Launch Into Math 3

Launch Into Angles

The Bridge Across the Bay

The Sunshine Skyway Bridge across Tampa Bay is just like Florida itself. It is a surprising blend of sunshine, ocean, and progress.

The Sunshine Skyway Bridge is a cable-stayed bridge. The roadway is suspended from 21 cables anchored to each side of two towers that bear the bridge's weight.

The bridge looks like two sailboats gliding above the sea. As vehicles travel across the bridge, they are 190 feet above the water. This provides drivers and riders an open and beautiful view of Tampa Bay.

Bridge Facts

- Each cable is covered in a steel pipe that is 9 inches in diameter. The pipes are bright yellow to represent sunshine.
- The bridge has a 40-foot-wide roadway on each side of the cables.
- The bridge is 4.14 miles long.
- About 52,000 vehicles cross the bridge every day.

Three Reads

First, read the story to understand the situation.

Next, read to understand the math.

Then, read to ask what mathematical questions could be asked about the situation.

The cables on each side of the towers on the Sunshine Skyway Bridge meet in the middle of the towers to form angles.

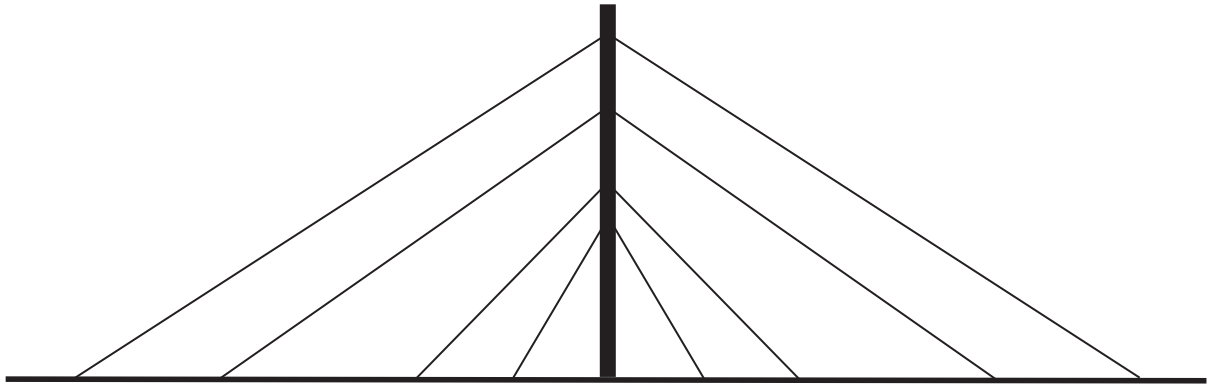
Go Online
For the interactive lesson

Read the final questions. Make a plan to solve the problem.

The cables on each side of the towers on the Sunshine Skyway Bridge meet in the middle of the towers to form angles.

The angles in the drawing space below are like the angles on the Sunshine Skyway Bridge. Which one is the right angle? Which angles are greater than right angles? Which are smaller? Explain how you know.

Write, model, or draw to solve the problem.



Discuss with a partner or in a group.

Math Talk

Look at each of the 4 triangles formed by the bottom of the bridge and the 2 cables that connect to the tower at the same height. Use a ruler to measure their sides. What do you notice about the measurements of each triangle?

Chapter 14

Name _____

Measure Angles

Show What You Know

Use a Metric Ruler
Use a centimeter ruler to measure. Find the length in centimeters.

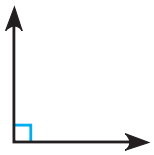
1. 

_____ centimeters

2. 

_____ centimeters

Describe Angles
Describe the angle. Write *less than right*, *right*, or *greater than right*.

3. 

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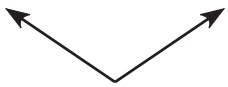
4. 

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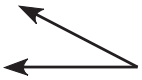
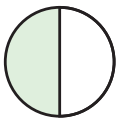
5. 

_____

Parts of a Whole
Write a fraction for each shaded part.

6. 

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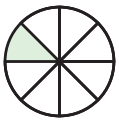
7. 

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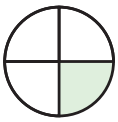
8. 

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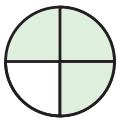
9. 

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MATH in the Real World

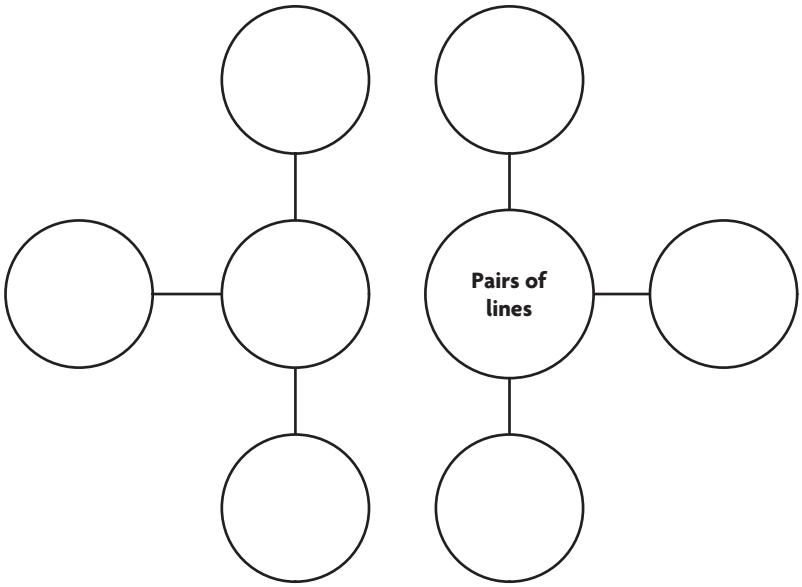
The Sunshine Skyway Bridge crosses over Tampa Bay, Florida. Bridges and other building structures can model geometric figures. Look at the bridge in the photo. Describe the geometric figures you see. Then classify the labeled angles and triangle.

Vocabulary Builder

Go Online For more help

Visualize It

Complete the Bubble Map using review words with a ✓.



Connect to Vocabulary

Review Words

- ✓ intersecting lines
- ✓ line segment
- ✓ perpendicular lines
- ✓ parallel lines
- ✓ point
- ✓ ray
- right angle
- vertex

Preview Words

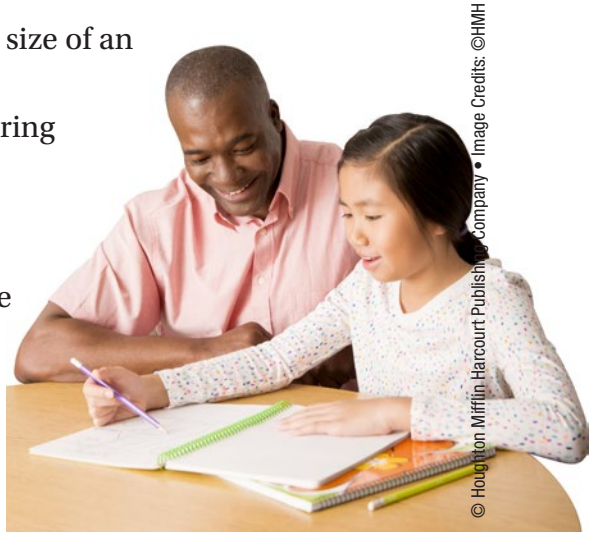
- acute angle
- degree (°)
- obtuse angle
- protractor
- reflex angle
- straight angle

Understand Vocabulary

Draw a line to match each preview word with its definition.

