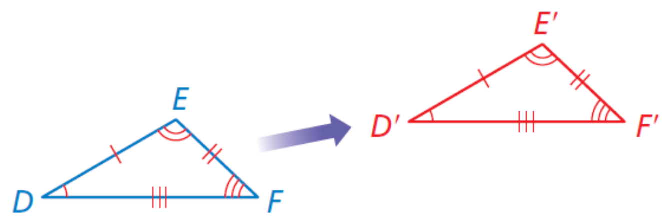
5.2 Congruent Polygons NOTES

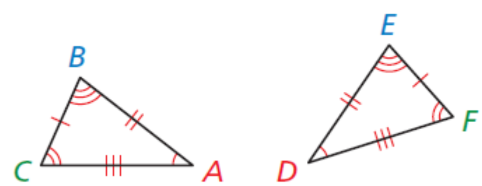
Recall from Chapter 4 transformations, that rigid motions (translations, reflections and rotations) produce congruent images. By the definition of congruent figures, all corresponding dimensions are congruent (sides & angles). When using prime notation, identifying corresponding parts is easy. $\Delta DEF \cong \Delta D'E'F'$



- $DE = D'E'$ $\quad EF = E'F'$ $\quad FD = F'D'$
- $m\angle D = m\angle D'$ $\quad m\angle E = m\angle E'$ $\quad m\angle F = m\angle F'$

Sometimes, prime notation is not used therefore we must be very careful in our congruence statements to label corresponding parts. ORDER MATTERS! In the example below, $\Delta ABC \cong DEF$.

When $\triangle DEF$ is the image of $\triangle ABC$ after a rigid motion or a composition of rigid motions, you can write congruence statements for the corresponding angles and corresponding sides.



Corresponding angles

$\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$

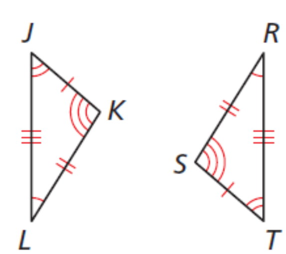
Corresponding sides

$\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$

EXAMPLE 1 Identifying Corresponding Parts

WATCH

Write a congruence statement for the triangles. Identify all pairs of congruent corresponding parts.



SOLUTION

The diagram indicates that $\triangle JKL \cong \triangle TSR$.

Corresponding angles $\angle J \cong \angle T$, $\angle K \cong \angle S$, $\angle L \cong \angle R$

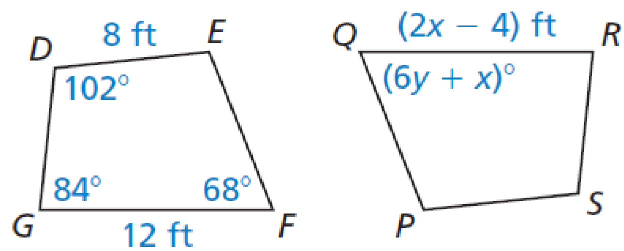
Corresponding sides $\overline{JK} \cong \overline{TS}$, $\overline{KL} \cong \overline{SR}$, $\overline{LJ} \cong \overline{RT}$

EXAMPLE 2 Using Properties of Congruent Figures

In the diagram, $DEFG \cong SPQR$.

a. Find the value of x.

b. Find the value of y.



SOLUTION

a. You know that $\overline{FG} \cong \overline{QR}$.

$$FG = QR$$
$$12 = 2x - 4$$
$$16 = 2x$$
$$8 = x$$

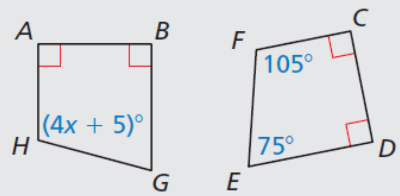
b. You know that $\angle F \cong \angle Q$.

$$m\angle F = m\angle Q$$
$$68^\circ = (6y + x)^\circ$$
$$68 = 6y + 8$$
$$10 = y$$

ADDITIONAL EXAMPLES:

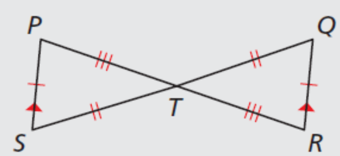
In the diagram, $ABGH \cong CDEF$.

