Math 150 Lecture Notes
The Law of Cosines

The Law of Cosines
In any triangle *ABC* we have

$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$b^2 = a^2 + c^2 - 2ac \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Since an angle and its supplement have the same sine, knowing the sine of an angle does not uniquely specify the angle. However, every angle between 0° and 180° has a unique cosine. Therefore, when it is possible to use the Law of Cosines to solve a triangle, ambiguity is not present.

A **bearing** is a navigation direction that is an acute angle measure from due north or due south.

Heron's Formula
The area of triangle *ABC* is given by $A_\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ where s is the **semiperimeter**, $s = \frac{1}{2}(a + b + c)$, of the triangle.

Example 1: Solve triangle *ABC* given that $a = 52$, $b = 66$, and $\angle C = 55°$.

Example 2: Solve triangle *ABC* given that $a = 20$, $b = 25$, and $c = 35$.

Example 3:   Find the area of the triangle given that $a = 12$, $b = 25$, and $c = 14$.

Example 4: Two tugboats that are 130 ft apart pull a barge. If the length of one cable is 220 ft and the length of the other is 250 ft, find the angle formed by the two cables.