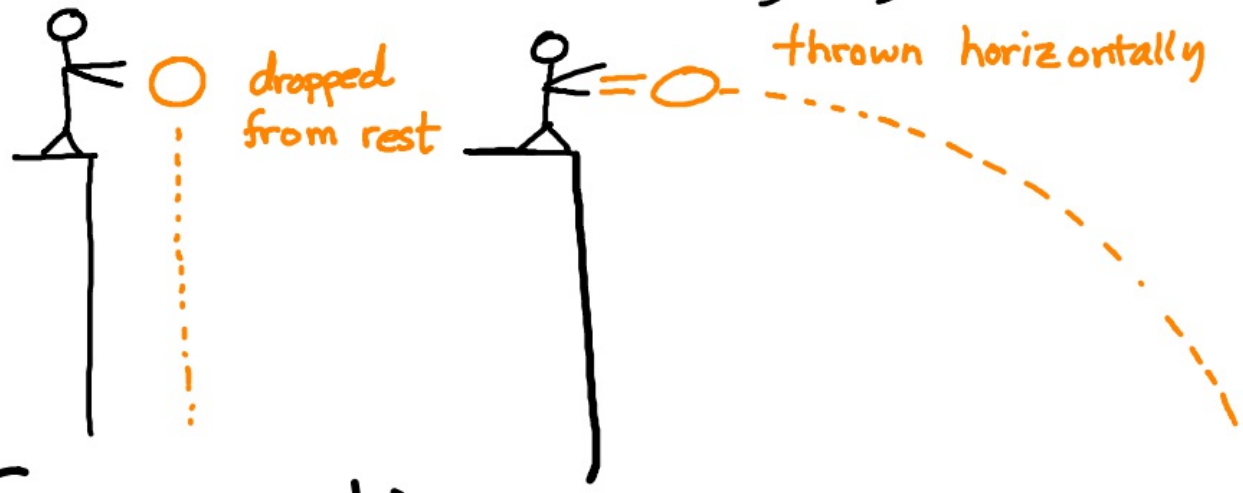
Bellwork 4/12

Which hits ground first?

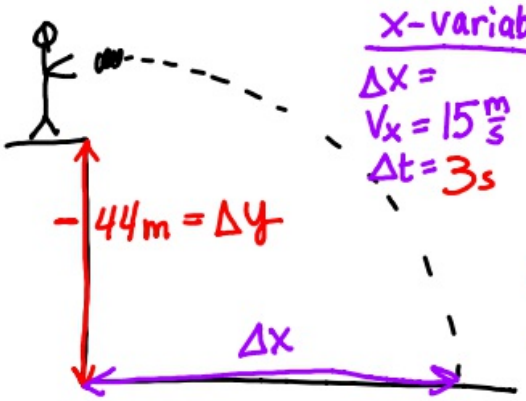
*we always neglect air resistance



Same time

no horizontal force
⇒ no horizontal acceleration

gravity is a downwards force, causes downwards acceleration on both balls



x-variables	y-variables
$\Delta x =$	✓ $\Delta y = -44m$
✓ $V_x = 15\frac{m}{s}$	✓ $V_{yi} = 0\frac{m}{s}$
✓ $\Delta t = 3s$	$V_{yf} =$
	✓ $a_y = -9.8\frac{m}{s^2}$
	✓ $\Delta t = 3s$

$$\vec{\Delta y} = \vec{V}_{iy}\Delta t + \frac{1}{2}\vec{a}_y \Delta t^2$$

$$-44m = \left(0\frac{m}{s}\right)\Delta t + \frac{1}{2}\left(-9.8\frac{m}{s^2}\right)\Delta t^2$$

$$2(-44m) = \left(\frac{1}{2}\left(-9.8\frac{m}{s^2}\right)\Delta t^2\right)2$$

$$\frac{-88m}{-9.8\frac{m}{s^2}} = \frac{-9.8\frac{m}{s^2}\Delta t^2}{-9.8\frac{m}{s^2}}$$

a $\boxed{3s = \Delta t}$

$$V_x = \frac{\Delta x}{\Delta t}$$

$$15\frac{m}{s} = \frac{\Delta x}{3s}$$

b $\boxed{45m = \Delta x}$

c $15\frac{m}{s}$ horizontal velocity never changes

d $V_{fy} = ?$ $\quad V_{fy}^2 = V_{iy}^2 + 2a_y\Delta y$

$$V_{fy}^2 = 0 + 2(-9.8\frac{m}{s^2})(-44)$$

$$V_{fy} = \pm 29.4\frac{m}{s}$$