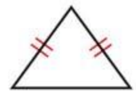
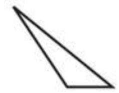
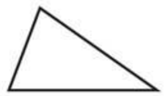
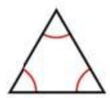
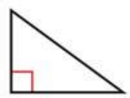
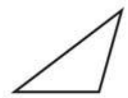
4 CHAPTER SUMMARY

BIG IDEAS *For Your Notebook*

Big Idea 1

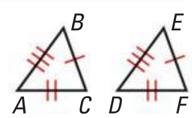
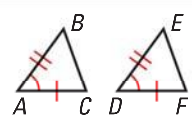
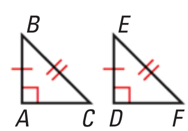
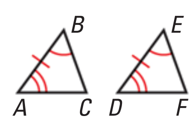
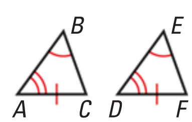
Classifying Triangles by Sides and Angles

	Equilateral	Isosceles	Scalene
Sides	 3 congruent sides	 2 or 3 congruent sides	 No congruent sides

	Acute	Equiangular	Right	Obtuse
Angles	 3 angles < 90°	 3 angles = 60°	 1 angle = 90°	 1 angle > 90°

Big Idea 2

Proving That Triangles Are Congruent

SSS	All three sides are congruent.	$\triangle ABC \cong \triangle DEF$	
SAS	Two sides and the included angle are congruent.	$\triangle ABC \cong \triangle DEF$	
HL	The hypotenuse and one of the legs are congruent. (Right triangles only)	$\triangle ABC \cong \triangle DEF$	
ASA	Two angles and the included side are congruent.	$\triangle ABC \cong \triangle DEF$	
AAS	Two angles and a (non-included) side are congruent.	$\triangle ABC \cong \triangle DEF$	

Big Idea 3

Using Coordinate Geometry to Investigate Triangle Relationships

You can use the Distance and Midpoint Formulas to apply postulates and theorems to triangles in the coordinate plane.

4 CHAPTER REVIEW

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- Multi-Language Glossary
- Vocabulary practice

REVIEW KEY VOCABULARY

For a list of postulates and theorems, see pp. 926–931.

- triangle, *p. 217*
  scalene, isosceles, equilateral, acute, right, obtuse, equiangular
- interior angles, *p. 218*
- exterior angles, *p. 218*
- corollary to a theorem, *p. 220*
- congruent figures, *p. 225*
- corresponding parts, *p. 225*
- right triangle, *p. 241*
  legs, hypotenuse
- flow proof, *p. 250*
- isosceles triangle, *p. 264*
  legs, vertex angle, base, base angles
- transformation, *p. 272*
- image, *p. 272*
- congruence transformation, *p. 272*
  translation, reflection, rotation

VOCABULARY EXERCISES

1. Copy and complete: A triangle with three congruent angles is called __?__.
2. **WRITING** *Compare* vertex angles and base angles.
3. **WRITING** *Describe* the difference between isosceles and scalene triangles.
4. Sketch an acute scalene triangle. Label its interior angles 1, 2, and 3. Then draw and shade its exterior angles.
5. If $\triangle PQR \cong \triangle LMN$, which angles are corresponding angles? Which sides are corresponding sides?

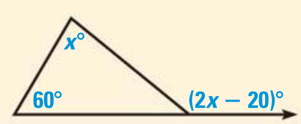
REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of Chapter 4.

4.1 Apply Triangle Sum Properties *pp. 217–224*

EXAMPLE

Find the measure of the exterior angle shown.



Use the Exterior Angle Theorem to write and solve an equation to find the value of x.

$(2x - 20)° = 60° + x°$ **Apply the Exterior Angle Theorem.**

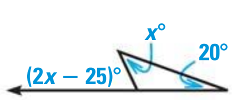
$x = 80$ **Solve for *x*.**

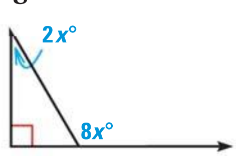
The measure of the exterior angle is $(2 \cdot 80 - 20)°$, or $140°$.

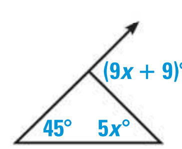
EXERCISES

EXAMPLE 3 on p. 219 for Exs. 6–8

Find the measure of the exterior angle shown.

6.


7.


8.


