Nestor Plata – 101282246
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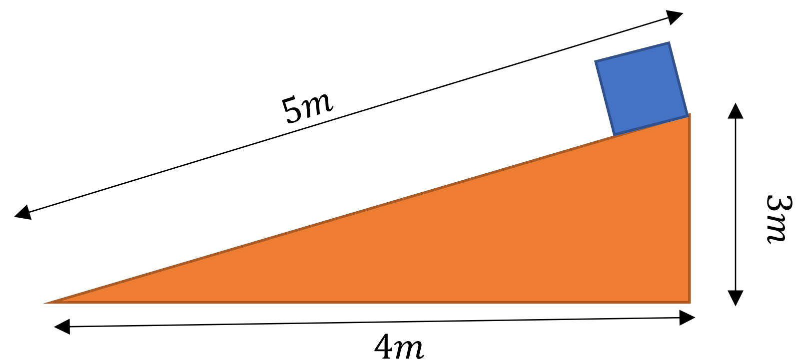
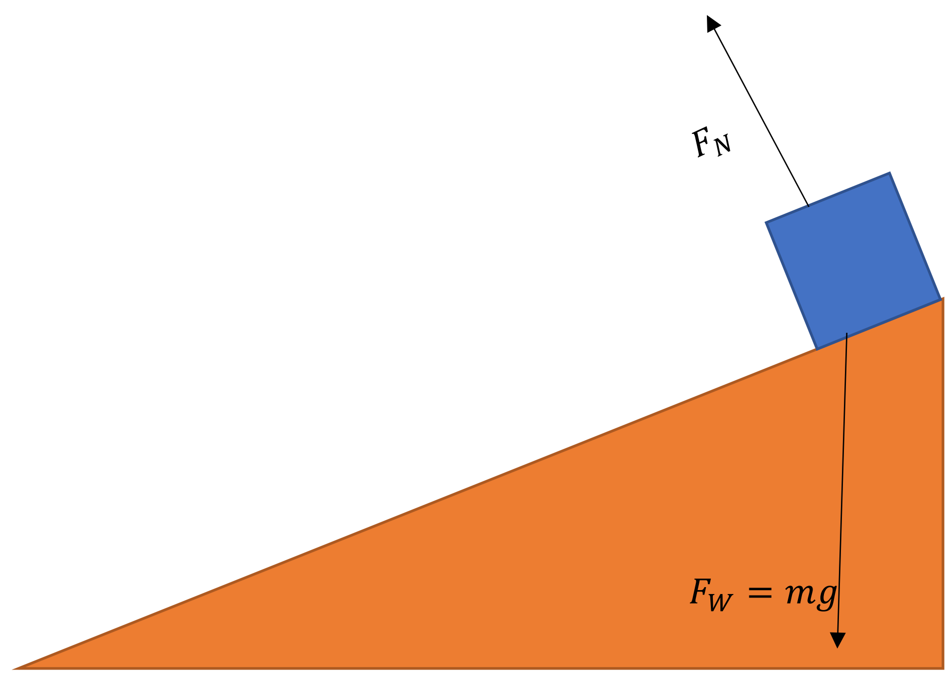
Consider a metal loot crate, at the top of a frictionless ramp. If the mass of the loot crate is 12.8kg and the ramp has a rise of 3m and a run of 4m, then compute the following.



a) Compute the free body diagram of the loot crate a time 0. (i.e. when the loot crate is at the top of the ramp.)

$t = 0$



b) Compute the net force and the acceleration of the loot crate at time 0. Given the frictionless surface what do we know about the acceleration as the object moves down the ramp?

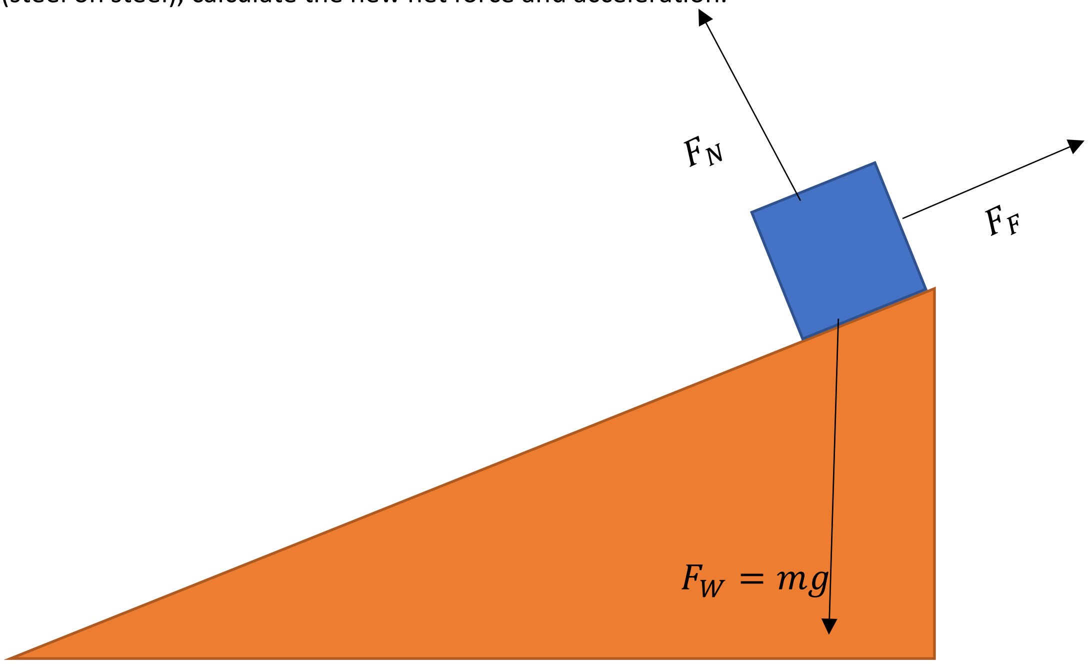
$$F_W = mg = 12.8 * 9.8 = 125.44_N$$

$$F_N = \; cos\theta F_W = \; 75.3_N$$

$$a = \frac{F_x}{m}$$

$$a = \frac{83.10}{12.8} = \; 5.88_{m/s^2}$$

c) Consider the loot crate as it leaves the ramp and moves onto a at surface that now has some friction. Compute the free body diagram for this situation. If coefficient of kinetic friction is 0.42 (steel on steel), calculate the new net force and acceleration.



$$F_W = mg = 12.8 * 9.8 = 125.44_N$$

$$F_F = \mu F_N$$

$$F_F = 0.42 * 125.44 = 52.7_N$$

$$a = \frac{f}{m} = \frac{52.7}{12.8} = 4.12_{m/s^2}$$

d) If we assume that the force of friction is constant after this point, how long will it take for the loot crate to stop moving? At what distance in meters will the loot crate stop?

$$\frac{1}{2}mv^2 = mgh$$

$$v^2 = 2(gh)$$

$$v = 7.67_{m/s}$$

$$v = v_0 + at$$

$$t = \frac{0 - 7.67}{-4.12} = 1.86_s$$

$$v^2 = v_0^2 + 2ad$$

$$d = \frac{0 - 7.67^2}{(2 * -4.12)} = 7.14m$$