through**.



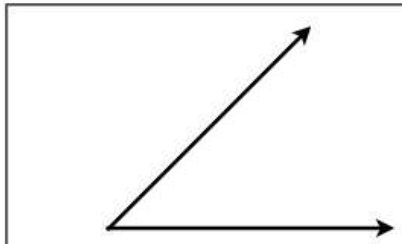
To measure angles opening from the **left**, use the **TOP** set of numbers.



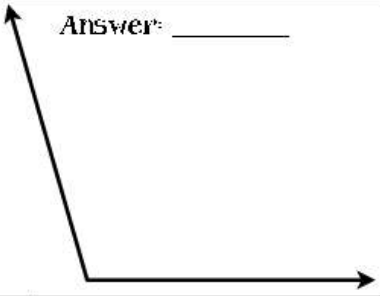
To measure angles opening from the **right**, use the **Bottom** set of numbers.

Glue in notebook.

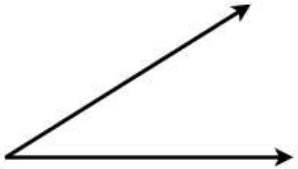
Protractor Practice



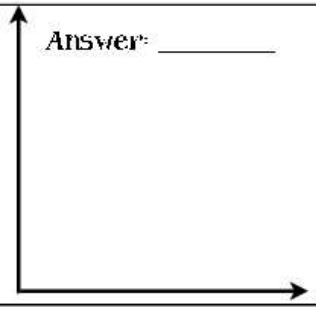
Answer: _____



Answer: _____



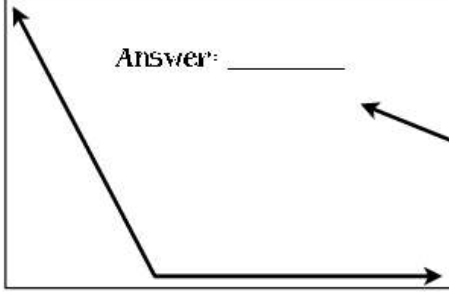
Answer: _____



Answer: _____

Answer: _____

Answer: _____

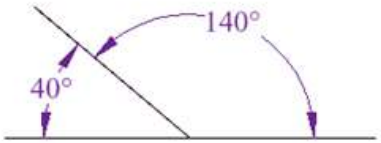
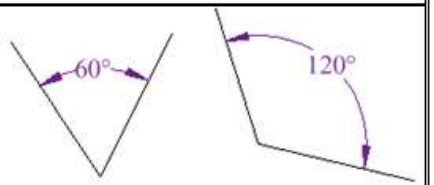


Answer: _____

Answer: _____

Supplementary Angles:

Two Angles are _____ if they **add up to** _____ **degrees**.

These two angles (140° and 40°) are Supplementary Angles, because they add up to **180°**. Notice that together they make a straight angle, or straight line which is 180 degrees.	
But the angles don't have to be together. These two are supplementary because **60° + 120° = 180°**	

FUN TRICK TO REMEMBER:
"S" for Supplementary.... "S" makes 180!

S

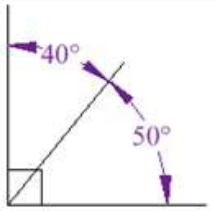
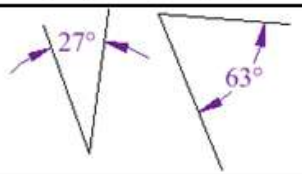
PRACTICE PROBLEMS:

Two angles are supplementary and one of them is 31°
What is the size of the other angle?

Two angles are supplementary and one of them is 127°
What is the size of the other angle?

Complementary Angles:

Two Angles are _____ if they **add up to** _____ **degrees** (Right Angle).

These two angles (40° and 50°) are **Complementary Angles**, because they add up to 90°. Notice that together they make a right angle.	
But the angles don't have to be together. These two are complementary because 27° + 63° = 90°	

FUN TRICK TO REMEMBER:
"C" for Complementary.... "C" makes 90!

C

PRACTICE:

If two angles are complementary and one of them is 77°, what is the size of the other angle?

