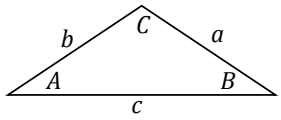
## Section 9.3

**The Law of Cosines**

## THE LAW OF COSINES




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

$$b^2 = a^2 + c^2 - 2ac\cos B$$

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

## TH E LAW OF COSINES RESTATED

The square of one side of a triangle equals the sum of the squares of the other four two sides minus twice their product times the cosine of their included angle.

COMMENT: If the triangle is a right triangle, the Law of Cosines formula becomes the familiar Pythagorean Theorem. Thus, the Pythagorean Theorem is said to be a special case of the Law of Cosines.

## WHEN TO USE THE LAW OF COSINES

The Law of Cosines is used when you have:

(a) a side-angle-side (SAS) triangle or
(b) a side-side-side (SSS) triangle.

## TIPS ON USING THE LAW OF COSINES

- Since the Law of Cosines is more complicated than the Law of Sines, we usually use it only once and then use the Law of Sines.
- If we have a SSS triangle, we use the Law of Cosines to solve for the largest angle. This eliminates the ambiguous case when we use the Law of Sines.

## EXAMPLE

A ship leaves Norfolk at noon with a heading of 41° at a constant speed of 12 mph. At 5:30 pm, the course is changed to a heading of 100° to avoid a storm. At midnight, find the distance and bearing from Norfolk.