Find $m\angle1.$

Example 1
(page 132)

1.

117°

1

33°

2.

52.2°

44.7°   1

3.

33°   57

1

4. $\triangle RGT$ is a right triangle. $\angle G$ is a right angle and $m\angle R = 19$. Find $m\angle T$.

5. $\triangle TNL$ is a right triangle. $\angle N$ is a right angle. Find $m\angle T + m\angle L$.

**2 ⬜ Algebra** Find the value of each variable.

6.

7.

8.

9.

10.

11.
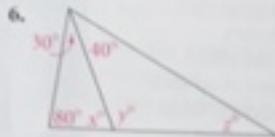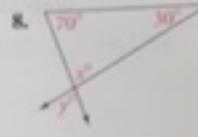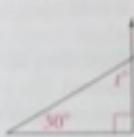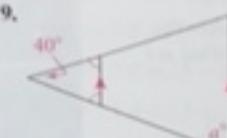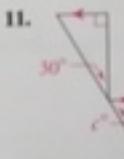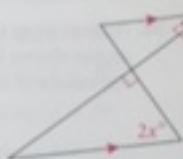
3 Use a protractor and a centimeter ruler to measure the angles and the sides of each triangle. Classify each triangle by its angles and sides.

12.

13.

14.

15.

If possible, draw a triangle to fit each description. Mark the triangle to show known information. If no triangle can be drawn, write *not possible* and explain why.

16. acute equilateral

17. equilateral right

18. obtuse scalene

19. obtuse isosceles

20. scalene right

21. acute isosceles

22. isosceles right

23. scalene acute

4
24. a. Which of the numbered angles at the right are exterior angles?
    b. Name the remote interior angles for each.
    c. How are exterior angles 6 and 8 related?

25. a. How many exterior angles at the right are at each vertex of the triangle?
   b. How many exterior angles does a triangle have in all?
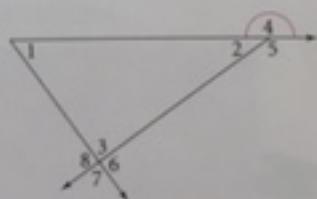
⬜ **Algebra** Find each missing angle measure.

26.
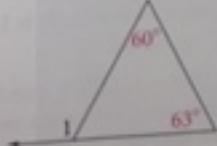
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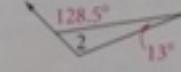
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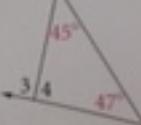
Example 5
(page 134)

29. Music The lid of a grand piano is held open by a prop stick whose length can vary, depending upon the effect desired. The longest prop stick makes angles as shown. What are the values of x and y?

57°

30. A short prop stick makes the angles shown below. What are the values of a and b?

$a°$ $b°$ 72°

our Skills ⟨x⟩ **Algebra** Find the values of the variables and then the measures of the angles. Classify each triangle by its angles. Note that some figures have more than one triangle.

31.

75°
$x°$

32.

$(8x - 1)°$
$(4x + 7)°$

33.

$(2x + 4)°$
$(2x - 9)°$ $x°$

34.

B
$y°$ $x°$
54° $z°$ 52°
A D C

35.

E $d°$ 32° $e°$ F
$b°$
$c°$ 55°
H $a°$
G

36.
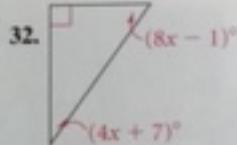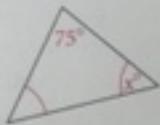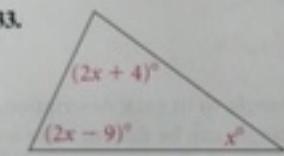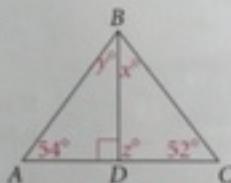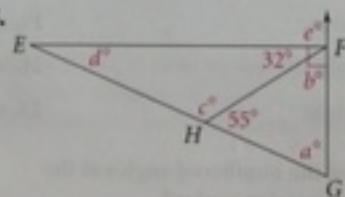
I
$z°$
$w°$ $x°$
L $y°$ 30° K
$(2y - 6)°$
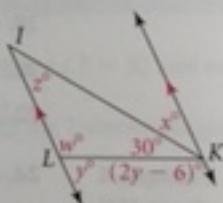
37. Reasoning What is the measure of each angle of an equiangular triangle? Explain.

