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## Skills Practice

### The Law of Cosines

In  $\triangle RST$ , given the following measures, find the measure of the missing side.

1.  $r = 5, s = 8, m\angle T = 39$   $t \approx 5.2$
2.  $r = 6, t = 11, m\angle S = 87$   $s \approx 12.3$
3.  $r = 9, t = 15, m\angle S = 103$   $s \approx 19.2$
4.  $s = 12, t = 10, m\angle R = 58$   $r \approx 10.8$

In  $\triangle HIJ$ , given the lengths of the sides, find the measure of the stated angle to the nearest tenth.

5.  $h = 12, i = 18, j = 7; m\angle H$   $24.7$
6.  $h = 15, i = 16, j = 22; m\angle I$   $46.7$
7.  $h = 23, i = 27, j = 29; m\angle J$   $70.4$
8.  $h = 37, i = 21, j = 30; m\angle H$   $91.3$

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## Practice

### The Law of Cosines

In  $\triangle JKL$ , given the following measures, find the measure of the missing side.

1.  $j = 1.3, k = 10, m\angle L = 77$   $\ell \approx 9.8$
2.  $j = 9.6, \ell = 1.7, m\angle K = 43$   $k \approx 8.4$
3.  $j = 11, k = 7, m\angle L = 63$   $\ell \approx 10.0$
4.  $k = 4.7, \ell = 5.2, m\angle J = 112$   $j \approx 8.2$

In  $\triangle MNQ$ , given the lengths of the sides, find the measure of the stated angle to the nearest tenth.

5.  $m = 17, n = 23, q = 25; m\angle Q$   $75.7$
6.  $m = 24, n = 28, q = 34; m\angle M$   $44.2$
7.  $m = 12.9, n = 18, q = 20.5; m\angle N$   $60.2$
8.  $m = 23, n = 30.1, q = 42; m\angle Q$   $103.7$

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# Study Guide and Intervention *(continued)*

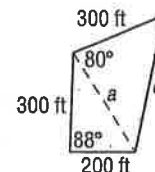
## The Law of Cosines

**Use the Law of Cosines to Solve Problems** You can use the **Law of Cosines** to solve some problems involving triangles.

<b>Law of Cosines</b>	Let $\triangle ABC$ be any triangle with $a$ , $b$ , and $c$ representing the measures of the sides opposite the angles with measures $A$ , $B$ , and $C$ , respectively. Then the following equations are true. $a^2 = b^2 + c^2 - 2bc \cos A$ $b^2 = a^2 + c^2 - 2ac \cos B$ $c^2 = a^2 + b^2 - 2ab \cos C$
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**Example**

**Ms. Jones wants to purchase a piece of land with the shape shown. Find the perimeter of the property.**



Use the Law of Cosines to find the value of  $a$ .

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Law of Cosines

$$a^2 = 300^2 + 200^2 - 2(300)(200) \cos 88^\circ$$

$b = 300, c = 200, m\angle A = 88$

$$a = \sqrt{130,000 - 120,000 \cos 88^\circ}$$

$$\approx 354.7$$

Take the square root of each side.

Use a calculator.

Use the Law of Cosines again to find the value of  $c$ .

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Law of Cosines

$$c^2 = 354.7^2 + 300^2 - 2(354.7)(300) \cos 80^\circ$$

$a = 354.7, b = 300, m\angle C = 80$

$$c = \sqrt{215,812.09 - 212,820 \cos 80^\circ}$$

$$\approx 422.9$$

Take the square root of each side.

Use a calculator.

The perimeter of the land is  $300 + 200 + 422.9 + 200$  or about 1223 feet.

**Exercises**

**Draw a figure or diagram to go with each exercise and mark it with the given information. Then solve the problem. Round angle measures to the nearest degree and side measures to the nearest tenth.**

1. A triangular garden has dimensions 54 feet, 48 feet, and 62 feet. Find the angles at each corner of the garden.

75°; 48°; 57°

2. A parallelogram has a 68° angle and sides 8 and 12. Find the lengths of the diagonals.

11.7; 16.7

3. An airplane is sighted from two locations, and its position forms an acute triangle with them. The distance to the airplane is 20 miles from one location with an angle of elevation 48.0°, and 40 miles from the other location with an angle of elevation of 21.8°. How far apart are the two locations?

50.5 mi

4. A ranger tower at point  $A$  is directly north of a ranger tower at point  $B$ . A fire at point  $C$  is observed from both towers. The distance from the fire to tower  $A$  is 60 miles, and the distance from the fire to tower  $B$  is 50 miles. If  $m\angle ACB = 62$ , find the distance between the towers.

57.3 mi.