

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 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?

W2.04a**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, 25.8 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 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.**