1. protractor
2. degree (°)
3. right angle
4. acute angle
5. obtuse angle
6. reflex angle
7. straight angle

- An angle that forms a square corner
- An angle that is less than a right angle
- A tool for measuring the size of an angle
- The unit used for measuring angles
- An angle larger than a straight angle
- An angle that forms a line
- An angle that is greater than a right angle and less than a straight angle



Name _____

Exploring Angles

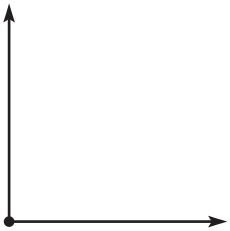
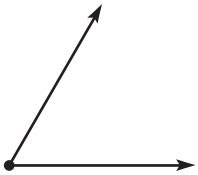
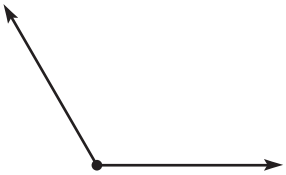
Florida's B.E.S.T.
- **Geometric Reasoning** 4.GR.1.1
- **Mathematical Thinking & Reasoning** MTR.2.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1, MTR.7.1

I Can identify and classify angles.

UNLOCK the Problem Real World

You can name an angle by the vertex. When you name an angle using 3 points, the vertex is always the point in the middle.

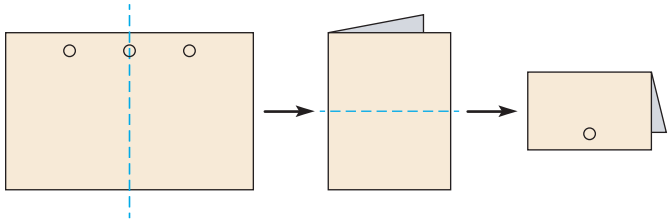
Angles are classified by the size of the opening between the rays.

A **right angle** forms a square corner. 	A **straight angle** forms a line.	An **acute angle** is less than a right angle. 
An **obtuse angle** is larger than a right angle. 	A **reflex angle** is is larger than an obtuse angle. 	

Activity 1 Classify angles.

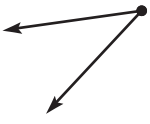
Materials ■ paper

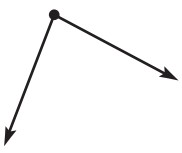
To classify an angle, you can compare it to a right angle.

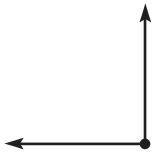


Make a right angle by using a sheet of paper. Fold the paper twice evenly to model a right angle. Use the right angle to classify the angles below. Write *acute, obtuse, right,* or *reflex*.

a.  _____

b.  _____

c.  _____

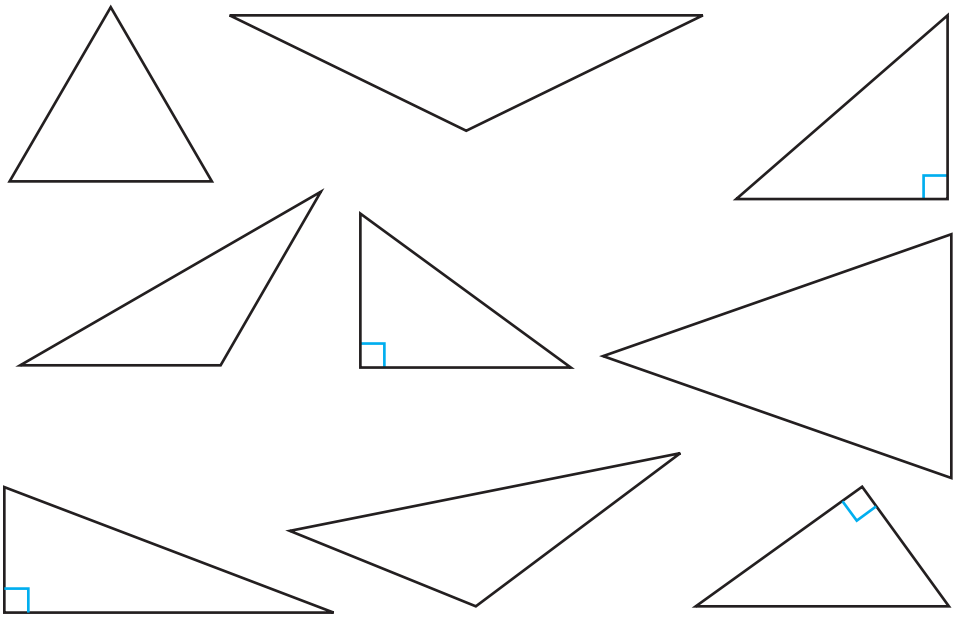
d.  _____

e.  _____

Activity 2 Identify right, acute, and obtuse angles in triangles.

Materials ■ colored pencils

Use the Triangle Color Guide to color the triangles below.



Triangle Color Guide	
RED	one right angle
BLUE	one obtuse angle
ORANGE	three acute angles

Math Talk

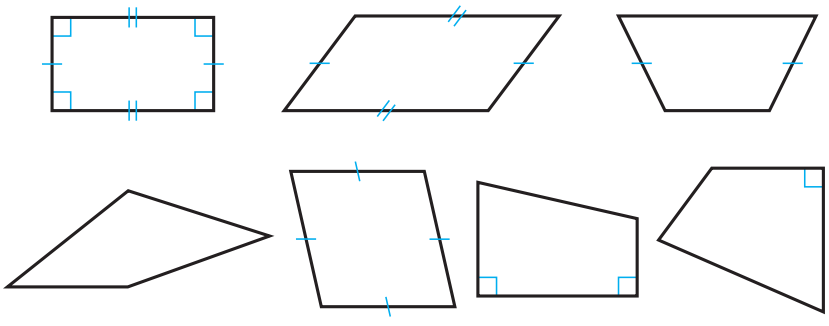
MTR 5.1 Use patterns and structure.

Can a triangle have more than one obtuse angle? Explain.

Try This!

Identify right angles in quadrilaterals. Use the Quadrilateral Color Guide to color the quadrilaterals.

Materials ■ color pencils



Quadrilateral Color Guide	
RED	exactly 4 right angles
BLUE	exactly 2 right angles
ORANGE	exactly 1 right angle

Math Talk

MTR 5.1 Use patterns and structure.

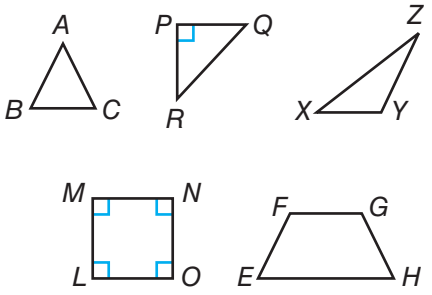
Can a quadrilateral have exactly 3 right angles? Explain.

Name _____

Share and Show Math Board

Identify the angles in each shape.

1. Name the triangle with one right angle. _____
2. Name the triangle with one obtuse angle. _____
3. Name the triangle with three acute angles. _____
4. Name the quadrilateral with four right angles. _____
5. Name the quadrilateral with two obtuse angles. _____

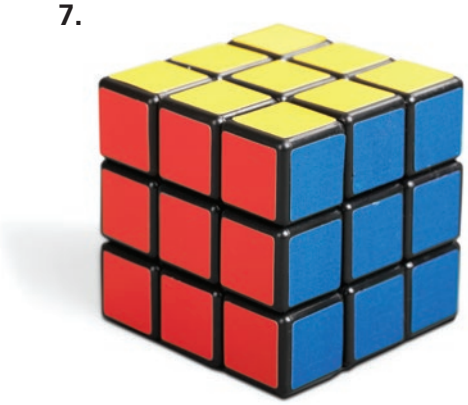


Identify the angle in each image.

6.

_____

7.



_____

8.

_____

On Your Own Real World

Tell whether each angle is acute, right or obtuse.

9. $\angle O$ is _____

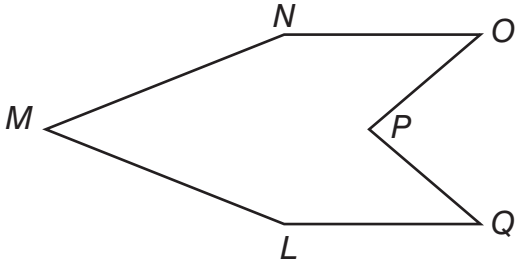
   $\angle P$ is _____

   $\angle Q$ is _____

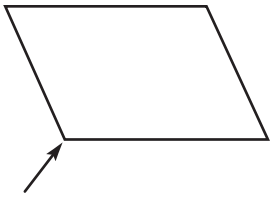
10. $\angle L$ is _____

    $\angle M$ is _____

    $\angle N$ is _____



11. Medivh drew this shape. Which of the following describes the angle?



- ○ obtuse
- ○ acute
- ○ reflex
- ○ right angle

12. Whose statement makes sense? Whose statement is nonsense? Explain your reasoning.

Carla's Statement	Enrique's Statement

- Name at least two things in the real-world that have obtuse angles.

