Do Now 10-16

Say you launch a marble straight up, then it comes back down to the same height. Using a stopwatch, how would you find the initial velocity of the marble?

$y = 0$

$x = V_0 t + \frac{1}{2} a t^2$

$0 = V_0 t + \frac{1}{2}(-9.8 \frac{m}{s^2}) t^2$

$0 = V_0 t - 4.9 t^2$

$\frac{0 = (V_0 - 4.9t)t}{t}$

$0 = V_0 - 4.9t$

$\boxed{V_0 = 4.9t}$

Marble launcher lab

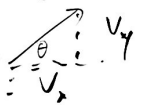
① Find launch velocity of the Marble (3 trials)

$t_{avg} = \frac{1.19 + 1.20 + 1.26}{3}$

$= 1.22 \text{ sec}$

$\boxed{V_0 = 6.0 \frac{m}{s}}$

(2) predict range of marble for 30°, 45°, & random angle



x	y
$x = ?$	$y = 0$
$V_x = V_0 \cos\theta$	$V_{0y} = V_0 \sin\theta$
$a_x = 0$	$a_y = -9.8\ m/s^2$
$t \neq t$	

30° $V_x = \frac{x}{t}$

$x = V_x t$

$y = V_{0y} t + \frac{1}{2} a_y t^2$

$0 = (V_0 \sin\theta) t + \frac{1}{2}(-9.8\ m/s^2) t^2$

$0 = V_0 \sin\theta - 4.9\, t$

$t = \frac{V_0 \sin\theta}{4.9}$

$x = (V_0 \cos\theta)\left(\frac{V_0 \sin\theta}{4.9}\right)$

$$x = \frac{V_0^2 \cos\theta \sin\theta}{4.9}$$

(3) measure range (metrestick) (3 trials)

(4) compare measurement with prediction