If two angles are complementary and one of them is 34°, what is the size of the other angle?

Name: _____ Date: _____

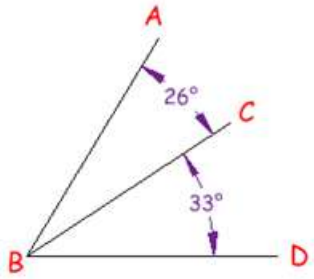
SOL 8.6 Notes – Adjacent Angles

Adjacent Angles:

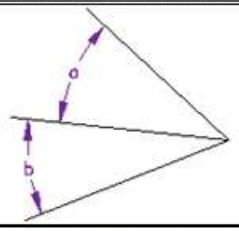
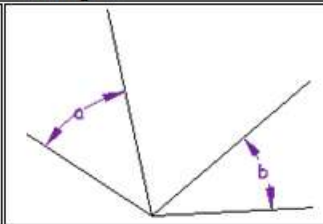
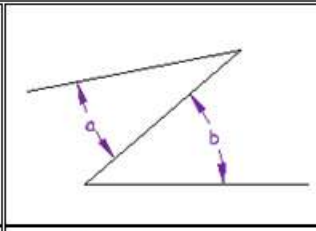
Two angles are _____ if they have a common side, a common vertex (corner point) and do not overlap.

Angle ABC is adjacent to angle CBD because:

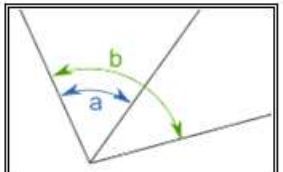
- **they have a common side (line CB)**
- **they have a common vertex (point B)**



What Is and Is NOT an Adjacent Angle:

		
These **ARE** Adjacent Angles They share a vertex *and* a side	**NOT** Adjacent Angles they only share a vertex, *not* a side	**NOT** Adjacent Angles they only share a side, *not* a vertex

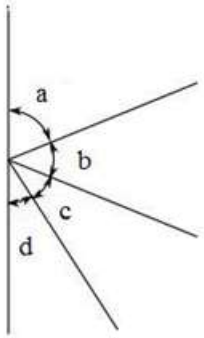
Don't Overlap!
The angles must not overlap.



NOT Adjacent Angles

angles a and b overlap

PRACTICE:
Which of the following pairs of angles are NOT adjacent?



Name: _____ Date: _____

NOTES – SOL 8.6 – Vertical Angles

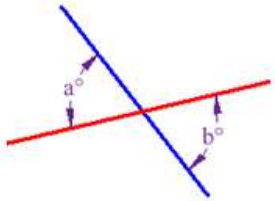
_____ are the angles opposite each other when two lines cross.

"Vertical" in this case means they **share the same Vertex** (or corner point), not the usual meaning of up-down.

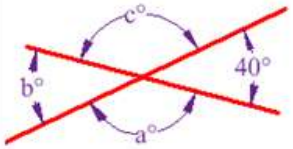
In this example, a° and b° are vertical angles.

Vertical angles are ALWAYS _____.

a° = b°



EXAMPLE: **Find angles a°, b° and c° below:**



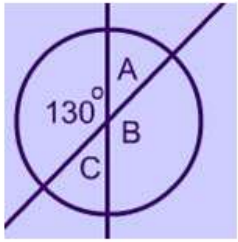
Because b° is opposite 40°, it must also be _____.

A full circle is _____°, so that leaves 360°- 2×40° = 280°

Angles a° and c° are also vertical angles, so must be equal, which means they are 140° each.

