

Projectile Motion Review

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Concept #1: Vectors

- Vectors have both magnitude and direction so
- Scalar distance = the total distance traveled
- Net/resultant displacement = the displacement from the ending point to the starting point
 - There are two ways of finding displacement: Tail to tip method and parallelogram method
- Velocity is the vector we use in this unit

Concept #2: Motion

A projectile is any object with mass that is moving in two dimensions.

There are a few rules that projectiles will ALWAYS follow, we can use them as laws in our calculations.

1. Horizontal velocity remains constant - no acceleration
2. Vertical velocity is accelerated by the force of gravity, 9.8 m/s^2
3. Horizontal and vertical velocity are completely independent of each other and treated separately
4. Objects dropping/thrown from a moving vehicle have the same horizontal velocity as the vehicle

Concept #2: Motion

Projectile motion is just like linear motion, except the added horizontal axis. So we can treat it just like free fall and use those equations, as long as we separate into vertical and horizontal components.

$$d = v_i * t + \frac{1}{2} * a * t^2$$

$$v_f = v_i + a * t$$

$$v_f^2 = v_i^2 + 2 * a * d$$

d = displacement a = acceleration t = time

v_f = final velocity v_i = initial velocity

Common Mistakes or Misconceptions Relevant to Projectile Motion and How to Avoid them

Mistake/Misconception #1:

The vertical and horizontal components are dependent on each other.

This is a misconception because the vertical and horizontal components are completely independent of each other. An object projected horizontally will reach the ground at the exact same time as an object projected vertically.

Common Mistakes or Misconceptions Relevant to Projectile Motion and How to Avoid them

Mistake/Misconception #2:

Not taking into account the direction of the vectors.

This is important because the direction determines whether or not the number is positive or negative. Not taking this into account will change the answer.

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Mistake/Misconception #3:

Not drawing out the vectors when depicting physics situations.

This is helpful because without it you would not know the direction of the vectors. You also would be able to determine if the direction is negative or positive.