CHAPTER 4

Study Guide and Review

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FOLDABLES Study Organizer

GET READY to Study

Be sure the following Key Concepts are noted in your Foldable.

Key Concepts

Classifying Triangles (Lesson 4-1)

- Triangles can be classified by their angles as acute, obtuse, or right.
- Triangles can be classified by their sides as scalene, isosceles, or equilateral.

Angles of Triangles (Lesson 4-2)

- The sum of the measures of the angles of a triangle is 180°.
- The measures of an exterior angle is equal to the sum of the measures of the two remote interior angles.

Congruent Triangles (Lessons 4-3 through 4-5)

- If all of the corresponding sides of two triangles are congruent, then the triangles are congruent (SSS).
- If two corresponding sides of two triangles and the included angle are congruent, then the triangles are congruent (SAS).
- If two pairs of corresponding angles and the included sides of two triangles are congruent, then the triangles are congruent (ASA).
- If two pairs of corresponding angles and a pair of corresponding, nonincluded sides of two triangles are congruent, then the triangles are congruent (AAS).

Isosceles Triangles (Lesson 4-6)

- A triangle is equilateral if and only if it is equiangular.

Triangles and Coordinate Proof (Lesson 4-7)

- Coordinate proofs use algebra to prove geometric concepts.
- The Distance Formula, Slope Formula, and Midpoint Formula are often used in coordinate proof.

Key Vocabulary

acute triangle (p. 202)
base angles (p. 244)
congruence transformation (p. 219)
congruent triangles (p. 217)
coordinate proof (p. 251)
corollary (p. 213)
equiangular triangle (p. 202)
equilateral triangle (p. 203)
exterior angle (p. 211)
flow proof (p. 212)
included side (p. 234)
isosceles triangle (p. 203)
obtuse triangle (p. 202)
remote interior angles (p. 211)
right triangle (p. 202)
scalene triangle (p. 203)
vertex angle (p. 244)

Vocabulary Check

Select the word from the list above that best completes the following statements.

1. A triangle with an angle measure greater than 90 is a(n) ____?____.
2. A triangle with exactly two congruent sides is a(n) ____?____.
3. A triangle that has an angle with a measure of exactly 90° is a(n) ____?____.
4. An equiangular triangle is a form of a(n) ____?____.
5. A(n) ____?____ uses figures in the coordinate plane and algebra to prove geometric concepts.
6. A(n) ____?____ preserves a geometric figure's size and shape.
7. If all corresponding sides and angles of two triangles are congruent, those triangles are ____?____.

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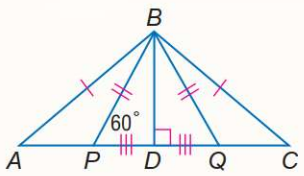
Lesson-by-Lesson Review

4-1 Classifying Triangles (pp. 202–208)

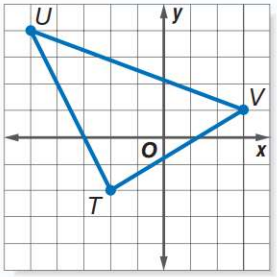
Classify each triangle by its angles and by its sides if $m\angle ABC = 100$.



8. $\triangle ABC$ **9.** $\triangle BDP$ **10.** $\triangle BPQ$

11. DISTANCE The total distance from Sufjan's to Carol's to Steven's house is 18.77 miles. The distance from Sufjan's to Steven's house is 0.81 miles longer than the distance from Sufjan's to Carol's. The distance from Sufjan's to Steven's house is 2.25 time the distance from Carol's to Steven's. Find the distance between each house. Use these lengths to classify the triangle formed by the three houses.

Example 1 **Find the measures of the sides of $\triangle TUV$. Classify the triangle by sides.**



Use the Distance Formula to find the measure of each side.

$$TU = \sqrt{[-5 - (-2)]^2 + [4 - (-2)]^2}$$
$$= \sqrt{9 + 36} \text{ or } \sqrt{45}$$
$$UV = \sqrt{[3 - (-5)]^2 + (1 - 4)^2}$$
$$= \sqrt{64 + 9} \text{ or } \sqrt{73}$$
$$VT = \sqrt{(-2 - 3)^2 + (-2 - 1)^2}$$
$$= \sqrt{25 + 9} \text{ or } \sqrt{34}$$

Since the measures of the sides are all different, the triangle is scalene.

