Solution

The labels cannot be correct because $PR + QR = 10 \text{ ft} + 13 \text{ ft} = 23 \text{ ft}$ and $PQ = 24$ ft, which is greater than the sum of the other two sides. In a triangle, the sum of the lengths of any two sides must be greater than the length of the third side.

Now work margin exercise 10.

11. Now assume that in ΔBOR, $m\angle B = 35°$ and $m\angle O = 55°$. Answer each question.

a. What is $m\angle R$?

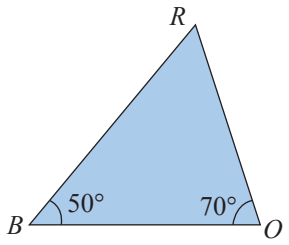
b. Which side is opposite $\angle B$?

c. Which sides include $\angle B$?

d. Is ΔBOR a right triangle? Why or why not?

Example 11 Analyzing Triangles

In ΔBOR, $m\angle B = 50°$ and $m\angle O = 70°$.



a. What is $m\angle R$?

b. Which side is opposite $\angle R$?

c. Which sides include $\angle R$?

d. Is ΔBOR a right triangle? Why or why not?

Solution

The sum of the measures of the angles must be 180°.

a. Since $50° + 70° = 120°$, $m\angle R = 180° - 120° = 60°$.

b. $\overline{BO}$ is opposite $\angle R$.

c. $\overline{RB}$ and $\overline{RO}$ include $\angle R$.

d. ΔBOR is not a right triangle because none of the angles is a right angle.

Now work margin exercise 11.

Margin Exercise Answers

1. $m\angle 1 = 120°$, $m\angle 2 = 60°$ **2. a.** Right **b.** Obtuse **c.** Straight **3.** Complementary: $\angle MON$ and $\angle POQ$ Supplementary: $\angle QOP$ and $\angle POM$, $\angle QON$ and $\angle NOM$ **4. a.** 110° **b.** No **5.** $\angle ROS \cong \angle TOU$ and $\angle ROU \cong \angle SOT$ **6. a.** 40° **b.** 90° **c.** 50° **d.** 50° **7.** $\angle VQZ$, $\angle ZQW$ or $\angle WQX$ **8.** $m\angle 4 = 80°$, $m\angle 5 = 100°$, $m\angle 6 = 80°$ **9.** Scalene **10.** Yes **11. a.** 90° **b.** $\overline{RO}$ **c.** $\overline{BR}$ and $\overline{BO}$ **d.** Yes, because $m\angle R = 90°$.

6.1 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. A/An _____ has no beginning or end and is labeled with a lowercase letter or by the labels of two points on it.

2. Two rays with a common endpoint, called a vertex, form a/an _____.

3. A point where two sides of a triangle meet is called a/an _____.

4. An angle with a measure less than 90° is a/an _____ angle.

5. An angle that measures 180° is a/an _____ angle.

6. If the sum of the measures of two angles is 180°, they are said to be _____ angles.

7. Two lines are _____ if they intersect and form right angles.

8. A triangle with no equal sides is a/an _____ triangle.

9. A triangle with three equal sides is a/an _____ triangle.

10. When the measures of the three angles in a triangle are added, the sum is _____ degrees.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

11. The sum of the measures of two complementary angles is equal to the measure of one right angle.

12. The sum of the measures of complementary angles is greater than the sum of the measures of supplementary angles.

13. Adjacent angles are two angles that share a vertex and a common side but do not overlap.

14. If two lines in a plane are not parallel, then they are perpendicular.

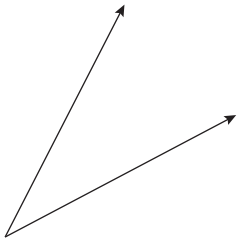
15. A triangle with sides of 4 inches, 4 inches, and 3 inches is an isosceles triangle.

16. A triangle with three angles that each measure less than 90 degrees is an acute triangle.

Practice

Use a protractor to find the measure of each angle. (**Note:** You may need to extend the rays to be able to read the numbers on your protractor.) See Example 1.

1.



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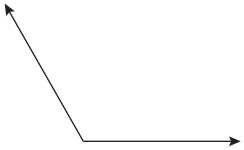

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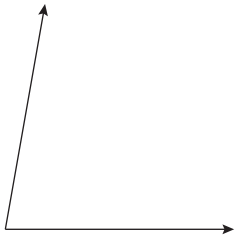

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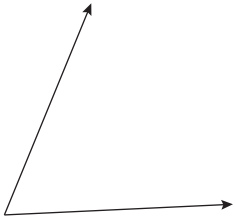
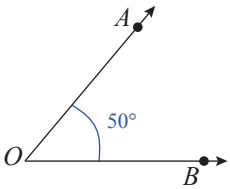


Classify each angle as acute, right, obtuse, or straight. See Example 2.

