LESSON
15.2

Sum of Angle Measures in a Triangle

TEKS
Expressions, equations, and relationships—6.8.A Extend previous knowledge of triangles and their properties to include the sum of angles in a triangle...

? **ESSENTIAL QUESTION**

How do you use the sum of angles in a triangle to find an unknown angle measure?

EXPLORE ACTIVITY TEKS 6.8.A

Exploring Angles in a Triangle

Recall that a triangle is a closed figure with three line segments and three angles. The measures of the angles of a triangle have a special relationship with one another.

A Use a straightedge to draw a large triangle. Label the angles *1*, *2*, and *3*.

B Use scissors to cut out the triangle.

C Tear off the three angles. Arrange them around a point on a line as shown.

D What is the measure of the straight angle formed by the three angles?

_____
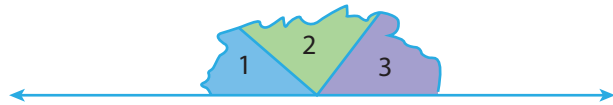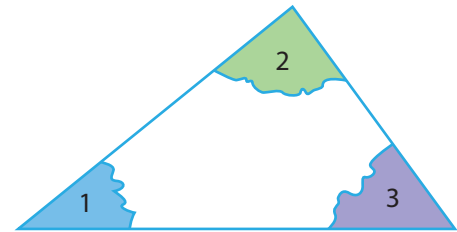
E What is the sum of the measures of the three angles? Explain.

_____

_____

F Compare your results with those of your classmates. What guess can you make?

_____

Reflect

1. **Justify Reasoning** How can you show that your guess is correct?

_____

_____

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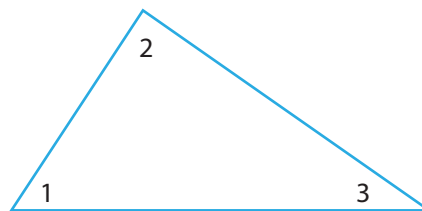# Finding an Angle Measure in a Triangle

Sum of Angle Measures of a Triangle

The sum of the measures of the angles in a triangle is $180°$.

$$m\angle 1 + m\angle 2 + m\angle 3 = 180°$$

EXAMPLE 1 Real World

TEKS 6.8.A

Fountain Place, shown to the right, is a 720-foot Dallas skyscraper. Find the measure of the unknown angle in the triangle at the top of the building.

$m\angle 1 + m\angle 2 + m\angle 3 = 180°$ The sum of the angle measures in a triangle is $180°$.

$65° + 65° + x = 180°$ Write an equation.

$130° + x = 180°$ Add.

$\underline{-130° \qquad -130°}$ Subtract $130°$ from both sides.

$x = 50°$

The angle at the top of the triangle measures $50°$.
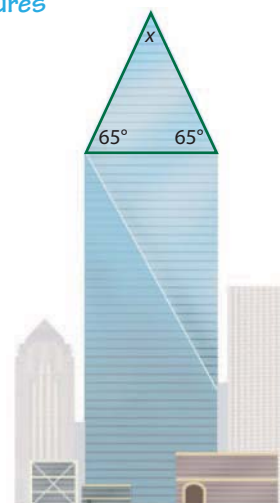
Math Talk
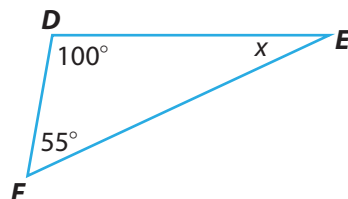
Mathematical Processes

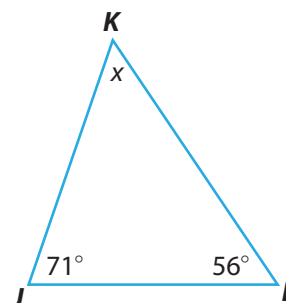Can a triangle have two obtuse angles? Why or why not?

YOUR TURN

Find the unknown angle measures.

2.

$x = $ _____

3.

