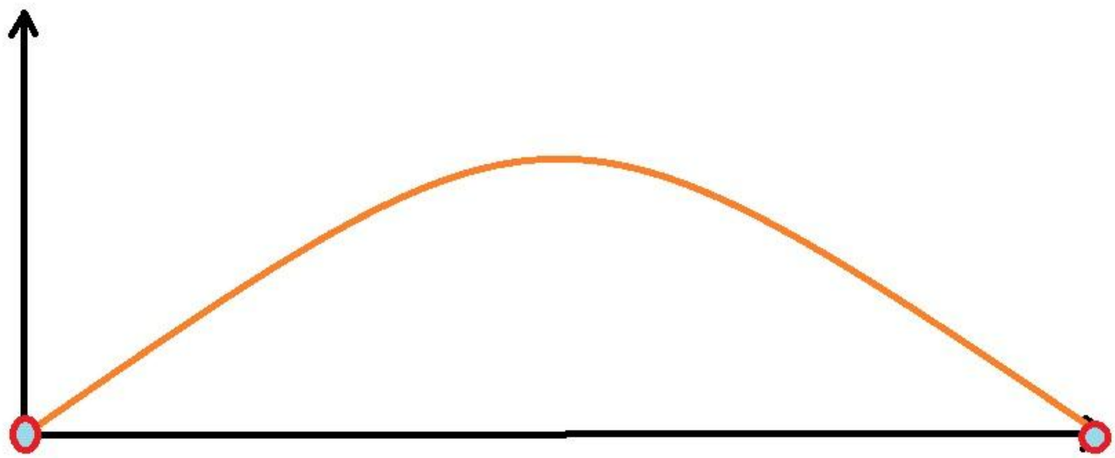
Lettergram.Net – Projectile Motion

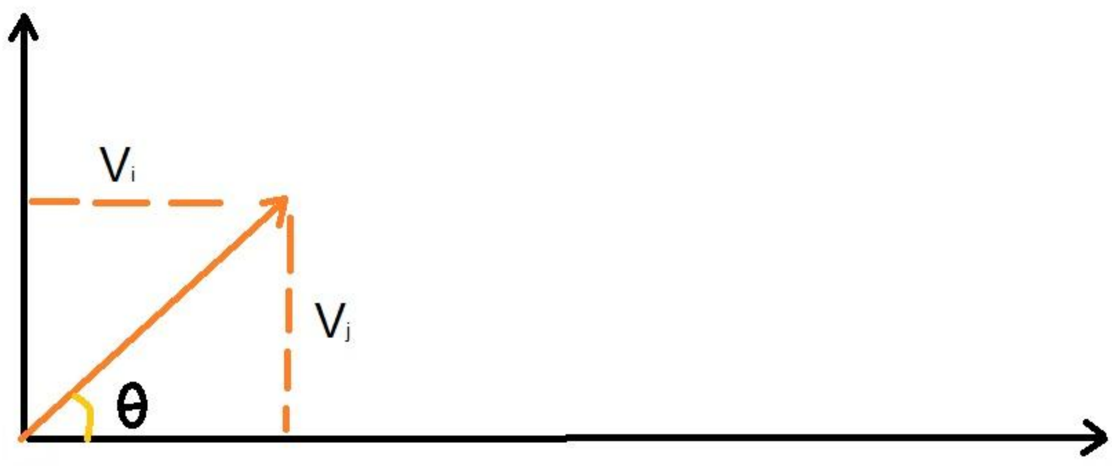
To understand this section you must have a firm grasp of motion in one direction and vectors.



Above is the path of what we can call a projectile, picture when you throw a baseball through the air or a snow ball. The ball follows a path and once it is released, do you have any effect on it? Of course not, you have no impact once it is thrown, you do however have the ability to direct the angle and speed at which is released.

Based on that, what could you say about a projectiles path? Is it able to be pre-determined if we know the angle and speed at which it was released? Can we determine the speed at which it was released by knowing the angle of its release and how far it travels? The answer is yes to all of these questions.

