

8.2

Congruent Polygons

For use with Exploration 8.2

Essential Question Given two congruent triangles, how can you use rigid motions to map one triangle to the other triangle?

1 EXPLORATION: Describing Rigid Motions

Work with a partner. Of the three transformations you studied in Chapter 11, which are rigid motions? Under a rigid motion, why is the image of a triangle always congruent to the original triangle? Explain your reasoning.



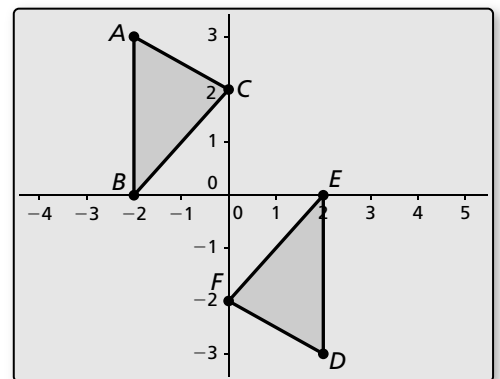
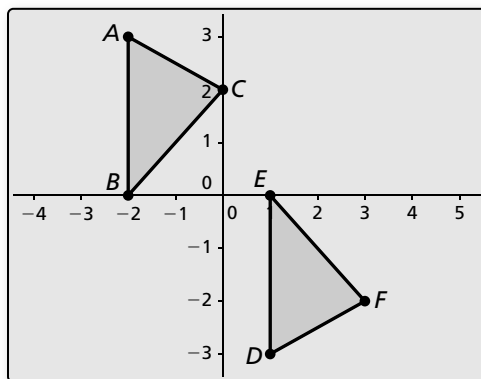
2 EXPLORATION: Finding a Composition of Rigid Motions

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner. Describe a composition of rigid motions that maps $\triangle ABC$ to $\triangle DEF$. Use dynamic geometry software to verify your answer.

a. $\triangle ABC \cong \triangle DEF$

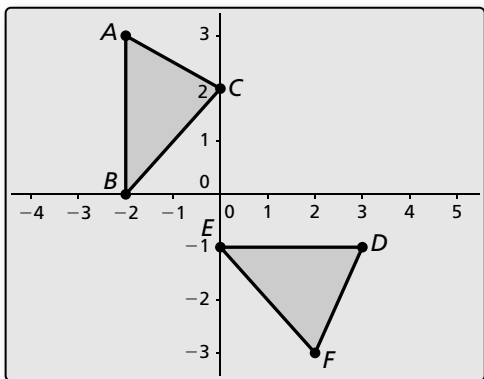
b. $\triangle ABC \cong \triangle DEF$



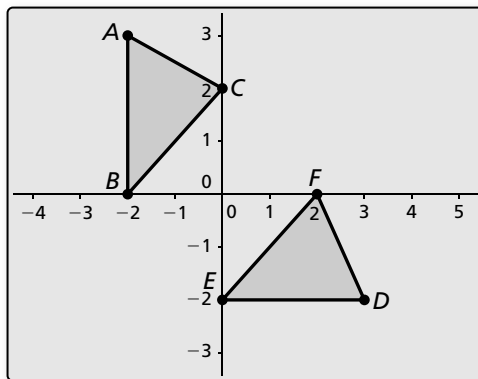
8.2 Congruent Polygons (continued)

2 EXPLORATION: Finding a Composition of Rigid Motions (continued)

c. $\triangle ABC \cong \triangle DEF$



d. $\triangle ABC \cong \triangle DEF$



Communicate Your Answer

3. Given two congruent triangles, how can you use rigid motions to map one triangle to the other triangle?

4. The vertices of $\triangle ABC$ are $A(1, 1)$, $B(3, 2)$, and $C(4, 4)$. The vertices of $\triangle DEF$ are $D(2, -1)$, $E(0, 0)$, and $F(-1, 2)$. Describe a composition of rigid motions that maps $\triangle ABC$ to $\triangle DEF$.

8.2

Practice

For use after Lesson 8.2

Theorems

Properties of Triangle Congruence

Triangle congruence is reflexive, symmetric, and transitive.

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

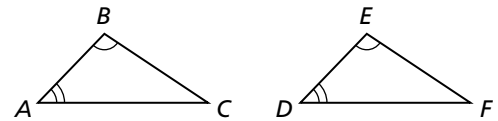
Symmetric If $\triangle ABC \cong \triangle DEF$, then $\triangle DEF \cong \triangle ABC$.

