


7-3

Congruent Figures

What You'll Learn

To identify congruent figures and use them to solve problems

 **New Vocabulary** congruent polygons

 **CONTENT STANDARDS**

8.G.2

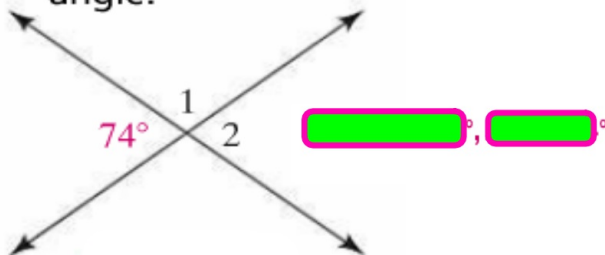
You will need your Evernote notes today.
Call the notes "Congruent Figures"

Check Skills You'll Need

1. Vocabulary Review

Congruent angles
have ? measures.

2. Find the measure of each numbered angle.



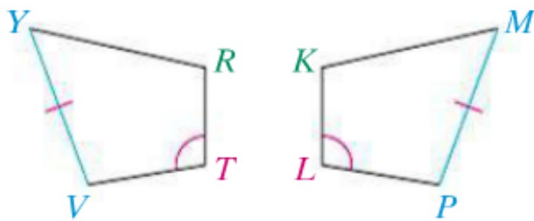
Why Learn This?

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 \cong 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 .

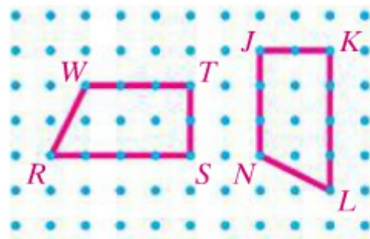
You can write $VTRY \cong PLKM$.

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 Writing Congruence Statements

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

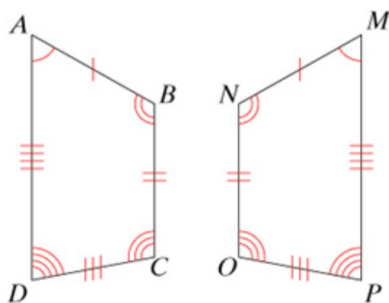
$\angle R \cong \angle L$, $\angle S \cong \angle K$, $\angle T \cong \angle J$, and $\angle W \cong \angle N$. So $RSTW \cong LKJN$.



Test Prep Tip

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

- 1 EXAMPLE In the diagram below, list the congruent parts of the two figures. Then write a congruence statement.



Congruent Angles

$\angle A \cong \angle M$
 $\angle B \cong \angle N$
 $\angle C \cong \angle O$
 $\angle D \cong \angle P$

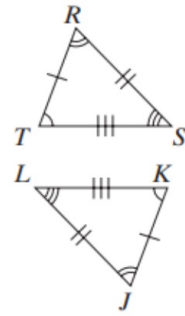
Congruent Sides

$\overline{AB} \cong \overline{MN}$
 $\overline{BC} \cong \overline{NO}$
 $\overline{CD} \cong \overline{OP}$
 $\overline{DA} \cong \overline{PM}$

Since $\angle A$ corresponds to $\angle M$, $\angle B$ corresponds to $\angle N$, $\angle C$ corresponds to $\angle O$, and $\angle D$ corresponds to $\angle P$, a congruence statement is $ABCD \cong MNOP$.

Quick Check

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



Use evernote & take a picture of this page

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.

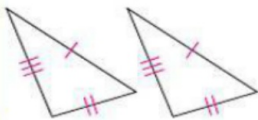
Vocabulary Tip

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

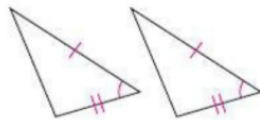
KEY CONCEPTS Showing Triangles Are Congruent

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.