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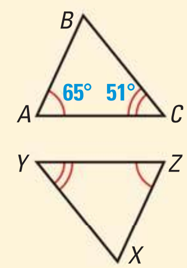
Chapter Review Practice

4.2 Apply Congruence and Triangles

pp. 225–231

EXAMPLE

Use the Third Angles Theorem to find $m\angle X$.



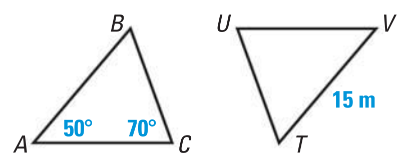
In the diagram, $\angle A \cong \angle Z$ and $\angle C \cong \angle Y$. By the Third Angles Theorem, $\angle B \cong \angle X$. Then by the Triangle Sum Theorem, $m\angle B = 180° - 65° - 51° = 64°$.

So, $m\angle X = m\angle B = 64°$ by the definition of congruent angles.

EXERCISES

EXAMPLES 2 and 4
on pp. 226–227
for Exs. 9–14

In the diagram, $\triangle ABC \cong \triangle VTU$. Find the indicated measure.



9. $m\angle B$

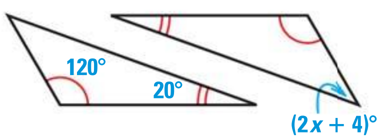
10. AB

11. $m\angle T$

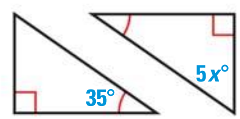
12. $m\angle V$

Find the value of *x*.

13.



14.

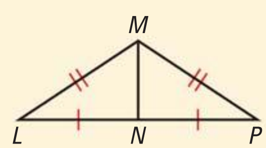


4.3 Prove Triangles Congruent by SSS

pp. 234–239

EXAMPLE

Prove that $\triangle LMN \cong \triangle PMN$.



The marks on the diagram show that $\overline{LM} \cong \overline{PM}$ and $\overline{LN} \cong \overline{PN}$. By the Reflexive Property, $\overline{MN} \cong \overline{MN}$.

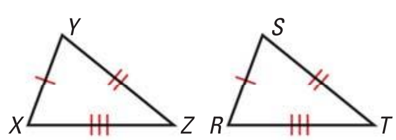
So, by the SSS Congruence Postulate, $\triangle LMN \cong \triangle PMN$.

EXERCISES

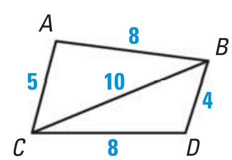
EXAMPLE 1
on p. 234
for Exs. 15–16

Decide whether the congruence statement is true. *Explain* your reasoning.

15. $\triangle XYZ \cong \triangle RST$



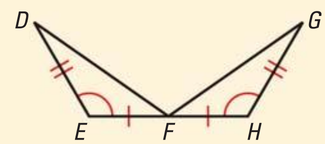
16. $\triangle ABC \cong \triangle DCB$



4 CHAPTER REVIEW

4.4 Prove Triangles Congruent by SAS and HL *pp. 240–246*

EXAMPLE



Prove that $\triangle DEF \cong \triangle GHF$.

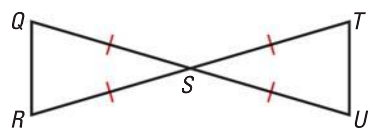
From the diagram, $\overline{DE} \cong \overline{GH}$, $\angle E \cong \angle H$, and $\overline{EF} \cong \overline{HF}$. By the SAS Congruence Postulate, $\triangle DEF \cong \triangle GHF$.

EXERCISES

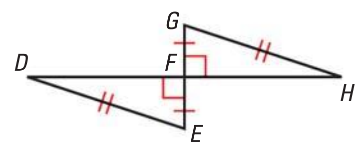
EXAMPLES 1 and 3 on pp. 240, 242 for Exs. 17–18

Decide whether the congruence statement is true. *Explain* your reasoning.

17. $\triangle QRS \cong \triangle TUS$

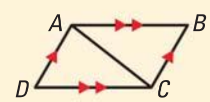


18. $\triangle DEF \cong \triangle GHF$



4.5 Prove Triangles Congruent by ASA and AAS *pp. 249–255*

EXAMPLE



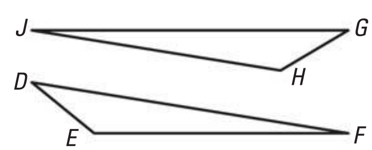
Prove that $\triangle DAC \cong \triangle BCA$.

