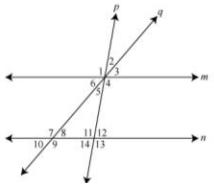
Warmup $2/(10 \div 2 \cdot 2 + 6 \div 2)$

Created by Ms. Poe

The figure shows parallel lines m and n cut by transversals p and q.



Connect the equal values. (Connect each value on the left with an equal value on the right)

$m\angle 5$	$m\angle 1$
$m\angle 13$	$m\angle 2$
$m\angle 4 + m\angle 5$	$m\angle 7$
$180° - m\angle 12$	

CHECK HOMEWORK

Plan for the Week

- Triangle Congruence and Proofs
- NO QUIZ ON FRIDAY.
- This will give everyone time to make up the quiz from last Friday

OBJECTIVE: WHAT DOES CONGRUENT MEAN???

$\cong$ Symbol for congruence!

Some other symbols to know

$\parallel$ parallel

$\perp$ perpendicular

Rigid Motions

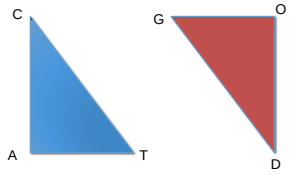
- What are Rigid Motions???
  - "Motions that preserve the size and shape of figures"
- Who can name some Rigid Motions that we know???
  - Translations
  - Rotations
  - Reflections

Congruent = same size, same shape

- What do we mean by same shape?
  - All the angles are the same
- What do we mean by same size?
  - All the side lengths are the same

Two Congruent Triangles…

If I tell you that triangle CAT is congruent to triangle DOG… what else can you conclude? Tell me everything you know!



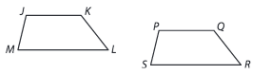
Complete Reflection Questions 1 and 2 on pg. 910

Reflect

1. If you know that $\triangle ABC \cong \triangle DEF$, what six congruence statements about segments and angles can you write? Why?

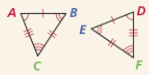
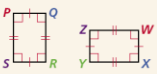
   $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$, $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$. The rigid motions that map $\triangle ABC$ to $\triangle DEF$ also map the sides and angles of $\triangle ABC$ to the corresponding sides and angles of $\triangle DEF$, which establishes congruence.

2. Do your findings in this Explore apply to figures other than triangles? For instance, if you know that quadrilaterals $JKLM$ and $PQRS$ are congruent, can you make any conclusions about corresponding parts? Why or why not?



Yes; since quadrilateral $JKLM$ is congruent to quadrilateral $PQRS$, there is a sequence of rigid motions that maps $JKLM$ to $PQRS$. This same sequence of rigid motions maps sides and angles of $JKLM$ to the corresponding sides and angles of $PQRS$.

Properties of Congruent Polygons

DIAGRAM	CORRESPONDING ANGLES	CORRESPONDING SIDES
 $\triangle ABC \cong \triangle DEF$	$\angle A \cong \angle D$ $\angle B \cong \angle E$ $\angle C \cong \angle F$	$\overline{AB} \cong \overline{DE}$ $\overline{BC} \cong \overline{EF}$ $\overline{AC} \cong \overline{DF}$
 polygon $PQRS \cong$ polygon $WXYZ$	$\angle P \cong \angle W$ $\angle Q \cong \angle X$ $\angle R \cong \angle Y$ $\angle S \cong \angle Z$	$\overline{PQ} \cong \overline{WX}$ $\overline{QR} \cong \overline{XY}$ $\overline{RS} \cong \overline{YZ}$ $\overline{PS} \cong \overline{WZ}$

Highlight! pg. 910

Corresponding Parts of Congruent Figures Are Congruent

If two figures are congruent, then corresponding sides are congruent and corresponding angles are congruent.

Helpful Hint

When you write a statement such as $\Delta ABC \cong \Delta DEF$, you are also stating which parts are congruent!!!

Given: $\Delta PQR \cong \Delta STW$
Identify all pairs of corresponding congruent parts.

