Trigonometry/Precalculus

§6.2 Law of Cosines

Name _____

Date _____ Pd _____

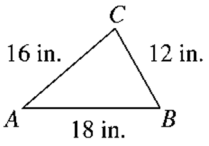
Two cases remain in the list of conditions needed to solve an oblique triangle—SSS and SAS. In these cases you can use the **Law of Cosines**.

Law of Cosines

Standard Form	*Alternative Form*
$a^2 = b^2 + c^2 - 2bc\cos(A)$	$\cos(A) = \dfrac{b^2 + c^2 - a^2}{2bc}$
$b^2 = a^2 + c^2 - 2ac\cos(B)$	$\cos(B) = \dfrac{a^2 + c^2 - b^2}{2ac}$
$c^2 = a^2 + b^2 - 2ab\cos(C)$	$\cos(C) = \dfrac{a^2 + b^2 - c^2}{2ab}$

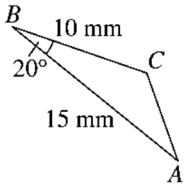
Example 1 (SSS)

Use the Law of Cosines to solve the triangle.



Example 2 (SAS)

Use the Law of Cosines to solve the triangle.



Example 3

A plane flies 810 miles from Franklin to Centerville with a bearing of $75°$. Then it flies 648 miles from Centerville to Rosemont with a bearing of $32°$. Find the straight-line distance and bearing from Rosemont to Franklin.

Heron's Area Formula

Given any triangle with sides of lengths a, b, and c, the area of the triangle is given by

$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$$

where $s = \dfrac{a+b+c}{2}$ is the semiperimeter.

Example 4

The Landau Building in Cambridge, Massachusetts has a triangular-shaped base. The lengths of the sides of the triangular base are 145 feet, 257 feet, and 290 feet. Find the area of the base of the building.

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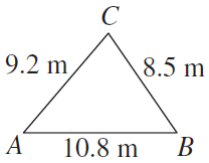
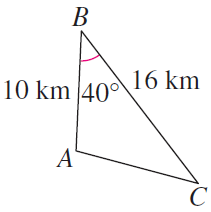
In Exercises 1-4, use the Law of Cosines to solve the triangle.

1.



2.



3. $a = 6,\ b = 8,\ c = 12$

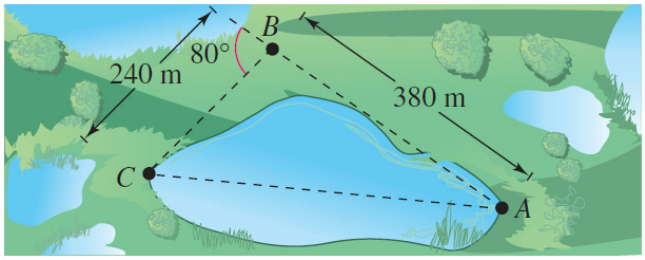
4. $A = 50°,\ b = 15,\ c = 30$

In Exercises 5-6, find the area of the triangle.

5. $a = 5,\ b = 8,\ c = 10$

6. $a = 14,\ b = 17,\ c = 7$

7. To approximate the length of a marsh, a surveyor walks 380 meters from point A to point B. Then the surveyor turns $80°$ and walks 240 meters to point C. Approximate the length AC of the marsh.



8. A boat race runs along a triangular course marked by buoys A, B, and C. The race starts with the boats headed west for 3600 meters. Then other two sides of the course lie to the north of the first side, and their lengths are 1500 meters and 2800 meters. Find the bearings for the last two legs of the race.