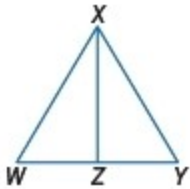


## 12-3 Congruent Triangles

8. **PROOF** Write a paragraph proof.

**Given:**  $\angle WXZ \cong \angle YXZ$ ,  $\angle XZW \cong \angle XZY$ ,  
 $\overline{WX} \cong \overline{YX}$ ,  $\overline{WZ} \cong \overline{YZ}$

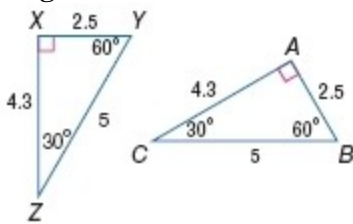
**Prove:**  $\triangle WXZ \cong \triangle YXZ$



**ANSWER:**

We know that  $\overline{WX} \cong \overline{YX}$ ,  $\overline{WZ} \cong \overline{YZ}$ ,  $\overline{XZ} \cong \overline{XZ}$  by the Reflexive Property. We also know  $\angle WXZ \cong \angle YXZ$ ,  $\angle XZW \cong \angle XZY$  and by the Third Angles Theorem,  $\angle W \cong \angle Y$ . So,  $\triangle WXZ \cong \triangle YXZ$  by the definition of congruent polygons.

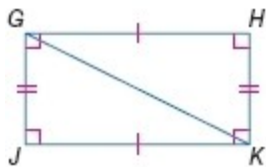
**Show that polygons are congruent by identifying all congruent corresponding parts. Then write a congruence statement.**



9.

**ANSWER:**

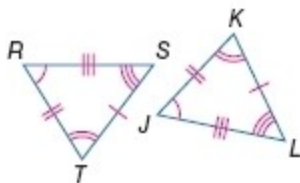
$\angle X \cong \angle A$ ,  $\angle Y \cong \angle B$ ,  $\angle Z \cong \angle C$ ,  $\overline{XY} \cong \overline{AB}$ ,  $\overline{XZ} \cong \overline{AC}$ ,  $\overline{YZ} \cong \overline{BC}$ ;  $\triangle XYZ \cong \triangle ABC$



10.

**ANSWER:**

$\angle J \cong \angle H$ ,  $\angle JGK \cong \angle HKG$ ,  $\angle KGH \cong \angle GKJ$ ,  $\overline{GJ} \cong \overline{KH}$ ,  $\overline{JK} \cong \overline{HG}$ ,  $\overline{GK} \cong \overline{GK}$ ;  $\triangle GJK \cong \triangle KHG$

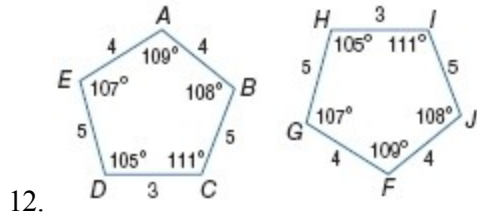


11.

**ANSWER:**

$\angle R \cong \angle J$ ,  $\angle T \cong \angle K$ ,  $\angle S \cong \angle L$ ,  $\overline{RT} \cong \overline{JK}$ ,  $\overline{TS} \cong \overline{KL}$ ,  $\overline{RS} \cong \overline{JL}$ ;  $\triangle RTS \cong \triangle JKL$

**12-3 Congruent Triangles**

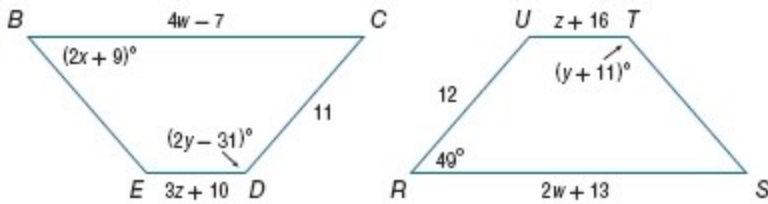


**ANSWER:**

$$\angle A \cong \angle F, \angle B \cong \angle J, \angle C \cong \angle I, \angle D \cong \angle H, \angle E \cong \angle G,$$

$$\overline{AB} \cong \overline{FJ}, \overline{BC} \cong \overline{JI}, \overline{CD} \cong \overline{IH}, \overline{DE} \cong \overline{HG}, \overline{AE} \cong \overline{FG}; \text{ polygon } ABCDE \cong \text{ polygon } FJIHG$$

