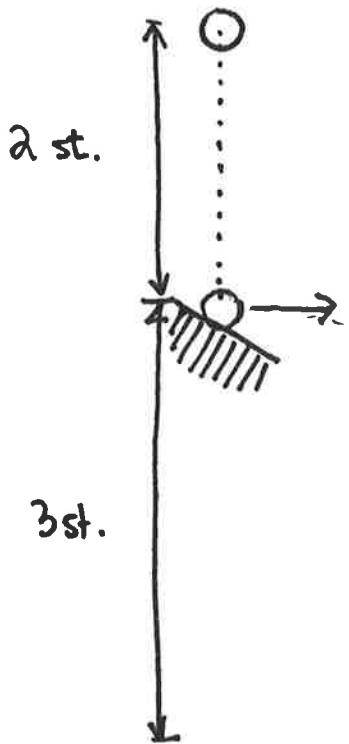
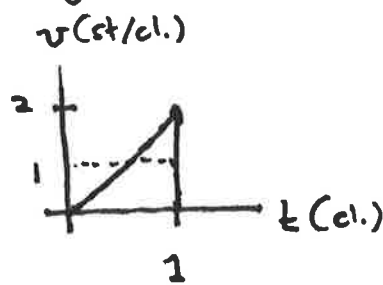


ASGV2 EX 12.1 (Castaway physics)



- A ball falls a distance of one stick (st) in one click (cl). (This is how one unit of time (1 cl.) is defined.)
- Suppose a ball strikes an angled plate after having fallen 2 st.



while falling, it has an acceleration of $a = 2 \frac{\text{st}}{\text{cl}^2}$

a) So it takes a time given by

$$d = \frac{1}{2} a t^2$$

$$2 = \frac{1}{2} \cdot 2 \cdot t^2 \Rightarrow \boxed{t = \sqrt{2}} \text{ clicks}$$

to fall 2 sticks.

And it takes how long to fall 3 sticks?

$$d = \frac{1}{2} a t^2 \Rightarrow 3 = \frac{1}{2} \cdot 2 \cdot t^2 \Rightarrow \boxed{t = \sqrt{3}} \text{ clicks.}$$

b) Immediately after striking the plate, the (horizontal) speed of the rock is $v_H = at \Rightarrow \boxed{v_H = 2 \cdot \sqrt{2}} \text{ st/cl}$

c) The range is $x_H = v_H t = (2\sqrt{2})(\sqrt{3}) = \boxed{2\sqrt{6} = x_H}$

d) See next page.

d) when it strikes the ground, the

horizontal speed is $v_H = 2\sqrt{2}$. The

vertical speed is $v_V = at = 2\sqrt{3} = 2\sqrt{3} \text{ s}^{1/2}/\text{cl}$

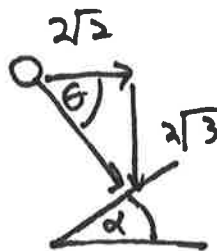
And the total speed is

$$v = \sqrt{v_H^2 + v_V^2} = \sqrt{(2\sqrt{2})^2 + (2\sqrt{3})^2} = \sqrt{8+12}$$

$$\boxed{v = \sqrt{20} \text{ s}^{1/2}/\text{cl}}$$

e) What is the angle of impact?

$$\theta = \arctan\left(\frac{2\sqrt{3}}{2\sqrt{2}}\right) = 50.8 \text{ degrees}$$



So to maximize the force of impact we need to angle the surface so the impact is perpendicular to this. So $\alpha = 39^\circ$

f) Can we find out how many sticks per second there are?

No. We would need to know, for instance, a in m/s^2 .