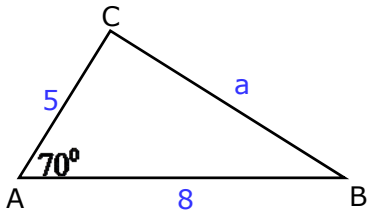
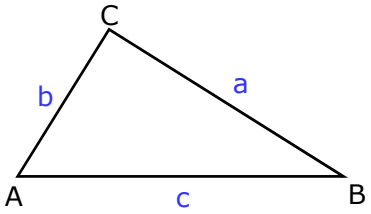
Example 1: Solve the triangle using the sine law.



Not so easy, is it? We have 2 unknowns in 1 equation. Solution? Constuct an altitude and use right triangle trigonometry to calculate $h, AD, \& DB$, then use Pythagoras to determine 'a'.

If we use this example we can actually derive the Cosine Law, by substituting the numbers with variables and doing a little algebra.



- We started with $a^2 = \left(5\sin 70^0\right)^2 + \left(8 - 5\cos 70^0\right)^2$
- Replacing the numbers with the appropriate variables we get $a^2 = (b\sin A)^2 + (c - b\cos A)^2$
- By expanding, we get $a^2 = b^2(\sin A)^2 + c^2 - 2bc\cos A + b^2(\cos A)^2$
- Rearranging, we get $a^2 = b^2(\sin A)^2 + b^2(\cos A)^2 + c^2 - 2bc\cos A$
- Factoring b^2, we get $a^2 = b^2\left[(\sin A)^2 + (\cos A)^2\right] + c^2 - 2bc\cos A$
- Since, $(\sin A)^2 + (\cos A)^2 = 1$, we get $a^2 = b^2[1] + c^2 - 2bc\cos A$
- Therefore, the Cosine Law is $\boxed{a^2 = b^2 + c^2 - 2bc\cos A}$

The Cosine Law can be used to solve triangles with the following characteristics.

- Given 2 sides and an angle in between
- Given 3 sides and no angles

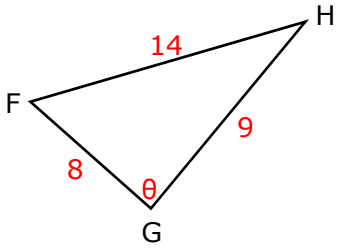
Now try solving the triangle from Example 1.

Example 2: A radar tracking station detects a fishing trawler 5.4km away, and a cruise ship 7.2km away. From the station, the angle between the lines of sight to the two boats is 118^0. How far apart are the two boats?

Example 3: A triangular park has sides with lengths of 200m, 155m, and 172m. What is the area of the park?

Example 4: The minute hand on an analog clock measures 16 cm and the hour hand measures 12 cm. What is the distance between the two hands if it was 4 o'clock?

Example 5: Determine the value of the missing angle from this triangle.



Homework: