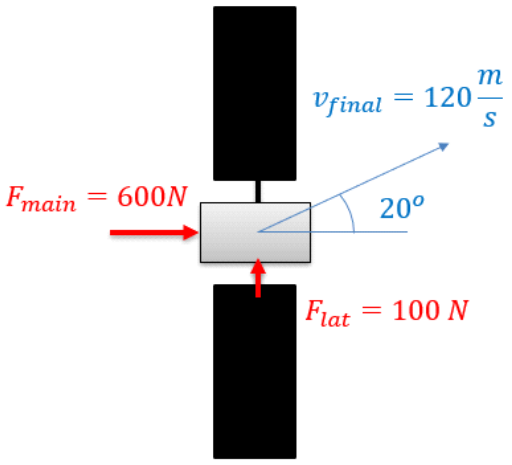
Problem 1

Force Method in Two Dimensions (Worked Example)

- You are controlling a satellite with a mass of 300 kg. The main and lateral thrusters can exert the forces shown. How long do you need to run each of the thrusters to achieve the final velocity as shown in the diagram? Assume the satellite has zero initial velocity.



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$$V(t) = a\,t \rightarrow a = \frac{V}{t}$$

$$\sum F_x = m\,a_x \rightarrow 600\ N = 300\ kg\left(\frac{120\cos(20)\ m/s}{t}\right)$$

$$t = 300\ kg\left(\frac{120\cos(20)\ m/s}{600\ N}\right) = \boxed{56.38\ s}$$

t_{main}

$$\sum F_y = m\,a_y \rightarrow 100\ N = 300\ kg\left(\frac{120\sin(20)}{t}\right)$$

$$t = 300\ kg\left(\frac{120\sin(20)\ m/s}{100\ N}\right) = \boxed{123.13\ s}$$

t_{lat}