5.



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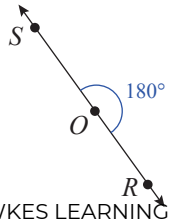

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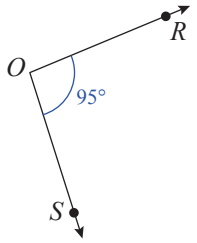

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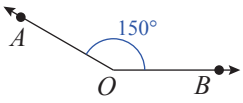

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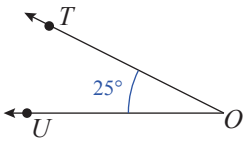

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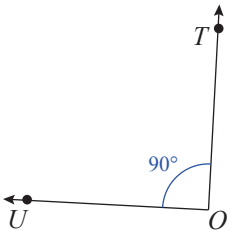
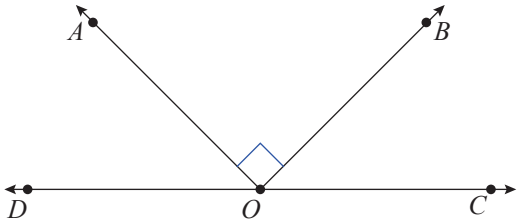


Use the definitions of acute, right, obtuse, and straight angles to answer the questions. See Example 2.

11. In the figure shown, $\overleftrightarrow{DC}$ is a straight line and $m\angle BOA = 90°$.



a. What type of angle is $\angle AOC$?

b. What type of angle is $\angle BOC$?

c. What type of angle is $\angle BOA$?

12. Name the type of angle formed by the hands on a clock.

a.

b.

c.

d.

a. at six o'clock

b. at three o'clock

c. at one o'clock

d. at five o'clock

13. What is the measure of each angle formed by the hands of the clock in Exercise 12?

Use the definitions of complementary, supplementary, and straight angles to answer each question. See Examples 3 and 4.

14. Assume that $\angle 1$ and $\angle 2$ are complementary.

a. If $m\angle 1 = 15°$, what is $m\angle 2$?

b. If $m\angle 1 = 3°$, what is $m\angle 2$?

c. If $m\angle 1 = 45°$, what is $m\angle 2$?

d. If $m\angle 1 = 75°$, what is $m\angle 2$?

15. Assume $\angle 3$ and $\angle 4$ are supplementary.

a. If $m\angle 3 = 45°$, what is $m\angle 4$?

b. If $m\angle 3 = 90°$, what is $m\angle 4$?

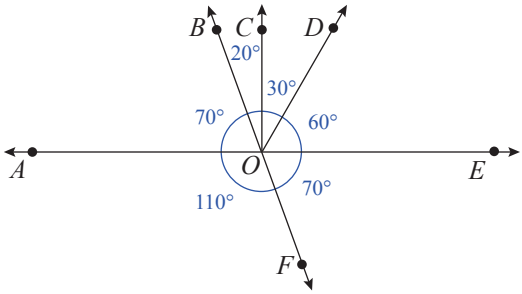
c. If $m\angle 3 = 110°$, what is $m\angle 4$?

d. If $m\angle 3 = 135°$, what is $m\angle 4$?

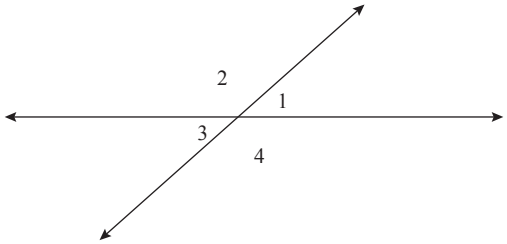
16. In the figure shown,

a. Name all of the pairs of supplementary angles.

b. Name all the pairs of complementary angles.



Use the definitions of adjacent and vertical angles to answer each question. See Examples 6 through 8.



17. The figure shows two intersecting lines.

a. If $m\angle 1 = 30°$, what is $m\angle 2$?

b. Is $m\angle 3 = 30°$? Give a reason for your answer other than the fact that $\angle 1$ and $\angle 3$ are vertical angles.

c. Name two pairs of congruent angles.

d. Name four pairs of adjacent angles.

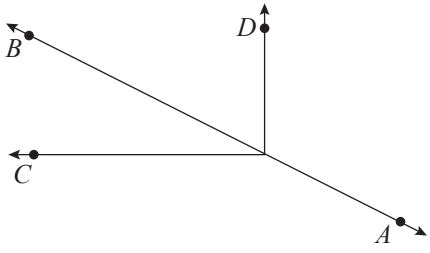
18. The figure shows two intersecting lines where $m\angle 1 = 30°$. Find the measures of the other three angles.