Answer: **a = 140°, b = 40° and c = 140°.**

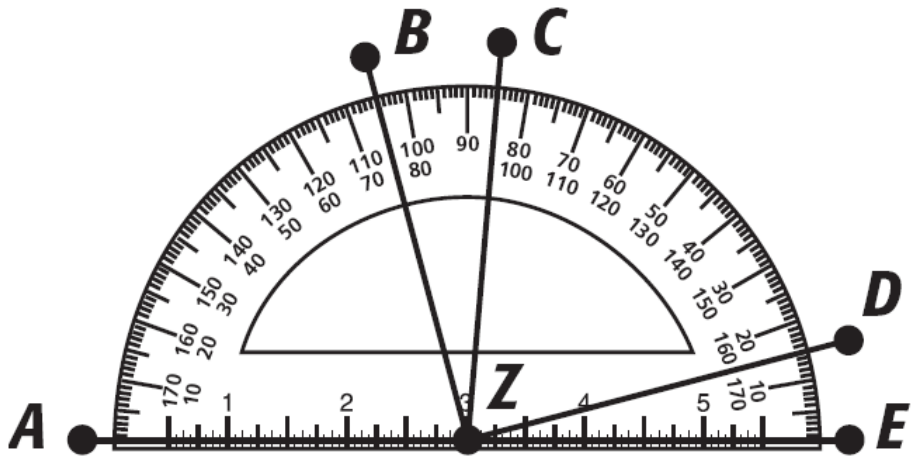
PRACTICE PROBLEM: **What is the measure of angles a°, b° and c° below?**



Classifying Angles

Lesson Quiz: Part II

Use the diagram to tell whether the angles are complementary, supplementary, or neither.



3. $\angle AZB$ and $\angle BZC$ **neither**

4. $\angle BZC$ and $\angle CZD$ **complementary**

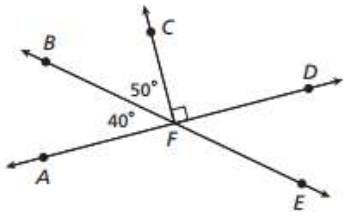
5. Angles *M* and *N* are supplementary. If $m\angle M$ is 117°, what is $m\angle N$? **63°**

are supplementary.

MCC7.G.5

2 EXAMPLE Identifying Angles and Angle Pairs

Use the diagram below.



A Name a right angle. _____

B Name a pair of adjacent angles. _____

C Name a pair of complementary angles. _____

D Name an angle that is supplementary to $\angle CFE$. _____

E Name an angle that is supplementary to $\angle BFD$. _____

F Name an angle that is supplementary to $\angle CFD$. _____

G Name a pair of non-adjacent angles that are complementary. _____

REFLECT

2a. What is the measure of $\angle DFE$? Explain how you found the measure.

_____

_____

2b. Are $\angle CFB$ and $\angle DFE$ adjacent angles? Why or why not?

_____

_____

2c. Are $\angle BFD$ and $\angle AFE$ adjacent angles? Why or why not?

_____

_____

Classifying Angles

Additional Example 3: Finding Angle Measures

Angles *A* and *B* are complementary. If m∠*A* is 56°, what is the m∠*B*?

Since ∠*A* and ∠*B* are complementary, m∠*A* + m∠*B* = 90°.

m∠*A* + m∠*B* = 90°

56° + m∠*B* = 90° *Substitute 56° for m∠A.*

− 56° − 56° *Subtract 56° from both sides.*

m∠*B* = 34°

The measure of ∠*B* = 34°.

Classifying Angles

Check It Out: Example 3

Angles *P* and *Q* are supplementary. If m∠*P* is 32°, what is the m∠*Q*?

Since ∠*P* and ∠*Q* are supplementary, m∠*P* + m∠*Q* = 180°.

m∠*P* + m∠*Q* = 180°

32° + m∠*Q* = 180° *Substitute 32° for m∠P.*

− 32° − 32° *Subtract 32° from both sides..*

m∠*Q* = 148°

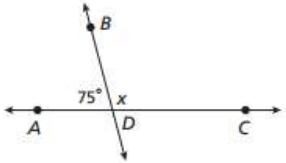
The measure of ∠*Q* = 148°.

MCC7.G.5

3 EXAMPLE Finding Angle Measures

Find the measure of each angle.

A $\angle BDC$



$\angle BDC$ and _____ are _____ angles.

The sum of their measures is _____.

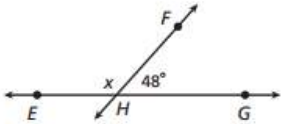
Write an equation to help you find the measure of $\angle BDC$.

$75 + x =$ _____

In the box, solve the equation for x.

$m\angle BDC =$ ____.

