NAME _____ DATE _____

6-6 Triangles

Objective: To classify triangles by their sides and angles and to use the triangle inequality.

Terms to Know

Scalene triangle A triangle in which no sides are the same length.

Isosceles triangle A triangle in which at least two sides are the same length.

Equilateral triangle A triangle in which all three sides are the same length.

Acute triangle A triangle in which all angles are acute angles.

Right triangle A triangle in which one angle is a right angle.

Obtuse triangle A triangle in which one angle is an obtuse angle.

The Triangle Inequality
In any triangle, the sum of the lengths of any two sides is greater than the length of the third side.

Example 1 Tell whether line segments of the given lengths *can* or *cannot* be the sides of a triangle. If they can, tell whether the triangle would be *scalene, isosceles,* or *equilateral.*

a. 15 in., 8 in., 4 in. **b.** 12 cm, 9 cm, 5 cm

Solution Compare each sum of two lengths to the third length.

a. $15 + 8 \stackrel{?}{>} 4$ $\quad 15 + 4 \stackrel{?}{>} 8$ $\quad 8 + 4 \stackrel{?}{>} 15$

$23 > 4$ $\quad 19 > 8$ $\quad 12 < 15$

The sum $8 + 4$ is less than the third length, 15, so the line segments *cannot* be the sides of a triangle.

b. $12 + 9 \stackrel{?}{>} 5$ $\quad 12 + 5 \stackrel{?}{>} 9$ $\quad 9 + 5 \stackrel{?}{>} 12$

$21 > 5$ $\quad 17 > 9$ $\quad 14 > 12$

Each sum of two lengths is greater than the third, so the line segments *can* be the sides of a triangle. No lengths are the same, so the triangle is *scalene.*

Tell whether line segments of the given lengths *can* or *cannot* be the sides of a triangle. If they can, tell whether the triangle would be *scalene*, *isosceles*, or *equilateral.*

1. 6 in., 4 in., 9 in.

2. 8 km, 8 km, 8 km

3. 2 in., 2 in., 1 in.

4. 6 ft, 3 ft, 3 ft

6-6 Triangles *(continued)*

Tell whether line segments of the given lengths *can* or *cannot* be the sides of a triangle. If they can, tell whether the triangle would be *scalene*, *isosceles*, or *equilateral*.

5. 18 m, 12 m, 8 m

6. 24 mm, 15 mm, 4 mm

7. 10 yd, 5 yd, 8 yd

8. 15 in., 8 in., 4 in.

9. 6 in., 6 in., 6 in.

10. 3 km, 3 km, 2 km

11. 11.2 ft, 1.7 ft, 1.7 ft

12. 13.2 in., 8.1 in., 5.9 in.

Example 2 The measures of two angles of a triangle are 48° and 43°. Tell whether the triangle is *acute*, *right*, or *obtuse*.

Solution Find the measure of the third angle. Recall that the sum of the measures of all the angles is 180°.

Add the known measures: $48° + 43° = 91°$

Subtract this sum from 180° : $180° - 91° = 89°$

The third angle measure is 89°, so the triangle is *acute*.

The measures of two angles of a triangle are given. Tell whether the triangle is *acute*, *right*, or *obtuse*.

13. 60°, 30°

14. 41°, 65°

15. 19°, 35°

16. 9°, 81°

17. 54°, 36°

18. 45°, 45°

19. 48°, 54°

20. 97°, 81°

21. 102°, 26°

22. 39°, 62°

23. 90°, 31°

24. 5°, 24°

25. Is it possible for a triangle to have two obtuse angles? Explain.

26. Is it possible for a triangle to have both a right angle and an obtuse angle? Explain.

27. Can a right triangle have angle measures of 89°, 30°, and 61°? Explain.

28. Can an equilateral triangle have sides of 6 m, 6 m, and 8 m? Explain.

Spiral Review

29. Use the formula $P = 2l + 2w$. Let $P = 28$ in. and $w = 5$ in. Find l. *(Lesson 4-10)*

30. The measures of two angles of a triangle are 18° and 49°. Tell whether the triangle is *acute*, *right*, or *obtuse*. *(Lesson 6-6)*

31. Find the quotient: $\frac{12}{15} \div \frac{6}{25}$ *(Toolbox Skill 21)*

32. Find the difference: $-83 - (-49)$ *(Lesson 3-4)*