| 5.2 | Projectile Motion |
|---|---|

LEARNING TARGETS

**5.2** I can interpret, analyze, and calculate the motion of a zero launch angle projectile.

## Projectile Motion

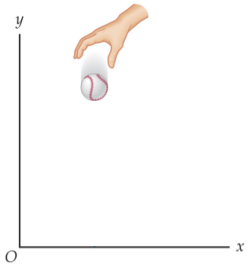
**Projectile Motion** is the motion of objects that are initially launched, or "projected," and which then continue moving under the influence of gravity alone.

## Projectile Motion

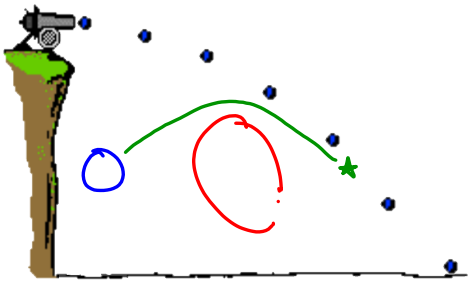
In studying projectile motion we make the following assumptions:

3. The Earth's rotation is ignored

## Acceleration In Free Fall




## Zero Launch Angle



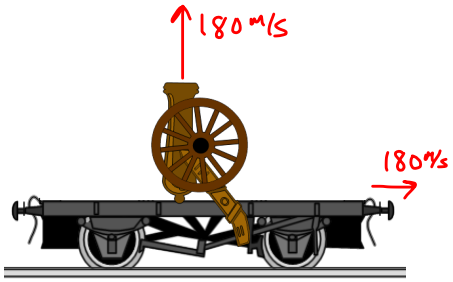
## Acceleration In Free Fall

All objects in free fall have acceleration components $a_{horizontal} = 0$ and $a_{vertical} = -g$. This is true regardless of whether the object is dropped, thrown, kicked, or otherwise set into motion.

## Acceleration In Free Fall

The horizontal and vertical motions of a projectile are independent of each other.

## Cannon On A Train

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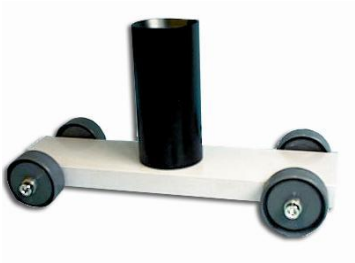
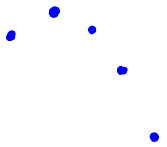
## Ballistics Car





## Equations For Projectile Motion

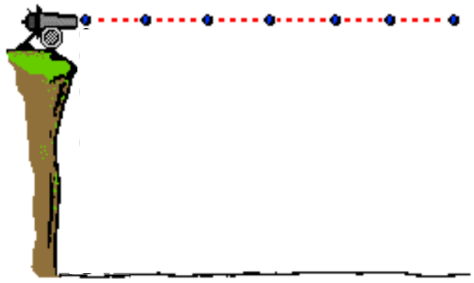
($a_x = 0$, $a_y = -g$)

$$x = x_0 + v_{0x}t$$
$$y = y_0 + v_{0y}t - \frac{1}{2}gt^2$$

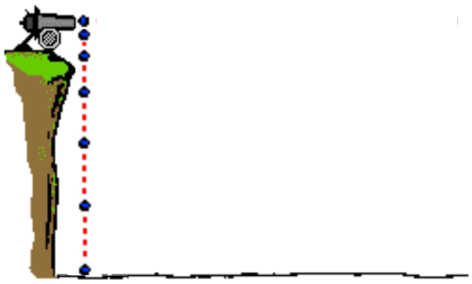
$$v_x = v_{0x}$$
$$v_y = v_{0y} - gt$$

$$v_x^2 = v_{0x}^2$$
$$v_y^2 = v_{0y}^2 - 2g\Delta y$$

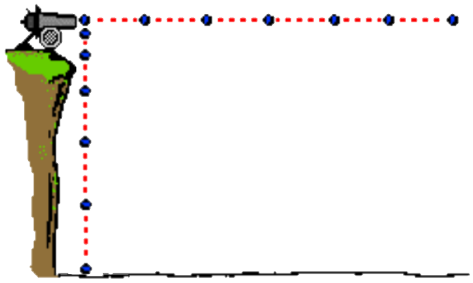
## Zero Launch Angle



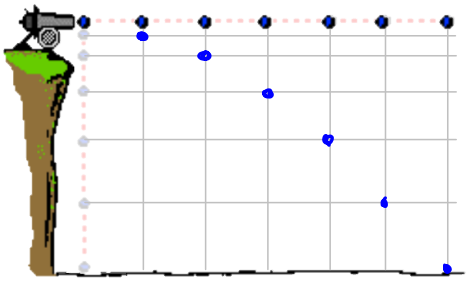
# Zero Launch Angle



# Zero Launch Angle

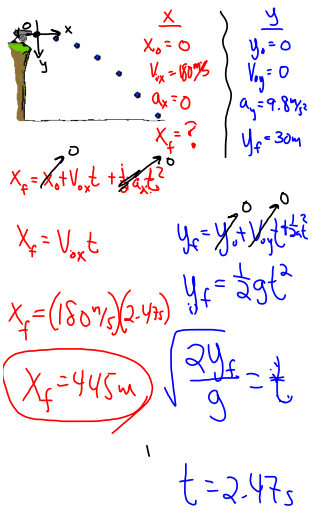


# Zero Launch Angle



**Fire When Ready!**

A cannon ball is fired horizontally at 180.0 m/s from the top of a cliff that is 30.0 m high. How far from the bottom of the cliff will the cannon ball land?




# HOMEWORK

## Unit 5 Problems (5-9)