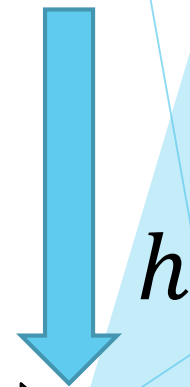# Part A – Velocity at Impact 1

$$v_y = a_y * t = g * t$$

$$h = \frac{1}{2}gt^2$$

$$\sqrt{\frac{2h}{g}} = t$$

$$v = g * \sqrt{\frac{2h}{g}} = \sqrt{2hg}$$
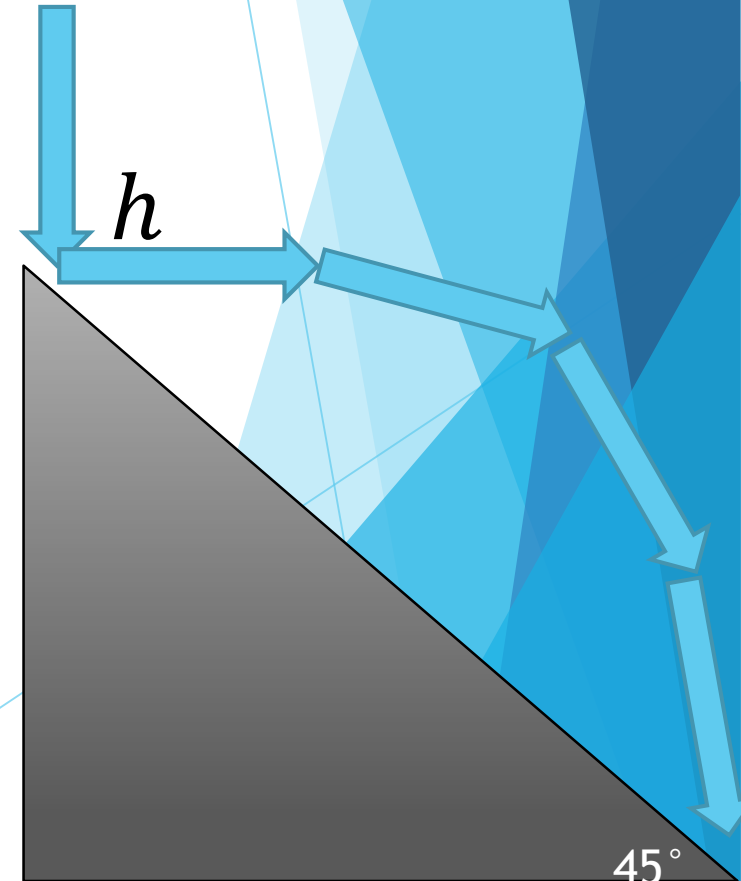
h

Part B – Time Between Bounces

$$d_x = d_y$$

$$d_x = v_x * t = \sqrt{2hg} * t$$

$$d_y = \frac{1}{2}gt^2$$

$$\sqrt{2hg} * t = \frac{1}{2}gt^2$$

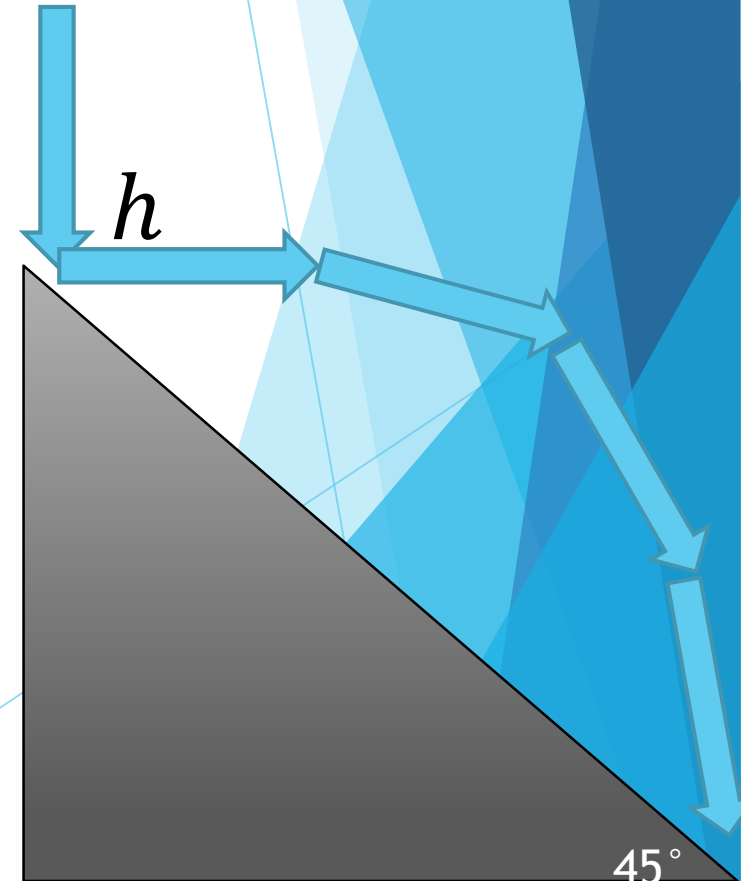$$t = \frac{2}{g}\sqrt{2hg} = \sqrt{\frac{8h}{g}}$$

h

$45°$

Part C – Distance Within Bounces

$$d_x = v_x * t = \sqrt{2hg} * \sqrt{\frac{8h}{g}} = 4h$$

$$c = \sqrt{a^2 + b^2}$$

$$L = \sqrt{(4h)^2 + (4h)^2} = \boxed{4h\sqrt{2}}$$

h

45°

Part D – Velocity At Impact 2

$$v = \sqrt{v_x^2 + v_y^2}$$

$$v_x = \sqrt{2hg}$$

$$v_y = g\sqrt{\frac{8h}{g}} = \sqrt{8hg}$$

$$v = \sqrt{\sqrt{2hg}^2 + \sqrt{8hg}^2} = \sqrt{2hg + 8hg} = \sqrt{10hg}$$