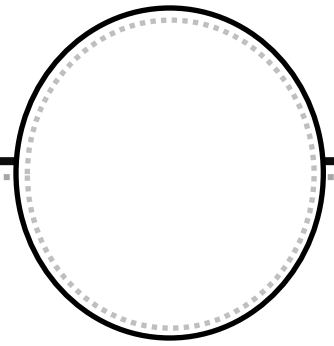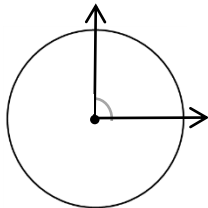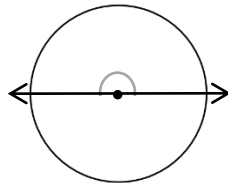# Chapter 14, Lesson 3 Angles and Turns

Angles & Turns

An <u>angle</u> is formed by two rays with a common endpoint.
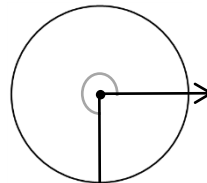
Angles are measured by the amount of rotation from one ray to another.
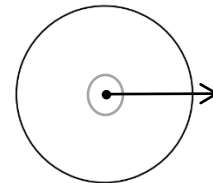

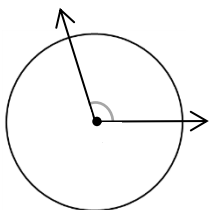$\frac{1}{4}$ turn $\frac{1}{2}$ turn $\frac{3}{4}$ turn   full turn
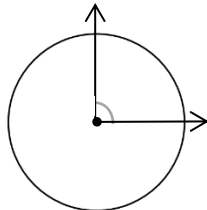
Identify each angle below using the following letters:

- A = An angle that measures less than ¼ turn.
- B = An angle with a measure of ¼ turn.
- C = An angle with a measure greater than ¼ turn, but less than ½ turn.
- D = An angle with a measure of ½ turn.
- E = An angle that measures greater than ½ turn.
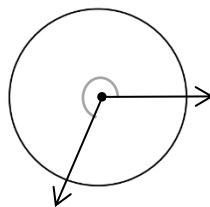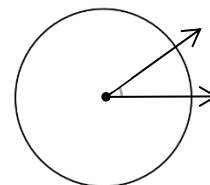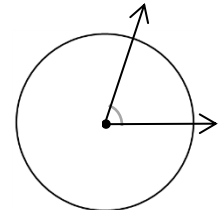
1. ___   2. ___   3. ___   4. ___   5. ___
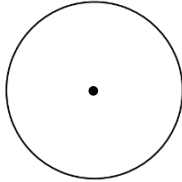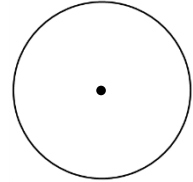
Angles & Turns: More Practice

Using the circles below, draw an angle to represent each measure.
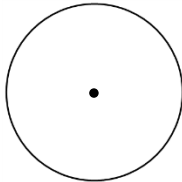
1.   ½ turn

2.   greater than ½ turn
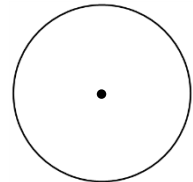
3.   ¼ turn

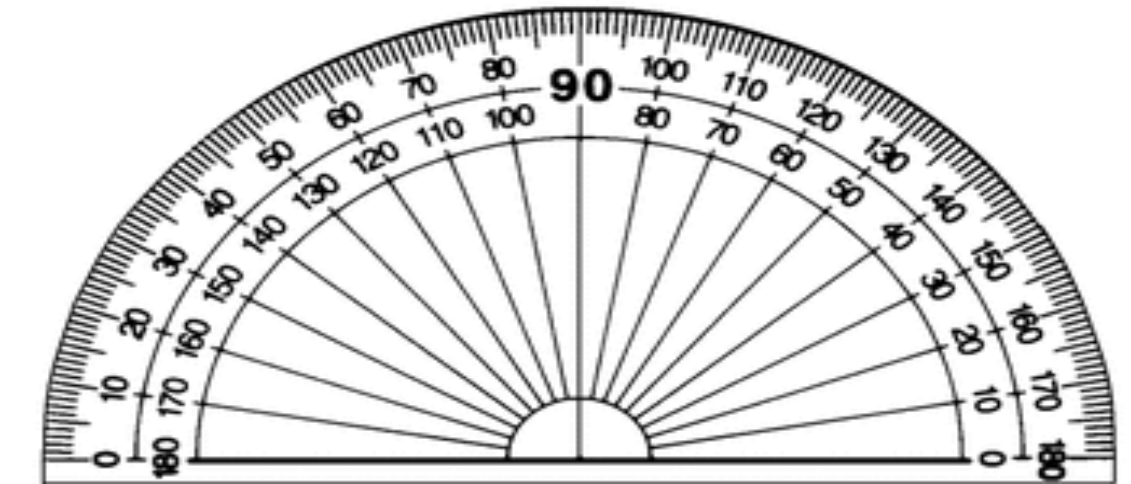4.   less than ¼ turn

Chapter 14, Lessons 4: Classify Angles

Learning Targets: I can identify angles as right, acute, or obtuse.

Watch Me

An **angle** is a geometric shape that is formed when two _____ have the same endpoint.

