What is Projectile Motion?

Worksheet

Projectile motion is two-dimensional motion where an object moves horizontally at constant velocity while accelerating downward due to gravity, tracing a parabola. Its range is R = vsin(2)/g.

$$x = v_x t, y = v_{y0} t - \frac{1}{2}gt^2$$

Questions

1. At what launch angle is the range of a projectile maximized (level ground)?

A) 30
B) 45
C) 60
D) 90

2. What happens to horizontal velocity during projectile motion (no air resistance)?

A) It increases
B) It decreases
C) It stays constant
D) It becomes zero at the peak

3. A ball launched at 10 m/s and 45 has what approximate range (g = 9.8 m/s)?

A) 5.10 m
B) 10.20 m
C) 20.40 m
D) 2.55 m

4. What causes the parabolic shape of projectile motion?

A) Constant horizontal velocity + constant vertical acceleration
B) Changing horizontal velocity
C) Zero gravity
D) Air resistance only

5. A ball is launched at 20 m/s at a 30 angle. Find its range (g = 9.8 m/s).

6. A projectile is launched at 15 m/s at 45. Find its time of flight.

7. A projectile is launched at 25 m/s at 60. Find its maximum height.

8. Define: What is projectile motion?

9. Define: What shape does a projectile's path trace?

10. Define: At what angle is range maximum?

Answer Key

1. B) 45 - sin(2) is maximum at = 45, since sin(90) = 1.

2. C) It stays constant - No horizontal force acts, so horizontal velocity is constant throughout the flight.

3. B) 10.20 m - R = vsin(2)/g = 100 1 / 9.8 10.20 m.

4. A) Constant horizontal velocity + constant vertical acceleration - Constant horizontal speed combined with gravity's constant downward acceleration creates the parabola.

5. R = vsin(2)/g R = 20 sin(60) / 9.8 R = 400 0.866 / 9.8 R = 35.35 m

6. T = 2vsin / g T = 2 15 sin(45) / 9.8 T = 21.21 / 9.8 T = 2.16 s

7. H = vsin / (2g) H = 25 sin(60) / (2 9.8) H = 625 0.75 / 19.6 H = 23.92 m

8. Two-dimensional motion combining constant horizontal velocity with vertical acceleration due to gravity.

9. A parabola (assuming no air resistance).

10. 45, for a given launch speed on level ground.