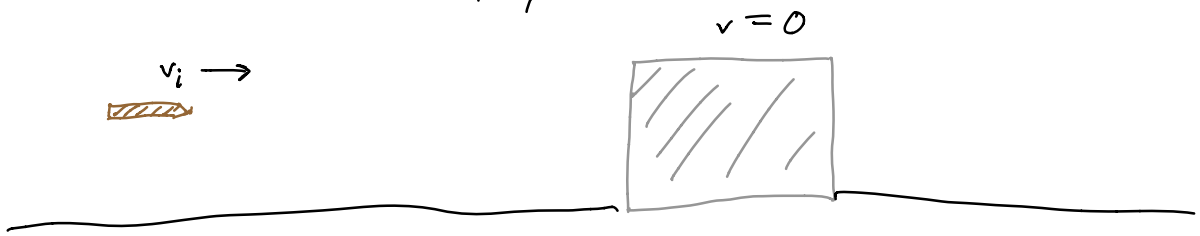
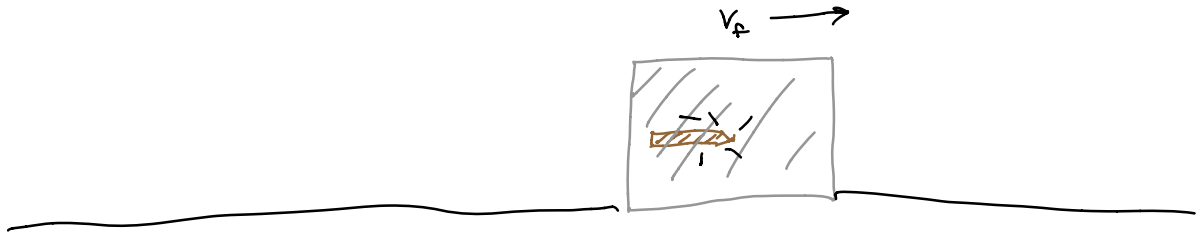
System: bullet + block

Surroundings: Earth, ice

Use conservation of momentum

initially





$$\Delta \vec{p}_{sys} + \Delta \vec{p}_{sur} = \vec{0}$$

$$= \vec{0}$$

$$\Delta \vec{p}_{sys} = 0$$

$$\Delta p_{x,sys} = 0$$

$$P_{x,\,initial} = (m_{bullet})(v_{bullet}) + 0$$

block isn't moving initially

$$P_{x\,final} = (m_{bullet})(v_f) + (m_{block})(v_f)$$

bullet + block move w/ same speed

$$P_{xf} - P_{xi} = 0$$

$$P_{xf} = P_{xi}$$

$$(m_{bullet} + m_{block})v_f = (m_{bullet})v_{bullet}$$

$$v_f = \left(\frac{m_{bullet}}{m_{bullet} + m_{block}}\right) v_{bullet}$$

$$= \left(\frac{0.04\ kg}{0.5\ kg + 0.04\ kg}\right)(800\ m/s) = \boxed{59.3\ m/s}$$