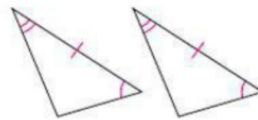
**Side-Side-Side
(SSS)**



**Side-Angle-Side
(SAS)**



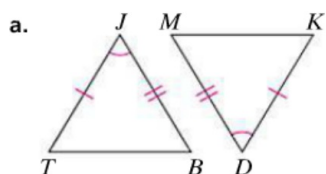
**Angle-Side-Angle
(ASA)**



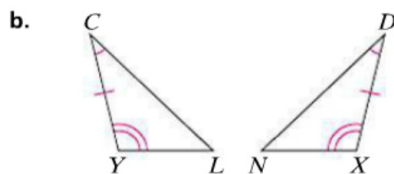
The order of the angles and sides is important in deciding whether two triangles are congruent.

EXAMPLE Congruent Triangles

2 Show that each pair of triangles is congruent.

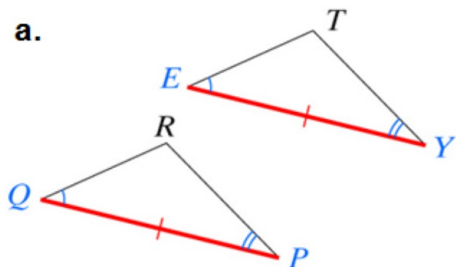


$$\begin{aligned} \overline{TJ} &\cong \overline{KD} && \text{Side} \\ \angle J &\cong \angle D && \text{Angle} \\ \overline{JB} &\cong \overline{MD} && \text{Side} \\ \triangle TJB &\cong \triangle KDM && \text{by SAS.} \end{aligned}$$

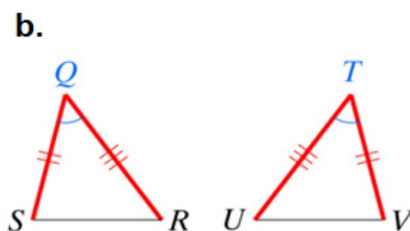


$$\begin{aligned} \angle C &\cong \angle D && \text{Angle} \\ \overline{CY} &\cong \overline{DX} && \text{Side} \\ \angle Y &\cong \angle X && \text{Angle} \\ \triangle CYL &\cong \triangle DXN && \text{by ASA.} \end{aligned}$$

2 EXAMPLE Show that each pair of triangles is congruent.



$$\begin{aligned} \angle Q &\cong \angle E && \text{Angle} \\ \overline{QP} &\cong \overline{EY} && \text{Side} \\ \angle R &\cong \angle T && \text{Angle} \\ \triangle QPR &\cong \triangle EYT && \text{by ASA.} \end{aligned}$$



$$\begin{aligned} \overline{SQ} &\cong \overline{VT} && \text{Side} \\ \angle Q &\cong \angle T && \text{Angle} \\ \overline{QR} &\cong \overline{TU} && \text{Side} \\ \triangle SQR &\cong \triangle VTU && \text{by SAS.} \end{aligned}$$

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

EXAMPLE Application: Surveying

- 3 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 .

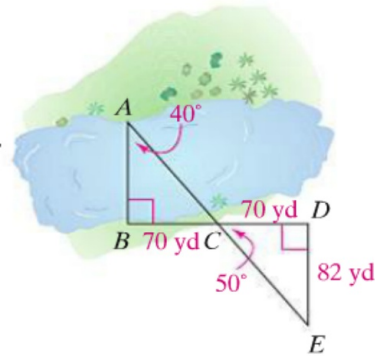
$$\angle B \cong \angle D \quad \leftarrow \text{Both are right angles.}$$

$$BC = DC \quad \leftarrow \text{Both measure 70 yd.}$$

$$\angle ACB \cong \angle ECD \quad \leftarrow \text{They are vertical angles.}$$

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

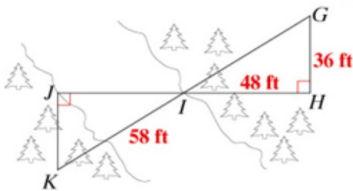
Corresponding parts of congruent triangles are congruent. \overline{AB} corresponds to \overline{ED} , so AB is 82 yd.



