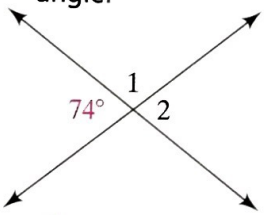
7-3 Congruent Figures

Check Skills You'll Need

1. **Vocabulary Review** *Congruent angles* have ? measures.
2. Find the measure of each numbered angle.



GO for Help Lesson 7-1

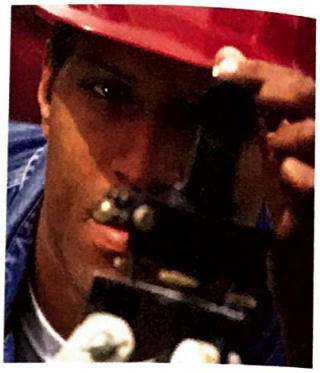
CONTENT STANDARD
8.G.2

What You'll Learn

To identify congruent figures and use them to solve problems

New Vocabulary congruent polygons

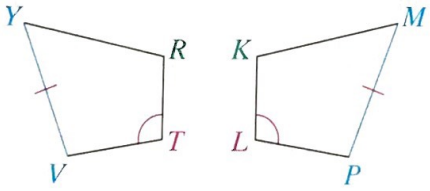
Why Learn This?



Land surveyors measure angles and distances on land. To do so, they may use congruent polygons.

Congruent polygons are polygons that have the same size and shape. The symbol ≅ means "is congruent to." When two polygons are congruent, you can slide, flip, or turn one so that it fits exactly on top of the other one.

Corresponding angles and corresponding sides of congruent polygons are congruent. The two polygons below are congruent.



$\angle T$ corresponds to $\angle L$.

$\overline{YV}$ corresponds to $\overline{MP}$.

R corresponds to K.

You can write $VTRY \cong PLKM$.

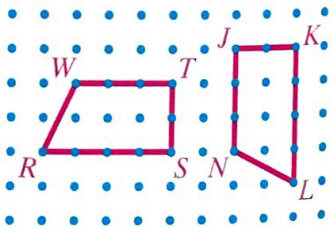
The tick marks in the diagram tell you which sides are congruent. The arcs tell you which angles are congruent. When you name congruent polygons, you must list the corresponding vertices in the same order.

EXAMPLE 1 Writing Congruence Statements

Test Prep Tip

Before you write congruence statements, copy the figures and mark the congruent corresponding parts.

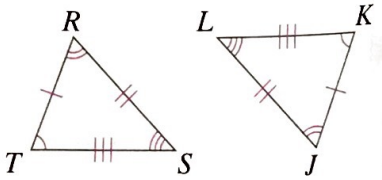
Write a congruence statement for the congruent figures at the right.



$\angle R \cong \angle L$, $\angle S \cong \angle K$, $\angle T \cong \angle J$, and $\angle W \cong \angle N$. So $RSTW \cong LKJN$.

Quick Check

1. Write a congruence statement for the congruent figures at the right.

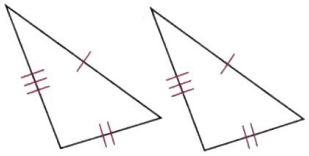


You can use corresponding parts of triangles to show that two triangles are congruent. You do not need to know that *all* the corresponding parts are congruent to show the triangles are congruent. You can show congruence in several ways.

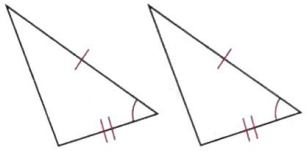
KEY CONCEPTS **Showing Triangles Are Congruent**

To demonstrate that two triangles are congruent, show that the following parts of one triangle are congruent to the corresponding parts of the other triangle.

