



Activity 8.2b – Math Calculations for the Range

Purpose

Understanding the process for calculating the range of the Ballistic Device (BD) using angle and velocity

Given the velocity of the BD calculated in a previous activity, determine the formula and calculate ideal ranges based on known initial velocity and angles.

Equipment

Calculator

Procedure

Recall that the formula for initial velocity of the BD is as follows (see section on Calculating the Velocity of the BD)

$$v_i = \sqrt{\frac{-gx}{\sin 2\theta}}$$

Step 1: Remove the square root by squaring both sides of this equation.

$$v_i^2 = \frac{-gx}{\sin 2\theta}$$

Step 2: Multiply both sides of the equation by $\sin 2\theta$, and divide by $-g$. This results in an equation for x , expressed in terms of v_i , g , and θ .

$$x = \frac{-v_i^2 \sin 2\theta}{g}$$

Conclusion

1. Which firing angle will give you the greatest distance?

2. What is the distance if the BD is placed at an angle to the horizon of 15 degrees? What would the distance be if the angle is 75 degrees? Compare the two and explain why the distances worked out the way they did.