**Polygon BCDE  $\cong$  polygon RSTU. Find each value.**



13. x

**ANSWER:**

20

14. y

**ANSWER:**

42

15. z

**ANSWER:**

3

16. w

**ANSWER:**

10

### 12-3 Congruent Triangles

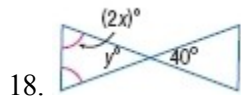
17. **SAILING** To ensure that sailboat races are fair, the boats and their sails are required to be the same size and shape. Refer to the figure on page 260.

- Write a congruence statement relating the triangles in the photo.
- Name six pairs of congruent segments.
- Name six pairs of congruent angles.

**ANSWER:**

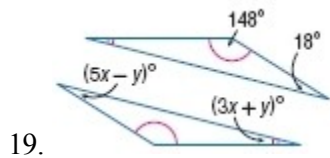
- $\triangle ABC \cong \triangle MNO, \triangle DEF \cong \triangle PQR$
- $\overline{AB} \cong \overline{MN}, \overline{BC} \cong \overline{NO}, \overline{AC} \cong \overline{MO}, \overline{DE} \cong \overline{PQ},$   
 $\overline{EF} \cong \overline{QR}, \overline{DF} \cong \overline{PR}$   
 $\angle A \cong \angle M, \angle B \cong \angle N, \angle C \cong \angle O,$
- $\angle D \cong \angle P, \angle E \cong \angle Q, \angle F \cong \angle R$

**Find x and y.**



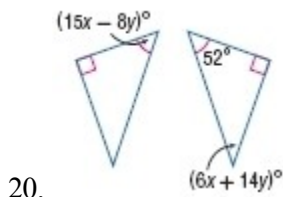
**ANSWER:**

$$y = 40; x = 35$$



**ANSWER:**

$$x = 4; y = 2$$



**ANSWER:**

$$x = 4; y = 1$$

## 12-3 Congruent Triangles

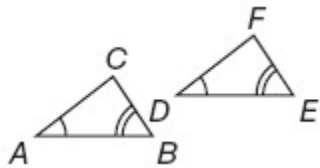
21. **PROOF** Write a two-column proof of Theorem 4.3.

**ANSWER:**

Given:  $\angle A \cong \angle D$

$\angle B \cong \angle E$

Prove:  $\angle C \cong \angle F$



Proof:

Statements (Reasons)

1.  $\angle A \cong \angle D, \angle B \cong \angle E$  (Given)
2.  $m\angle A = m\angle D, m\angle B = m\angle E$  (Def. of  $\cong \angle$ s)
3.  $m\angle A + m\angle B + m\angle C = 180, m\angle D + m\angle E + m\angle F = 180$  ( $\angle$  Sum Theorem)
4.  $m\angle A + m\angle B + m\angle C = m\angle D + m\angle E + m\angle F$  (Trans. Prop.)
5.  $m\angle D + m\angle E + m\angle C = m\angle D + m\angle E + m\angle F$  (Subst.)
6.  $m\angle C = m\angle F$  (Subt. Prop.)
7.  $\angle C \cong \angle F$  (Def. of  $\cong \angle$ s)

## 12-3 Congruent Triangles

22. **PROOF** Put the statements used to prove the statement below in the correct order. Provide the reasons for each statement.

Congruence of triangles is symmetric. (Theorem 4.4)



**Given:**  $\triangle RST \cong \triangle XYZ$

**Prove:**  $\triangle XYZ \cong \triangle RST$

**Proof:**

$\angle X \cong \angle R, \angle Y \cong \angle S, \angle Z \cong \angle T, \overline{XY} \cong \overline{RS}, \overline{YZ} \cong \overline{ST}, \overline{XZ} \cong \overline{RT}$

?