Angles are measured using **degrees**.
There are _____ degrees in a full rotation.
The symbol for degrees is °

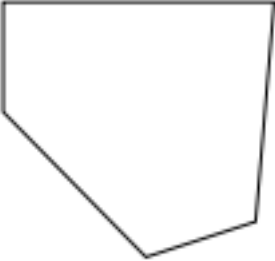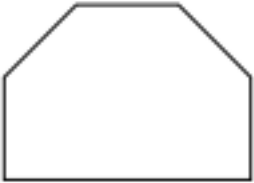| Angle	Definition	Pictures	
right angle	A right angle measures _____. It has two edges that go straight up and straight across.		

Angles are described in comparison to **right angles**, such as greater than, less than, or the same size as a right angle.
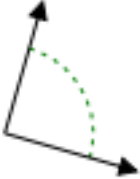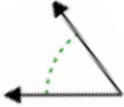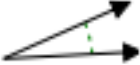
acute angle	An acute angle is smaller than a right angle and measures less than _____.		
obtuse angle	An obtuse angle is bigger than a right angle and measures more than _____ but less than _____.		

Count the number of acute, obtuse and right angles inside each shape.

Acute = _____

Obtuse = _____

Right = _____

Acute = _____

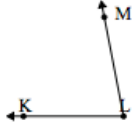Obtuse = _____

Right = _____

You Try

Identify each angle
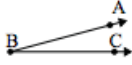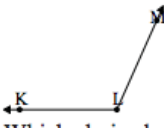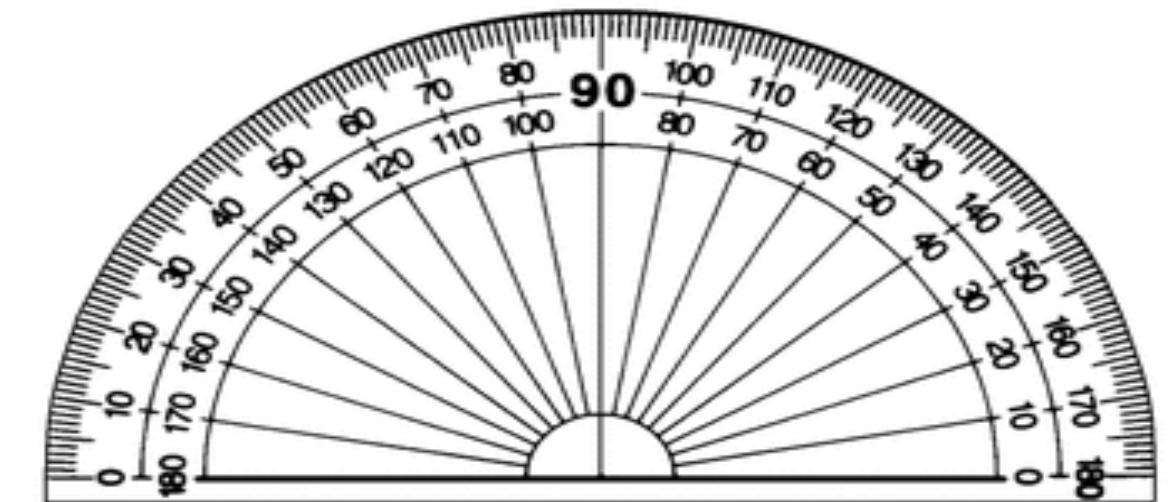
Determine if the angle described is acute, obtuse, or right

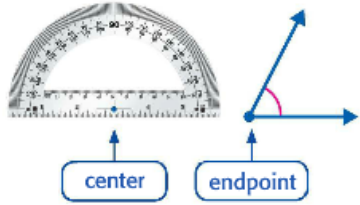| 7°	165°	90°
74°	100°	89°

Chapter 14, Lessons 5 Measure Angles
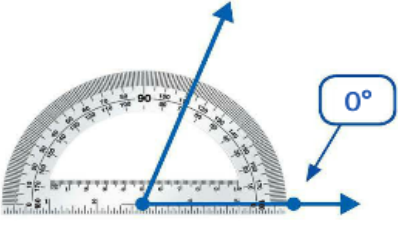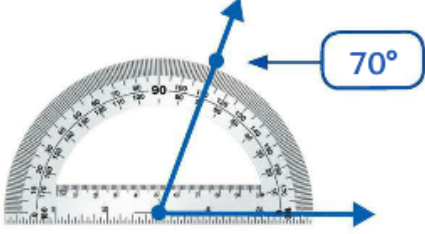
Learning Target: I can use a protractor to find the degree measure of an angle.

Lets Review…

M K L Which choice best represents ∟KLM? A. 176° B. 79° C. 138° D. 21°	A B C Which choice best represents ∟ABC? A. 67° B. 142° C. 100° D. 15°	M K L Which choice best represents ∟KLM? A. 21° B. 160° C. 114° D. 0°

The protractor is a tool used to measure angles. The length of the rays does not affect the measure.

1. **Line up the protractor** ▪ Place the middle of the protractor on the endpoint of the angle with the straightedge along one ray.	 center endpoint

2. **Extend and Line up the angle**
  ▪ Using the straightedge of the protractor, extend the ray.
  ▪ Line up one ray of the angle with the line on the protractor.
	