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

Notes:

Third Angles Theorem

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



Notes:

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

Worked-Out Examples

Example #1

Find the values of x and y .

$$ABCD \cong EFGH$$

$$135 = 10x + 65$$

$$70 = 10x$$

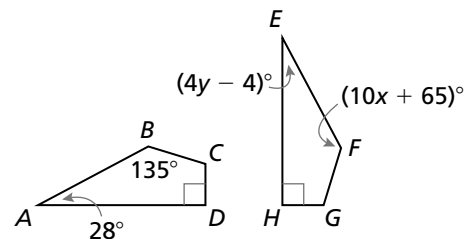
$$7 = x$$

$$4y - 4 = 28$$

$$4y = 32$$

$$y = 8$$

So, $x = 7$ and $y = 8$.

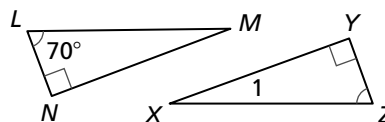


8.2 Practice (continued)

Example #2

Find $m\angle 1$.

$\angle L \cong \angle Z$ and $\angle N \cong \angle Y$, so by the Third Angles Theorem, $\angle 1 \cong \angle M$. By the Triangle Sum Theorem, $m\angle 1 = 180^\circ - 90^\circ - 70^\circ = 20^\circ$.

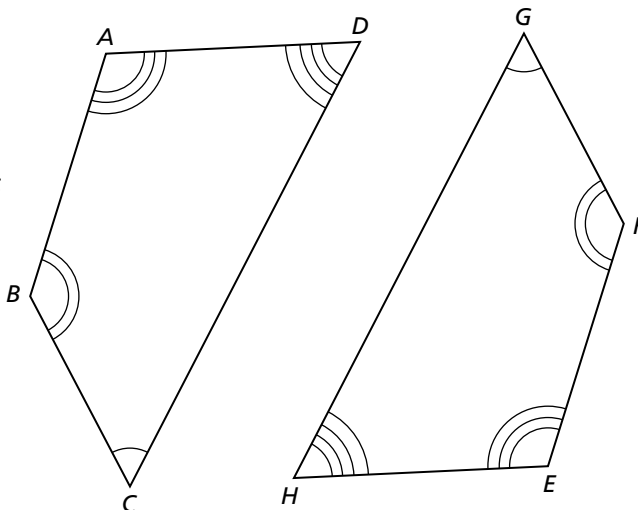
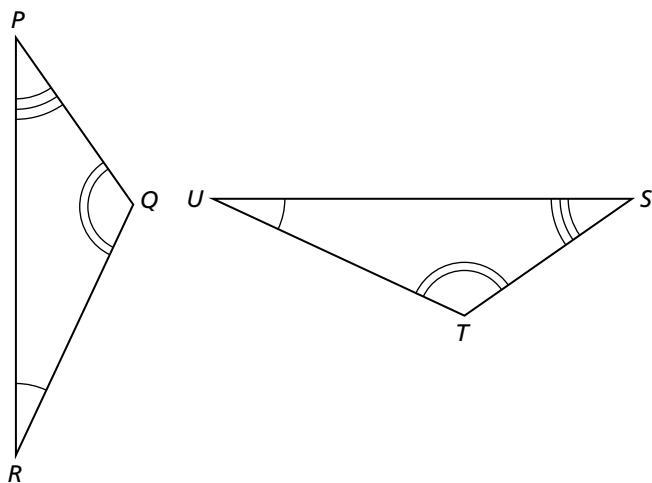


Practice A

In Exercises 1 and 2, identify all pairs of congruent corresponding parts. Then write another congruence statement for the polygons.

1. $\triangle PQR \cong \triangle STU$

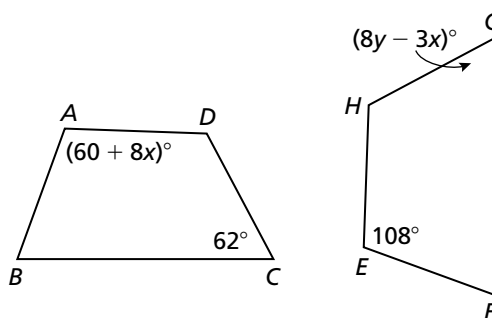
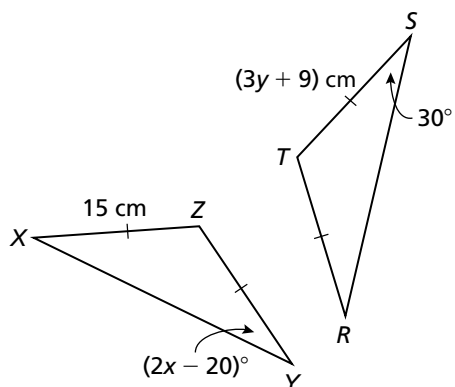
2. $ABCD \cong EFGH$



In Exercises 3 and 4, find the values of x and y .