By the Reflexive Property, $\overline{AC} \cong \overline{AC}$. Because $\overline{AD} \parallel \overline{BC}$ and $\overline{AB} \parallel \overline{DC}$, $\angle DAC \cong \angle BCA$ and $\angle DCA \cong \angle BAC$ by the Alternate Interior Angles Theorem. So, by the ASA Congruence Postulate, $\triangle ADC \cong \triangle ABC$.

EXERCISES

EXAMPLES 1 and 2 on p. 250 for Exs. 19–20

State the third congruence that is needed to prove that $\triangle DEF \cong \triangle GHJ$ using the given postulate or theorem.

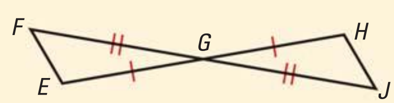


19. **GIVEN ▶** $\overline{DE} \cong \overline{GH}$, $\angle D \cong \angle G$, _?_ $\cong$ _?_
Use the AAS Congruence Theorem.

20. **GIVEN ▶** $\overline{DF} \cong \overline{GJ}$, $\angle F \cong \angle J$, _?_ $\cong$ _?_
Use the ASA Congruence Postulate.

4.6 Use Congruent Triangles *pp. 256–263*

EXAMPLE



GIVEN ▶ $\overline{FG} \cong \overline{JG}$, $\overline{EG} \cong \overline{HG}$

PROVE ▶ $\overline{EF} \cong \overline{HJ}$

You are given that $\overline{FG} \cong \overline{JG}$ and $\overline{EG} \cong \overline{HG}$. By the Vertical Angles Theorem, $\angle FGE \cong \angle JGH$. So, $\triangle FGE \cong \triangle JGH$ by the SAS Congruence Postulate. Corres. parts of $\cong$ ▵ are $\cong$, so $\overline{EF} \cong \overline{HJ}$.

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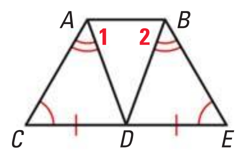
Chapter Review Practice

EXAMPLE 3
on p. 257
for Exs. 21–23

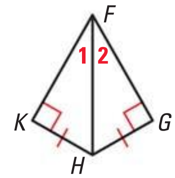
EXERCISES

Write a plan for proving that $\angle 1 \cong \angle 2$.

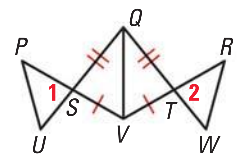
21.



22.



23.



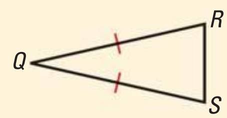
4.7 Use Isosceles and Equilateral Triangles

pp. 264–270

EXAMPLE

$\triangle QRS$ is isosceles. Name two congruent angles.

$\overline{QR} \cong \overline{QS}$, so by the Base Angles Theorem, $\angle R \cong \angle S$.

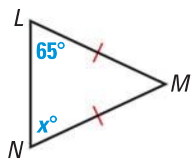


EXAMPLE 3
on p. 266
for Exs. 24–26

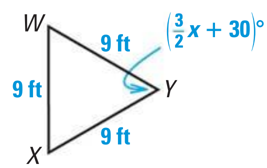
EXERCISES

Find the value of x.

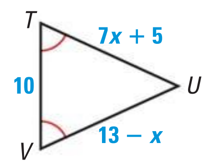
24.



25.



26.



4.8 Perform Congruence Transformations

pp. 272–279

EXAMPLE

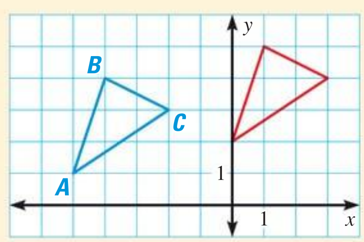
Triangle ABC has vertices $A(-5, 1)$, $B(-4, 4)$, and $C(-2, 3)$. Sketch $\triangle ABC$ and its image after the translation $(x, y) \rightarrow (x + 5, y + 1)$.

$(x, y) \rightarrow (x + 5, y + 1)$

$A(-5, 1) \rightarrow (0, 2)$

$B(-4, 4) \rightarrow (1, 5)$

$C(-2, 3) \rightarrow (3, 4)$



EXAMPLES
2 and 3
on pp. 273–274
for Exs. 27–29

EXERCISES

Triangle QRS has vertices $Q(2, -1)$, $R(5, -2)$, and $S(2, -3)$. Sketch $\triangle QRS$ and its image after the transformation.

27. $(x, y) \rightarrow (x - 1, y + 5)$

28. $(x, y) \rightarrow (x, -y)$

29. $(x, y) \rightarrow (-x, -y)$