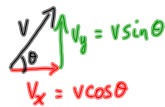
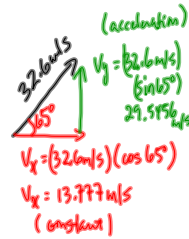
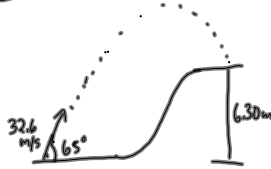


Projectiles Launched at an angle



MP 539



- a) $\Delta t = ?$
- b) $\Delta d_x = ?$
- c) v at impact

a) find Δt ... look at motion vertically
 $v_i = 29.5456 \text{ m/s}$
 $\Delta d = +6.30 \text{ m}$
 $a = -9.81 \text{ m/s}^2$
 $\Delta t = ?$

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

$$6.30 = (29.5456) \Delta t - \frac{9.81}{2} (\Delta t)^2$$

$$\frac{9.81}{2} (\Delta t)^2 - (29.5456) (\Delta t) + 6.30 = 0$$

$$\Delta t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Delta t = \frac{29.5456 \pm \sqrt{(29.5456)^2 - 4(\frac{9.81}{2})(6.30)}}{9.81}$$

$$\Delta t = \frac{29.5456 \pm 27.374}{9.81}$$

$$\Delta t = 0.2 \text{ or } 5.8 \text{ s}$$

b) how far horizontally (velocity is constant).

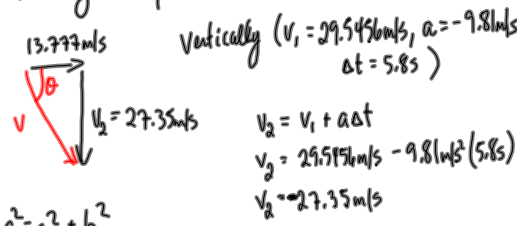
$$v = \frac{\Delta d}{\Delta t}$$

$$\Delta d = v \Delta t$$

$$\Delta d = (13.777 \text{ m/s})(5.8 \text{ s})$$

$$\Delta d = 8.0 \times 10^1 \text{ m}$$

c) velocity at impact?



$$c^2 = a^2 + b^2$$

$$c^2 = (13.777 \text{ m/s})^2 + (27.35 \text{ m/s})^2$$

$$c = 31 \text{ m/s}$$

$$\tan \theta = \frac{27.35}{13.777}$$

$$\theta = 63^\circ$$

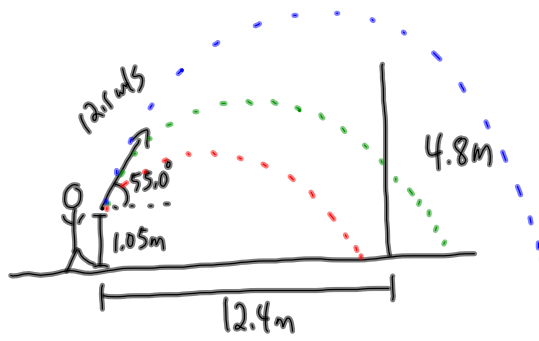
The velocity just before hitting the ground is 31 m/s [63° to the horiz]

MP/542

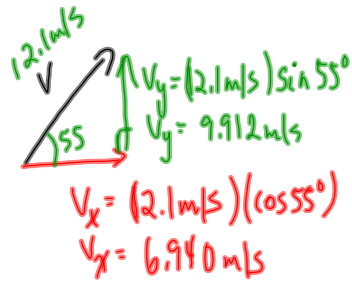
$V = 12.1 \text{ m/s}$

$\theta = 55.0^\circ$

Does the ball
hit the ground?
hit the fence?
go over the
fence?



After the ball has travelled 12.4m horizontally, what is its height above the ground? (Δy)



horizontally - velocity is constant.

$v = \frac{\Delta d}{\Delta t}$

$\Delta t = \frac{\Delta d_x}{v_x}$

$\Delta t = \frac{12.4 \text{ m}}{6.940 \text{ m/s}}$

$\Delta t = 1.8 \text{ s}$ (1.7867s)

How high is the ball when it has been in the air for 1.8s?

vertically - constant acc

$v_i = 9.912 \text{ m/s}$

$a = -9.8 \text{ m/s}^2$

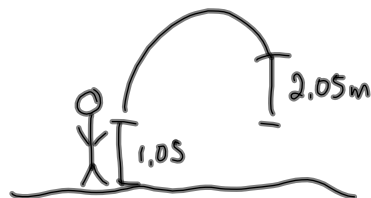
$\Delta t = 1.8 \text{ s}$

$\Delta d = ?$

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

$\Delta d = (9.912 \text{ m/s})(1.8 \text{ s}) - \frac{9.8 \text{ m/s}^2}{2} (1.8 \text{ s})^2$

$\Delta d = 2.05 \text{ m}$



The ball is 3.1m above the ground.

Hits the fence.

(3.1m < 4.8m)

PP/543