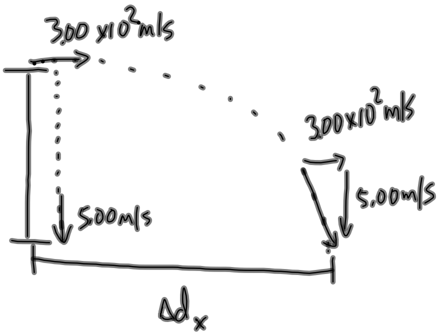
PP| 536-537

8.



Time for bullet to "fall":

Vertically (constant acc)

$v_1 = 0$

$v_2 = -5.00$ m/s

$a = -9.81$ m/s^2

$\Delta t = ?$

$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$

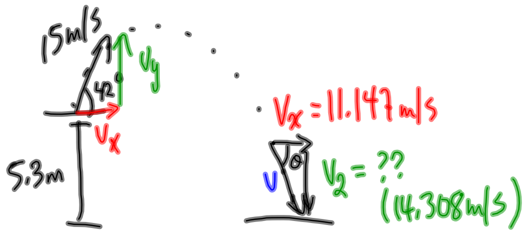
$\Delta t = \frac{\Delta \vec{v}}{a}$

$\Delta t = \frac{-5.00\text{ m/s} - 0}{-9.81\text{ m/s}^2}$

$\Delta t = 0.510$ s

MP| 543

11.



Vertically (constant acc)

$V_1 = 10.037$ m/s

$V_2 = ?$

$\Delta d = -5.3$ m

$a = -9.8$ m/s^2

$V_x = (15\text{ m/s})(\cos 42°) = 11.147$ m/s

$V_y = (15\text{ m/s})(\sin 42°) = 10.037$ m/s

$V_2^2 = V_1^2 + 2a\Delta d$

$V_2^2 = (10.037\text{ m/s})^2 - 2(9.81\text{ m/s}^2)(5.3\text{ m})$

$V_2 = -14.308$ m/s

~~±~~ (−) 14.308 m/s

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

$c^2 = (11.147\text{ m/s})^2 + (14.308\text{ m/s})^2$

$c \doteq 18$ m/s

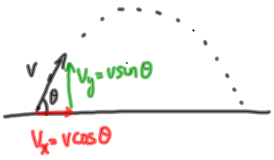
$\tan\theta = \frac{14.308\text{ m/s}}{11.147\text{ m/s}}$

$\theta = 52°$

The velocity just before hitting the ground is 18 m/s [52° to horizontal]

Symmetrical Trajectories

The projectile returns to the same level (vertically: $\Delta d = 0$)



Time the projectile is in the air

vertically → constant acc

$v_1 = v\sin\theta$
$\Delta d = 0$
$a = -g$
$\Delta t = ?$

$$\Delta d = v_1 \Delta t + \frac{1}{2}a(\Delta t)^2$$

$$0 = (v\sin\theta)\Delta t - \frac{g}{2}(\Delta t)^2$$

$$0 = \Delta t\left(v\sin\theta - \frac{g}{2}(\Delta t)\right)$$

$\Delta t = 0$ and $v\sin\theta - \frac{g}{2}(\Delta t) = 0$

$$-\frac{g}{2}\Delta t = -v\sin\theta$$

$$\Delta t = \frac{2v\sin\theta}{g}$$

How far does the projectile go horizontally?

horizontally → velocity is constant

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

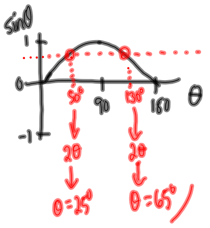
$$\Delta d = v\Delta t$$

$$\Delta d = (v\cos\theta)\left(\frac{2v\sin\theta}{g}\right)$$

$\sin 2\theta = 2\sin\theta\cos\theta$

$$\Delta d = \frac{v^2 \, 2\sin\theta\cos\theta}{g}$$ ← $\sin 2\theta$

$$\Delta d\ (R) = \frac{v^2 \sin 2\theta}{g}$$



* maximum range $\theta = 45°$

* Complementary launch angles give the same range (i.e. 25° and 65°)

Maximum Height

Vertically → constant acc

$v_1 = v\sin\theta$
$v_2 = 0$
$a = -g$
$\Delta d = ?$
$\Delta t = \frac{2v\sin\theta}{g}$

$$v_2^2 = v_1^2 + 2a\Delta d \quad \text{or} \quad v_{ave} = \frac{\Delta d}{\Delta t}$$

$$2a\Delta d = v_2^2 - v_1^2$$

$$\Delta d = \frac{v_2^2 - v_1^2}{2a}$$

$$\Delta d = \frac{-(v\sin\theta)^2}{2(-g)}$$

$$\Delta d\ (H) = \frac{v^2\sin^2\theta}{2g}$$

To Do:

1. mp|547 (look over)
2. PP|548
3. Assignment (p571|15-20) – Wed
4. HW Probe (PP|536-537) – Tues