	0°

3. **Measure the angle** ▪ Find the tic mark on the protractor that aligns with the second ray of the angle.	 70°

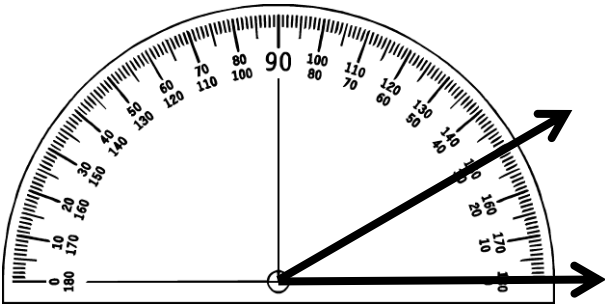3)

1)
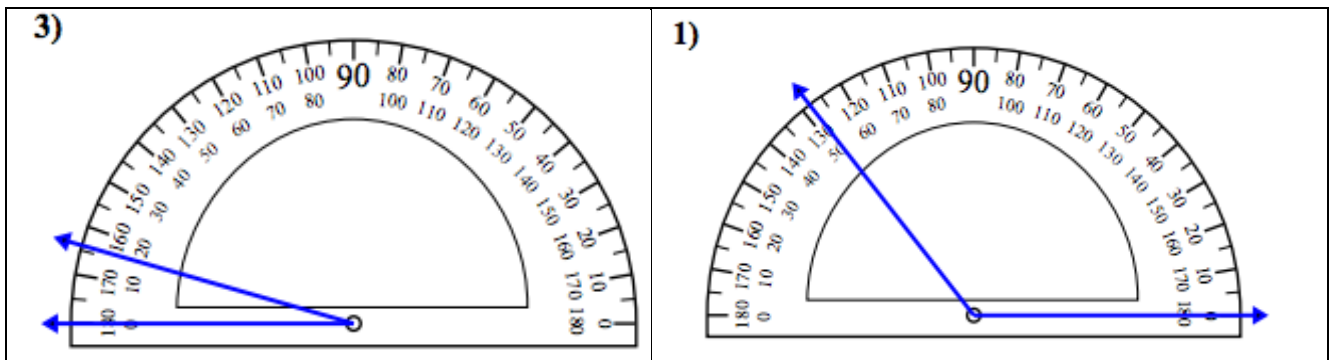
Reading a Protractor

A <u>protractor</u> is a tool used to measure angles (in degrees).
When using a protractor, it is important to first classify the angle:

- Acute angle ~ This angle should have a measure <u>less than</u> 90°.
- Obtuse angle ~ This angle should have a measure <u>greater than</u> 90°.
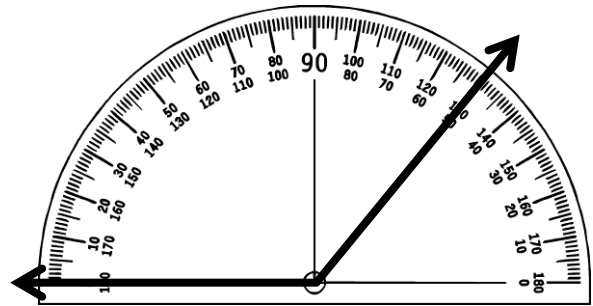

Angle 1 is an acute angle.
- The measure must be <u>less than</u> 90°.

The ray lands on the 30° and 150° mark.
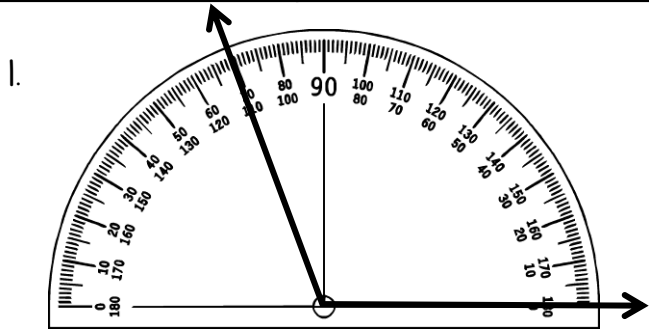Angle 1 is acute, so the measure is <u>30°</u>.

Angle 2 is an obtuse angle.
- The measure must be <u>more than</u> 90°.
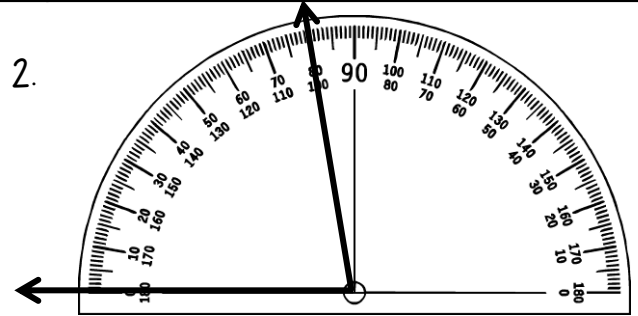
The ray lands on the 50° and 130° mark.
Angle 2 is obtuse, so the measure is <u>130°</u>.

