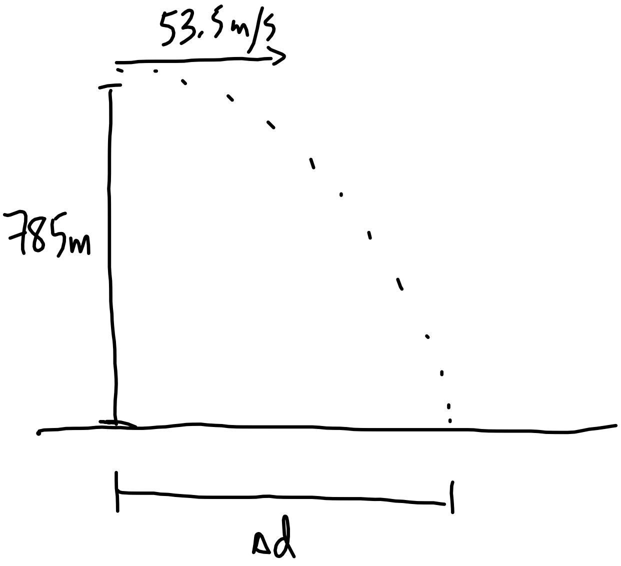
p536

1.



Horizontally → velocity is constant.

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

$$\Delta d = (53.5\,m/s)(12.7s)$$

$$\boxed{\Delta d = 677m}$$

vertically → acceleration

$v_1 = 0$

$\Delta d = -785m$

$a = -9.81\,m/s^2$

$\Delta t = ?$

$$\Delta d = \overset{0}{\cancel{v_1}}t + \frac{1}{2}at^2$$

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

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

$$t^2 = \frac{2(-785m)}{-9.81m/s^2}$$

$$\boxed{t = 12.7s}$$

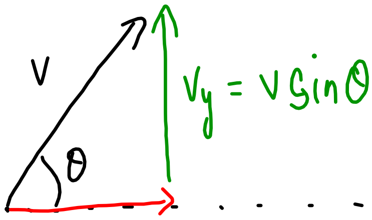
Projectiles (neglecting air resistance)

Horizontally -> velocity is constant (no force acting)

Vertically -> constant acceleration (only force is F_g)

① Projectiles launched horizontally (the initial vertical velocity is zero)

② Projectiles launched at an angle have both horizontal and a vertical velocity initially



$V_y = v \sin\theta$ (initial vertical velocity)

$V_x = v \cos\theta$
(stays constant)

Note: $V_y = 0$ when the projectile is at its maximum height.

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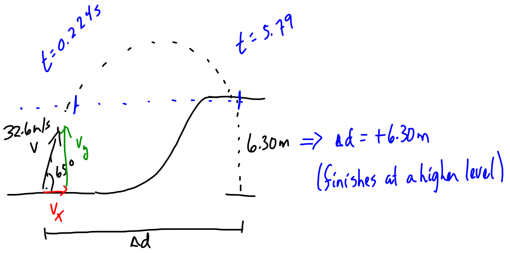


6.30m ⇒ Δd = +6.30m

(finishes at a higher level)

$V_x = (32.6 m/s) \cos 65° = 13.8 m/s$ ⤳ stays constant

$V_y = (32.6 m/s) \sin 65° = 29.5 m/s$ ⤳ the magnitude decreases → zero → increases.

a) $\Delta t = ?$

b) $\Delta d_x = ?$

c) $\vec{V}$ at impact = ?

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

$+6.30 m = (29.5 m/s) t - \frac{(9.81 m/s^2)}{2} t^2$

$4.905 t^2 - 29.5 t + 6.30 = 0$

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

$$x = \frac{29.5 \pm \sqrt{(29.5)^2 - 4(4.905)(6.30)}}{9.81}$$

$$x = \frac{29.5 \pm 27.3}{9.81}$$

$$x = \frac{29.5 + 27.3}{9.81} \quad \text{OR} \quad x = \frac{29.5 - 27.3}{9.81}$$

so $\Delta t = 5.79 s$ ⇒ $x = 5.79 s$ ✓ (on the way down)

~~$x = 0.224 s$~~ (on way up)

b) $\Delta d_x = ?$ Horizontally, the velocity is constant

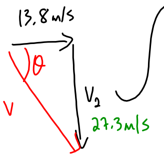
$V = \frac{\Delta d}{\Delta t}$

$\Delta d = V \Delta t$

$\Delta d = (13.8 m/s)(5.79 s)$ ← horizontal

$\boxed{\Delta d = 79.9 m}$

c) $\vec{V}$ at impact?



$a = \frac{\Delta V}{\Delta t}$

$\Delta V = a \Delta t$

$V_2 - V_1 = a \Delta t$

$V_2 = V_1 + a \Delta t$

$V_2 = (29.5 m/s) + (-9.81 m/s^2)(5.79 s)$

$V_2 = -27.3 m/s$

Vertically

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

$c^2 = (13.8)^2 + (27.3)^2$

$\boxed{C = 30.6 m/s}$

$\tan\theta = \frac{27.3}{13.8}$

$\boxed{\theta = 63.2°}$

The velocity of the golf ball just before it hits the ground is

30.6 m/s [63.2° to the horizontal]

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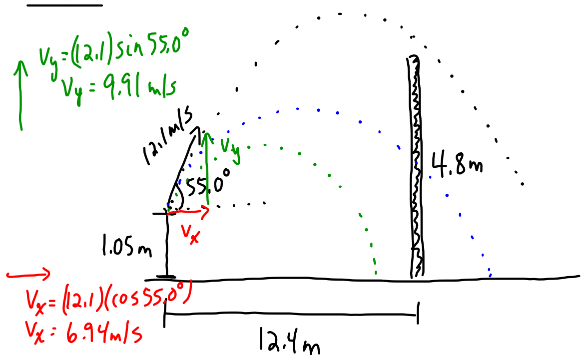

Does the ball clear the fence?
hit the fence?
land in front of the fence ?

Even if you find the horizontal distance to be greater than 12.4m, this does not necessarily mean the ball clears the fence.

What you REALLY need to find is the height of the ball AFTER it has travelled a horizontal distance of 12.4m

Horizontally → velocity is constant

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

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

$\Delta t = \frac{12.4m}{6.94m/s}$ ← horizontal

$\Delta t = 1.79s$

Vertically - acceleration.

$V_1 = 9.91$ m/s

$\Delta t = 1.79s$

$a = -9.81m/s^2$

$\Delta d = ?$

$\Delta d = v_1 t + \frac{1}{2}at^2$

$\Delta d = (9.91)(1.79) - \frac{9.81}{2}(1.79)^2$

$\Delta d = 2.02$ m

height:

2.02m + 1.05m = 3.07m

above the ground.

so the ball hits the fence.

TO DO

① PP|543

② Assignment p570|15-20 (due Fri)

③ Quiz - Thurs