

1.6 - Projectile Motion I Practice

Unit 1: Kinematics, Vectors, and Mathematics

Instructions for each problem:

- write out all possible variables, fill in the relevant values, eliminate variables not used
- draw/model the scenario
- Write the equations you are going to use before substituting values
- Show your work and track your units
- **Extend:** rearrange the equations first to solve for the unknown

1. A ball is thrown up with a velocity of 19.6 m/s at an angle of 30° relative to the horizontal.

a. Resolve the initial velocity into horizontal and vertical components.

b. Find the maximum height reached by the ball and the total time spent in the air.

c. Calculate the horizontal range.

2. A rock is thrown horizontally from a high cliff at 25 m/s.
 - a. What will its horizontal velocity be after 2.0 s?
 - b. What will its vertical velocity be after 2.0 s?
 - c. What will its velocity be after 3.0 s?
 - d. What will be its displacement after 3.0 s?

3. A projectile is fired from the edge of a 150 m cliff with an initial velocity of 180 m/s, at an angle of 30° with the horizontal.
 - a. Find the horizontal displacement from the gun to the point where the projectile strikes the ground.
 - b. Find the greatest elevation above the ground reached by the projectile.

4. A projectile is fired with an initial velocity of 240 m/s at a target located at the same level as the gun and at a horizontal displacement of 3600 m . Determine the value(s) of the firing angle.

5. A golf ball is struck and leaves the ground at 48 m/s on a 60° angle.
- How long will it be in the air before bouncing?

- How far will the ball travel in the air before the first bounce?

c. Determine the velocity of the ball 2 seconds after it was struck.

d. The most common incorrect answer for this question is 22m/s. What has actually been calculated if this is the answer?

Answers: **1a.** 17.0 m/s, 9.80 m/s **1b.** 4.90 m, 2.00 s **1c.** 34.0 m | **2a.** 25 m/s **2b.** 19.6 m/s ↓ **2c.** 38.6 m/s @ 50° ↓ **2d.** 87.0 m @ 30.5° ↓ | **3a.** 3.10×10^3 m **3b.** 5.63×10^2 m | **4.** 18.9° or 71.1° | **5a.** 8.49 s **5b.** 2.04×10^2 m **5c.** 32.6 m/s @ 42.5° ↑ **5d.** 22.0 m/s (vertical component)