

Worksheet

#8 $v_0 = 25 \text{ m/s}$ $x = 150 \text{ m}$ $v = 35 \text{ m/s}$

$x_0 = 0$ $t = 5 \text{ s}$ $a = 2 \text{ m/s}^2$ $t = 10 \text{ s}$

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$x = (25 \text{ m/s})(5 \text{ s}) + \frac{1}{2}(2 \text{ m/s}^2)(5 \text{ s})^2$$

$$x = 125 \text{ m} + 25 \text{ m}$$

$$x = 150 \text{ m}$$

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

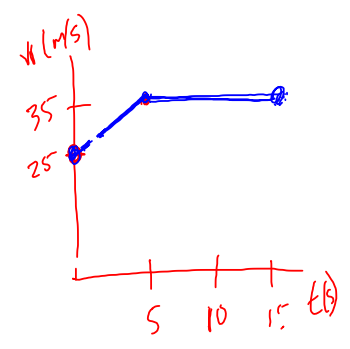
$$x = (150 \text{ m}) + (35 \text{ m/s})(5 \text{ s})$$

$$x = 150 + 350$$

$$x = 500 \text{ m}$$

$$v = v_0 + a t$$

$$v = (25 \text{ m/s}) + (2 \text{ m/s}^2)(5 \text{ s})$$

$$v = 35 \text{ m/s}$$


$$v^2 = v_0^2 + 2a(x - x_0)$$

$$0 = v_0^2 + 2ax$$

$$\frac{-v_0^2}{2x} = a$$

3.3 Freely Falling Objects

STANDARDS

3.1 I can interpret and analyze the motion of an object in free fall.


Free Fall is the motion of an object falling freely under the influence of gravity.

Equations

Equation
$v = v_0 + g t$
$x = x_0 + v_0 t + \frac{1}{2} g t^2$
$v^2 = v_0^2 + 2 g \Delta x$

Example

A ball is thrown straight upward at 15.2 m/s. What is the maximum height that the ball will reach?



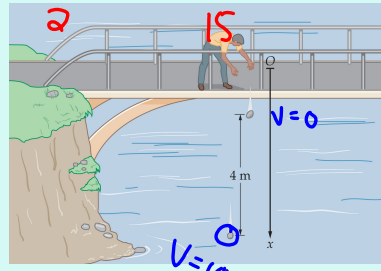
$x_0 = 0$
 $v_0 = 15.2 \text{ m/s}$
 $a = -9.80 \text{ m/s}^2$
 $v_f = 0$

$x = ?$
 ~~$v^2 = v_0^2 + 2a(x - x_0)$~~
 $0 = v_0^2 + 2ax$
 $\frac{-v_0^2}{2a} = \frac{v_0^2}{2a}$
 $x = 11.8 \text{ m}$

FALLING STONES


You drop a rock from a bridge to the river below. When the rock has fallen 4 meters, you drop a second rock. As the rocks continue their free fall, does their separation increase, decrease, or stay the same?

$v = v_0 + at$



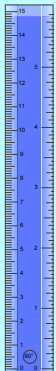
How Fast?

Purpose: Calculate human reaction time using free fall and the acceleration due to gravity.



Data:

- Create a data table and record the dropping distance for 10 trials of catching the ruler.



Calculations:

- Calculate your average dropping distance.
- Use your average dropping distance, and the acceleration due to gravity, to calculate your average reaction time.

Make sure to label your calculations!