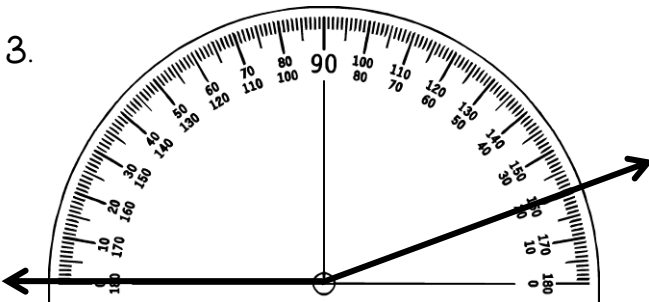
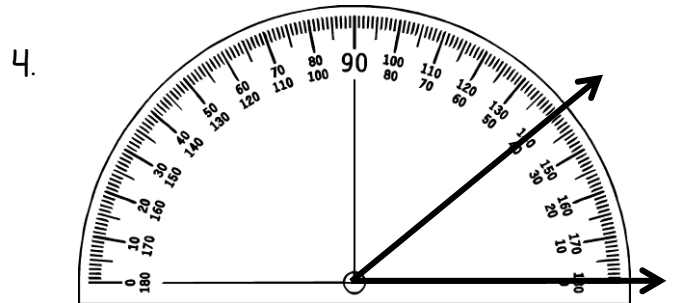Classify each angle below. Then, measure using the protractor.

1.

Type of Angle _____ Measure _____°

2.

Type of Angle _____ Measure _____°

3.

Type of Angle _____ Measure _____°

4.

Type of Angle _____ Measure _____°

Reading a Protractor: More Practice

Classify each angle below. Then, use the protractor to measure the angle.

1.

Type of Angle _____ Measure _____°

2.

Type of Angle _____ Measure _____°

3.

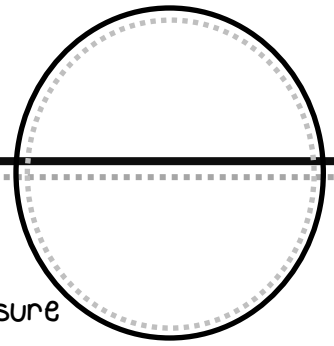Type of Angle _____ Measure _____°

4.

Type of Angle _____ Measure _____°

5.

Type of Angle _____ Measure _____°

6.

Type of Angle _____ Measure _____°

7.

Type of Angle _____ Measure _____°

8.

