Lesson 3
Triangles

What You'll Learn

Scan the lesson. List two headings you would use to make an outline of the lesson.

- _____
- _____

Essential Question

HOW does geometry help us describe real-world objects?

Vocabulary

acute triangle
right triangle
obtuse triangle
scalene triangle
isosceles triangle
equilateral triangle
triangle
congruent segments

Math Symbols

△

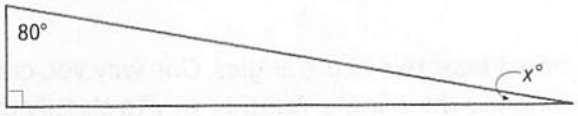
Common Core State Standards

Content Standards
7.G.2

Mathematical Practices
1, 2, 3, 4

Real-World Link

Ramps Julia practices jumping on a ski ramp. The front of the ramp is a triangle like the one shown below.



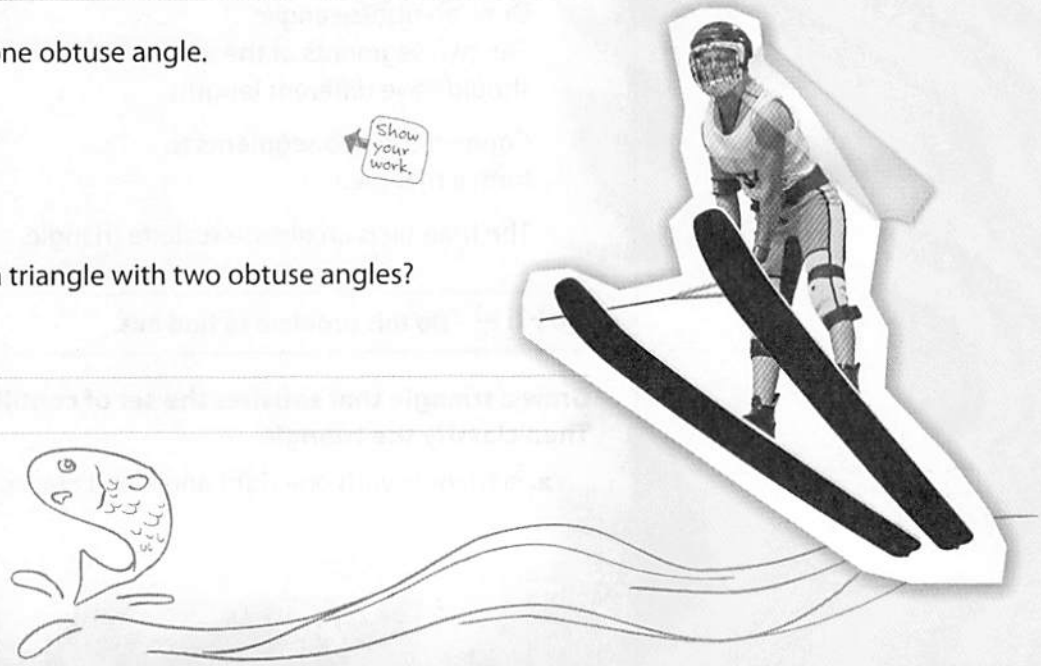
1. Draw an X through the type of angle that is not shown in the triangle.

   right acute obtuse

2. Measure the unkown angle. Describe the relationship between the 80° angle and the unknown angle.

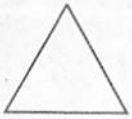
3. Draw a triangle with one obtuse angle.

4. Is it possible to draw a triangle with two obtuse angles? Explain.



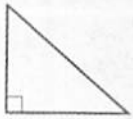
Key Concept

Classify Triangles



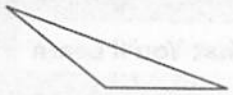
all acute angles

acute triangle



1 right angle

right triangle



1 obtuse angle

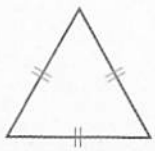
obtuse triangle

no congruent sides

scalene triangle

at least 2 congruent sides

isosceles triangle



3 congruent sides

equilateral triangle

A **triangle** is a figure with three sides and three angles. The symbol for triangle is $\triangle$.

