Physics A: Finding Component Vectors

Scene #	Description	Narration
1	A blank white screen is showing as a narrator is talking.	We've seen how we can add component vectors together to get a resultant vector, but usually in a problem, we'll be given the resultant vector, and we have to add that to another resultant vector. In order to do that, we need to break each resultant vector into its component vectors. So let's look at how we do that.
2	The narrator draws an arrow pointing at an angle going up. On top of the arrow he draws the velocity. At the bottom of the arrow he draws a dotted line and writes the theta value by the dotted lines. The narrator continues the dotted line in red and labels it v-sub-x for the x component. From the end of the red arrow he draws an arrow going up in blue to make a triangle and he labels it v-sub-y. On the right side of the screen the narrator writes the formula for the cosine ratio to solve for the x component. The narrator writes the formula for the sine ratio on the screen to solve for y.	Let's imagine a baseball thrown upward at an angle with a velocity of 31 meters per second. We'll say this baseball is thrown at an angle of theta equals 34 degrees above the horizontal. This velocity has an x-component and a y-component. The x-component of this velocity vector will look like that - that we're going to call v-sub-x. The y-component of this velocity vector will point upward like that, and we call that v-sub-y. To solve for each of these component vectors, we going to have to use some trigonometry. First, let's solve for the x-component. To solve for the x-component, we're going to use the cosine ratio. The cosine ratio says cosine of some angle theta is equal to the adjacent side divided by the hypotenuse. So let's enter in the values we know, and solve for the velocity in the x-direction. Cosine of our angle theta - that is 34 degrees - is equal to the adjacent side to that angle - in this case v-sub-x - divided by the hypotenuse, which is 31 meters per second. We can multiply both sides of this equation by 31 meters per second, and we get 31 meters per second times cosine of 34 degrees equals v-sub-x. Enter this into your calculator, and you'll find the velocity in the x-direction is equal to 25.7 meters per second. So when this baseball is thrown up at that angle and at that velocity of 31 meters per second, in the x-direction, it's moving at 25.7 meters per second. Now let's solve for the velocity in the y-direction. To solve for that one, we're going to

	He proceeds to record the steps to solve the problem.	use the sine ratio. And that tells us that sine of theta is equal to the opposite side divided by the hypotenuse. Again, let's enter the values we know. Sine of theta - theta is 34 degrees - is equal to the opposite side, opposite of that angle is our v-sub-y, divided by the hypotenuse, which is 31 meters per second. Again, we can multiply both sides of this equation by 31 meters per second, and we get 31 meters per second times the sine of 34 degrees equals v-sub-y. Enter this into your calculator, and you'll find the velocity in the y-direction is equal to 17.3 meters per second. So when this ball is thrown initially, it's at first moving upwards at a speed of 17.3 meters per second, and forwards at a speed of 25.7 meters per second. And we can use these values to add to other component vectors to more easily find the sum of our two resultant vectors.