W2.04A

Projectile Intro Problems

1. (review) A safe is dropped from the top of a building 125 meters high.

    a. What is its initial vertical velocity? Horizontal velocity?
    b. How far does it fall in the first second? The second second?
    c. How long does it take to hit the ground?
    d. What is its vertical speed after 2 seconds? 4 seconds?
    e. What is its vertical speed when it hits?
    f. What is its vertical acceleration after 3.22 seconds?

2. A piano is pushed horizontally off the same building at a horizontal velocity of 8 m/s.

    a. What is its initial vertical velocity? Horizontal velocity?
    b. How far does it fall vertically in the first second? The second second?
    c. How far does it move horizontally in the first second? The second second?
    d. How long does it take to hit the ground?
    e. How far away from the building does it hit the ground?
    f. What is its vertical speed after 2 seconds? 4 seconds?
    g. What is its horizontal speed after 2 seconds? 4 seconds?
    h. What is its overall speed after 2 seconds? 4 seconds?
    i. What is its overall speed when it hits?
    j. What is its vertical acceleration after 3.22 seconds? Horizontal acceleration?

3. A shot put is thrown horizontally off a wall at 12 m/s. It lands on the ground 1.5 seconds later.

    a. How high is the wall?
    b. How far away horizontally does it hit?
    c. What is the **displacement** of the shot put after landing?

4. A cannon ball is fired horizontally from the edge of a cliff 60 meters high and lands 400 meters away on the level ground below.

    a. What was the cannon ball's initial horizontal velocity?
    b. How long did it take to hit the ground?
    c. What was the cannon ball's overall **velocity** when it hit?

5. Which is greater for the cannon ball above, the distance it travels, or the distance it's displaced? Why?

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Projectile Intro Problems KEY

1. (review) A safe is dropped from the top of a building 125 meters high.

    a. What is its initial vertical velocity? Horizontal velocity? 0,0
    b. How far does it fall in the first second? The second second? 5 m, 15 m
    c. How long does it take to hit the ground? 5 sec
    d. What is its vertical speed after 2 seconds? 4 seconds? 20 m/s, 40 m/s
    e. What is its vertical speed when it hits? 50 m/s
    f. What is its vertical acceleration after 3.22 seconds? 10 m/s/s

2. A piano is pushed horizontally off the same building at a horizontal velocity of 8 m/s.

    a. What is its initial vertical velocity? Horizontal velocity? 0 m/s, 8 m/s
    b. How far does it fall vertically in the first second? The second second? 5 m, 15 m
    c. How far does it move horizontally in the first second? The second second? 8 m, 8 m
    d. How long does it take to hit the ground? 5 sec
    e. How far away from the building does it hit the ground? 40 m
    f. What is its vertical speed after 2 seconds? 4 seconds? 20 m/s, 40 m/s
    g. What is its horizontal speed after 2 seconds? 4 seconds? 8 m/s, 8 m/s
    h. What is its overall speed after 2 seconds? 4 seconds? 21.5 m/s, 40.8 m/s
    i. What is its overall speed when it hits? 50.6 m/s
    j. What is its vertical acceleration after 3.22 seconds? Horizontal acceleration? 10 m/s/s, 0 m/s/s

3. A shot put is thrown horizontally off a wall at 12 m/s. It lands on the ground 1.5 seconds later.

    a. How high is the wall? 11.25 m
    b. How far away horizontally does it hit? 18 m
    c. What is the **displacement** of the shot put after landing? 21.2 m at 32° below the horizontal

4. A cannon ball is fired horizontally from the edge of a cliff 60 meters high and lands 400 meters away on the level ground below.

    a. What was the cannon ball's initial horizontal velocity? 116 m/s
    b. How long did it take to hit the ground? 3.46 sec
    c. What was the cannon ball's overall **velocity** when it hit? 121 m/s at 16.6 ° below the horizontal

5. Which is greater for the cannon ball above, the distance it travels, or the distance it's displaced? Why? Distance—curved paths are longer than straight ones.