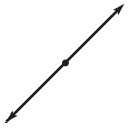
Name _____

Exploring Angles

Go Online
Interactive Examples

Classify the angles.

1. 

2. 

3. 

_____ _____ _____

Circle at least one acute, obtuse and right angle. Explain.

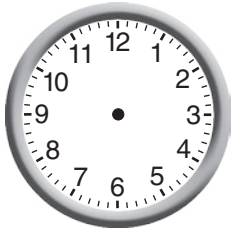
4. _____

_____

Problem Solving Real World

5. Dwayna started exercising at noon. If the time she ended her workout creates a reflex angle, what time could her workout end? Draw the minute hand on the clock to show the time.

Start



End

6. WRITE Math Explain how you know it's a reflex angle.

_____

_____

_____

_____

_____

_____

_____

Lesson Check

7. What type of angle is the alligator's mouth making? Explain.

8. Draw a shape with at least one acute angle and one obtuse angle. Label each angle.

Spiral Review

9. Write $\frac{2}{3}$ and $\frac{3}{4}$ as a pair of fractions with a common denominator.

10. Raymond bought $\frac{3}{4}$ of a dozen rolls. How many rolls did he buy?

11. List all the factors of 18.

12. Jonathan rode 1.05 miles on Friday, 1.5 miles on Saturday, 1.25 miles on Monday, and 1.1 miles on Tuesday. On which day did he ride the shortest distance?

Name _____

Degrees

Florida's B.E.S.T.

- **Geometric Reasoning** 4.GR.1.2, 4.GR.1.1
- **Mathematical Thinking & Reasoning** MTR.2.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1

I Can estimate angle measurements using benchmarks.

CONNECT You can use what you know about angles and fractional parts of a circle to understand angle measurement. Angles are measured in units called **degrees**. Think of a circle divided into 360 equal parts. An angle that turns through $\frac{1}{360}$ of the circle measures 1 degree.

Math Idea

The symbol for degrees is °.

UNLOCK the Problem Real World

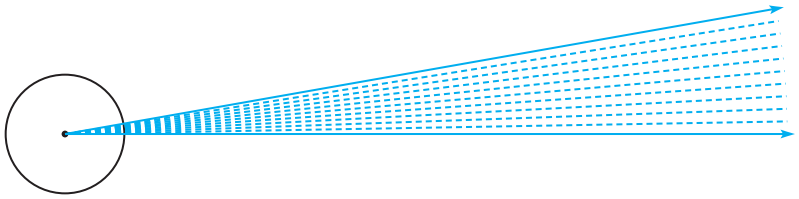
The angle between two spokes on the bicycle wheel turns through $\frac{10}{360}$ of a circle. What is the measure of the angle formed between the spokes?

What part of an angle does a spoke represent?

_____

_____

Example 1 Use fractional parts to find the angle measure.



Each $\frac{1}{360}$ turn measures _____ degree.

Ten $\frac{1}{360}$ turns measure _____ degrees.

So, the measure of the angle between the spokes is _____.

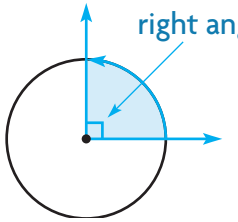
Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

How many degrees is the measure of an angle that turns through 1 whole circle? Explain.

▲ The Penny Farthing bicycle was built in the 1800s.

Example 2 Find the measure of a right angle.



Think: Through what fraction of a circle does a right angle turn? _____

STEP 1 Write $\frac{1}{4}$ as an equivalent fraction with 360 in the denominator.

$\frac{1}{4} = \frac{\square}{360}$ **Think:** $4 \times 9 = 36$, so $4 \times$ _____ $= 360$.

Remember
To write an equivalent fraction, multiply the numerator and denominator by the same factor.

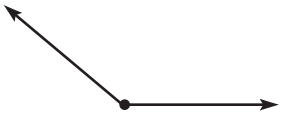
STEP 2 Write $\frac{90}{360}$ in degrees.

An angle that turns through $\frac{1}{360}$ of a circle measures _____.

An angle that turns through $\frac{90}{360}$ of a circle measures _____.

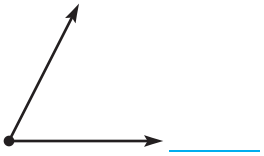
So, a right angle measures _____.

Try This! Estimate the measure of each angle using the **benchmark angles**. Benchmark angles are widely recognized angles that help you determine if your angle measurements and estimates are reasonable.

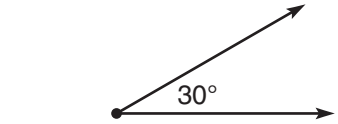
1.  _____

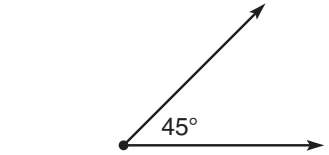
2.  _____

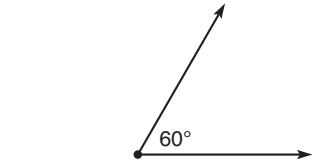
3.  _____

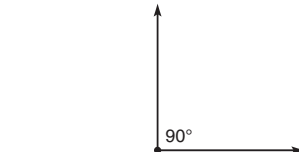
4.  _____

Benchmark Angles









Name _____

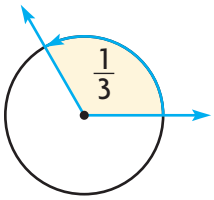
Share and Show

Math Board

1. Find the measure of the angle.

Through what fraction of a circle does the angle turn? _____

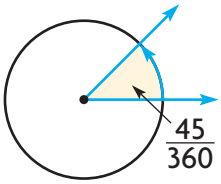
$\frac{1}{3} = \frac{\square}{360}$ **Think:** $3 \times 12 = 36$, so $3 \times$ _____ $= 360$.



So, the measure of the angle is _____.

Tell the measure of the angle in degrees.

2.



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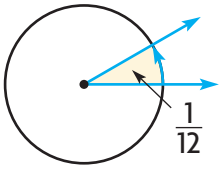
3.



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Math Talk

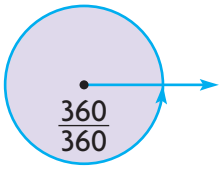
MTR 4.1 Engage in discussions on mathematical thinking.

If an angle measures 60°, through what fraction of a circle does it turn? Explain.

On Your Own

Tell the measure of the angle in degrees.

4.



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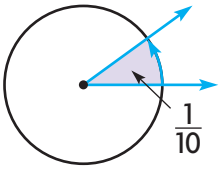
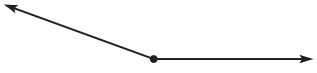


_____

Estimate the measure of each angle using benchmark angles: 30°, 45°, 60°, 90°, 180°.

6.



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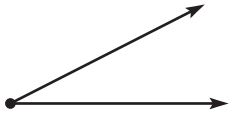
7.



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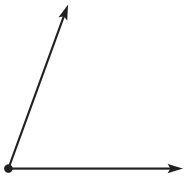
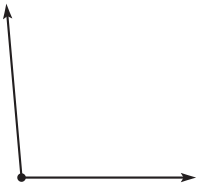
8.



_____

9.



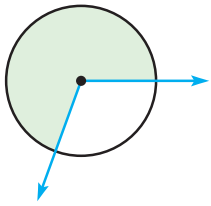
_____

10. MTR Is this an obtuse angle? Explain.

_____

_____

_____



11. Amon cut a circular pizza into 8 equal slices. He removed 2 of the slices of pizza. What is the measure of the angle made by the missing slices of pizza?

