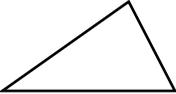
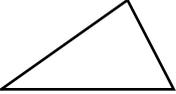
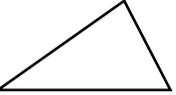
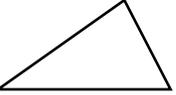


Lesson 6.5 & 6.6: The Law of Sines & The Law of Cosines

The Law of Sines

When do you use the Law of Sines?

Case 1:		
Case 2:		
Case 3:		
Case 4:		

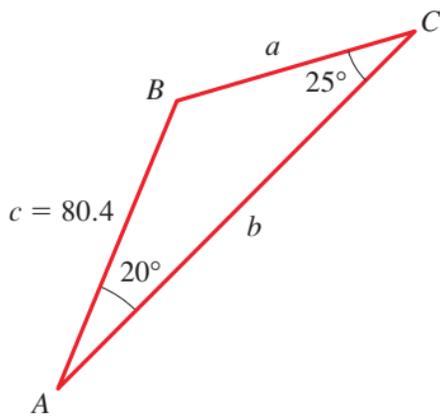
Law of Sines Formula:



Examples:

1. A satellite orbiting the earth passes directly overhead at observation stations in Phoenix and Los Angeles, 340 mi apart. At an instant when the satellite is between these two stations, its angle of elevation is simultaneously observed to be 60° at Phoenix and 75° at Los Angeles. How far is the satellite from Los Angeles?

2. Solve the triangle below.



Which of the four cases for Law of Sines is the triangle above? _____

The Ambiguous Case (SSA)

If we are given a triangle with two sides and an angle, but the angle is not adjacent to either of the two sides, there are three potential outcomes:

- 1.
- 2.
- 3.

Examples:

1. Solve triangle ABC, where $\angle A = 45^\circ$, $a = 7\sqrt{2}$, and $b = 7$.

How many solutions are there? Explain.

2. Solve triangle ABC if $\angle A = 43.1^\circ$, $a = 186.2$, and $b = 248.6$.

Triangle 1		Triangle 2	
$\angle A = 43.1$	$a = 186.2$	$\angle A = 43.1$	$a = 186.2$
$\angle B =$	$b = 248.6$	$\angle B =$	$b = 248.6$
$\angle C =$	$c =$	$\angle C =$	$c =$

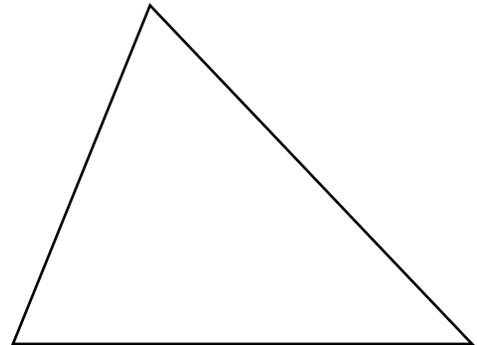
3. Solve triangle ABC, where $\angle A = 42^\circ$, $a = 70$, and $b = 122$.

How many solutions are there? Explain.

The Law of Cosines

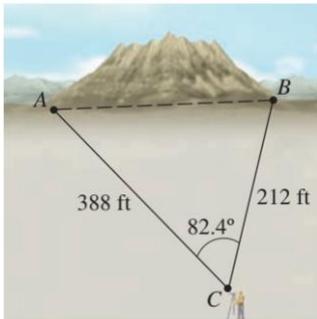
The law of sines cannot be used directly to solve triangles if we know two sides and the angle in between them (SAS) or if we know all three sides (SSS).

The two cases in which the Law of Cosines applies are _____ and _____ .

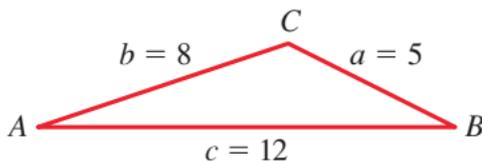


Examples:

1. A tunnel is to be built through a mountain. To estimate the length of the tunnel, a surveyor makes the measurements shown in the figure below. Use the surveyor's data to approximate the length of the tunnel.



2. Find the angles in the triangle below.



3. Solve triangle ABC, where $\angle A = 46.5^\circ$, $b = 10.5$, and $c = 18.0$.

Heron's Formula for Area (of a Triangle)

We can apply the Law of Cosines to finding the area of a triangle:

Example:

A businessman wishes to buy a triangular lot in a busy downtown location (see the figure below). The lot frontages on the three adjacent streets are 125, 280, and 315 ft. Find the area of the lot.