Type of Angle _____ Measure _____°
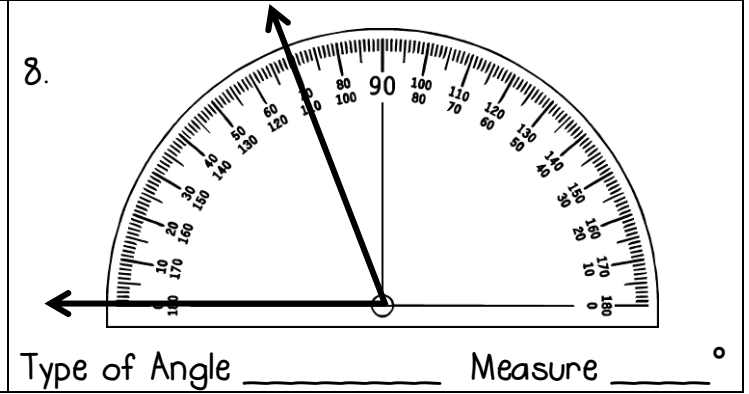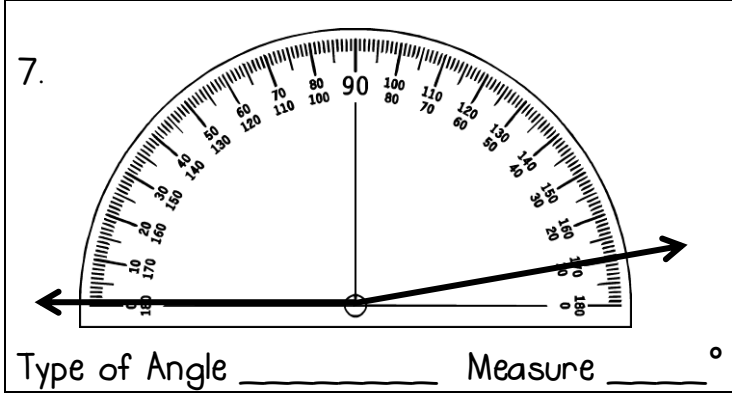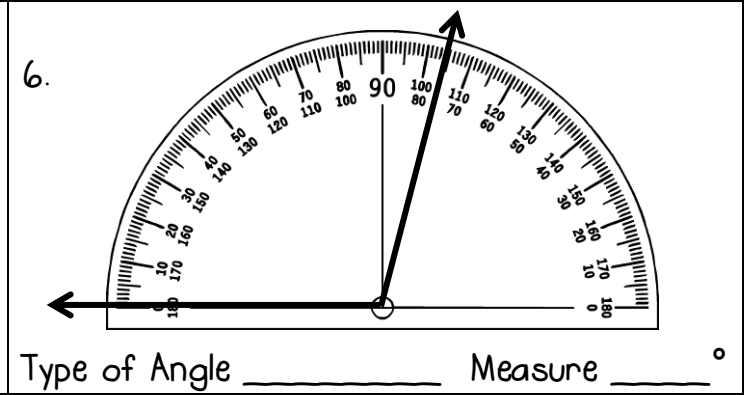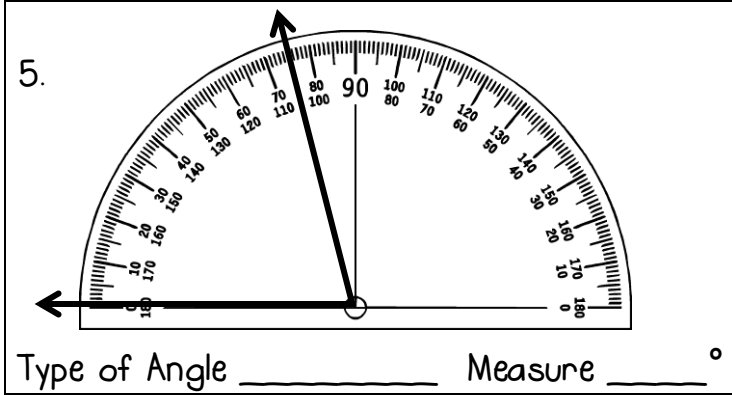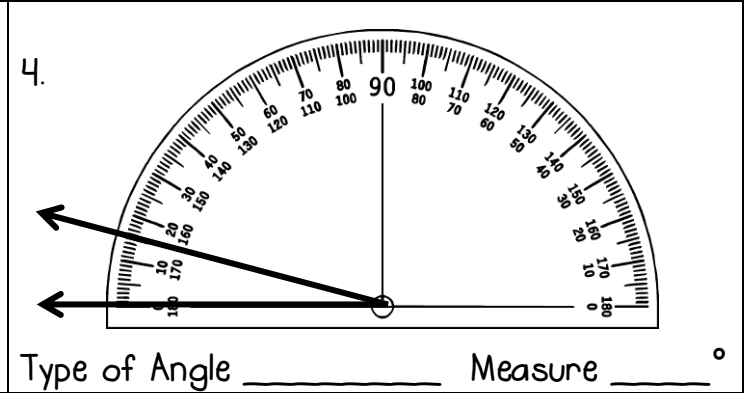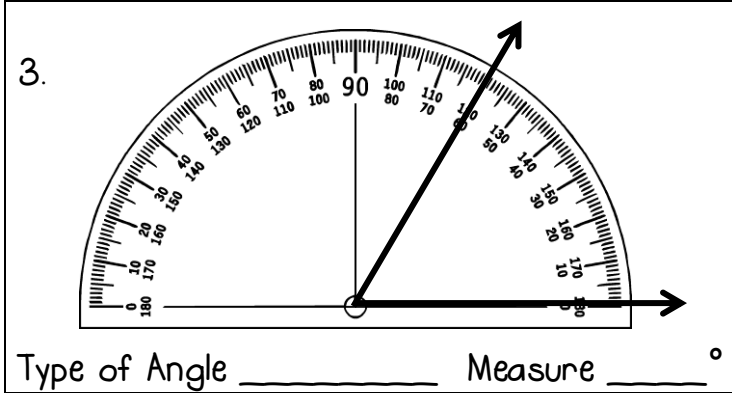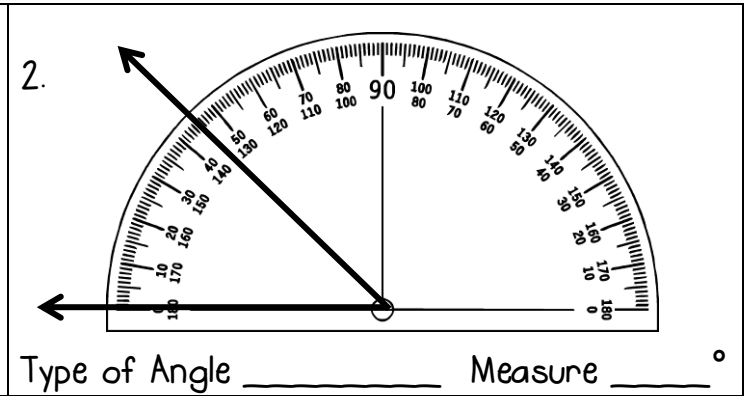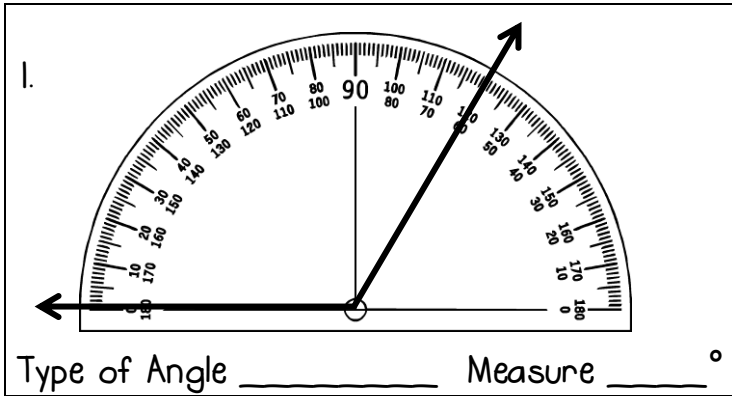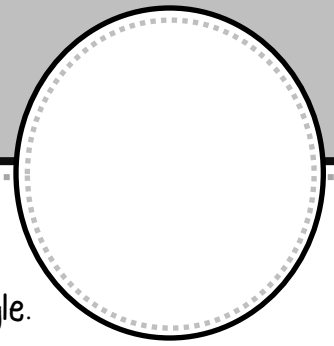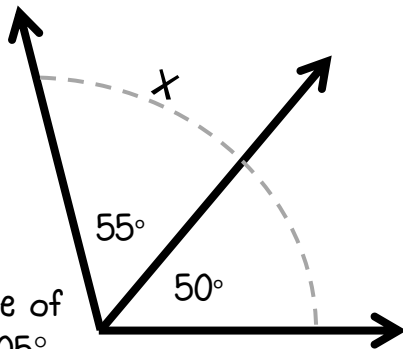
Chapter 14 , Lesson 6 Joining angles