B $\angle EHF$



$\angle EHF$ and _____ are _____ angles.

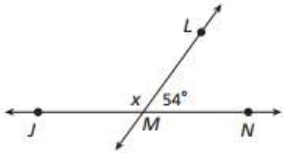
The sum of their measures is _____.

In the box, write and solve an equation to help you find $m\angle EHF$.

$m\angle EHF =$ ____.

TRY THIS!

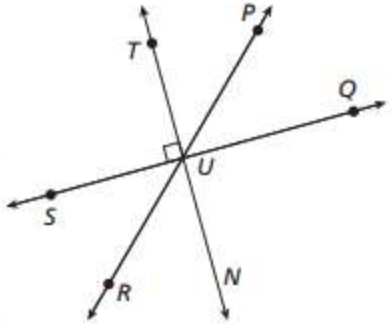
3a. Find the value of x, and $m\angle JML$.



$m\angle JML = x =$ ____.

PRACTICE

For 1–5, use the figure.



1. $m\angle QUP + m\angle PUT =$ _____

2. Name a pair of supplementary angles.

_____

3. Name a pair of complimentary angles.

_____

4. Name a pair of adjacent angles.

_____

5. What is the measure of $\angle QUN$? Explain your answer.

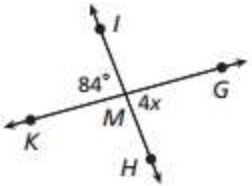
_____

_____

Solve for the indicated angle measure or variable.

6. $m\angle YLA =$ _____

7. $x =$ _____



8. The railroad tracks meet the road as shown. The town will allow a parking

5. What is the measure of $\angle QUN$? Explain your answer.

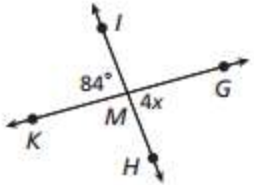
_____

_____

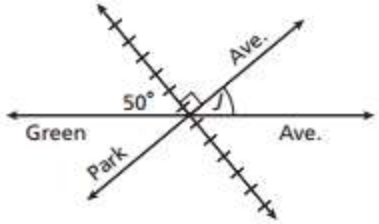
Solve for the indicated angle measure or variable.

6. m $\angle YLA$ = _____

7. x = _____



8. The railroad tracks meet the road as shown. The town will allow a parking lot at angle J if the measure of angle J is greater than 38°. Can a parking lot be built at angle J? Why or why not?



_____

_____

_____

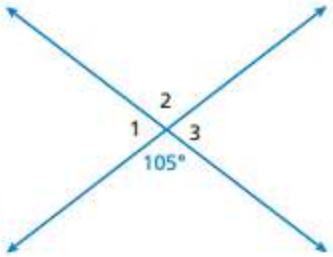
9. **Error Analysis** A student states that when the sum of two angle measures equals 180°, the two angles are complementary. Explain why the student is incorrect.

_____

_____

PRACTICE

The figure is formed by a pair of intersecting lines. Use the figure for each problem.



1. Use a protractor to find the measures of ∠1, ∠2, and ∠3.

m∠1 = _____, m∠2 = _____, and m∠3 = _____

2. Explain how you could find the measure of ∠1 without using a protractor.

_____

_____

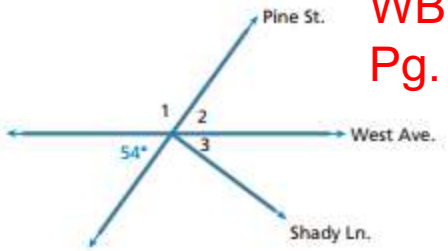
_____

3. Explain how you could find the measure of ∠2 without using a protractor.

_____

_____

The figure shows the intersection of Pine Street, West Avenue, and Shady Lane. Use the figure for each problem.



4. Write and solve an equation to find the measure of ∠1.

_____

5. What is the measure of ∠2? Justify your answer without using a protractor.

_____

_____

6. ∠2 and ∠3 are complementary angles. Write and solve an equation to find the measure of ∠3.

_____

Homework:
WB Pg. 275 Even
Pg. 279 All