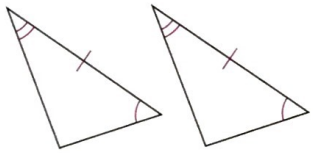
Side-Side-Side (SSS)



Side-Angle-Side (SAS)



Angle-Side-Angle (ASA)



Vocabulary Tip

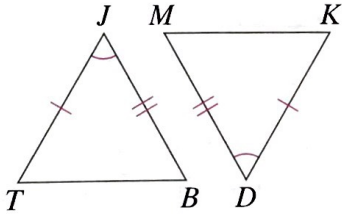
The abbreviations SSS, SAS, and ASA are easy ways to remember how to show triangles are congruent.

The order of the angles and sides is important in deciding whether two triangles are congruent.

EXAMPLE **Congruent Triangles**

2 Show that each pair of triangles is congruent.

a.



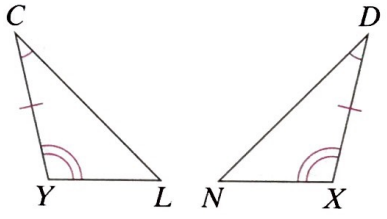
$\overline{TJ} \cong \overline{KD}$ Side

$\angle J \cong \angle D$ Angle

$\overline{BJ} \cong \overline{MD}$ Side

$\triangle TJB \cong \triangle KDM$ by SAS.

b.



$\angle C \cong \angle D$ Angle

$\overline{CY} \cong \overline{DX}$ Side

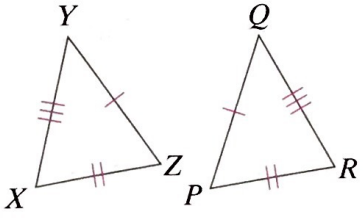
$\angle Y \cong \angle X$ Angle

$\triangle CYL \cong \triangle DXN$ by ASA.

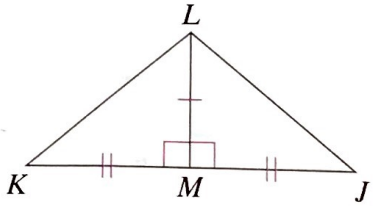
Quick Check

2. Show that each pair of triangles is congruent.

a.



b.



You can use corresponding parts of congruent figures to find distances.

EXAMPLE 3 Application: Surveying

Vocabulary Tip

The notation AB means the length of $\overline{AB}$.

A surveyor drew the picture below. A bridge will be built across the river from point A to point B. Show that the two triangles are congruent. Then find AB.

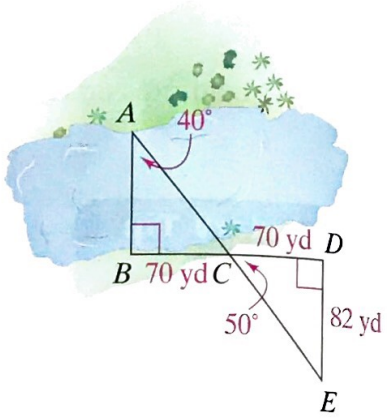
$\angle B \cong \angle D$ ← Both are right angles.

$BC = DC$ ← Both measure 70 yd.

$\angle ACB \cong \angle ECD$ ← They are vertical angles.

So $\triangle ABC \cong \triangle EDC$ by ASA.

Corresponding parts of congruent triangles are congruent. $\overline{AB}$ corresponds to $\overline{ED}$, so AB is 82 yd.



Quick Check

3. Use the diagram in Example 3 to find each measure.

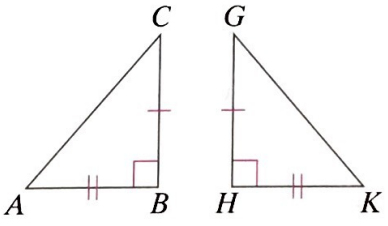
   a. $m\angle E$ b. $m\angle ACB$

Check Your Understanding

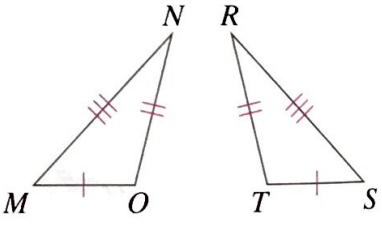
1. **Vocabulary** What two characteristics do congruent polygons have in common?
2. Is the following statement *true* or *false*? When two polygons are congruent, you can slide, flip, or turn one so that it fits on top of the other one.