Joining Angles

Two angles can be joined to form a larger angle. To determine the measure of the larger angle, add the two angle measures.

Example 1:

$$
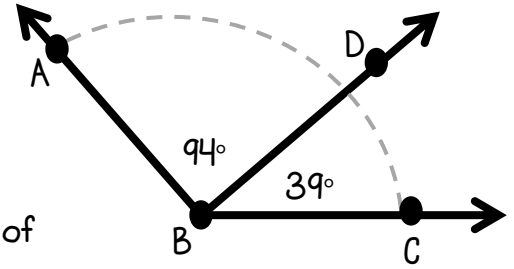\begin{array}{r}
55° \\
+\ 50° \\
\hline
105°
\end{array}
$$

The measure of angle x is 105°.

Example 2:

∠ABD   94°
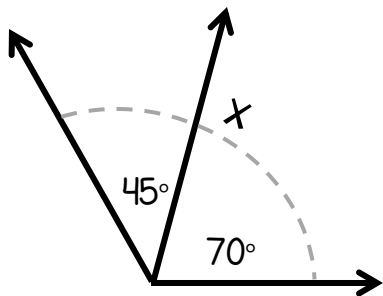∠DBC + 39°
         ─────
          133°

The measure of ∠ABC is 133°.

Add to find the measure of the larger angle.

1. Angle x = _____°

2. Angle x = _____°
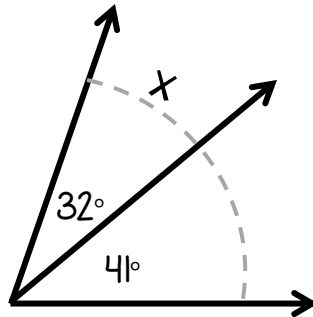
3. Angle x = _____°
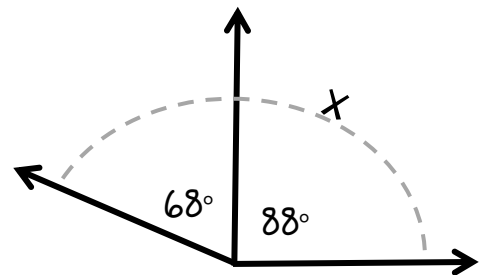
4. ∠ QRZ = _____°
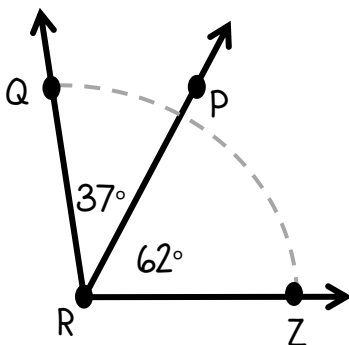
5. ∠ AFK = _____°
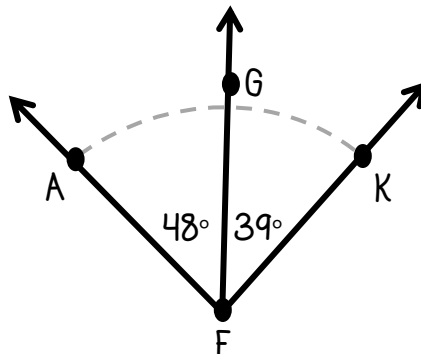
6. ∠ MNO = _____°
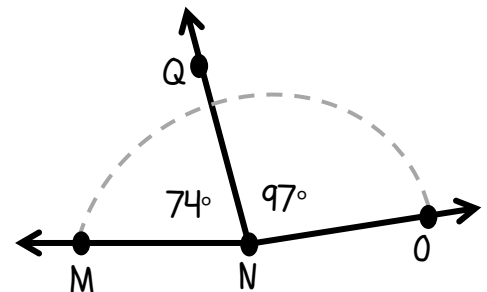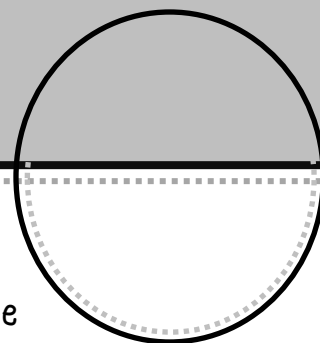
Separating Angles