Angles: $\angle P \cong \angle S$, $\angle Q \cong \angle T$, $\angle R \cong \angle W$

Sides: $\overline{PQ} \cong \overline{ST}$, $\overline{QR} \cong \overline{TW}$, $\overline{PR} \cong \overline{SW}$

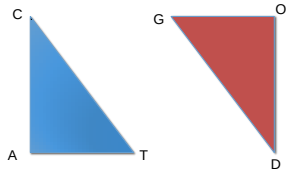
If polygon *LMNP* ≅ polygon *EFGH*, identify all pairs of corresponding congruent parts.

Angles: $\angle L \cong \angle E,\ \angle M \cong \angle F,\ \angle N \cong \angle G,\ \angle P \cong \angle H$

Sides: $\overline{LM} \cong \overline{EF},\ \overline{MN} \cong \overline{FG},\ \overline{NP} \cong \overline{GH},\ \overline{LP} \cong \overline{EH}$

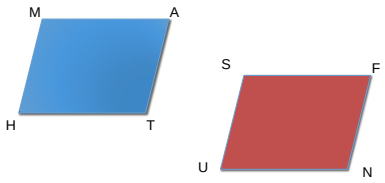
Two Congruent Triangles…

Triangle CAT is congruent to triangle DOG



Two Congruent Quadrilaterals

Quadrilateral MATH is congruent to Quadrilateral SFUN



Let's Look at Example A on pg. 910

Example 1 $\triangle ABC \cong \triangle DEF$. **Find the given side length or angle measure.**

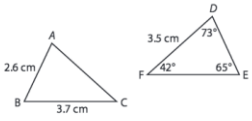
(A) DE

Step 1 Find the side that corresponds to $\overline{DE}$.

Since $\triangle ABC \cong \triangle DEF$, $\overline{AB} \cong \overline{DE}$.

Step 2 Find the unknown length.

$DE = AB$, and $AB = 2.6$ cm, so $DE = 2.6$ cm.



Try Part B on pg. 910!

(B) $m\angle B$

Step 1 Find the angle that corresponds to $\angle B$.

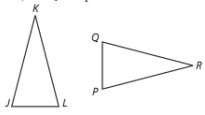
Since $\triangle ABC \cong \triangle DEF$, $\angle B \cong \angle$ **E** .

Step 2 Find the unknown angle measure.

$m\angle B = m\angle$ **E** , and $m\angle$ **E** $=$ **65** °, so $m\angle B =$ **65** °.

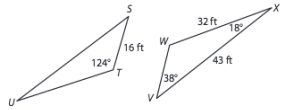
Try Questions 3 – 5 on pg. 911

3. **Discussion** The triangles shown in the figure are congruent. Can you conclude that $\overline{JK} \cong \overline{QR}$? Explain.



No; the segments appear to be congruent, but the correspondence between the triangles is not given, so you cannot assume $\overline{JK}$ and $\overline{QR}$ are corresponding parts.

$\triangle STU \cong \triangle VWX$. **Find the given side length or angle measure.**



4. SU

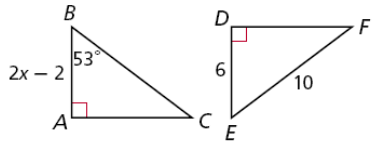
Since $\triangle STU \cong \triangle VWX$, $\overline{SU} \cong \overline{VX}$. $SU = VX = 43$ ft.

5. $m\angle S$

Since $\triangle STU \cong \triangle VWX$, $\angle S \cong \angle V$. $m\angle S = m\angle V = 38°$.

Given: $\Delta ABC \cong \Delta DEF$

Find the value of x.



$\overline{AB} \cong \overline{DE}$

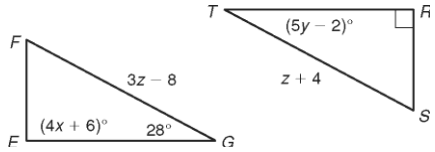
$AB = DE$

$2x - 2 = 6$

$2x = 8$

$x = 4$

Given: $\triangle EFG \cong \triangle RST$. Find the values of x, y, and z.

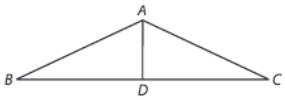


x = 21
y = 6
z = 6

Properties of Equality	
Reflexive Property of Equality	a = a
Symmetric Property of Equality	If a = b then b = a
Transitive Property of Equality	If a = b and b = c then a = c

Highlight pg. 911

Properties of Congruence	
Reflexive Property of Congruence	$\overline{AB} \cong \overline{AB}$
Symmetric Property of Congruence	If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AD}$.
Transitive Property of Congruence	If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$.



