FREE FALL PRACTICE

Name: _____ ***Period:*** _____ ***Date:*** _____

$d = \frac{1}{2} at^2$ $d = [(v_i + v_f)/2]\, t$ $d = v_i t + \frac{1}{2} at^2$ $2ad = v_f^2 - v_i^2$ $v_f = v_i + at$

$v = d/t$ (uniform or constant velocity) $d = vt$

1. An object is dropped from the top of a 612 ft building. How **much time** will it take for the object to hit the ground? Convert all units to SI. 3 sig figs

$$612\text{ft} \left| \frac{1\text{m}}{3.28\text{ft}} \right. = 186.59\text{m}$$

$$t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(186.59)}{9.8}} = \boxed{6.17\text{s}}$$

2. Jorge jump up 13 inches above the floor at his peak height. At what upward **velocity** must Iverson leave the floor to achieve this? Convert all units to SI.

$$13\text{in} \left| \frac{2.54\text{cm}}{1\text{in}} \right| \frac{1\text{m}}{100\text{cm}} = 0.33059\text{m}$$

$$v_f = v_i + at$$

$$0 = v_i + (9.8)(0.33059)$$

$$\boxed{v_i = 3.2\text{m/s}}$$

3. Jorge jump up 13 inches above the floor at his peak height. What is his hang time? Convert all units to SI.

$$d = \frac{1}{2} at^2$$

$$t = \sqrt{\frac{2d}{g}} = \sqrt{\frac{2(0.33059)}{9.8}} = 0.2597\text{s} \times 2 = \boxed{0.52\text{s}}$$

2 sig figs

3. A bullet is shot vertically into the air with a velocity of +160.1 m/s. Neglecting air resistance:

a. How **long** is the bullet in the air?

$$v_f = v_i + at$$

$$0 = 160.1 + (9.8)t$$

$$\frac{-160.1}{9.8} = t$$

$$t = 16.33 \times 2 = \boxed{32.67\text{s}}$$

b. How **high** does the bullet go?

$$2ad = v_f^2 - v_i^2$$

$$2(9.8)(d) = (0)^2 - (160.1)^2$$

$$\frac{19.6d}{19.6} = \frac{-25632.01}{19.6}$$

$$\boxed{d = 1308\text{m}}$$