The measure of an angle equals the sum of its parts. When the measure of the larger angle and one of the smaller angles is known, subtract to determine the measure of the other small unknown angle.
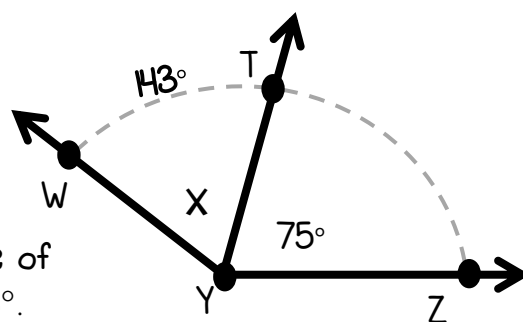
Example 1:   75° + x = 110°

$$\begin{array}{r} 110° \\ - 75° \\ \hline 35° \end{array}$$
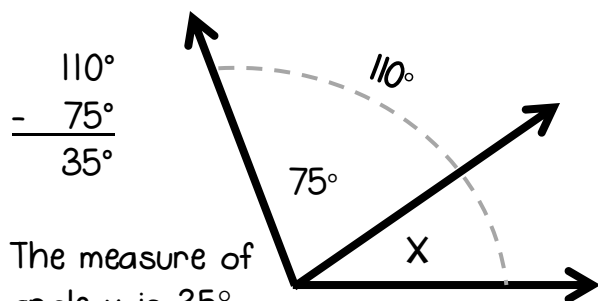
The measure of angle x is 35°.

Example 2: The measure of angle WYZ is 143°.

$$\begin{array}{r} \angle WYZ \quad 143° \\ \angle TYZ \; - \; 75° \\ \hline 68° \end{array}$$
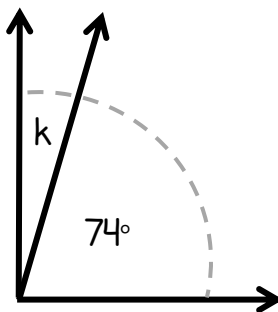
The measure of ∠WYT is 68°.

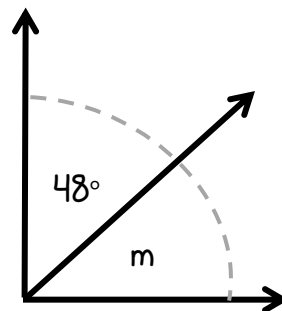The combined measure of each angle below is 90°. Find the measure of the unknown angle.

1.   Angle x = _____°

35°   X

2.   Angle k = _____°

k   74°
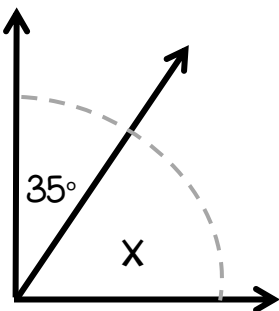
3.   Angle m = _____°

48°   m

The combined measure of each angle below is 180°. Find the measure of the unknown angle.

4.   Angle b = _____°

b   127°

5.   Angle z = _____°

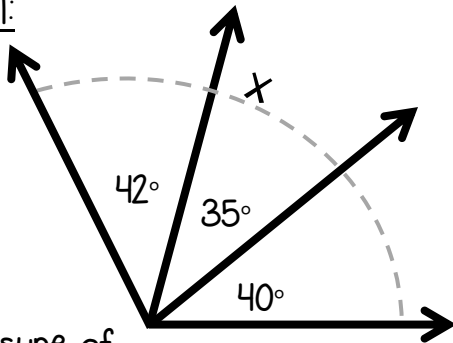z   79°

6.   Angle h = _____°

h   154°

Joining More than Two Angles

More than two angles can be joined to form a larger angle. To determine the measure of the larger angle, add <u>all</u> angle measures.
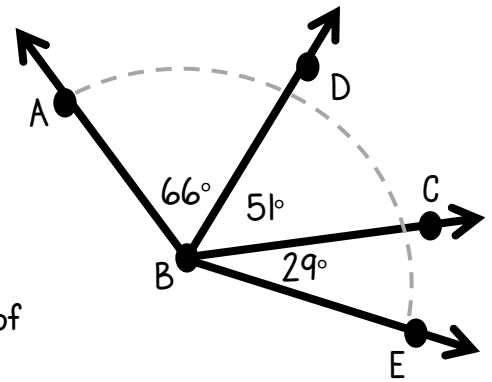
Example 1:

$$\begin{array}{r} 42° \\ 35° \\ + \ 40° \\ \hline 117° \end{array}$$

42° 35° 40° x

The measure of angle x is 117°.

Example 2:

$$\begin{array}{lr} \angle ABD & 66° \\ \angle DBC & 51° \\ \angle CBE \ + & 29° \\ \hline & 146° \end{array}$$

A D 66° 51° C B 29° E

The measure of ∠ABE is 146°.

Add to find the measure of the larger angle.