_____

Problem Solving · Applications

12. Ava started reading at 3:30 p.m. She stopped for a snack at 4:15 p.m. During this time, through what fraction of a circle did the minute hand turn? How many degrees did the minute hand turn?

MATH on the Spot

a. What are you asked to find?

b. What information can you use to find the fraction of a circle through which the minute hand turned?

c. How can you use the fraction of a circle through which the minute hand turned to find how many degrees it turned?

d. Show the steps to solve the problem.

STEP 1 $\frac{3 \times \square}{4 \times \square} = \frac{?}{360}$

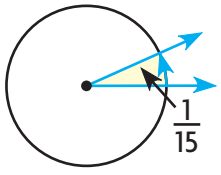
STEP 2 $\frac{3 \times 90}{4 \times 90} = \frac{\square}{360}$

e. Complete the sentences.

From 3:30 p.m. to 4:15 p.m., the minute hand made a _____ turn.

The minute hand turned _____ degrees.

13. An angle represents $\frac{1}{15}$ of a circle. Select the number to show how to find the measure of the angle in degrees.



$\frac{1}{15} = \frac{1 \times \square}{15 \times \square} = \frac{\square}{360}$

The angle measures _____.

20

24

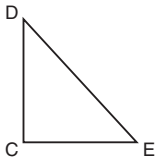
30

Name _____

Degrees

Go Online
Interactive Examples

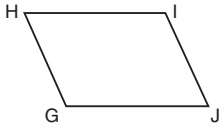
1. Sterling drew a triangle *CDE*, as shown below.



Which is the closest to the measure of $\angle D$?

○ A. 45° ○ B. 90° ○ C. 180° ○ D. 360°

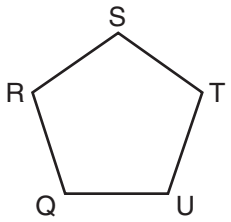
2. Colleen drew a parallelogram *GHIJ*, as shown below.



Which is the closest to the measure of $\angle G$?

○ A. 45° ○ B. 90° ○ C. 180° ○ D. 360°

3. Tillman drew a polygon *QRSTU*, as shown below.

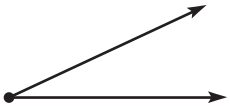


Which is the closest to the measure of $\angle T$?

○ A. 45° ○ B. 90°

○ C. 180° ○ D. 360°

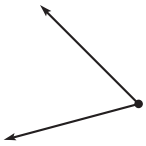
Estimate the measure of each angle using benchmark angles: 30°, 45°, 60°, 90°, 180°.

4. 

_____

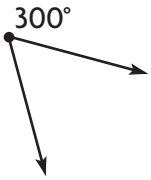
5. 

_____

6. 

_____

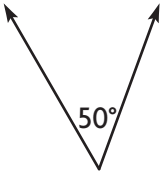
Classify the angle. Write acute, obtuse, right, reflex or straight.

7. 

_____

8. 

_____

9. 

_____

Problem Solving Real World

Ann started reading at 4:00 p.m. and finished at 4:20 p.m.

10. Through what fraction of a circle did the minute hand turn?

_____


Start


End

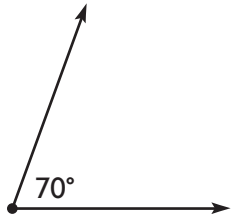
11. WRITE Math Give an example from everyday life of an angle that measures 90 degrees.

_____

_____

Lesson Check

12. What kind of angle is shown?



13. How many degrees are in an angle that turns through $\frac{1}{3}$ of a circle? What type of angle is it?

Spiral Review

14. Mae bought 15 football cards and 18 baseball cards. She separated them into 3 equal groups. How many sports cards are in each group?

15. Each part of a race is $\frac{1}{10}$ mile long. Marsha finished 5 parts of the race. How far did Marsha race?

16. Jeff said his city got $\frac{11}{3}$ inches of snow. Write this fraction as a mixed number.

17. Xia ran $\frac{3}{4}$ mile. Write the distance Xia ran as a decimal.

Name _____

Measure and Draw Angles

Florida's B.E.S.T.
- **Geometric Reasoning** 4.GR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.4.1, MTR.5.1

I Can use a protractor to measure and draw angles.

UNLOCK the Problem Real World

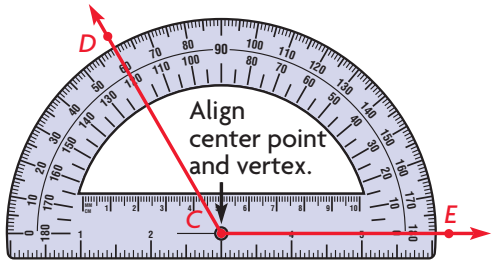
Emma wants to make a clay sculpture of her daughter as she appears in the photo from her dance recital. How can she measure $\angle DCE$, or the angle formed by her daughter's arms?

A **protractor** is a tool for measuring the size of an angle.

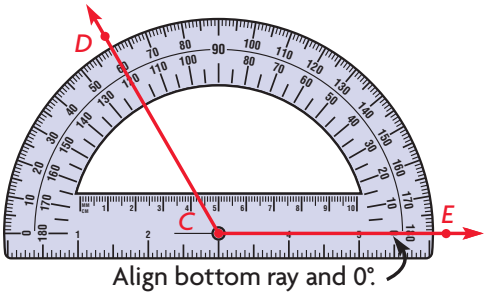
Activity **Measure $\angle DCE$ using a protractor.**

Materials ■ protractor

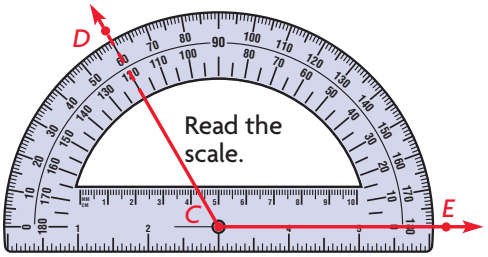
STEP 1 Place the center point of the protractor on vertex *C* of the angle.



STEP 2 Align the 0° mark on the scale of the protractor with ray *CE*.



STEP 3 Find where ray *CD* intersects the same scale. Read the angle measure on that scale. Extend the ray if you need to.



$m\angle DCE$ = _____ **Read $m\angle DCE$ as "the measure of angle *DCE*".**

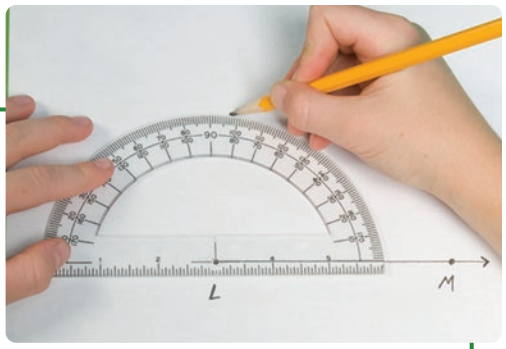
So, the angle formed by Emma's daughter's arms is _____.

Math Talk **MTR 4.1** Engage in discussions on mathematical thinking.

Can you line up either ray of the angle with the protractor when measuring? Explain.

Go Online For more help

Draw Angles You can also use a protractor to draw an angle of a given measure.



Activity

Draw $\angle KLM$ with a measure of 82°.

Materials ■ protractor

STEP 1 Use the straight edge of the protractor to draw and label ray *LM*.

STEP 2 Place the center point of the protractor on point *L*. Align ray *LM* with the 0° mark on the protractor.

STEP 3 Using the same scale, mark a point at 82°. Label the point *K*.

STEP 4 Use the straight edge of the protractor to draw ray *LK*.

Share and Show

Math Board

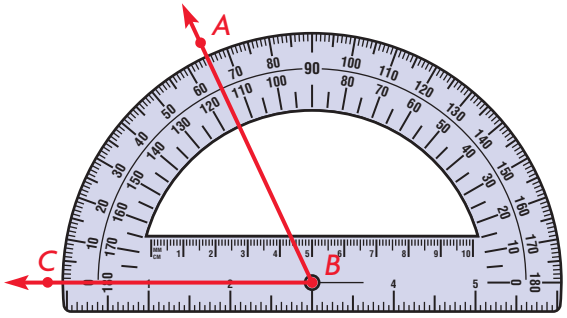
1. Measure $\angle ABC$.