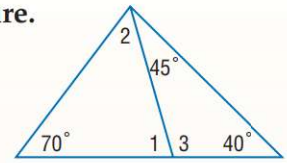
4-2 Angles of Triangles (pp. 210–216)

Find each measure.

12. $m\angle 1$

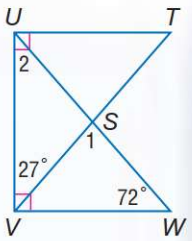
13. $m\angle 2$

14. $m\angle 3$



15. CONSTRUCTION The apex of the truss being built for Tamara's new house measures 72 degrees. If the truss is shaped like an isosceles triangle what are the measures of the other two angles?

Example 2 **If $\overline{TU} \perp \overline{UV}$ and $\overline{UV} \perp \overline{VW}$, find $m\angle 1$.**



Use the Angle Sum Theorem to write an equation.

$$m\angle 1 + 72 + m\angle TVW = 180$$
$$m\angle 1 + 72 + (90 - 27) = 180$$
$$m\angle 1 + 135 = 180$$
$$m\angle 1 = 45$$

CHAPTER 4

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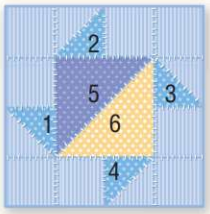
4-3 Congruent Triangles (pp. 217–223)

Name the corresponding angles and sides for each pair of congruent triangles.

16. $\triangle EFG \cong \triangle DCB$ **17.** $\triangle NCK \cong \triangle KER$

18. QUILTING Meghan's mom is going to enter a quilt at the state fair. Name the congruent triangles found in the quilt block.



Example 3 **If $\triangle EFG \cong \triangle JKL$, name the corresponding congruent angles and sides.**

The letters of the triangles correspond to the congruent angles and sides. $\angle E \cong \angle J$, $\angle F \cong \angle K$, $\angle G \cong \angle L$, $\overline{EF} \cong \overline{JK}$, $\overline{FG} \cong \overline{KL}$, and $\overline{EG} \cong \overline{JL}$.

4-4 Proving Congruence–SSS, SAS (pp. 225–232)

Determine whether $\triangle MNP \cong \triangle QRS$ given the coordinates of the vertices. Explain.

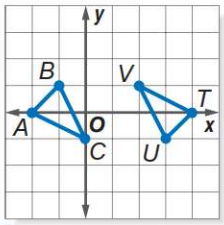
19. $M(0, 3)$, $N(-4, 3)$, $P(-4, 6)$, $Q(5, 6)$, $R(2, 6)$, $S(2, 2)$

20. $M(3, 2)$, $N(7, 4)$, $P(6, 6)$, $Q(-2, 3)$, $R(-4, 7)$, $S(-6, 6)$

21. GAMES In a game, Lupe's boats are placed at coordinates (3, 2), (0, −4), and (6, −4). Do her ships form an equilateral triangle?

22. Triangle ABC is an isosceles triangle with $\overline{AB} \cong \overline{BC}$. If there exists a line $\overline{BD}$ that bisects $\angle ABC$, show that $\triangle ABD \cong \triangle CBD$.

Example 4
Determine whether $\triangle ABC \cong \triangle TUV$. Explain.



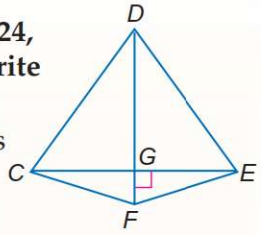
$$AB = \sqrt{[-1 - (-2)]^2 + (1 - 0)^2}$$
$$= \sqrt{1 + 1} \text{ or } \sqrt{2}$$
$$BC = \sqrt{[0 - (-1)]^2 + (-1 - 1)^2}$$
$$= \sqrt{1 + 4} \text{ or } \sqrt{5}$$
$$CA = \sqrt{(-2 - 0)^2 + [0 - (-1)]^2}$$
$$= \sqrt{4 + 1} \text{ or } \sqrt{5}$$
$$TU = \sqrt{(3 - 4)^2 + (-1 - 0)^2}$$
$$= \sqrt{1 + 1} \text{ or } \sqrt{2}$$
$$UV = \sqrt{(2 - 3)^2 + [1 - (-1)]^2}$$
$$= \sqrt{1 + 4} \text{ or } \sqrt{5}$$
$$VT = \sqrt{(4 - 2)^2 + (0 - 1)^2}$$
$$= \sqrt{4 + 1} \text{ or } \sqrt{5}$$

Therefore, $\triangle ABC \cong \triangle TUV$ by SSS.