1. Angle x = _____°

x 54° 29° 47°

2. Angle x = _____°

x 28° 36° 25°

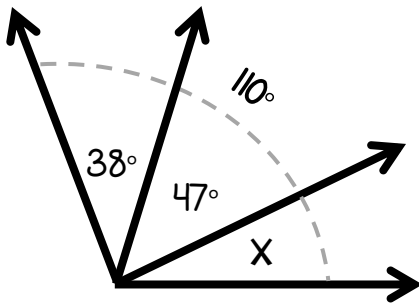3. Angle x = _____°

x 27° 35° 90°
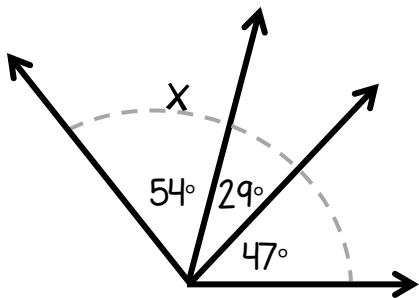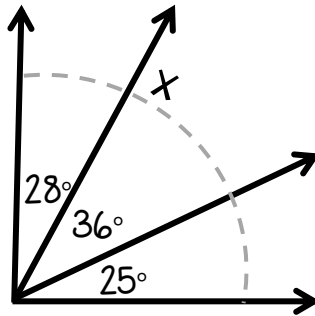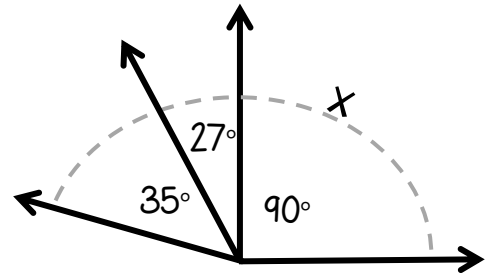
Separating More Than Two Angles

In the angles below, you must first add the two known smaller angles.
Then, subtract this measure from the known combined angle to determine
the measure of the unknown angle.
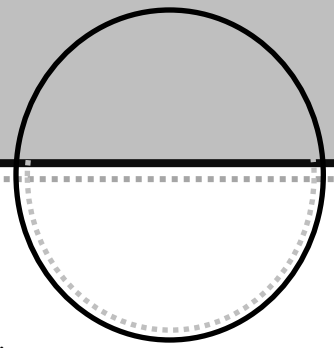
Example 1:   38° + 47° + x = 110°

38°
47°
110°
X

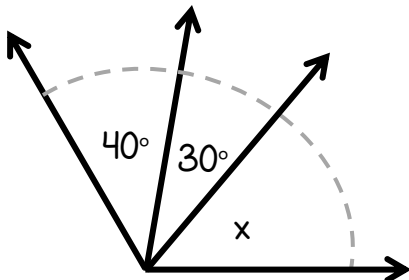The measure of angle x is 25°.

Step 1:
Add the two small
known angles.

$$\begin{array}{r} 38° \\ + \quad 47° \\ \hline 85° \end{array}$$
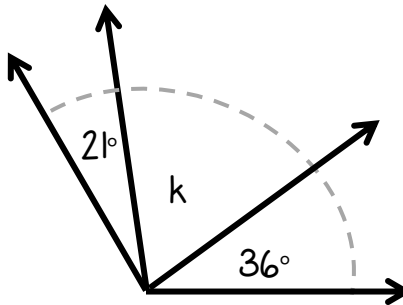
Step 2:
Subtract the large
angle from this total.

$$\begin{array}{r} 110° \\ - \quad 85° \\ \hline 25° \end{array}$$

The combined measure of each angle below is 120°. Find the measure of the unknown angle.

1.   Angle x = _____°
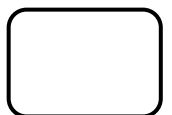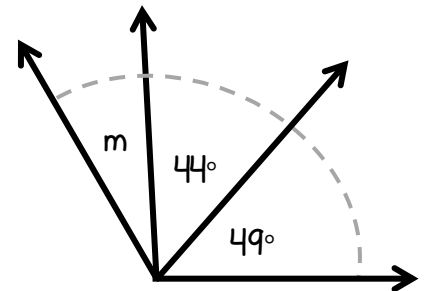
40° 30°
x

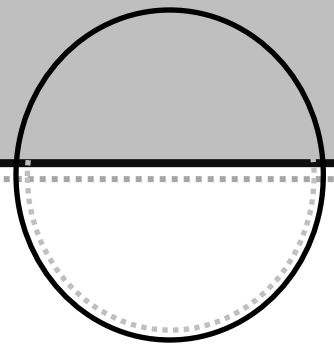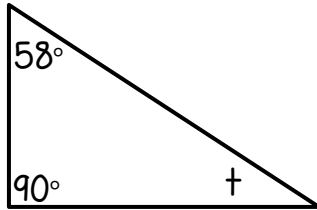2.   Angle k = _____°

21°
k
36°

3.   Angle m = _____°

m
44°
49°

Additive Angles in Shapes

You can determine the measure of an unknown angle in shapes.

Example 1:
The angles in a triangle add up to 180°.

```
  90°      180°
+ 58°    - 148°
 148°       32°
```

58°

90°   t

The measure of angle t = 32°.

Example 2:
The angles in a quadrilateral add up to 360°.

```
  90°      360°
  90°    - 264°
+ 84°       96°
 264°
```

q   84°

90°   90°
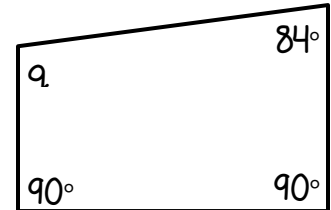
The measure of angle q = 96°.

Find the measure of the unknown angle.

1.   x = _____°

x

90°   27°

2.   x = _____°

68°   68°

112°   x

3.   x = _____°

x

49°   49°

4.   x = _____°

29°

x   35°

5.   x = _____°

61°

x

75°

97°

6.   x = _____°

36°   x

70°