5-8

Practice

The Law of Cosines

Solve each triangle. Round to the nearest tenth.

1. $a = 20, b = 12, c = 28$

2. $a = 10, c = 8, B = 100°$

3. $c = 49, b = 40, A = 53°$

4. $a = 5, b = 7, c = 10$

Find the area of each triangle. Round to the nearest tenth.

5. $a = 5, b = 12, c = 13$

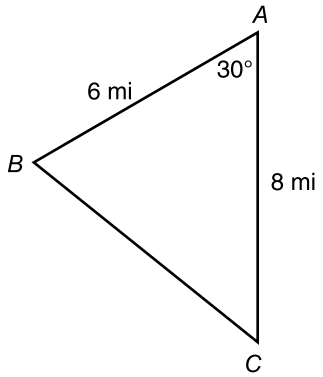
6. $a = 11, b = 13, c = 16$

7. $a = 14, b = 9, c = 8$

8. $a = 8, b = 7, c = 3$

9. The sides of a triangle measure 13.4 centimeters, 18.7 centimeters, and 26.5 centimeters. Find the measure of the angle with the least measure.

10. ***Orienteering*** During an orienteering hike, two hikers start at point A and head in a direction 30° west of south to point B. They hike 6 miles from point A to point B. From point B, they hike to point C and then from point C back to point A, which is 8 miles directly north of point C. How many miles did they hike from point B to point C?



NAME _____ DATE _____ PERIOD _____

5-8

Practice

The Law of Cosines

Solve each triangle. Round to the nearest tenth.

1. $a = 20, b = 12, c = 28$
$A = 38.2°, B = 21.8°, C = 120.0°$

2. $a = 10, c = 8, B = 100°$
$b = 13.8, A = 45.5°, C = 34.5°$

3. $c = 49, b = 40, A = 53°$
$a = 40.5, B = 52.0°, C = 75.0°$

4. $a = 5, b = 7, c = 10$
$A = 27.7°, B = 40.5°, C = 111.8°$

Find the area of each triangle. Round to the nearest tenth.

5. $a = 5, b = 12, c = 13$
30.0 units^2

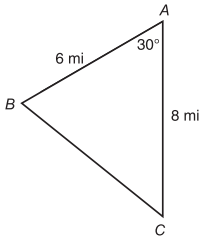
6. $a = 11, b = 13, c = 16$
71.0 units^2

7. $a = 14, b = 9, c = 8$
33.7 units^2

8. $a = 8, b = 7, c = 3$
10.4 units^2

9. The sides of a triangle measure 13.4 centimeters, 18.7 centimeters, and 26.5 centimeters. Find the measure of the angle with the least measure.
about 28.3°

10. ***Orienteering*** During an orienteering hike, two hikers start at point A and head in a direction 30° west of south to point B. They hike 6 miles from point A to point B. From point B, they hike to point C and then from point C back to point A, which is 8 miles directly north of point C. How many miles did they hike from point B to point C?
4.1 mi



NAME _____ DATE _____ PERIOD _____

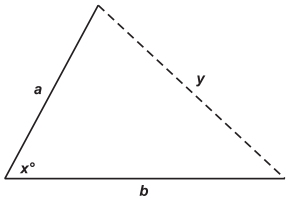
5-8

Enrichment

The Law of Cosines and the Pythagorean Theorem

The law of cosines bears strong similarities to the Pythagorean Theorem. According to the Law of Cosines, if two sides of a triangle have lengths a and b and if the angle between them has a measure of x, then the length, y, of the third side of the triangle can be found by using the equation

$$y^2 = a^2 + b^2 - 2ab \cos (x°).$$



Answer the following questions to clarify the relationship between the Law of Cosines and the Pythagorean Theorem.

1. If the value of x becomes less and less, what number is $\cos (x°)$ close to?
1

2. If the value of x is very close to zero but then increases, what happens to $\cos (x°)$ as x approaches 90?
decreases, approaches 0

3. If x equals 90, what is the value of $\cos (x°)$? What does the equation of $y^2 = a^2 + b^2 - 2ab \cos (x°)$ simplify to if x equals 90?
0, $y^2 = a^2 + b^2$

4. What happens to the value of $\cos (x°)$ as x increases beyond 90 and approaches 180?
decreases to −1

5. Consider some particular values of a and b, say 7 for a and 19 for b. Use a graphing calculator to graph the equation you get by solving $y^2 = 7^2 + 19^2 - 2(7)(19) \cos (x°)$ for y.
See students' graphs.

a. In view of the geometry of the situation, what range of values should you use for X on a graphing calculator?
Xmin = 0; Xmax = 180

b. Display the graph and use the TRACE function. What do the maximum and minimum values appear to be for the function?
See students' graphs; Ymin = 12, Ymax = 26

c. How do the answers for part **b** relate to the lengths 7 and 19? Are the maximum and minimum values from part **b** ever actually attained in the geometric situation?
min = (19 − 7); max = (19 + 7); no