Congruence

Lesson 7-2
In the figure below, the two triangles are congruent because $\triangle DEF$ is the image of $\triangle ABC$ reflected over line $m$. The notation $\triangle ABC \cong \triangle DEF$ is read \textit{triangle ABC is congruent to triangle DEF}.

**Corresponding Parts** - The parts of congruent figures that match or correspond.
If two figures are congruent, their corresponding sides are congruent and their corresponding angles are congruent.

Statement: \( \triangle ABC \cong \triangle DEF \)

Congruent Angles: \( \angle A \cong \angle D, \angle B \cong \angle E, \angle C \cong \angle F \)

Congruent Sides: \( AB \cong DE, BC \cong EF, CA \cong FD \)
1. Write congruence statements comparing the corresponding parts in the congruent triangles shown.

Use the matching arcs and tick marks to identify the corresponding parts.

**Congruent Angles:**

\[ \angle J \cong \angle G, \]
\[ \angle L \cong \angle I, \]
\[ \angle K \cong \angle H \]

**Congruent Sides:**

\[ \overline{JK} \cong \overline{GH}, \]
\[ \overline{KL} \cong \overline{HI}, \]
\[ \overline{LJ} \cong \overline{IG} \]
Write congruence statements comparing the corresponding parts in each set of congruent figures.  (Example 1)

Congruent Angles:
\[ \angle Q \cong \angle T; \; S \cong \angle V; \; \angle R \cong \angle U \]

Congruent Sides:
\[ QS \cong TV; \; SR \cong VU; \; QR \cong TU \]
Write congruence statements comparing the corresponding parts in each set of congruent figures.  (Example 1)

Congruent Angles:  \( \angle J \cong \angle M; \angle I \cong \angle L; \angle H \cong \angle K \)

Congruent Sides:  \( \overline{JI} \cong \overline{ML}; \overline{IH} \cong \overline{LK}; \overline{HJ} \cong \overline{KM} \)
Mark the angles and sides of each pair of triangles to indicate that they are congruent.

\[ \triangle BDC \cong \triangle MLK \]

\[ \triangle JIK \cong \triangle JCD \]
a. On the figure, draw arc and tic marks to identify the corresponding parts.

b. Write congruence statements comparing the corresponding parts in each set of congruent figures. (Example 1)

\[ \angle A \cong \angle M, \angle B \cong \angle N, \angle K \cong \angle O, \angle S \cong \angle P \]

\[ \overline{AB} \cong \overline{MN}, \overline{BK} \cong \overline{NO}, \overline{KS} \cong \overline{OP}, \overline{SA} \cong \overline{PM} \]
Example

2. Triangle $ABC$ is congruent to $\triangle XYZ$. Write congruence statements comparing the corresponding parts. Then determine which transformations map $\triangle ABC$ onto $\triangle XYZ$.

**Step 1**

Analyze the figures to determine which angles and sides of the figures correspond.

**Congruent Angles:**

$\angle A \cong \angle X$, $\angle B \cong \angle Y$, $\angle C \cong \angle Z$

**Congruent Sides:**

$\overline{AB} \cong \overline{XY}$, $\overline{BC} \cong \overline{YZ}$, $\overline{CA} \cong \overline{ZX}$
2. Triangle $ABC$ is congruent to $\triangle XYZ$. Write congruence statements comparing the corresponding parts. Then determine which transformations map $\triangle ABC$ onto $\triangle XYZ$.

**Step 2**

Determine any changes in the orientation of the triangles.

The transformations that map $\triangle ABC$ onto $\triangle XYZ$ consist of a reflection over the $y$-axis followed by a translation of 2 units down.
Got It? Do this problem to find out.

Parallelogram WXYZ is congruent to parallelogram KLMN. Write congruence statements comparing the corresponding parts. Then determine which transformation(s) map parallelogram WXYZ onto parallelogram KLMN.

**Step 1**

**Congruent Angles:**

\[ \angle W \cong \angle K, \quad \angle X \cong \angle L, \quad \angle Y \cong \angle M, \quad \angle Z \cong \angle N \]

**Congruent Sides:**

\[ \overline{WX} \cong \overline{KL}, \quad \overline{XY} \cong \overline{LM}, \quad \overline{YZ} \cong \overline{MN}, \quad \overline{ZW} \cong \overline{NK}; \]

**Step 2**

Sample answer: If you reflect KLMN over the x-axis and then translate it to the right 5 units, it coincides with WXYZ.
Triangle $RST$ is congruent to $\triangle UVW$. Write congruence statements comparing the corresponding parts. Then determine which transformation(s) map $\triangle RST$ onto $\triangle UVW$. (Examples 1 and 2)

**Step 1**

Congruent Angles: \[ \angle R \cong \angle U, \quad \angle S \cong \angle V, \quad \angle T \cong \angle W; \]

Congruent Sides: \[ \overline{RS} \cong \overline{UV}, \quad \overline{ST} \cong \overline{VW}, \quad \overline{TR} \cong \overline{WU}. \]

**Step 2**

Sample answer: If you translate $\triangle RST$ up 4 units then 2 units right, then reflect it over the $y$-axis, it coincides with $\triangle UVW$. 
Find Missing Measures

You can use properties of congruent figures to find the missing measures of angles and sides in a figure.

**Congruence**
Congruent angles have the same measure and congruent sides have equal length.
3. Miley is using a brace to support a tabletop. In the figure, \( \triangle BCE \cong DFG \). If \( m\angle CEB = 50^\circ \), what is the measure of \( \angle FGD \)?

Since \( \angle CEB \) and \( \angle FGD \) are corresponding parts in congruent figures, they are congruent. So, \( \angle FGD \) measures 50°.
In the figure shown above, the length of $CE$ is 2 feet. What is the length of $FG$?

2 feet
In the figure below, quadrilateral $ABCD$ is congruent to quadrilateral $WXYZ$. What is the measure of $\angle X$?
Example

a. On the figure, draw arc and tic marks to identify the corresponding parts.

b. Find the value of x.

\[4x - 9 = 15\]
\[+ 9 + 9\]
\[4x = 24\]
\[\frac{4x}{4} = \frac{24}{4}\]
\[6\]
Homework:

Pg. 525 - 528

# 1-7 (all), # 9-19 (odds)