Example 1: Ball being released.



In the example above we have a ball being released at some angle into the air as a normal toss would. That vector has an angle, and two components of the vector of the ball, some velocity which is aimed in the y direction and some velocity in the x direction. In order to solve all projectile motion questions we must first break the vector of the ball into the two separate components. Once that is achieved, we know that there is an acceleration due to gravity and that the ball will slow down in the y direction and come back to Earth (in these problems air resistance plays effect more at high speeds and upper level classes, and acceleration due to gravity is usually estimated at 9.8 m/s^2)

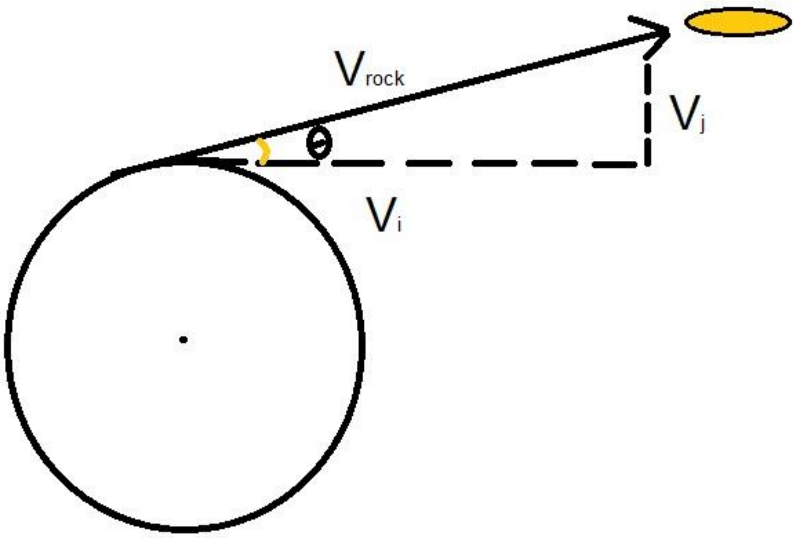
Note:

$V_i = V_{ball} * \cos\theta$

$V_j = V_{ball} * \sin\theta$

*If you do not understand why visit lettergram.net and search vectors.

Example 2: David and Goliath!



In this example there is a rock in a sling traveling around a circular path before being released at a specific point. *Please go over circular motion previous to this or when you see this problem, just search circular motion at lettergram.net. In the case of this example we must define our x and y directions and then identify the components. Usually, the x-components are parallel to the ground and the y-components are 90 degrees to the ground, often called normal. Using the equation $V^2/r = a_c$ we know that the release velocity is equivalent to $\sqrt{ar}$ which when then find the angle of release by taking the tangent of when the rock was released (Newton's laws applied) and the difference in angle between that and parallel to the ground or normal allows us to obtain an angle. Once we know the angle all that is necessary is to break down the components just like example 1 and there we go.

Key Concepts!

To understand these problems, all we need to do is reapply what we already know about Newton's Laws, Vectors, Rotational Motion, Kinematics, it is simple. For example gravity is always acting on objects, so take into account gravity, Newton's laws of an object in motion will stay in motion, enables us to say that the component of the velocity vector in the x-direction will remain unchanged if air resistance is not taken into account. The simple rules to follow are much like that of force:

1) Draw out the problem.

2) Draw it out as a diagram of forces.

3) List all known variables.

4) Solve for what you are trying to find using variables, and using vector rules.

5) Plug in the information you have and solve for unknown variables.

6) Check using logic (You do not want to say, for example, a person weighs 1,000kg).

7) If everything seems logical, CONGRADULATIONS, if not, redo.

The only thing that changes in this case is that there is no x and y components and some concepts must be combined.

Recommendations:

Because I do not know the specific knowledge each individual has using this guide, I would recommend that if there is something I mention that you do not fully understand you either use YouTube to find a video; Tweet me via Twitter *(though I may be a while getting back); Comment on the related post on Lettergram.net or simply ask your teacher.