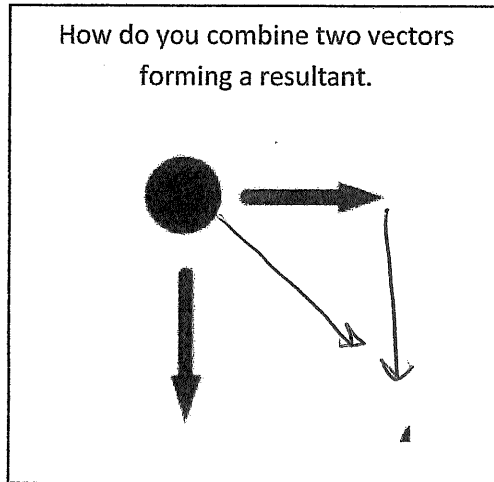What do I need to know about vectors and projectile motion?
What skills do I need to use vectors and projectile motion?

1. Example scenario A: As a kid I would ride in the back of pickup trucks on my grandpa's farm. In the back of the truck there would be rocks. I would stand up and throw the rocks over the front of the truck while we were moving down the road. The rock would propel forwards over the truck and then come back over the truck.

   a. If the truck is traveling at 20m/s and the rock is thrown at 5 m/s what is the combined velocity of the ball as it is thrown.

   $20 \rightarrow \quad 5 \rightarrow$

   $\longrightarrow \quad 25 \, m/s$
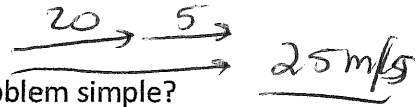
   b. This example is fairly simple... why is this problem simple?

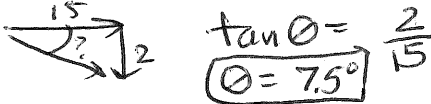   How do you combine two vectors forming a resultant.

2. Example scenario: A car is traveling south the 15 m/s and a person throws and apple out the window at 2m/s. What is the speed and direction of the apple?

   a. How do we combine (add) these two vectors to give a new resultant vector?

   $2^2 + 15^2 = V^2 \qquad 15.1 \, m/s = V$

   [Car] $\xrightarrow{15}$ apple 2m/s

   b. What is the resultant velocity and angle?

   $\tan \theta = \dfrac{2}{15}$

   $\boxed{\theta = 7.5°}$

3. A ball is thrown at 20° with a velocity of 20m/s.

   a. What is the component of velocity moving in the X direction?

   $Mg \, Cos \, \theta = X$

   $20 \cdot Cos \, 20 = 18.7 \, m/s$

   20m/s, 20°

   20°

   Draw component vectors?

   b. What is the component of velocity moving in the Y direction?

   $Mg \, Sin \theta = Y$

   $20 \cdot Sin \, 20 = 6.8 \, m/s$

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