# Free Fall – Accel Gravity 2

1. $v_i = 6.0 m/s$
$\Delta d = -2.0 m$
$g = -9.80 m/s^2$

$v_f^2 = v_i^2 + 2g\Delta d$

$v_f = \sqrt{(6.0)^2 + 2(-9.80)(-2.0)}$

$= \sqrt{36 + (-39)}$

$= \sqrt{75}$

$= -8.7 m/s$

$v_f = v_i + g\Delta t$

$\Delta t = \frac{v_f - v_i}{g}$

$= \frac{-8.7 - 6.0}{-9.80}$

$= \frac{-14.7}{-9.80}$

$= 1.50 s$

2. $\Delta d = -24000 m$
$g = -3.7 m/s^2$
$v_i = 0 m/s$

$\Delta d = v_i \Delta t + \frac{1}{2} g \Delta t^2$

$\Delta t = \sqrt{\frac{2\Delta d}{g}}$

$= \sqrt{\frac{2(-24000)}{-3.7}}$

$= 110 s$

$v_f = v_i + g\Delta t$

$= 0 + (-3.7)(110)$

$= 0 - (410)$

$= -410 m/s$

3. $d_f = ?$
$d_i = 1.3 m$
$v_i = 2.4 m/s$
$g = -9.80 m/s^2$

A) $v_f^2 = v_i^2 + 2g(d_f - d_i)$

$d_f = \frac{v_f^2 - v_i^2}{2g} + d_i$

$= \frac{0 - 2.4^2}{2(-9.80)} + 1.3$

$= \frac{-5.8}{-19.6} + 1.3$

$= .30 + 1.3$

$= 1.6 m$

No, only reaches 1.6 m from the ground

B) $\Delta d = -1.3 m$
$v_i = 2.4 m/s$
$g = -9.80 m/s^2$

$v_f^2 = v_i^2 + 2g\Delta d$

$= \sqrt{2.4^2 + 2(-9.80)(-1.3)}$

$= \sqrt{5.8 + 25}$

$= \sqrt{31}$

$= -5.6 m/s$

$v_f = v_i + g\Delta t$

$\Delta t = \frac{v_f - v_i}{g}$

$= \frac{-5.6 - 2.4}{-9.80}$

$= .82 s$

4. on your own

$v_i = 0 m/s$

$\Delta t = 4.00 s$

$\bar{a} = 29.4 m/s^2$

$\Delta d = v_i \Delta t + \frac{1}{2} a \Delta t^2$

$= \frac{1}{2}(29.4)(4.00)^2$

$= 235 m$

$v_f = v_i + a\Delta t$

$= 0 + (29.4)(4.00)$

$= 118 m/s$

$v_i = 118 m/s$

$v_f = 0 m/s$

$g = -9.80 m/s^2$

$v_f^2 = v_i^2 + 2g\Delta d$

$\Delta d = \frac{v_f^2 - v_i^2}{2g}$

$= \frac{0 - 118^2}{2(-9.80)}$

$= \frac{13900}{-19.6}$

$= 709 m$

$235 m + 709 m = \boxed{944 m}$

6. Ball #1

$v_i = -14.7 m/s$

$\Delta d = -19.6 m$

$g = -9.80 m/s^2$

$v_f^2 = v_i^2 + 2g\Delta d$

$= \sqrt{-14.7^2 + 2(-9.80)(-19.6)}$

$= \sqrt{216 + 384}$

$= \sqrt{216 + 384}$

$= -24.5 m/s$

$\Delta t = \frac{v_f - v_i}{g}$

$= \frac{-24.5 - (-14.7)}{-9.80}$

$= 1.0 s$

Ball #2

$v_i = 14.7 m/s$

$g = -9.80 m/s^2$

$\Delta d = -19.6 m$

B) Both have same velocity, $-24.5 m/s$, when the reach the ground

$v_f = -24.5 m/s$

$\Delta t = \frac{v_f - v_i}{g}$

$= \frac{-24.5 - (14.7)}{-9.80}$

$= 4.0 s$

(A) $4.0 s - 1.0 s = 3.0 s$

C) Ball #1

$\Delta d = v_i \Delta t + \frac{1}{2} g \Delta t^2$

$= -14.7(.800) + \frac{1}{2}(-9.80)(.800)^2$

$= -11.8 + (-3.14)$

$= -14.9 m$

Ball #2

$\Delta d = v_i \Delta t + \frac{1}{2} g \Delta t^2$

$= (14.7)(.800) + \frac{1}{2}(-9.80)(.800)^2$

$= 11.8 + (-3.14)$

$= 8.6 m$

difference of $23.5 m$