

Projectile Motion

Goals

- 1) Review key concepts of Linear Motion
- 2) Analyze objects that are in projectile motion
- 3) Apply mathematical relationships to predict what will happen in real-world situations

Remember!

Linear motion =
objects move in a
straight line!

Review of Key Equations for Linear Motion

Use these when:

- Initial speed = 0
- Acceleration is constant (not “jerky”)

Key Equations:

$$\mathbf{a} = \frac{\Delta v}{t}$$

$$\mathbf{d} = \frac{1}{2} g t^2$$

Projectile Motion

When an object moves in a **curved**
path



Key Terms

Vector Components

What makes up a velocity vector

Projectile

Any object that moves through
air or space acted on only by
gravity

Projectile Motion

- Projectile motion can be described with:

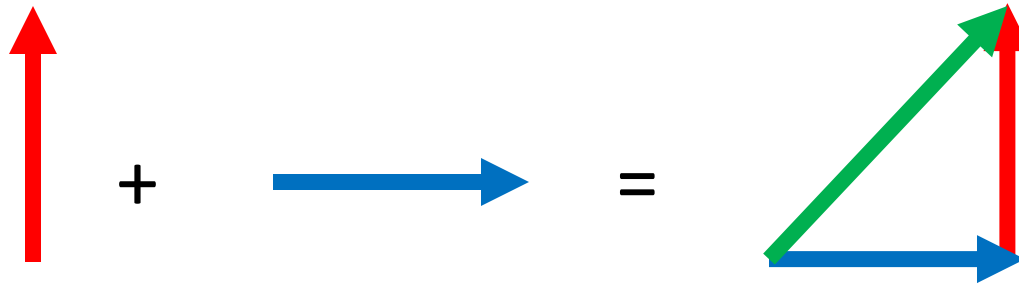
–Horizontal component



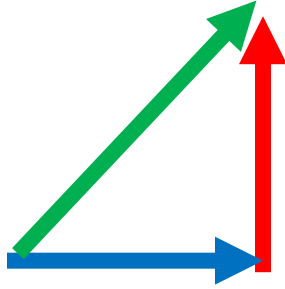
–Vertical component



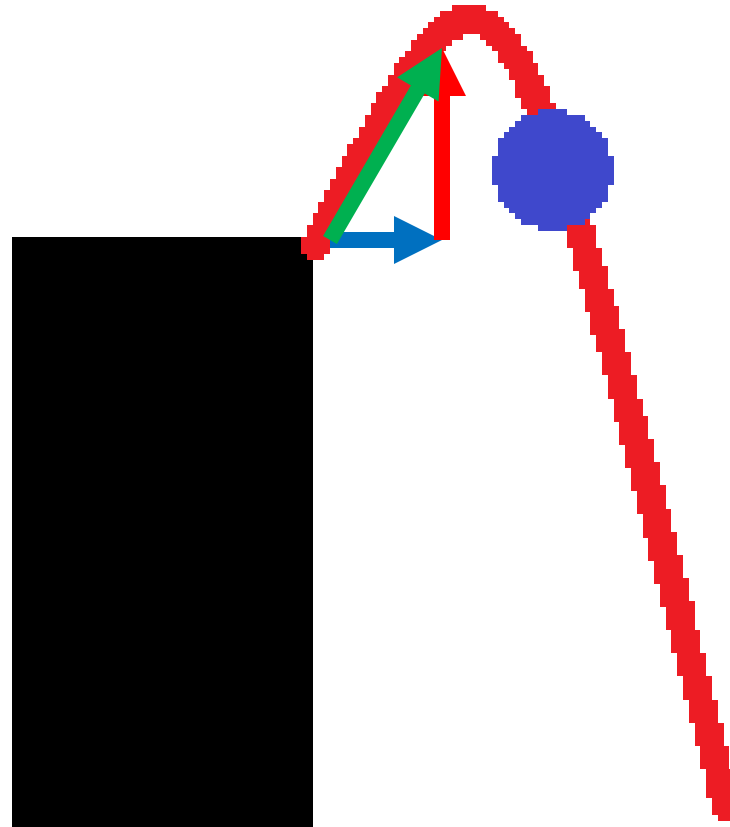
Projectile Motion: Vector Review




Projectile Motion: Breaking it Down



Projectile Motion: Breaking it Down



Horizontal Component

- Just like the **linear** motion of a ball rolling along a level surface without friction! 
- **Horizontal** component of **velocity** remains **constant**!
- **Horizontal** component of **distance** remains **constant**!

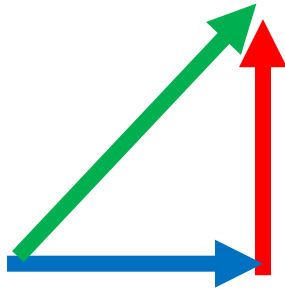
Vertical Component

- Just like the **linear** motion of a ball in **free fall**!
- **Vertical** component of **velocity** increases because **gravity** is acting on it!
- **Vertical** component of **distance** can be calculated as if the object was dropped from a height.



So... combined vectors

Produce the projectile path the object follows!



Summary

Horizontal Component

Just like the linear motion
of a ball rolling freely along
a level surface without
friction!

Velocity is constant

Vertical Component

Just like the motion of a
ball in free fall!

Velocity increases

Combined vectors produce projectile motion!

Applying Math to Projectile Motion

Horizontal Components of distance and velocity:

$$d = v \times t$$

$$v = \frac{d}{t}$$

Applying Math to Projectile Motion

Vertical Components of distance and velocity:

$$d = \frac{1}{2} g \times t^2$$

$$v = a \times t$$