Place the center of the protractor on point _____.

Align ray *BC* with _____.

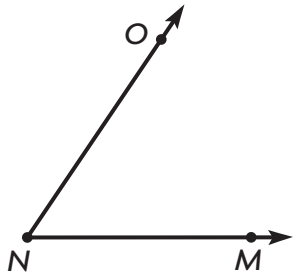
Read where _____ intersects the same scale.

So, $m\angle ABC$ is _____.



Use a protractor to find the angle measure.

2.



$m\angle ONM =$ _____

3.

$m\angle TSR =$ _____

Use a protractor to draw the angle.

4. 170°

5. 78°

Common Error

Be sure to use the correct scale on the protractor. Ask yourself: Is the measure reasonable?

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

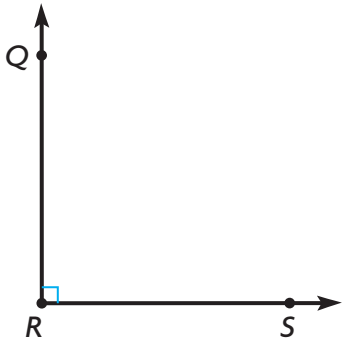
Describe how drawing and measuring angles are similar.

Name _____

On Your Own

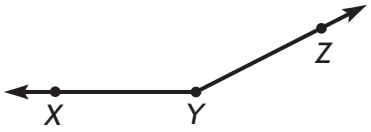
Use a protractor to find the angle measure.

6.



m∠*QRS* = _____

7.



m∠*XYZ* = _____

Use a protractor to draw the angle.

8. 115°

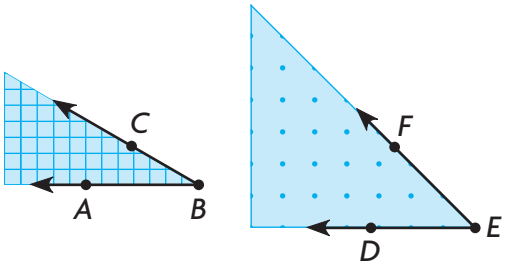
9. 67°

Draw an example of each. Label the angle with its measure.

10. an acute angle

11. an obtuse angle

12. Elizabeth is making a quilt with scraps of fabric. What is the difference between m∠*ABC* and m∠*DEF*?



_____

13. Draw an angle with a measure of 0°. Describe your drawing.

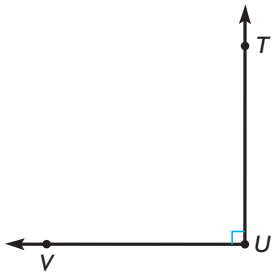
MATH on the Spot

_____

_____

Problem Solving · Applications

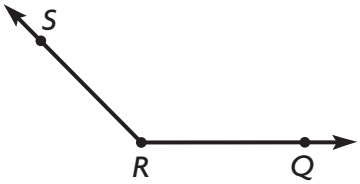
14. Hadley wants to divide this angle into three angles with equal measure. What will the measure of each angle be?



15. MTR Tracy measured an angle as 50° that was actually 130°. Explain her error.

16. Choose the word and angle measure to complete a true statement about $\angle QRS$.

$\angle QRS$ is a(n) [acute / obtuse / right] angle that has a measure of [45°. / 115°. / 135°.]



Connect to Science

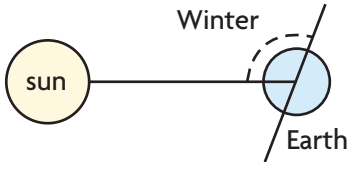
Earth's Axis

Earth revolves around the sun yearly. The Northern Hemisphere is the half of Earth that is north of the equator. The seasons of the year are due to the tilt of Earth's axis.

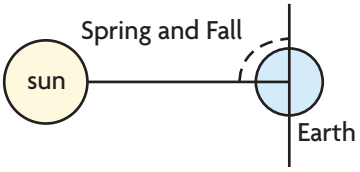
Use the diagrams and a protractor for problems 17–18.

17. In the Northern Hemisphere, Earth's axis is tilted away from the sun on the first day of winter, which is often on December 21. What is the measure of the marked angle on the first day of winter, the shortest day of the year?

Northern Hemisphere



18. Earth's axis is not tilted away from or toward the sun on the first days of spring and fall, which are often on March 20 and September 22. What is the measure of the marked angle on the first day of spring or fall?



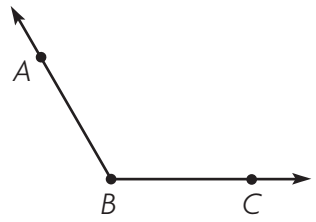
Name _____

Measure and Draw Angles

Go Online
Interactive Examples

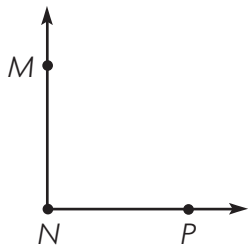
Use a protractor to find the angle measure.

1.



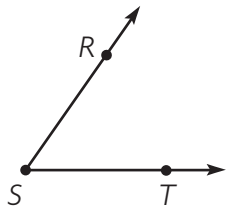
m∠*ABC* = 120°

2.



m∠*MNP* = _____

3.



m∠*RST* = _____

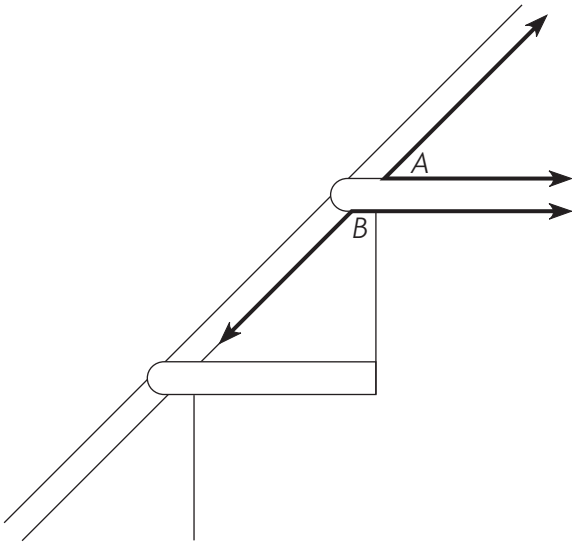
Use a protractor to draw the angle.

4. 40°

5. 170°

Problem Solving Real World

The drawing shows the angles a stair tread makes with a support board along a wall. Use your protractor to measure the angles.



6. What is the measure of ∠*A*? _____

7. What is the measure of ∠*B*? _____

8. WRITE Math Find an angle at home. Measure the angle. Record the measure. Classify the angle.

_____

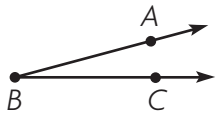
_____

_____

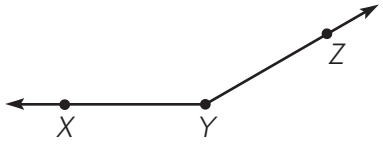
_____

Lesson Check

9. What is the measure of $\angle ABC$?



10. What is the measure of $\angle XYZ$?

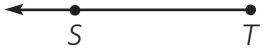


Spiral Review

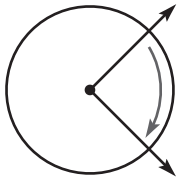
11. Dante earned $1,472 during the 4 weeks he had his summer job. If he earned the same amount each week, how much did he earn each week?

12. Arthur baked $1\frac{7}{12}$ dozen muffins. Nina baked $1\frac{1}{12}$ dozen muffins. How many dozen muffins did they bake?