19. Given that $m\angle 1 = 42°$ in the figure, find the measures of the other three angles.

20. In the figure shown, $\overline{AB}$ is a straight line.

a. Name two pairs of adjacent angles.

b. Name two vertical angles, if there are any.

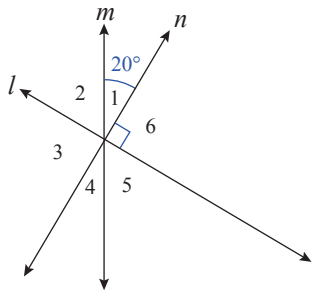


21. In the figure shown, l, m, and n are straight lines with $m\angle 1 = 20°$ and $m\angle 6 = 90°$.

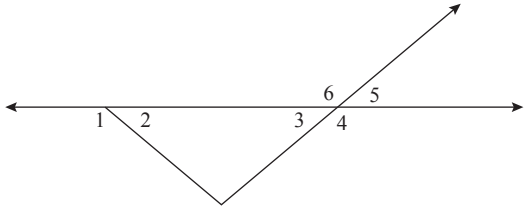
a. Find the measures of the other four angles.

b. Which angle is supplementary to $\angle 6$?

c. Which angles are complementary to $\angle 1$?



22. In the figure, $m\angle 2 = m\angle 3 = 40°$. Find all other pairs of angles that are congruent.



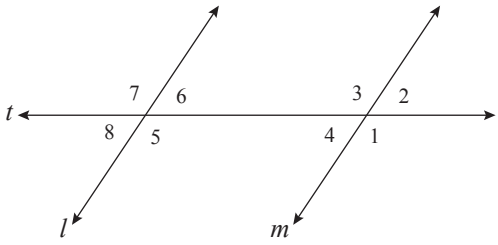
23. Use the figure to answer each question. Assume l and m are parallel.

a. If $m\angle 1 = 125°$, then $m\angle 3 =$ _____. Explain your reasoning.

b. If $m\angle 8 = 55°$, then $m\angle 6 =$ _____. Explain your reasoning.

c. What is $m\angle 7$? Explain your reasoning.

d. Does $m\angle 2 = m\angle 6$? Explain your reasoning.



24. Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{PQ}$ are perpendicular.

a. Which angle(s) are acute?

b. Which angle(s) are obtuse?

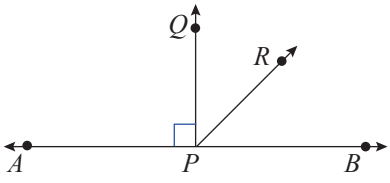
c. Which angle(s) are right angles?

d. Which pair(s) of angles are vertical angles?

e. Which pair(s) of angles are complementary?

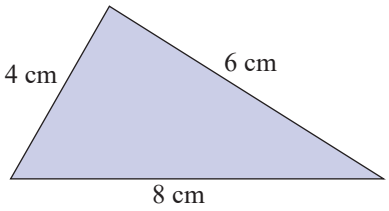
f. Which pair(s) of angles are supplementary?

g. Which pair(s) of angles are adjacent?



Classify each triangle in the most precise way possible, given the indicated lengths of its sides and/or measures of its angles. See Example 9.

25.



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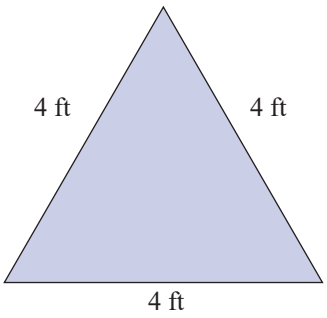

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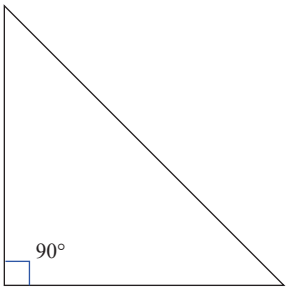

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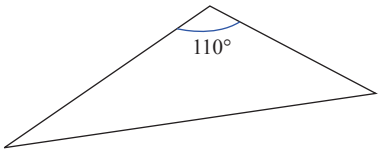

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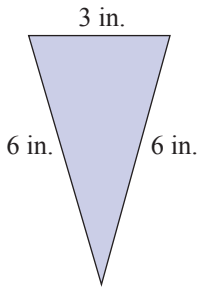

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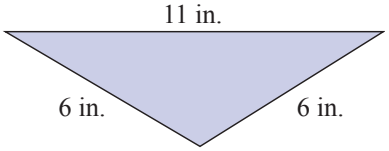