$\angle R \cong \angle X, \angle S \cong \angle Y, \angle T \cong \angle Z, \overline{RS} \cong \overline{XY}, \overline{ST} \cong \overline{YZ}, \overline{RT} \cong \overline{XZ}$

?

$\triangle RST \cong \triangle XYZ$

?

$\triangle XYZ \cong \triangle RST$

?

**ANSWER:**

**Proof:**

**Proof:**

$\triangle RST \cong \triangle XYZ$

Given

$\angle R \cong \angle X, \angle S \cong \angle Y, \angle T \cong \angle Z, \overline{RS} \cong \overline{XY}, \overline{ST} \cong \overline{YZ}, \overline{RT} \cong \overline{XZ}$

CPCTC

$\angle X \cong \angle R, \angle Y \cong \angle S, \angle Z \cong \angle T, \overline{XY} \cong \overline{RS}, \overline{YZ} \cong \overline{ST}, \overline{XZ} \cong \overline{RT}$

Congruence of  $\angle$ s and segments is symmetric.

$\triangle XYZ \cong \triangle RST$

Def. of  $\cong \triangle$

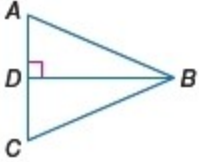
## 12-3 Congruent Triangles

**CCSS ARGUMENTS** Write a two-column proof.

23. **Given:**  $\overline{BD}$  bisects  $\angle B$ .

$$\overline{BD} \perp \overline{AC}$$

**Prove:**  $\angle A \cong \angle C$



**ANSWER:**

Proof:

Statements (Reasons)

1.  $\overline{BD}$  bisects  $\angle B$ ,  $\overline{BD} \perp \overline{AC}$  (Given)
2.  $\angle ABD \cong \angle DBC$  (Def. of angle bisector)
3.  $\angle ADB$  and  $\angle BDC$  are right angles. ( $\perp$  lines form rt.  $\angle$  s.)
4.  $\angle ADB \cong \angle BDC$  (All rt.  $\angle$  s are  $\cong$ .)
5.  $\angle A \cong \angle C$  (Third  $\angle$  s Thm.)

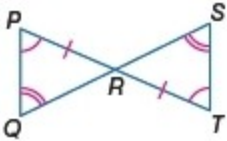
24. **Given:**  $\angle P \cong \angle T$ ,  $\angle S \cong \angle Q$

$$\overline{TR} \cong \overline{PR}, \overline{RP} \cong \overline{RQ},$$

$$\overline{RT} \cong \overline{RS}$$

$$\overline{PQ} \cong \overline{TS}$$

**Prove:**  $\triangle PRQ \cong \triangle TRS$



**ANSWER:**

Proof:

Statements (Reasons)

1.  $\angle P \cong \angle T$ ,  $\angle S \cong \angle Q$ ,  $\overline{TR} \cong \overline{PR}$ ,  $\overline{RP} \cong \overline{RQ}$ ,  $\overline{RT} \cong \overline{RS}$ ,  $\overline{PQ} \cong \overline{TS}$  (Given)
2.  $\overline{PR} \cong \overline{QR}$ ,  $\overline{TR} \cong \overline{SR}$  (Symm. Prop.)
3.  $\overline{TR} \cong \overline{QR}$  (Trans. Prop)
4.  $\overline{QR} \cong \overline{TR}$  (Symm. Prop.)
5.  $\overline{QR} \cong \overline{SR}$  (Trans. Prop.)
6.  $\angle PRQ \cong \angle TRS$  (Vert.  $\angle$  s are  $\cong$ .)
7.  $\triangle PRQ \cong \triangle TRS$  (Def. of  $\cong \Delta$  s)

## 12-3 Congruent Triangles

25. **SCRAPBOOKING** Lanie is using a flower-shaped corner decoration punch for a scrapbook she is working on. If she punches the corners of two pages as shown, what property guarantees that the punched designs are congruent? Explain.