13. Trisha drew the figure below. What figure did she draw?



14. Measure and describe the turn shown by the angle. Be sure to tell about the size and direction of the turn.



Name _____

Join and Separate Angles

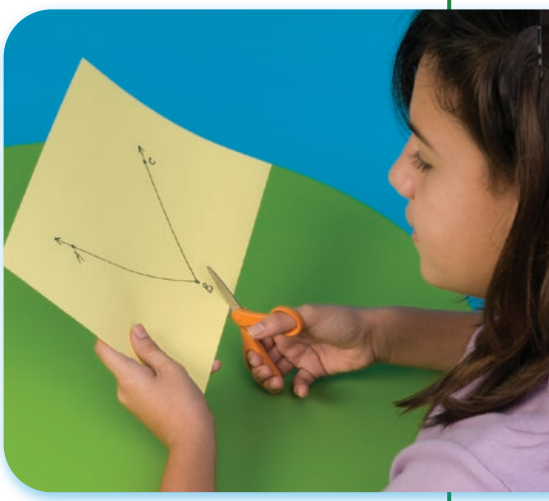
Florida's B.E.S.T.

- **Geometric Reasoning** 4.GR.1.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1

I Can determine the measure of an angle separated into parts.

Investigate

Materials ■ construction paper ■ scissors ■ protractor



A. Use construction paper. Draw an angle that measures exactly 70°. Label it $\angle ABC$.

B. Cut out $\angle ABC$.

C. Separate $\angle ABC$ by cutting it into two parts. Begin cutting at the vertex and cut between the rays.

What figures did you form? _____

D. Use a protractor to measure the two angles you formed.

Record the measures. _____

E. Find the sum of the angles you formed.

_____ + _____ = _____

part + part = whole

F. Join the two angles. Compare $m\angle ABC$ to the sum of the measures of its parts. Explain how they compare.

_____

_____

_____

_____

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

You can think of $\angle ABC$ as the whole and the two angles you formed as the parts of the whole.

Draw Conclusions

1. What if you cut $\angle ABC$ into two different angles? What can you conclude about the sum of the measures of these two angles? Explain.

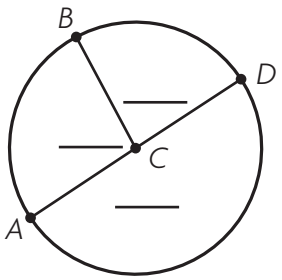
2. Seth cut $\angle ABC$ into 3 parts. Draw a model that shows two different ways he could have separated his angle.

3. Write a sentence that compares the measure of an angle to the sum of its parts.

Make Connections

Materials ■ protractor

You can write the measure of the angles shown in a circle as a sum.



STEP 1 Use a protractor to find the measure of each angle.

STEP 2 Label each angle with its measure.

STEP 3 Write the sum of the angle measures as an equation.

$$\underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad}$$

part + part + part = whole

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

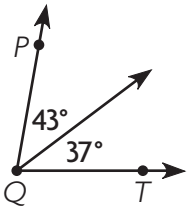
Describe the angles shown in the circle above using the words *whole* and *part*.

Name _____

Share and Show Math Board

Add to find the measure of the angle. Write an equation to record your work.

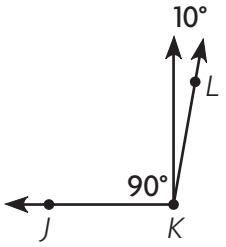
1.



_____

$m\angle PQT =$ _____

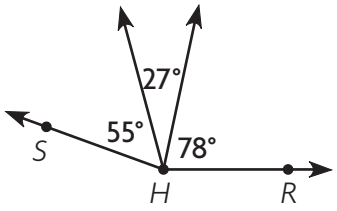
2.



_____

$m\angle JKL =$ _____

3.

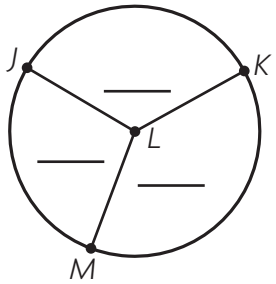


_____

$m\angle RHS =$ _____

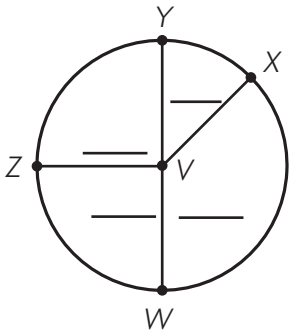
Use a protractor to find the measure of each angle. Label each angle with its measure. Write the sum of the angle measures as an equation.

4.



_____

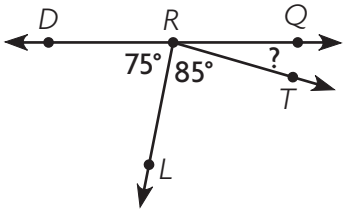
5.



_____

On Your Own Real World

6. MTR What is $m\angle QRT$?



_____

7. Look back at Problem 1. Suppose you joined an angle measuring 10° to $\angle PQT$. Draw the new angle, showing all three parts. What type of angle is formed?

_____

UNLOCK the Problem Real World

MATH on the Spot

8. Stephanie, Kay, and Shane each ate an equal-sized piece of a pizza. The measure of the angle of each piece was 45°. When the pieces were together, what is the measure of the angle they formed?

a. What are you asked to find? _____

_____

b. What information do you need to use? _____

_____

_____

c. Tell how you can use addition to solve the problem. _____

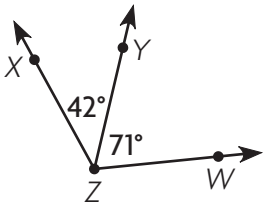
_____

_____

_____

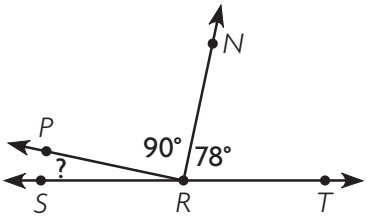
d. Complete the sentence. The three pieces of pizza formed a _____ angle.

9. What is the measure of $\angle XZW$? Write an equation to record your work.



_____

10. What is m$\angle PRS$? Use equations to explain and check your answer.



_____

_____

_____

_____

_____

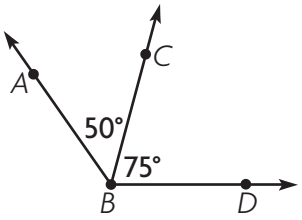
Name _____

Join and Separate Angles

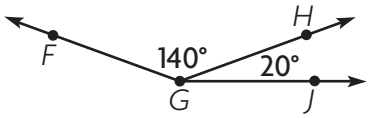
Go Online
Interactive Examples

Add to find the measure of the angle. Write an equation to record your work.

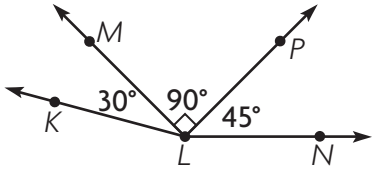
1.



2.



3.



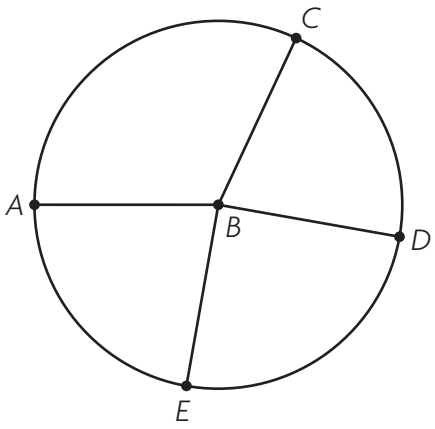
50° + 75° = 125°

m∠*ABD* = 125°

m∠*FGJ* = _____

m∠*KLN* = _____

Use a protractor to find the measure of each angle in the circle.