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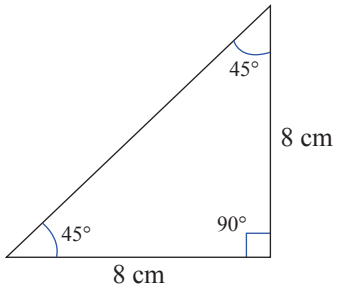

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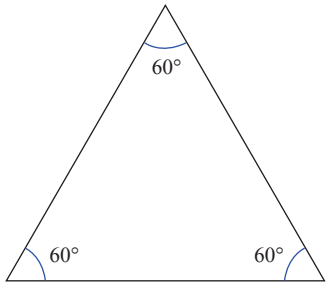

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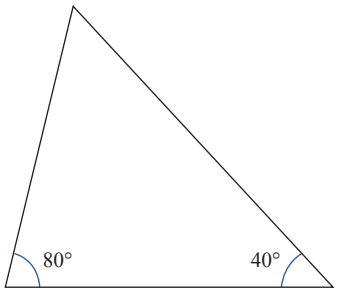

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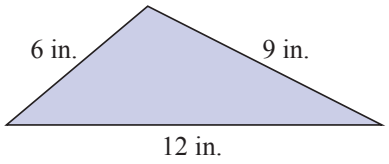

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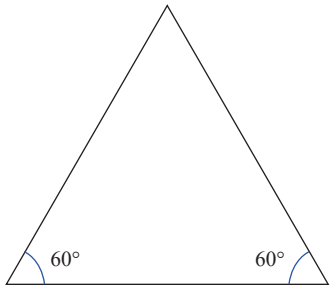

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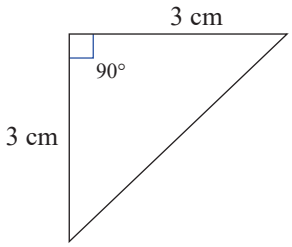
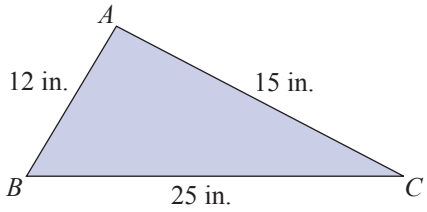


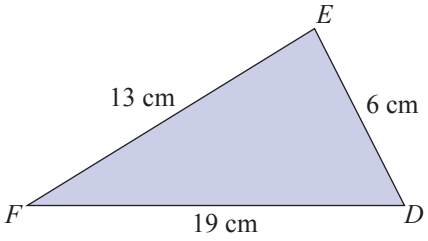
Applications

Solve.

37. Suppose the lengths of the sides of ΔABC are as shown in the figure. Is this possible? Explain your reasoning.



38. Suppose the lengths of the sides of ΔDEF are as shown in the figure. Is this possible? Explain your reasoning.



39. In the triangle shown, $m\angle X = 30°$ and $m\angle Y = 70°$.

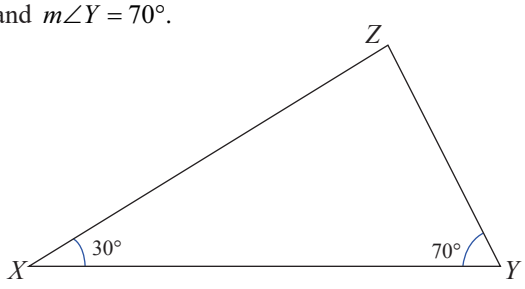
a. What is $m\angle Z$?

b. What kind of triangle is ΔXYZ?

c. Which side is opposite $\angle X$?

d. Which sides include $\angle X$?

e. Is ΔXYZ a right triangle?



40. In the triangle shown, $m\angle T = 50°$ and $m\angle U = 40°$.

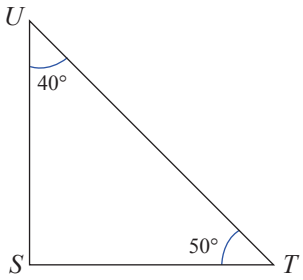
a. What is $m\angle S$?

b. What kind of triangle is ΔSTU?

c. Which side is opposite $\angle T$?

d. Which sides include $\angle T$?

e. Is ΔSTU a right triangle?



Writing & Thinking

41. Explain, in your own words, the relationships between vertex, ray, angle, and line.

42. List four types of angles and define each one in terms of measurement.

43. **a.** The supplement of a right angle is what type of angle?

b. The supplement of an obtuse angle is what type of angle?

c. The supplement of an acute angle is what type of angle?

44. List the three types of triangles that are classified according to their angles and give a brief description of each.