**ANSWER:**

Sample answer: Both of the punched flowers are congruent to the flower on the stamp, because it was used to create the images. According to the Transitive Property of Polygon Congruence, the two stamped images are congruent to each other because they are both congruent to the flowers on the punch.

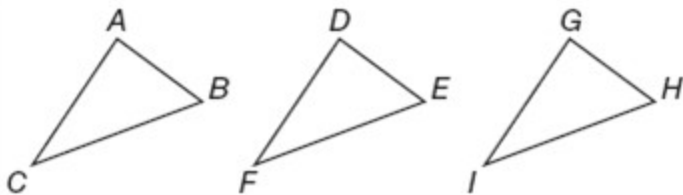
**PROOF** Write the specified type of proof of the indicated part of Theorem 4.4.

26. Congruence of triangles is transitive. (paragraph proof)

**ANSWER:**

Given:  $\triangle ABC \cong \triangle DEF$ ,  $\triangle DEF \cong \triangle GHI$

Prove:  $\triangle ABC \cong \triangle GHI$



Proof:

We know that  $\triangle ABC \cong \triangle DEF$ . Because corresponding parts of congruent triangles are congruent,  $\angle A \cong \angle D$ ,  $\angle B \cong \angle E$ ,  $\angle C \cong \angle F$ ,  $\overline{AB} \cong \overline{DE}$ ,  $\overline{BC} \cong \overline{EF}$ ,  $\overline{AC} \cong \overline{DF}$ . We also know that  $\triangle DEF \cong \triangle GHI$ . So  $\angle D \cong \angle G$ ,  $\angle E \cong \angle H$ ,  $\angle F \cong \angle I$ ,  $\overline{DE} \cong \overline{GH}$ ,  $\overline{EF} \cong \overline{HI}$ ,  $\overline{DF} \cong \overline{GI}$ , by CPCTC. Therefore,  $\angle A \cong \angle G$ ,  $\angle B \cong \angle H$ ,  $\angle C \cong \angle I$ ,  $\overline{AB} \cong \overline{GH}$ ,  $\overline{BC} \cong \overline{HI}$ ,  $\overline{AC} \cong \overline{GI}$  because congruence of angles and segments is transitive. Thus,  $\triangle ABC \cong \triangle GHI$  by the definition of congruent triangles.

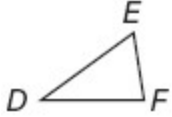
### 12-3 Congruent Triangles

27. Congruence of triangles is reflexive. (flow proof)

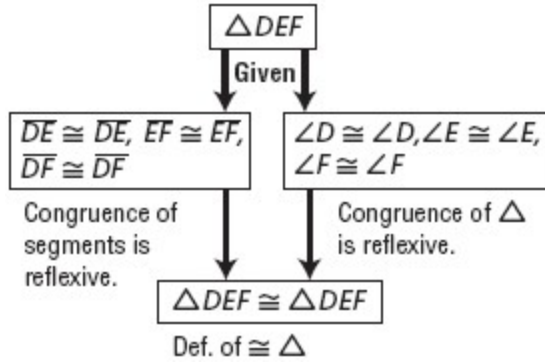
ANSWER:

Given:  $\triangle DEF$

Prove:  $\triangle DEF \cong \triangle DEF$



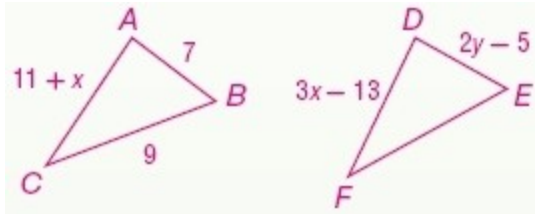
Proof:



**ALGEBRA** Draw and label a figure to represent the congruent triangles. Then find  $x$  and  $y$ .

28.  $\triangle ABC \cong \triangle DEF$ ,  $AB = 7$ ,  $BC = 9$ ,  $AC = 11 + x$ ,  $DF = 3x - 13$ , and  $DE = 2y - 5$

ANSWER:



$x = 12; y = 6$