Mixed Problem Solving
For mixed problem-solving practice, see page 831.

4-5 Proving Congruence–ASA, AAS (pp. 234–241)

For Exercises 23 and 24, use the figure and write a two-column proof.



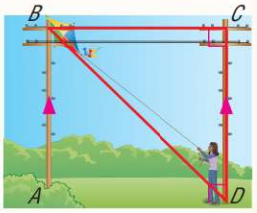
23. **Given:** DF bisects $\angle CDE$.
$\overline{CE} \perp \overline{DF}$

Prove: $\triangle DGC \cong \triangle DGE$

24. **Given:** $\triangle DGC \cong \triangle DGE$
$\triangle GCF \cong \triangle GEF$

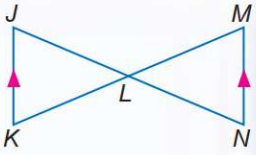
Prove: $\triangle DFC \cong \triangle DFE$

25. KITES Kyra's kite is stuck in a set of power lines. If the power lines are stretched so that they are parallel with the ground, prove that $\triangle ABD \cong \triangle CDB$.



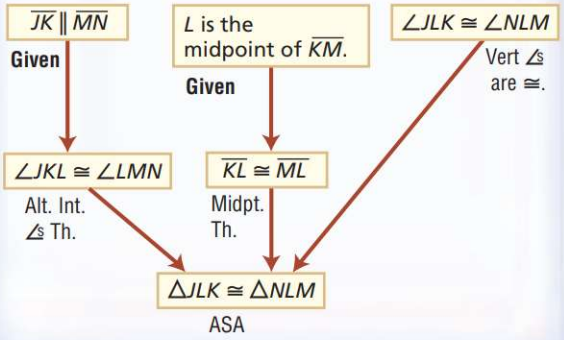
Example 5 **Write a proof.**

Given: $\overline{JK} \parallel \overline{MN}$
L is the midpoint of $\overline{KM}$.



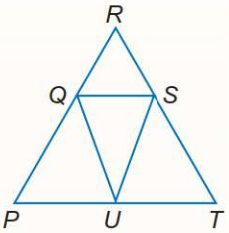
Prove: $\triangle JLK \cong \triangle NLM$

Flow Proof:



4-6 Isosceles Triangles (pp. 244–250)

For Exercises 26–28, refer to the figure.



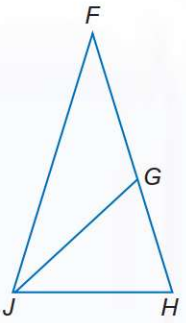
26. If $\overline{PQ} \cong \overline{UQ}$ and $m\angle P = 32$, find $m\angle PUQ$.

27. If $\overline{RQ} \cong \overline{RS}$ and $m\angle RQS = 75$, find $m\angle R$

28. If $\overline{RQ} \cong \overline{RS}$, $\overline{RP} \cong \overline{RT}$, and $m\angle RQS = 80$, find $m\angle P$.

29. ART This geometric design from Western Cameroon uses approximations of isosceles triangles. Trace the figure. Identify and draw one isosceles triangle of each type from the design. Describe the similarities between the different triangles.

Example 6 **If $\overline{FG} \cong \overline{GJ}$, $\overline{GJ} \cong \overline{JH}$, $\overline{FJ} \cong \overline{FH}$, and $m\angle GJH = 40$, find $m\angle H$.**



$\triangle GHJ$ is isosceles with base $\overline{GH}$, so $\angle JGH \cong \angle H$ by the Isosceles Triangle Theorem. Thus, $m\angle JGH = m\angle H$.

$$m\angle GJH + m\angle JGH + m\angle H = 180$$
$$40 + 2(m\angle H) = 180$$
$$2 \cdot m\angle H = 140$$
$$m\angle H = 70$$