Every triangle has at least two acute angles. One way you can classify a triangle is by using the third angle. Another way to classify triangles is by their sides. Sides with the same length are **congruent segments**.

Work Zone

Congruent Segments

The tick marks on the sides of the triangle indicate that those sides are congruent.

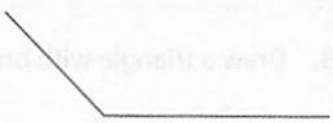
Example

Tutor

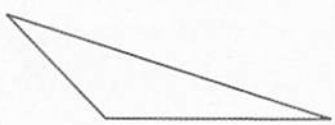
1. Draw a triangle with one obtuse angle and no congruent sides. Then classify the triangle.

Show your work.

Draw an obtuse angle.
The two segments of the angle should have different lengths.



Connect the two segments to form a triangle.



The triangle is an obtuse scalene triangle.

Got It? Do this problem to find out.

Draw a triangle that satisfies the set of conditions below. Then classify the triangle.

a. a triangle with one right angle and two congruent sides

a. _____

Example

Watch Tutor

2. **Classify the triangle on the house by its angles and by its sides.**

The triangle has one obtuse angle and two congruent sides. So, it is an obtuse isosceles triangle.

Got It? **Do this problem to find out.**

b. Classify the triangle shown by its angles and by its sides.

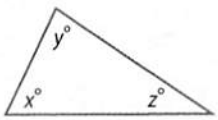
b. _____

STOP and Reflect

How would you classify a triangle with a right angle and two congruent sides?

Angles of a Triangle

Key Concept

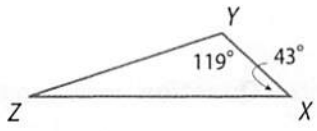
Words	The sum of the measures of the angles of a triangle is 180°.	**Model**	
Algebra	$x + y + z = 180$		

You can write and solve an equation to find the missing angle measure of a triangle.

Example

Tutor

3. **Find $m\angle Z$.**



The sum of the angle measures in a triangle is 180°.

$m\angle Z + 43° + 119° = 180°$ Write the equation.

$m\angle Z + 162° = 180°$ Simplify.

$-162° = -162°$ Subtract 162° from each side.

$m\angle Z = 18°$

So, $m\angle Z$ is 18°.

Got It? **Do this problem to find out.**

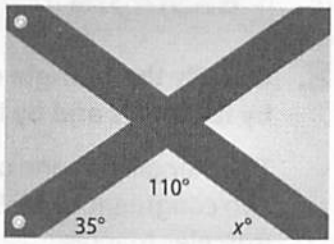
c. In $\triangle ABC$, if $m\angle A = 25°$ and $m\angle B = 108°$, what is $m\angle C$?

c. _____

Example

Tutor

4. **The Alabama state flag is shown. What is the missing measure in the triangle?**



To find the missing measure, write and solve an equation.

$$\begin{aligned} x + 110 + 35 &= 180 && \text{The sum of the measures is 180.} \\ x + 145 &= 180 && \text{Simplify.} \\ -145 &= -145 && \text{Subtract 145 from each side.} \\ \hline x &= 35 \end{aligned}$$

The missing measure is 35°.

Guided Practice

Check

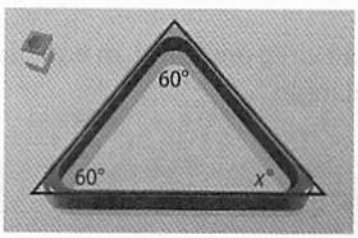
1. Draw a triangle with three acute angles and two congruent sides. Classify the triangle.

(Examples 1 and 2)

Show your work.