State whether each pair of triangles is congruent by SSS, SAS, or ASA.

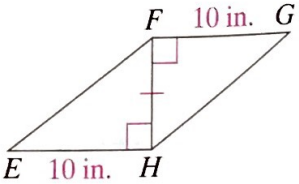
3.



4.



Use the two congruent triangles below for Exercises 5 and 6.



5. List the congruent corresponding angles and sides of the two triangles.
6. **Error Analysis** Vanessa writes $\triangle EFH \cong \triangle GFH$ by ASA. Michael writes $\triangle EFH \cong \triangle GHF$ by SAS. Who is correct?

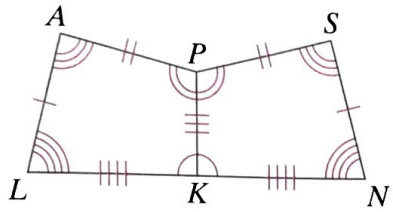
Homework Exercises

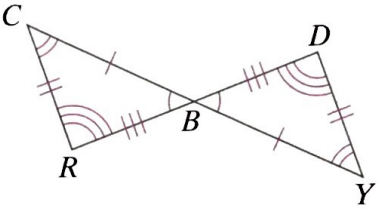
For more exercises, see Extra Skills and Word Problems.

GO for Help

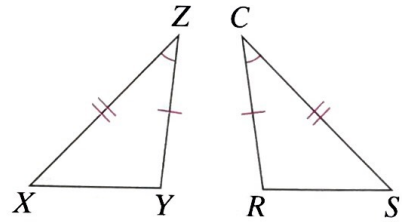
For Exercises	See Examples
7–8	1
9–10	2
11–18	3

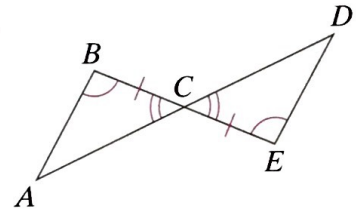
Write a congruence statement for each pair of congruent figures.

7. 

8. 

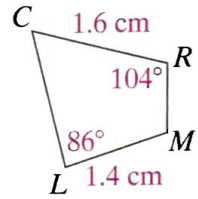
Show that each pair of triangles is congruent.

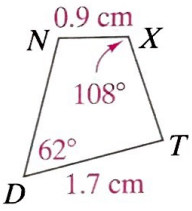
9. 

10. 

In the diagram below, $LMRC \cong TXND$. Find each measure.

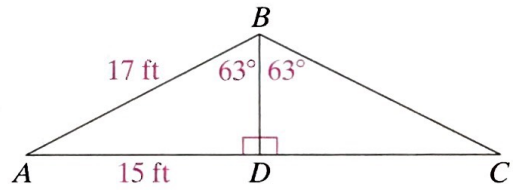
11. $m\angle N$
12. $m\angle T$
13. RM
14. ND
15. $m\angle C$
16. $m\angle M$
17. XT
18. CL





GPS

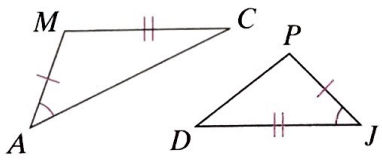
19. **Guided Problem Solving** A truss is a support structure made up of triangular units. Trusses are commonly used to strengthen roofs and bridges.

