*Honors Physics*
*Winnetonka High School*

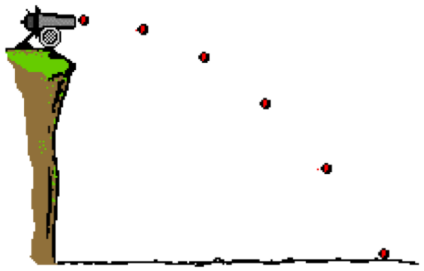
Name: _____Due Date: _____ Score: _____

# Horizontally Launched Projectiles

Use the GUESS method and show all of your work.

## CALCULATIONS: CANNON LAUNCH HEIGHT

1. A ball is launched straight out from a 10 meter tall cliff. It is launched horizontally at 15 m/s.
   a. How long is the ball in the air?
   b. How far does it land from the cliff?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

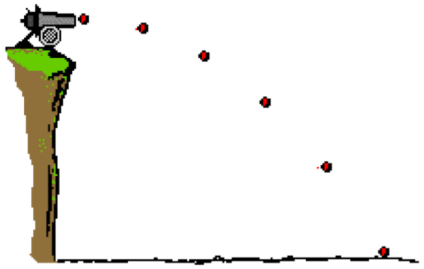
$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

5th State the answer:

2. A ball is launched straight out from a **40** meter tall cliff. It is launched horizontally at 15 m/s.
   a. How long is the ball in the air?
   b. How far does it land from the cliff?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

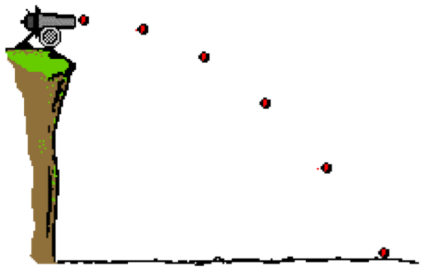
$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

5th State the answer:

3. Why does the ball's range increase when the cliff is higher?

## CALCULATIONS: INITIAL HORIZONTAL VELOCITY

4. A ball is launched straight out from a 20 meter tall cliff. It is launched horizontally at 7.5 m/s.
   a. How long is the ball in the air?
   b. How far does it land from the cliff?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

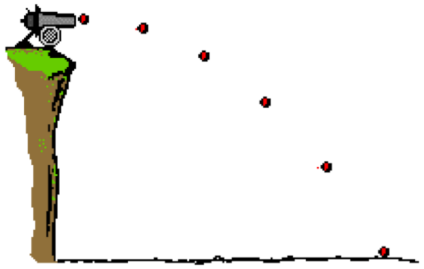
$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

5th State the answer:

5. A ball is launched straight out from a 20 meter tall cliff. It is launched horizontally at 15 m/s.
   a. How long is the ball in the air?
   b. How far does it land from the cliff?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

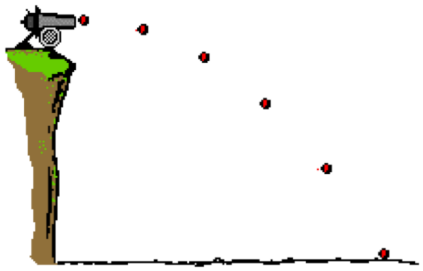
5th State the answer:

6. Does does the time in the air stay the same?

7. Why does the ball's range increase when the initial horizontal velocity is faster?

## MORE CALCULATIONS

8. A ball is launched straight out from a 10 meter tall cliff. It lands 85 meters from the base of the cliff.
   a. How long is the ball in the air? (see number one since you know the time in the air depends on the height) t = _____
   b. How fast is it travelling when it is fired?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

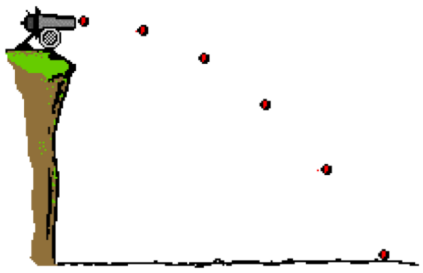
$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

5th State the answer:

9. A ball is launched straight out from a **40** meter tall cliff. It lands 85 meters from the base of the cliff.

a. How long is the ball in the air? (see number two since you know the time in the air depends on the height) t = _____

b. How fast is it travelling when it is fired?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

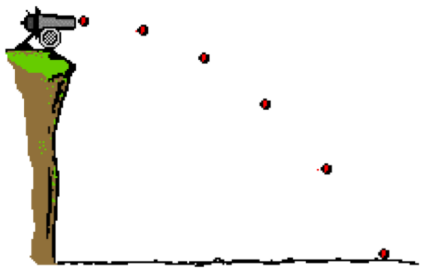
$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

5th State the answer:

10. A ball that is launched straight out from cliff lands on the valley below 3.4 seconds after it is released. The range of the ball is 240 m.
    a. How tall is the cliff?
    b. How fast is it travelling when it is fired?



1st Given (label the picture):

X direction Y direction

4th Substitute and Solve: Write out the equation first, then substitute values in.

2nd Unknown:

3rd Equations: (Circle the equation)

$\Delta x = v_x t$

$v_{yf} = v_{yi} + gt$

$v_{yf}^2 = v_{yi}^2 + 2g\Delta y$

$y_f = y_i + v_{yi}t + \frac{1}{2}gt^2$

5th State the answer:

11. Why does the ball's range increase when the cliff is higher?