4. m∠*ABC* = _____

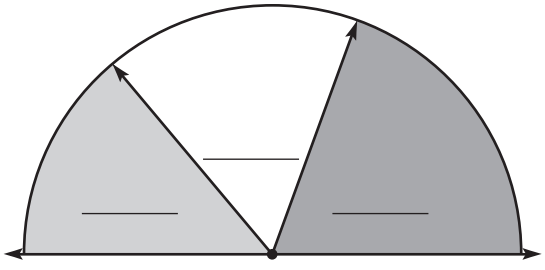
5. m∠*DBE* = _____

6. m∠*CBD* = _____

7. m∠*EBA* = _____

Problem Solving Real World

8. Ned made the design at the right. Use a protractor. Find and write the measure of each of the 3 angles.



_____

9. Write an equation to find the measure of the total angle.

_____

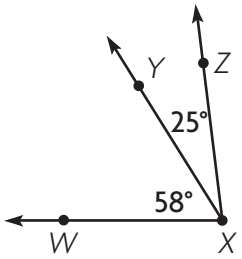
10. WRITE Math How can you use addition and subtraction to put together and separate measures of an angle and its parts?

_____

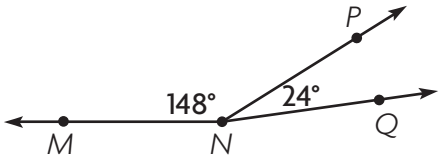
_____

Lesson Check

11. What is the measure of $\angle WXZ$?



12. Write an equation that you can use to find the m$\angle MNQ$.



Spiral Review

13. Jose bought 6 packages of envelopes. Each package contains 125 envelopes. How many envelopes did he buy?

14. Bill hiked $\frac{3}{10}$ mile on the Lake Trail. Then he hiked $\frac{5}{10}$ mile on the Rock Trail to get back to where he started. How many miles did he hike?

15. Rylan drew a quadrilateral with 4 right angles and 4 sides with the same length. What figure best describes his quadrilateral?

16. How many degrees are in an angle that turns through $\frac{3}{4}$ of a circle?

Name _____

Unknown Angle Measures

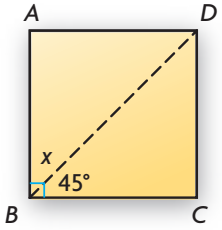
Florida's B.E.S.T.

- **Geometric Reasoning** 4.GR.1.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1

I Can solve real-world problems involving unknown whole-number angle measures using a variety of strategies.

UNLOCK the Problem Real World

Mr. Tran is cutting a piece of kitchen tile as shown at the right. He needs tiles with 45° angles to make a design. After the cut, what is the angle measure of the part left over? Can Mr. Tran use both pieces in the design?



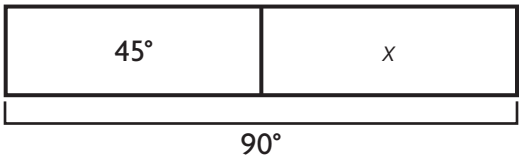
Use the graphic organizer below to solve the problem.

Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?
I need to find _____ _____	I can use the measures of the angles I know. _____ _____	I can draw a bar model and use the information to _____ _____

Solve the Problem

I can draw a bar model to represent the problem.
Then I can write an equation to solve the problem.



$m\angle ABD + m\angle CBD = m\angle ABC$

$x +$ _____ $=$ _____

$x =$ _____

The $m\angle ABD =$ _____.

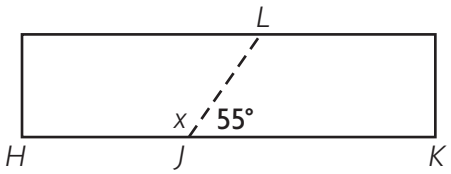
Since both tiles measure _____, Mr. Tran can use both pieces in the design.

Math Talk MTR 4.1 Engage in discussions on mathematical thinking.

What other equation can you write to solve the problem? Explain.

Try Another Problem

Marisol is building a frame for a sandbox, but the boards she has are too short. She must join two boards together to build a side as shown. At what angle did she cut the first board?



Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?

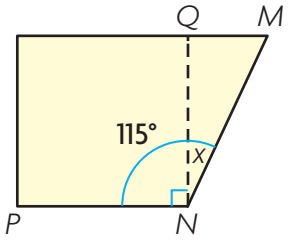
Solve the Problem

- Explain how you can check the answer to the problem.

Name _____

Share and Show Math Board

1. Laura cuts a square out of scrap paper as shown. What is the angle measure of the piece left over?



First, draw a bar model to represent the problem.

Next, write the equation you need to solve.

_____

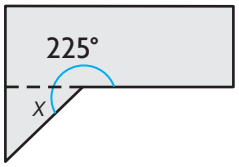
_____

Last, find the angle measure of the piece left over.

$m\angle MNQ =$ _____

So, the angle measure of the piece left over is _____.

2. Jackie trimmed a piece of scrap metal to make a straight edge as shown. What is the measure of the piece she trimmed off?

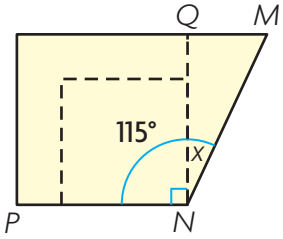


_____

On Your Own

MATH on the Spot

3. What if Laura cut a smaller square as shown? Would $m\angle MNQ$ be different? Explain.

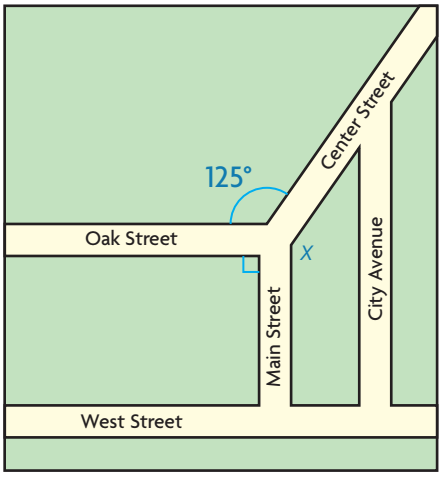


_____

_____

_____

4. The map shows Marco's paper route. When Marco turns right onto Center Street from Main Street, what degree turn does he make? **Hint:** Draw a dashed line to extend Oak Street to form a 180° angle.



_____

Problem Solving · Applications

5. MTR Two angles form a straight angle. One angle measures 89°. What is the measure of the other angle? Explain.

6. Look back at Problem 5. Write a similar problem about two angles that form a right angle.

7. Three angles have a combined measure of 285°. Two of the angles measure 75°and 120°. Write an equation to find the measure of the third angle.

8. Look back at Problem 7. Suppose Kya adds a fourth angle so the combined measure is 310°. Is the measure of the fourth angle less than or greater than the measure of the third angle? Explain.

9. It measures greater than 0° and less than 90°.

10. Two angles, $\angle A$ and $\angle B$, form a straight angle. $\angle A$ measures 65°. For numbers 10a–10c, select True or False for the statement.

10a.	$\angle B$ is an acute angle.	○ True	○ False
10b.	The equation $180° - 65° = x°$ can be used to find the measure of $\angle B$.	○ True	○ False
10c.	The measure of $\angle B$ is 125°.	○ True	○ False

Show the Math

Demonstrate Your Thinking

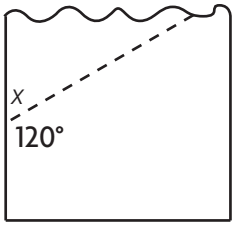
Name _____

Unknown Angle Measures

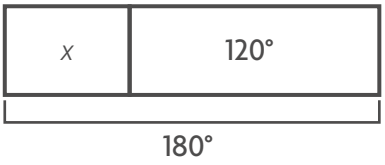
Go Online
Interactive Examples

Solve each problem. Draw a diagram to help.

1. Wayne is building a birdhouse. He is cutting a board as shown. What is the angle measure of the piece left over?



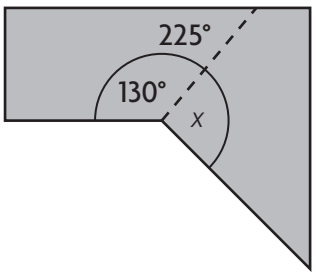
Draw a bar model to represent the problem.



$x + 120° = 180°$
$x = 180° - 120°$
$x = 60°$

60°

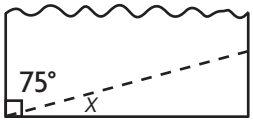
2. An artist is cutting a piece of metal as shown. What is the angle measure of the piece left over?



