Projectile Launched at an angle Practice Problem

Example 1: (from powerpoint)

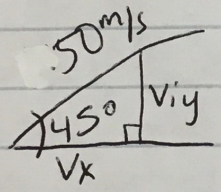
A projectile is launched at 50 m/s at an angle of 45° from the horizontal. It lands at a place level with the place it was launched from.

ⓐ Find time of flight ($t_{total} = ?$)
ⓑ Find maximum height of projectile ($d_y = ?$)
ⓒ Find horizontal range ($d_x = ?$)

① Find V_x and V_{iy} components

using $V_x = V_i \cos\theta$

$V_{iy} = V_i \sin\theta$



$V_x = 50\,m/s \cos 45° = 35.4\,m/s$

$V_{iy} = 50\,m/s \sin 45° = 35.4\,m/s$

★ once you find your V_x & V_{iy} using formulas from above, you no longer need to use the 45° & 50 m/s.

Givens:

horizontal	vertical
$V_x = 35.4\,m/s$	$V_{iy} = 35.4\,m/s$

ⓐ Find time: $V_f = V_{iy} + gt$

$0\,m/s = 35.4\,m/s + (-9.8\,m/s^2)(t)$

$\frac{-35.4}{-9.8} = \frac{-35.4}{-9.8} = \frac{-9.8\,t}{-9.8}$

$3.6\,s = t$ → this is the time for ½ of its flight

to find total time, multiply 1/2 time by 2.

$3.6s \times 2 = \boxed{7.2\,s}$

(b) Find $d_y = ?$

$$d_y = v_{iy} t + \frac{1}{2} g t^2$$

Use 1/2 time

$$d_y = (35.4\,m/s)(3.6s) + \frac{1}{2}(-9.8\,m/s^2)(3.6s)^2$$

$$\boxed{d_y = 63.9\,m}$$

(c) Find $d_x = ?$

$$v_x = \frac{d_x}{t} \rightarrow d_x = v_x(t)$$

Use full time

$$d_x = (35.4\,m/s)(7.2s)$$

$$\boxed{d_x = 254.88\,m}$$