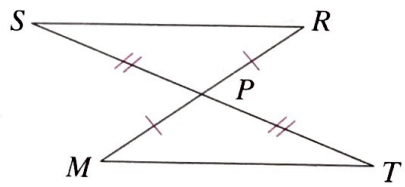


The diagram at the right shows a truss for a roof. What is the length of $\overline{AC}$?

- You know that $\triangle ABD \cong \triangle CBD$ by ▩.
- Because congruent parts of congruent triangles are congruent, the length of $\overline{DC}$ is ▩, which means that the length of $\overline{AC}$ is ▩.

Is each pair of triangles congruent? Explain.

20. 

21. 

22. **Writing in Math** Are all squares congruent to each other? Explain. Use the terms *corresponding sides* and *corresponding angles* in your explanation.

23. **Reasoning** Can you show that two triangles are congruent by Angle-Angle-Angle? Draw figures to support your answer.

GO Online
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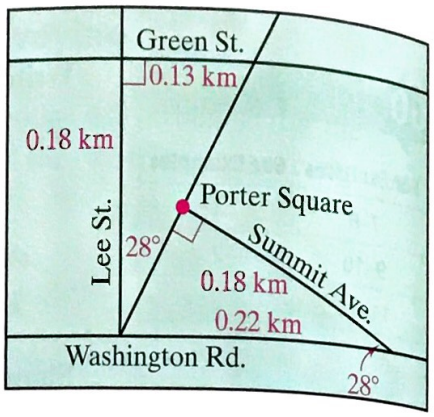
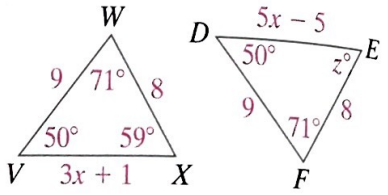
Maps **Use the map at the right for Exercises 24–27.**



24. Show that the triangles in the map are congruent.
25. Copy the triangles. Mark the sides and angles to show congruent corresponding parts.
26. How far is Porter Square from the intersection of Lee Street and Washington Road?
27. Find the distance along the road from Porter Square to Green Street.
28. **Challenge** Show that the two triangles at the right are congruent. Then find the missing measures.

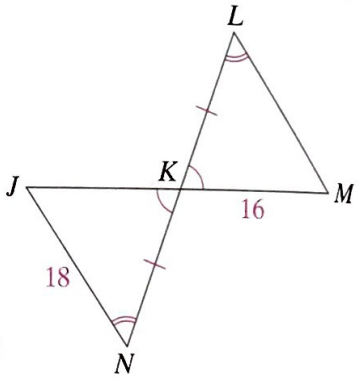


Test Prep and Mixed Review

Practice

Multiple Choice

29. Based on the figure at the right, which statement about JK is correct?



Ⓐ $JK = JN$ Ⓒ $JK = LM$
Ⓑ $JK > JN$ Ⓓ $JK < LM$

30. The volume of Earth's oceans is approximately 1.335×10^9 cubic kilometers, and each cubic kilometer of ocean water holds about 1.3×10^4 grams of dissolved gold. If the price of gold is \$50.60 per gram, about how much is the dissolved gold in the oceans worth?

Ⓕ \$70 billion Ⓗ \$20 trillion
Ⓖ \$300 billion Ⓙ \$900 trillion

31. A flower bed is shaped like a right triangle with legs that measure 8 ft and 8 ft. What is the perimeter of the flower bed to the nearest foot?

Ⓐ 11 ft Ⓑ 24 ft Ⓒ 27 ft Ⓓ 32 ft

For each pair of linear functions, determine which has the greater rate of change.

32. $2y - 3x = 8$;

x	2	4	6	8
y	7	11	15	19

33. $y = 4 + x$;

x	3	6	9	12
y	1	2	3	4

34. $y = 5x + 3$;

x	−4	−2	0	2
y	−30	−18	−6	6

35. $2y = x - 3$;

x	0	8	16	24
y	3	5	7	9

GO for Help

For Exercises	See Lesson
32–35	4-4