5.1 Angles of Triangles
For use with Exploration 5.1

Essential Question  How are the angle measures of a triangle related?

1 EXPLORATION: Writing a Conjecture

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner.

a. Use dynamic geometry software to draw any triangle and label it \( \triangle ABC \).

b. Find the measures of the interior angles of the triangle.

c. Find the sum of the interior angle measures.

d. Repeat parts (a)–(c) with several other triangles. Then write a conjecture about the sum of the measures of the interior angles of a triangle.

Sample
Angles
\( \angle A = 43.67^\circ \)
\( \angle B = 81.87^\circ \)
\( \angle C = 54.46^\circ \)
EXPLORATION: Writing a Conjecture

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner.

a. Use dynamic geometry software to draw any triangle and label it $\triangle ABC$.

b. Draw an exterior angle at any vertex and find its measure.

c. Find the measures of the two nonadjacent interior angles of the triangle.

d. Find the sum of the measures of the two nonadjacent interior angles. Compare this sum to the measure of the exterior angle.

e. Repeat parts (a)–(d) with several other triangles. Then write a conjecture that compares the measure of an exterior angle with the sum of the measures of the two nonadjacent interior angles.

Communicate Your Answer

3. How are the angle measures of a triangle related?

4. An exterior angle of a triangle measures $32^\circ$. What do you know about the measures of the interior angles? Explain your reasoning.
5.1 Notetaking with Vocabulary
For use after Lesson 5.1

In your own words, write the meaning of each vocabulary term.

interior angles

eexterior angles

corollary to a theorem

Core Concepts
Classifying Triangles by Sides

Scalene Triangle
Isosceles Triangle
Equilateral Triangle

no congruent sides
at least 2 congruent sides
3 congruent sides

Classifying Triangles by Angles

Acute Triangle
Right Triangle
Obtuse Triangle
Equiangular Triangle

3 acute angles
1 right angle
1 obtuse angle
3 congruent angles

Notes:
Theorems

Theorem 5.1  Triangle Sum Theorem
The sum of the measures of the interior angles of a triangle is 180°.

Notes:

\[ m\angle A + m\angle B + m\angle C = 180^\circ \]

Theorem 5.2  Exterior Angle Theorem
The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

Notes:

\[ m\angle 1 = m\angle A + m\angle B \]

Corollary 5.1  Corollary to the Triangle Sum Theorem
The acute angles of a right triangle are complementary.

Notes:

\[ m\angle A + m\angle B = 90^\circ \]
5.1 Notetaking with Vocabulary (continued)

Extra Practice

In Exercises 1–3, classify the triangle by its sides and by measuring its angles.

1. \( \triangle PQR \)

2. \( \triangle ABC \)

3. \( \triangle EFG \)

4. Classify \( \triangle ABC \) by its sides. Then determine whether it is a right triangle.
   \( A(6, 6), B(9, 3), C(2, 2) \)

In Exercises 5 and 6, find the measure of the exterior angle.

5. \( \angle 1 = 53° \)

6. \( 40°, (8x – 5)°, (5x + 15)° \)

7. In a right triangle, the measure of one acute angle is twice the sum of the measure of the other acute angle and 30. Find the measure of each acute angle in the right triangle.