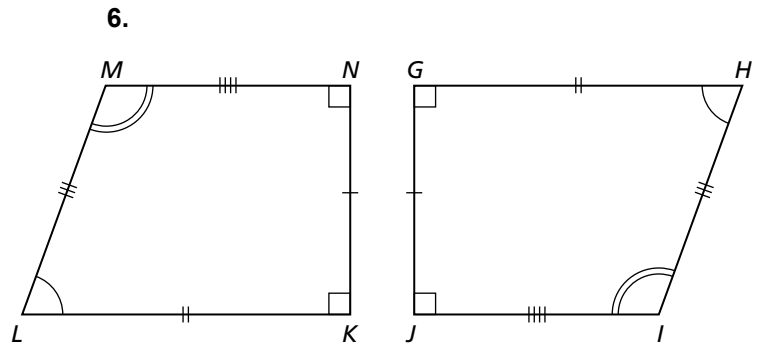
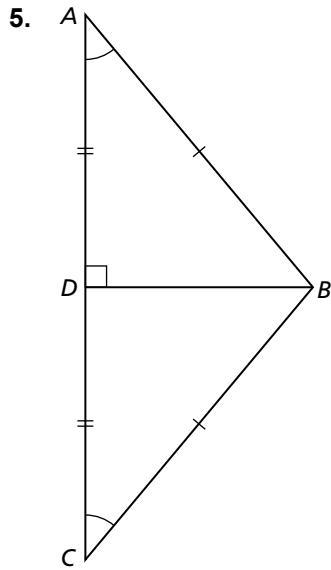
3. $\triangle XYZ \cong \triangle RST$

4. $ABCD \cong EFGH$

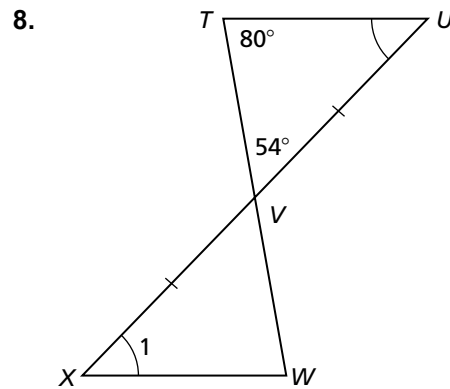
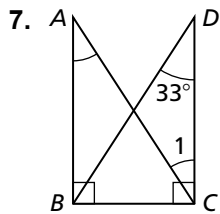


8.2 Practice (continued)

In Exercises 5 and 6, show that the polygons are congruent. Explain your reasoning.

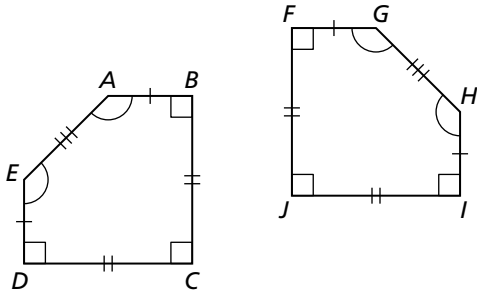


In Exercises 7 and 8, find $m\angle 1$.

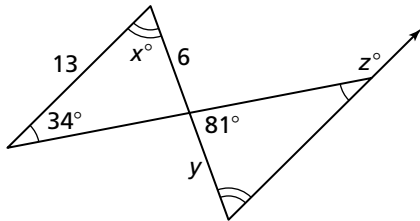


Practice B

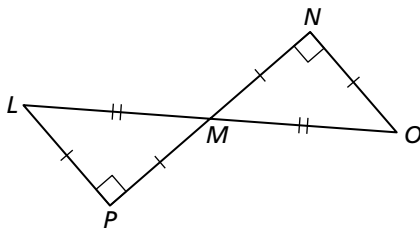
1. In the figure, $ABCDE \cong HIJFG$. Identify all pairs of congruent corresponding parts. Then complete the congruence statement: $ABCDE \cong G$ _____.



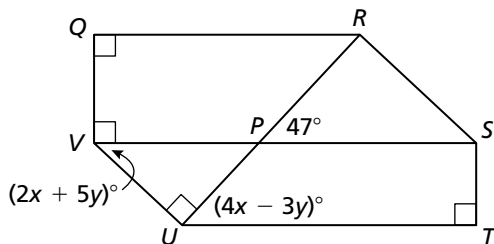
2. Find the values of x , y , and z .



3. Show that the two triangles are congruent.



4. In the figure, $RSTU \cong UVQR$. Find the values of x and y and $m\angle RST$. Explain your reasoning.



5. Draw a rectangle and label it $ABCD$. Draw diagonal \overline{AC} . Are the two triangles formed congruent? Explain.