$x = $ _____

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Finding Angles in an Equilateral Triangle

Recall that an *equilateral* triangle has three congruent sides and three congruent angles.

EXAMPLE 2

TEKS 6.8.A

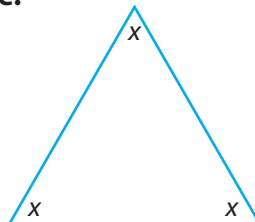**Find the angle measures in the equilateral triangle.**

$3x = 180°$ **Write an equation.**

$\dfrac{3x}{3} = \dfrac{180°}{3}$ **Divide both sides by 3.**

$x = 60°$

Each angle in an equilateral triangle measures $60°$.

Reflect

4. **Multiple Representations** Write a different equation to find the angle measures in Example 2. Will the answer be the same? Explain.

_____

_____

5. **Draw Conclusions** Triangle *ABC* is a right triangle. What conclusions can you draw about the measures of the angles of the triangle?

_____

_____

_____

YOUR TURN

Write an equation to find the unknown angle measure in each triangle.

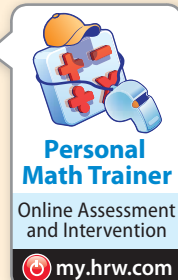**6.** The measures of two of the angles are $25°$ and $65°$.

_____

7. The measures of two of the angles are $60°$.
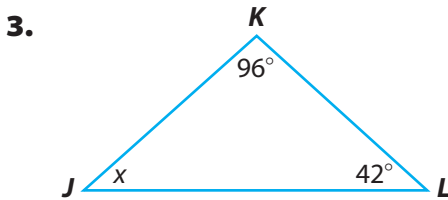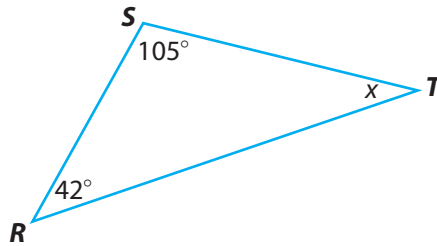
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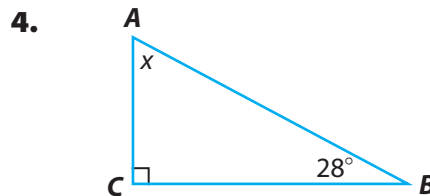**8.** The measures of two of the angles are $35°$.

_____

1. The sum of the angle measures in a triangle is _____.
(Explore Activity)

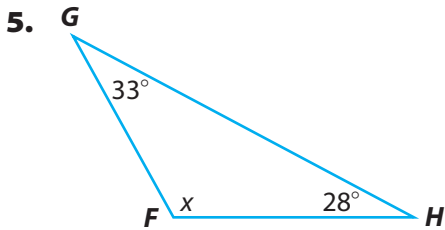**Find the unknown angle measure in each triangle.** (Examples 1 and 2)

2. $m\angle R + m\angle S + m\angle T =$ _____

_____ $+$ _____ $+ x =$ _____

_____ $+ x =$ _____

$-$ _____ $-$ _____

$x =$ _____

3.

$x =$ _____

4.

$x =$ _____

5.

$x =$ _____

6.
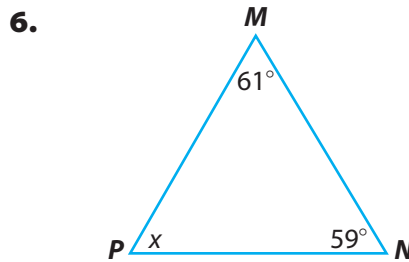
$x =$ _____

7. The measures of two of the angles are 45°. _____

8. The measures of two of the angles are 50° and 30°. _____

? ESSENTIAL QUESTION CHECK-IN

9. Arlen knows the measures of two angles of a triangle. Explain how he can find the measure of the third angle. Why does your method work?
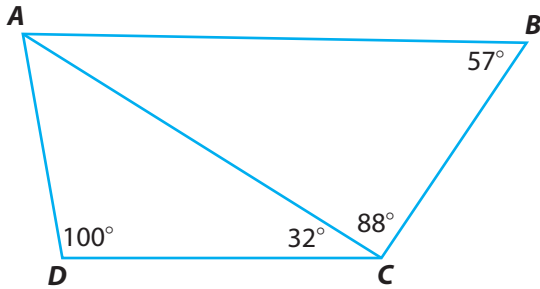
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15.2 Independent Practice

Personal Math Trainer

Online Assessment and Intervention

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Figure *ABCD* represents a garden crossed by straight walkway $\overline{AC}$. Use the figure for 10–15.