2. Find $m\angle T$ in $\triangle RST$ if $m\angle R = 37°$ and $m\angle S = 55°$. (Example 3)

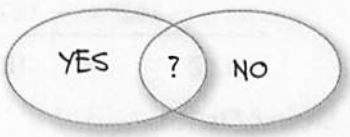
3. A triangle is used in the game of pool to rack the pool balls. Find the missing measure of the triangle. (Example 4)



4. **Building on the Essential Question** How can triangles be classified?

Rate Yourself!

Are you ready to move on? Shade the section that applies.



For more help, go online to access a Personal Tutor.

Tutor

FOLDABLES Time to update your Foldable!

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Draw a triangle that satisfies each set of conditions. Then classify the triangle. (Example 1)

1. a triangle with three acute angles and three congruent sides

2. a triangle with one right angle and no congruent sides

Show your work.

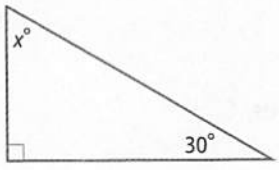
Classify the marked triangle by its angles and by its sides. (Example 2)

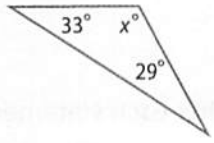
3. 

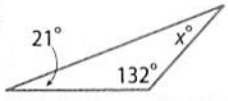
4. 

5. 

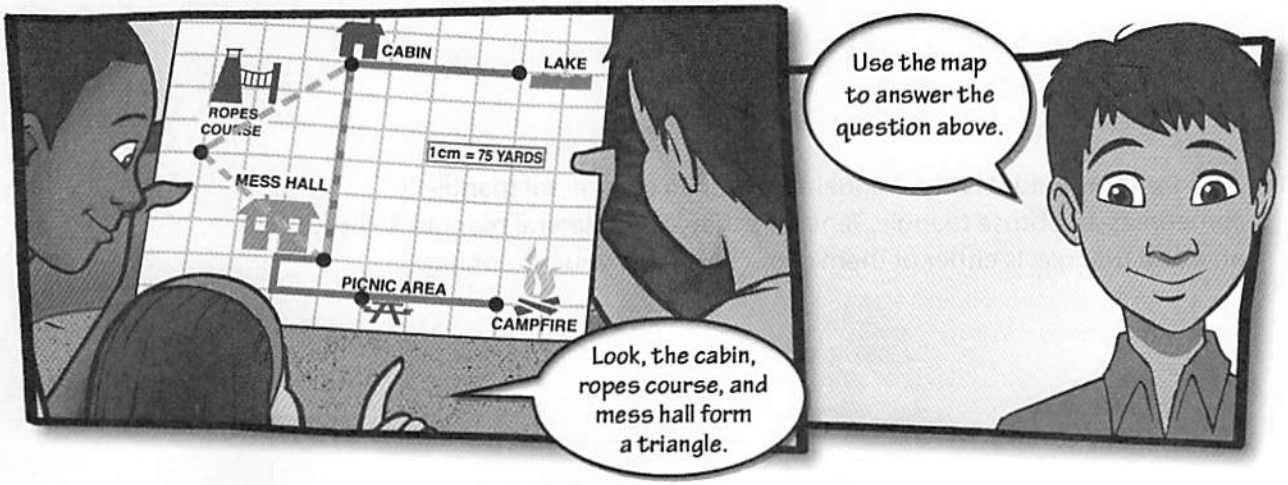
Find the value of x. (Examples 3 and 4)

6. 

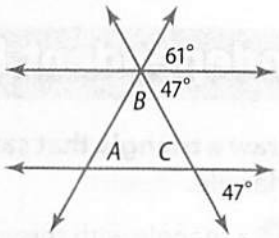
7. 

8. 

9. CCSS **Model with Mathematics** Refer to the graphic novel below. Classify the triangle formed by the cabin, ropes course, and mess hall by its angles and sides.

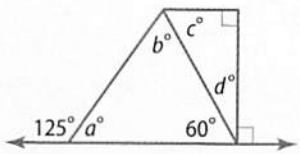


10. Triangle *ABC* is formed by two parallel lines and two other intersecting lines. Find the measure of each angle *A*, *B*, and *C* of the triangle.