38. Writing Is every equilateral triangle isosceles? Is every isosceles triangle equilateral? Explain.

39. Visualization The diagram shows a triangle on a 3-by-3 geoboard. How many different triangles can be made on this geoboard? Classify each triangle by its sides and angles.

40. The measure of one angle of a triangle is 115. The other two angles are congruent. Find their measures.

41. Draw any triangle. Label it $\triangle ABC$. Extend both sides of the triangle to form two exterior angles at vertex A. Use the two exterior angles to explain why it does not matter which side of a triangle is extended to form an exterior angle.

42. Algebra A right triangle has acute angles whose measures are in the ratio 1 : 2. Find the measures of these angles.

43. a. Algebra The ratio of the angle measures in $\triangle BCR$ is 2 : 3 : 4. Find the angle measures.
   b. What type of triangle is $\triangle BCR$?

Use the figure at the right for Exercises 44–47.

44. Find $m\angle 5$ if $m\angle 3 = 130$ and $m\angle 4 = 30$.

45. Find $m\angle 3$ if $m\angle 5 = 130$ and $m\angle 4 = 30$.

46. Find $m\angle 1$ if $m\angle 5 = 142$ and $m\angle 4 = 65$.

47. Find $m\angle 2$ if $m\angle 3 = 125$ and $m\angle 4 = 23$.
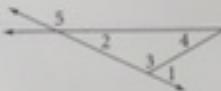
Proof **48. Developing Proof** Complete the paragraph proof of the following statement. The acute angles of a right triangle are complementary.

   Given: $\triangle ABC$ with right angle C
   Prove: $\angle A$ and $\angle B$ are complementary.

   Proof: By the definition of right angle, $m\angle C =$ **a.** _?_ .
   By the Triangle Angle-Sum Theorem, $m\angle A + m\angle B + m\angle C =$ **b.** _?_ .
   Subtracting 90 from each side gives $m\angle A + m\angle B =$ **c.** _?_ , so $\angle A$ and $\angle B$ are
   d. _?_ by the definition of **e.** _?_ .

49. Developing Proof Complete this proof of the Triangle Exterior Angle Theorem by filling in the blanks.

   Given: $\angle 1$ is an exterior angle of the triangle.
   Prove: $m\angle 1 = m\angle 2 + m\angle 3$
   a. $m\angle 1 + m\angle 4 = 180$ by the _?_ Postulate.
   b. $m\angle 2 + m\angle 3 + m\angle 4 = 180$ by the _?_ Theorem.
   c. $m\angle 1 + m\angle 4 = m\angle 2 + m\angle 3 + m\angle 4$ by the _?_ Property of Equality.
   d. $m\angle 1 = m\angle 2 + m\angle 3$ by the _?_ Property of Equality.
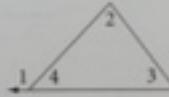
50. Reasoning Two angles of a triangle measure 64 and 48. Find the measure of the largest exterior angle. Explain.

51. Open-Ended Study the design in the Navajo weaving below. Make a design of your own that makes repeated use of isosceles triangles.

52. The measures of the angles of $\triangle RST$ are $5\sqrt{x}$, $7\sqrt{x}$, and $8\sqrt{x}$.

   a. Find the value of x.

   b. Give the measure of each angle.

   c. What type of triangle is $\triangle RST$?

Find the measure of an angle formed by the bisectors of the indicated angles.

53. two angles of an equiangular triangle

54. the acute angles of a right triangle

55. two same-side interior angles formed by two parallel lines and a tranversal

llenge **56. Geometry on a Sphere** Suppose you are measuring the angles of a "triangle" on a globe. The meridians of longitude pass through both poles and are perpendicular to the equator. Will the sum of the measures of the angles of this triangle be equal to, greater than, or less than 180? Explain.

Probability In Exercises 57–61, you know only what is given about the measures of the angles of a triangle. Find the probability that the triangle is equiangular.

57. Each is a multiple of 30.

58. Each is a multiple of 20.

59. Each is a multiple of 60.

60. Each is a multiple of 12.

61. One is an obtuse angle of measure x.

62. In the figure at the right, $\overline{CD} \perp \overline{AB}$ and $\overline{CD}$ bisects $\angle ACB$. Find $m\angle DBF$.

63. What can you conclude about the bisector of an exterior angle of a triangle if the remote interior angles are congruent? Justify your response.