A .... *B*

57°

100°   32° 88°

D   *C*

10. Find m∠*DAC*.

_____

11. Explain how you found m∠*DAC*.

_____

_____

_____

12. Find m∠*BAC*.

_____

13. Explain how you found m∠*BAC*.

_____

_____

_____

14. Find m∠*DAB*.

_____

15. Explain how you found m∠*DAB*.
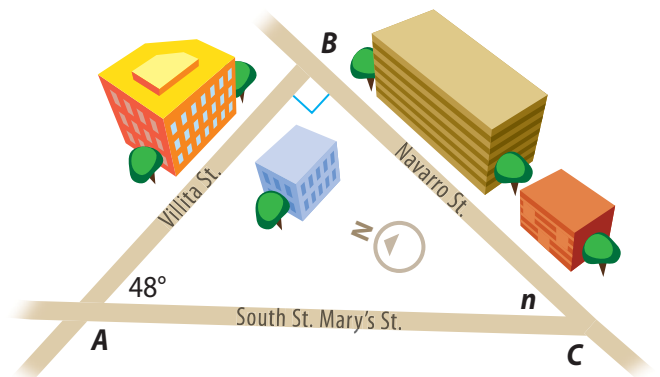
_____

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_____

16. An observer at point *O* sees airplane *P* directly over airport *A*. The observer measures the angle of the plane at 40.5°.

P

40.5°

O   *A*
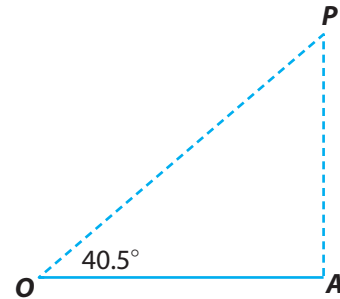
Find m∠*P*. _____

The map shows the intersection of three streets in San Antonio's River Walk district. Use the map for 17–18.

B

Navarro St.

Villita St.

N

48°   *n*

A   South St. Mary's St.   *C*

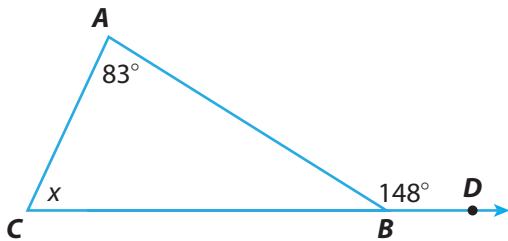**17.** Find the measures of the three angles of the triangle.

_____

_____

18. Explain how you found the angle measures.

_____

_____

_____

Work Area

19. Persevere in Problem Solving Find the measure of ∠ACB. Explain how you found your answer.
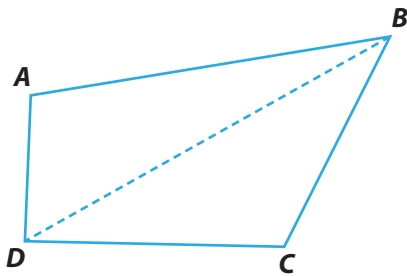
A

83°

x

148° **D**

C **B**

_____

_____

_____

_____

20. Communicate Mathematical Ideas Explain how you can use the figure to find the sum of the measures of the angles of quadrilateral *ABCD*. What is the sum?

B

A

D

C

_____

_____

_____

_____

21. Draw Conclusions Recall that a right triangle is a triangle with one right angle. One angle of a triangle measures 89.99 degrees. Can the triangle be a right triangle? Explain your reasoning.

_____

_____

_____

_____