Vocabulary Tip

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

- 3 EXAMPLE A surveyor drew the diagram below to find the distance from J to I across the canyon. Show that $\triangle GHI \cong \triangle KJI$. Then find JK .



$$\angle J \cong \angle H \quad \leftarrow \text{Both are right angles.}$$

$$\overline{JI} \cong \overline{HI} \quad \leftarrow \text{Both measure 48 ft.}$$

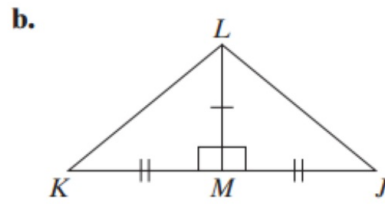
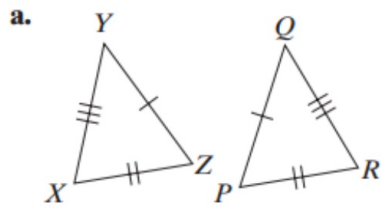
$$\angle KIJ \cong \angle GIH \quad \leftarrow \text{They are vertical angles.}$$

So $\triangle GHI \cong \triangle KJI$ by ASA

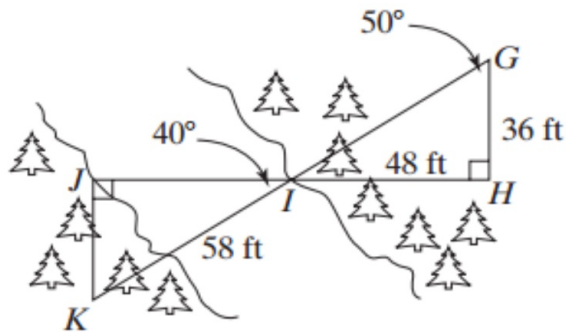
Corresponding parts of congruent triangles are congruent. \overline{JK} corresponds to \overline{HG} , so JK is 36 ft.

Quick Check

2. Show that each pair of triangles is congruent.



Quick Check



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

a. \overline{JK}

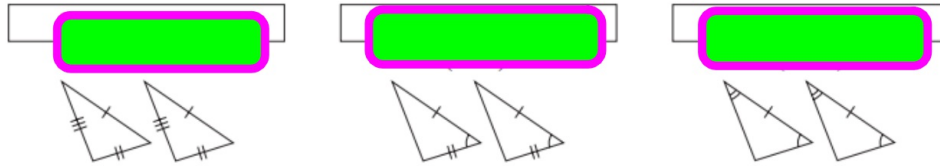
b. $m\angle K$

c. $m\angle GIH$

Vocabulary and 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.



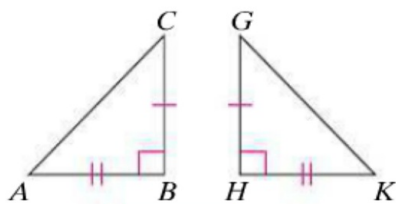
Congruent polygons are _____

Check Your Understanding

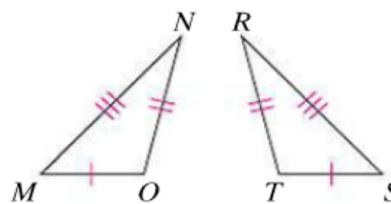
- Vocabulary** What two characteristics do congruent polygons have in common? _____
- Is the following statement *true* or *false*? When two polygons are congruent, you can slide, flip, or turn one so that it fits on top of the other one. _____

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

3.



4.



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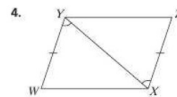
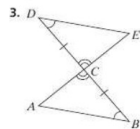
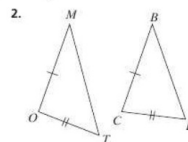
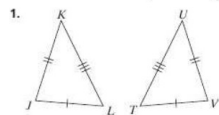
Assignment on congruent figures and congruence statements

Name _____ Class _____ Date _____

Practice 7-3

Congruent Figures

Determine whether each pair of triangles is congruent. Explain.



Determine if each triangle in Exercises 5-6 must be congruent to $\triangle XYZ$ at the right.



For Exercises 7-8, use the triangles at the right.

7. $\triangle XYZ \cong \triangle CAB$ by _____

8. Find the missing measures for $\triangle XYZ$.