H.O.T. Problems Higher Order Thinking

11. CCSS **Persevere with Problems** Apply what you know about triangles to write and solve equations to find the missing angle measures in the figure.



12. CCSS **Model with Mathematics** Draw an acute scalene triangle. Describe the angles and sides of the triangle.

13. CCSS **Justify Conclusions** Determine whether each statement is *sometimes*, *always*, or *never* true. Justify your answer.

a. It is possible for a triangle to have two right angles.

b. It is possible for a triangle to have two obtuse angles.

14. CCSS **Reason Inductively** Miguel says that an equilateral triangle is sometimes an obtuse triangle. Jane says that an equilateral triangle is always an acute triangle. Is either of them correct? Explain your reasoning.

Name _____ My Homework _____

Extra Practice

Classify the marked triangle in each object by its angles and by its sides.

15.

Homework Help

The triangle has all acute angles and two congruent sides. It is an acute isosceles triangle.

16.

_____

17.

_____

Draw a triangle that satisfies each set of conditions. Then classify the triangle.

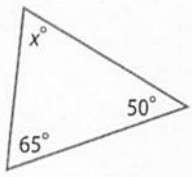
18. a triangle with three acute angles and no congruent sides _____

Show your work.

19. a triangle with one obtuse angle and two congruent sides _____

Find the value of *x*.

20.



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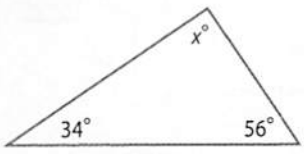

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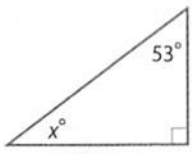
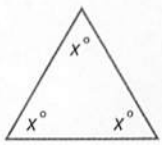


_____

23. Find $m\angle Q$ in $\triangle QRS$ if $m\angle R = 25°$ and $m\angle S = 102°$. _____

CCSS Reason Abstractly **Find the value of *x* in each triangle.**

24.



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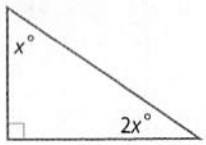

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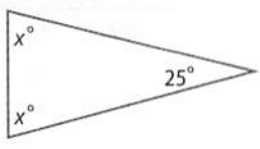

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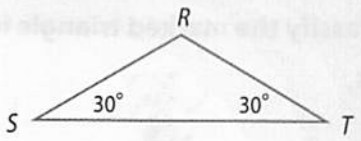
Think Smart for Smarter Balanced

27. Refer to the figure shown. Determine if each statement is true or false.



a. To find $m\angle R$, subtract 30° from 90°. ☐ True ☐ False

b. The measure of $\angle R$ is 120°. ☐ True ☐ False

c. Triangle *RST* is an acute triangle. ☐ True ☐ False

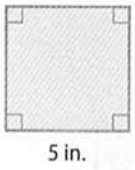
28. In a right triangle, the measure of one of the angles is 43°. Sketch a diagram to represent this situation.

What is the measure of the other angle? ☐

CCSS Common Core Spiral Review

Find the area of each figure. 6.G.1

29.



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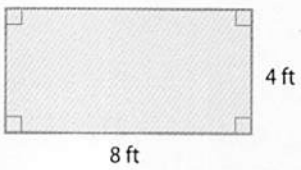

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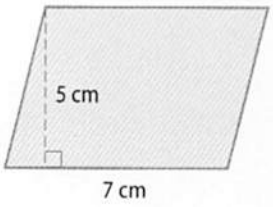

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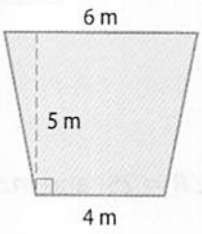

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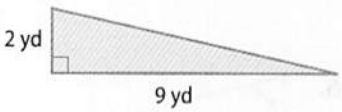

34.