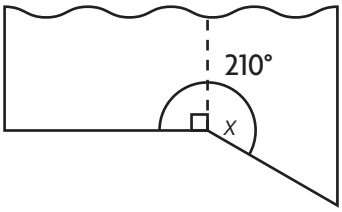
3. WRITE Math Give one example of when you would draw a diagram to solve an angle measurement problem.

Lesson Check

4. Angelo cuts a triangle from a sheet of paper as shown. What is the measure of $\angle x$ in the triangle?



5. Cindy cuts a piece of wood as shown. What is the angle measure of the piece left over?



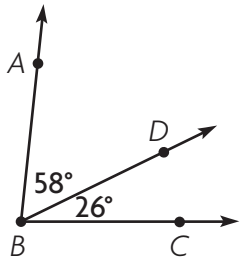
Spiral Review

6. Tyronne worked 21 days last month. He earned $79 each day. How much did Tyronne earn last month?

7. Meg inline skated for $\frac{7}{10}$ mile. Write this distance as a decimal.

8. Kerry ran $\frac{3}{4}$ mile. Sherrie ran $\frac{1}{2}$ mile. Marcie ran $\frac{2}{3}$ mile. List the friends in order from who ran the least distance to who ran the greatest distance.

9. What is the measure of $\angle ABC$?

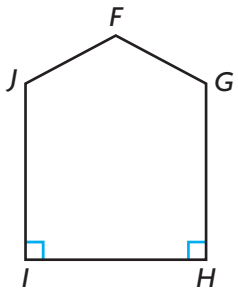


Name _____

Chapter 14

Chapter Review

1. Tell whether each angle is acute, right, or obtuse.



$\angle F$ is _____

$\angle G$ is _____

$\angle H$ is _____

2. Match the measure of each $\angle C$ with the measure of $\angle D$ that forms a straight angle.

$\angle C$	$\angle D$
	145°
122°	75°
35°	148°
62°	58°
105°	55°
	118°

3. Katie drew an obtuse angle. Which could be the measure of the angle she drew? Mark all that apply.

Ⓐ 35°

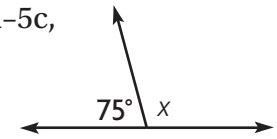
Ⓑ 157°

Ⓒ 180°

Ⓓ 92°

4. Using the ray, draw another ray with the same vertex to create a right angle.

5. Renee drew the figure shown. For Problems 5a–5c, choose Yes or No to tell whether the statement is true.

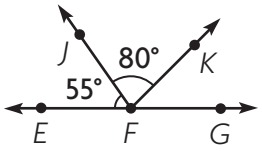


5a. The measure of a straight angle is 180°. ○ Yes ○ No

5b. To find the measure of x, Renee can subtract 75° from 180°. ○ Yes ○ No

5c. The measure of x is 115°. ○ Yes ○ No

6. Trey drew this figure with a protractor.



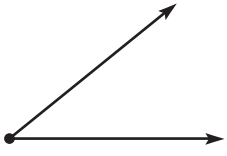
Part A

Write an equation that can be used to find m∠*KFG*.

Part B

What is the measure of ∠*KFG*? Describe how you solved the equation and how you can check your answer.

7. Use a protractor to find the measure of the angle. Classify it.

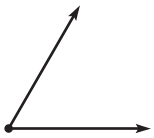


The angle measures _____.

It is a/an _____ angle.

Name _____

8. Alex drew this angle.
Which describes the angle?
Mark all that apply.



Ⓐ right angle

Ⓑ less than 90°

Ⓒ acute angle

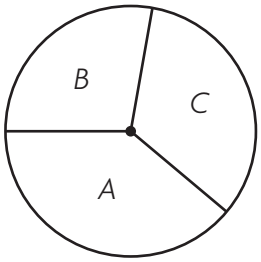
Ⓓ more than 90°

9. Describe the angle shown in the image. How would you classify it?

_____

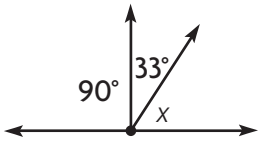
_____

10. Use a protractor to find the measure of each angle. Write each angle and its measure in a box ordered by the measure of the angles from least to greatest.



Angle: _____ Measure:	Angle: _____ Measure:	Angle: _____ Measure:

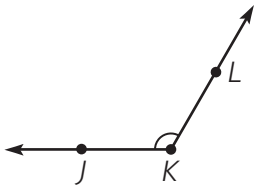
11. Use numbers and symbols on the tiles to write an equation that can be used to find the measure of the unknown angle.



33°	45°	90°	180°
x	=	+	×

What is the measure of the unknown angle? _____

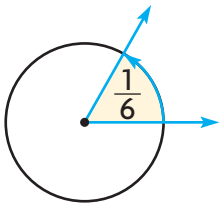
12. Choose the word and angle measure to complete a true statement about $\angle JKL$.



$\angle JKL$ is a(n) [acute / obtuse / right] angle that has a measure of [60° / 120° / 135°].

13. Circle at least one acute, obtuse, straight, and right angle in the picture. Choose two to explain how you can use benchmark angles to estimate angle size.

14. An angle turns through $\frac{1}{6}$ of a circle. What is the measure of the angle?



_____

15. Write the letter for each angle measure in the correct box.

(A) 125° (B) 90° (C) 180° (D) 30° (E) 45° (F) 95°

acute	obtuse	right	straight

Name _____

16. For Problems 16a and 16b, circle the words that make a true statement about the figure.

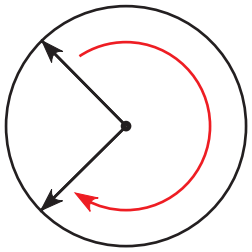


Figure 1

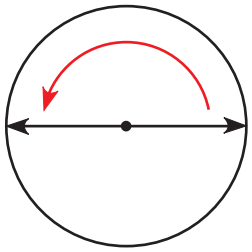
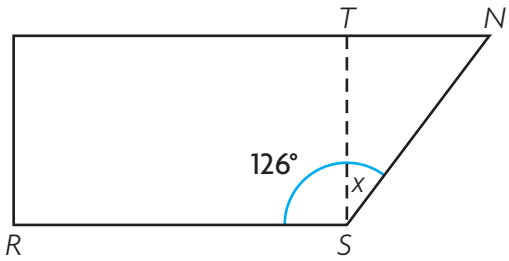


Figure 2

16a. Figure 1 is [an acute / an obtuse / a reflex / a right / a straight] angle.

16b. Figure 2 is [an acute / an obtuse / a reflex / a right / a straight] angle.

17. Melanie cuts a rectangle out of a piece of scrap paper as shown. She wants to calculate the angle measure x of the piece that is left over.



Part A

Draw a bar model to represent the problem.

Part B

Write and solve an equation to find x.

The angle measures _____.

18. Two angles, $\angle A$ and $\angle B$, form a right angle. $\angle A$ measures 32°. For Problems 18a–18c, choose True or False for the statement.

18a. $\angle B$ is an acute angle. ○ True ○ False

18b. The equation $180° - 32° = x$ can be used to find the measure of $\angle B$. ○ True ○ False

18c. The measure of $\angle B$ is 58°. ○ True ○ False

19. A circle is divided into parts. Which sum could represent the angle measures that make up the circle? Mark all that apply.

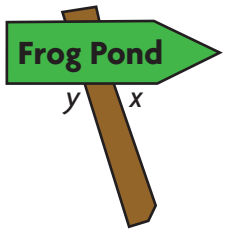
Ⓐ $120° + 120° + 120° + 120°$

Ⓑ $25° + 40° + 80° + 105° + 110°$

Ⓒ $33° + 82° + 111° + 50° + 84°$

Ⓓ $40° + 53° + 72° + 81° + 90° + 34°$

20. Use a protractor to find the measures of the unknown angles.



$m\angle x =$ _____ $m\angle y =$ _____

What do you notice about the measures of the unknown angles? Is this what you would have expected? Explain your reasoning.