PROJECTILE MOTION

Objectives

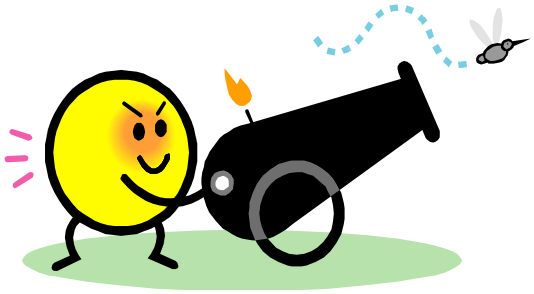
- Sketch the theoretical path of a projectile.
- Recognize the independence of the vertical and horizontal motions of a projectile.
- Solve problems involving projectile motion for projectiles fired horizontally and at an angle.

What is a Projectile?

- A projectile is an object that is in acted upon only by gravity.
- In reality, air resistance plays a role, but similar to free fall, we will neglect air resistance in this course.
- Typically, projectiles are objects launched at an angle.

Path of a Projectile

- Projectiles launched at an angle move in parabolic arcs.



Independence of Motion

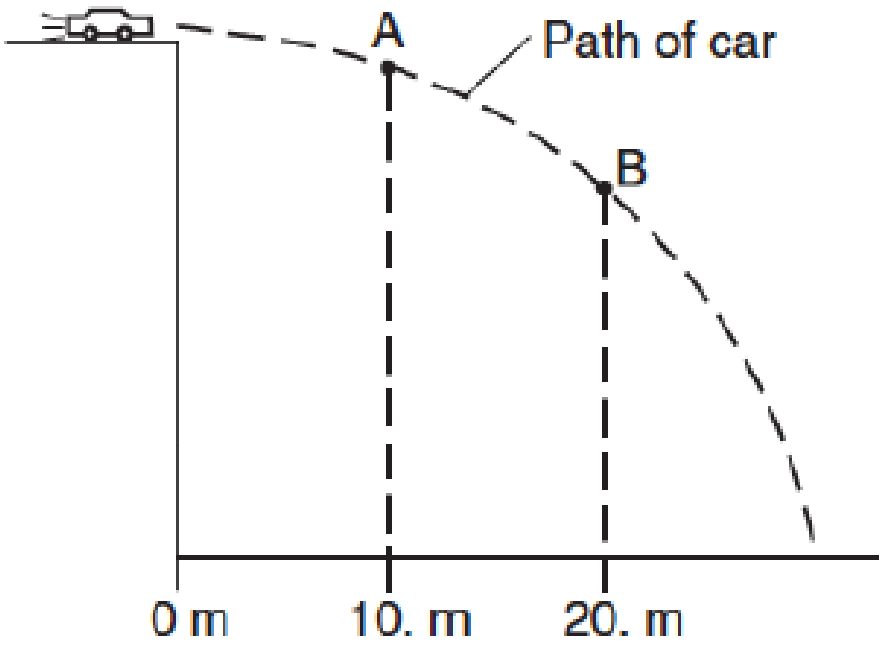
- Projectiles launched at an angle have motion in two dimensions.
  - Vertical- like free fall
  - Horizontal- 0 acceleration
- Vertical motion and horizontal motion can be treated separately.

Sample- Horizontal Launch

- Fred throws a baseball 42 m/s horizontally from a height of 2m. How far will the ball travel before it reaches the ground.

Sample- Parabolic Path

The diagram represents the path of a stunt car that is driven off a cliff, neglecting friction. Compared to the horizontal component of the car's velocity at point A, the horizontal component of the car's velocity at B is:



1. Smaller
2. Greater
3. The same

Angled Projectiles

- For objects launched at an angle, you must first break up the object's initial velocity into x- and y-components of initial velocity.
- Then, use these components of initial velocity in your horizontal and vertical motion tables.
- An object will travel the maximum horizontal distance with a launch angle of 45°.

Sample Problem- Human Cannonball

Nick the human cannonball is launched from level ground at an angle of 30° above the horizontal with an initial velocity of 26 m/s.

How far does Nick travel horizontally before reuniting with the ground?

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