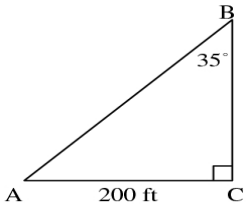
7.1 Right Triangle Trigonometry: Applications

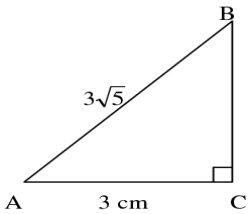
We will come back to right triangles again. In these questions, if it asks you to solve the triangle then that means you need to find all sides and angles.

EXAMPLE: Solve the triangle:



In this problem we need to find side AB, side AC, and $m\angle A$ (measurement of angle A). First we can find $m\angle A$. The sum of all the angles in a triangle is 180 degrees. We have a 35 degree angle and a 90 degree angle, so $m\angle A = 180 - 35 - 90 = 55^\circ$. Now we want to find side AB. Let's call this length x. From our picture above let's use the 35 degree angle. The side opposite this angle is 200 ft. The hypotenuse is x, which is what we are trying to find. We can set up the following equation: $\sin 35^\circ = \frac{200}{x}$. We can solve for x by cross multiplying. We get $x = \frac{200}{\sin 35^\circ} = 348.69$ ft. Now we can solve for side BC, which we are calling y. Again if we use the 35 degree angle, the y is the adjacent angle and 200 ft is still the opposite side. We will use the following equation to solve for y: $\tan 35^\circ = \frac{200}{y}$. We can solve for y by doing cross multiplication: $y = \frac{200}{\tan 35^\circ} = 285.63$ ft. Now we know the measurement of all three sides and angles, so it is solved.

EXAMPLE: Solve the triangle:



I will let side BC be x. Now we can use the Pythagorean Theorem to find find it: $3^2 + x^2 = \left(3\sqrt{5}\right)^2$. Solving this will give us: $9 + x^2 = 45$, so $x = 6$. To find $m\angle A$, we can set up the following trig equation: $\cos A = \frac{3}{3\sqrt{5}}$. So we have $\cos A = 0.4472$. We need to take the inverse cosine to get our answer. So $A = \cos^{-1} 0.4472 = 63.44^\circ$. To find $m\angle B$ we will subtract 90 degrees and 63.44 degrees from 180 degrees. We will get: $m\angle B = 180 - 63.44 - 90 = 26.56^\circ$. Now our triangle is solved.