Given: $\triangle ABD \cong \triangle ACD$

Prove: D is the midpoint of $\overline{BC}$.

What do we KNOW?

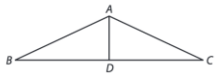
What are we trying to prove?

pg. 912

Example 3 Write each proof.

Ⓐ Given: $\triangle ABD \cong \triangle ACD$

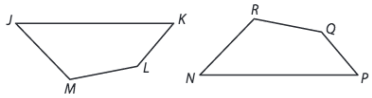
Prove: D is the midpoint of $\overline{BC}$.



Statements	Reasons
1. $\triangle ABD \cong \triangle ACD$	1. Given
2. $\overline{BD} \cong \overline{CD}$	2. Corresponding parts of congruent figures are congruent.
3. D is the midpoint of $\overline{BC}$.	3. Definition of midpoint.

Given: Quadrilateral $JKLM \cong$ quadrilateral $NPQR$; $\angle J \cong \angle K$

Prove: $\angle J \cong \angle P$



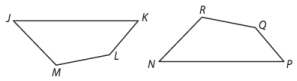
What do we KNOW?

What are we trying to prove?

Try B on pg. 913

B Given: Quadrilateral $JKLM \cong$ quadrilateral $NPQR$; $\angle J \cong \angle K$

Prove: $\angle J \cong \angle P$



Statements	Reasons
1. Quadrilateral $JKLM \cong$ quadrilateral $NPQR$	1. Given
2. $\angle J \cong \angle K$	2. Given
3. $\angle K \cong \angle P$	3. Corresponding parts of congruent figures are congruent.
4. $\angle J \cong \angle P$	4. Transitive Property of Congruence

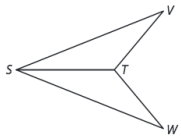
Now try 8 – 12 on pgs. 913- 914

Your Turn

Write each proof.

8. Given: $\triangle SVT \cong \triangle SWT$

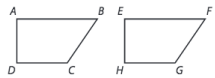
Prove: $\overline{ST}$ bisects $\angle VSW$.



Statements	Reasons
1. $\triangle SVT \cong \triangle SWT$	1. Given
2. $\angle VST \cong \angle WST$	2. Corresponding parts of congruent figures are congruent.
3. $\overline{ST}$ bisects $\angle VSW$.	3. Definition of angle bisector.

9. Given: Quadrilateral $ABCD \cong$ quadrilateral $EFGH$; $\overline{AD} \cong \overline{CD}$

Prove: $\overline{AD} \cong \overline{GH}$



Statements	Reasons
1. Quadrilateral $ABCD \cong$ quadrilateral $EFGH$	1. Given
2. $\overline{AD} \cong \overline{CD}$	2. Given
3. $\overline{CD} \cong \overline{GH}$	3. Corresponding parts of congruent figures are congruent.
4. $\overline{AD} \cong \overline{GH}$	4. Transitive Property of Congruence

Elaborate

10. A student claims that any two congruent triangles must have the same perimeter. Do you agree? Explain.

Yes; since the corresponding sides of congruent triangles are congruent, the sum of the lengths of the sides (perimeter) must be the same for both triangles.

11. If $\triangle PQR$ is a right triangle and $\triangle PQR \cong \triangle XYZ$, does $\triangle XYZ$ have to be a right triangle? Why or why not?

Yes; since $\triangle PQR$ is a right triangle, one of its angles is a right angle. Since corresponding parts of congruent figures are congruent, one of the angles of $\triangle XYZ$ must also be a right angle, which means $\triangle XYZ$ is a right triangle.

12. **Essential Question Check-In** Suppose you know that pentagon $ABCDE$ is congruent to pentagon $FGHJK$. How many additional congruence statements can you write using corresponding parts of the pentagons? Explain.

There are five statements using the congruent corresponding sides and five statements using the congruent corresponding angles.

Homework

- Pg. 914- 916 (1-5, 14-16 JUST TRY YOUR BEST)