1. Identify all pairs of congruent corresponding parts.
2. Find the value of x.



3. **DIFFERENT WORDS, SAME QUESTION** Which is different? Find *both* answers.

Is $\triangle PTS \cong \triangle RTQ$?	Is $\triangle TSP \cong \triangle TQR$?
Is $\triangle SPT \cong \triangle QRT$?	Is $\triangle TPS \cong \triangle TQR$?



More Theorems:

1

THEOREM

5.3 Properties of Triangle Congruence

Triangle congruence is reflexive, symmetric, and transitive.

Reflexive For any triangle $\triangle ABC$, $\triangle ABC \cong \triangle ABC$.

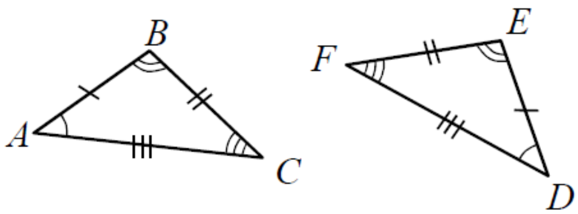
Symmetric If $\triangle ABC \cong \triangle DEF$, then $\triangle DEF \cong \triangle ABC$.

Transitive If $\triangle ABC \cong \triangle DEF$ and $\triangle DEF \cong \triangle JKL$, then $\triangle ABC \cong \triangle JKL$.

Sometimes you do not know if two figures are rigid motions of each other to determine if they're congruent. However, if we can determine that all of the corresponding parts are congruent, then we can say the figures are congruent.

Determine if the triangles below are congruent. If so, write a congruence statement. If not, state "CANNOT BE DETERMINED."

4)



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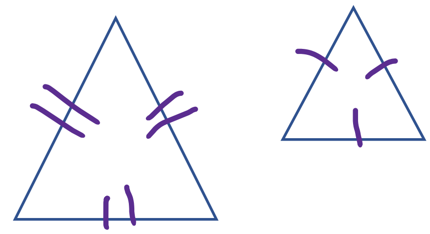

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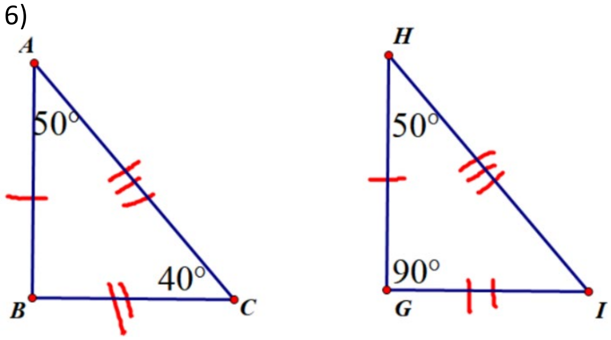

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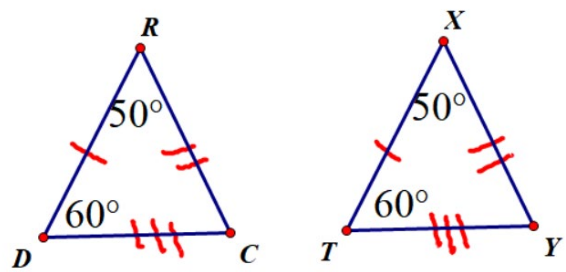


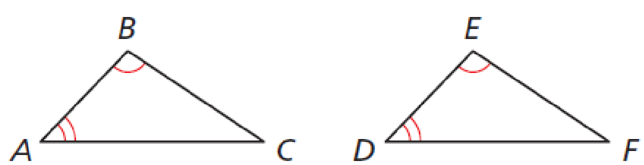
The last example leads to the next theorem:

Using the Third Angles Theorem

THEOREM

5.4 Third Angles Theorem

If two angles of one triangle are congruent to two angles of another triangle, then the third angles are also congruent.



If $\angle A \cong \angle D$ and $\angle B \cong \angle E$, then $\angle C \cong \angle F$.