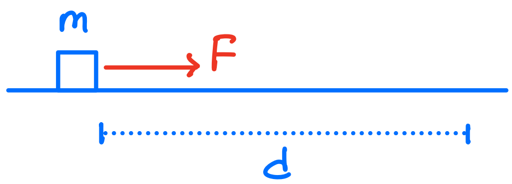
So why do we care about WORK? It turns out to be useful. Let's do some math to see "what happens" to an object when work is done it.



From above, let's see what happens when a constant net force F pushes an object m a distance d

$$\Sigma W = F d \qquad \text{(simple definition)}$$

$$\Sigma W = (ma) d \qquad \text{Newton's } 2^{nd} \text{ Law}$$

$$\Sigma W = (ma)(\bar{v}\, t) \qquad \bar{v} = \frac{d}{t}$$

$$\Sigma W = m\left(\frac{v_f - v_i}{t}\right) \bar{v}\, t \qquad \text{definition of } a$$

$$\Sigma W = m\left(\frac{v_f - v_i}{t}\right)\left(\frac{v_f + v_i}{2}\right) t \qquad \text{constant } a$$

Now just simplify:

$$\Sigma W = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 = Fd$$

If we define $K = \frac{1}{2} m v^2$ Let's call it "Kinetic Energy"!

Then we can say

$$\boxed{\Sigma W = \Delta K}$$

often called the "Work-Kinetic Energy Theorem" (but I ^it hate that)

Here's the calculus version:

$$\Sigma W = \int_i^f F \cdot dx$$

$$= \int ma\,dx$$

$$= \int m \frac{dv}{dt}\,dx$$

$$= \int m\,dv \frac{dx}{dt}$$

$$= \int mv\,dv$$

$$= \frac{1}{2}mv^2 \Big|_i^f$$

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

Notice:

$$Fd = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$mad = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$2ad = v_f^2 - v_i^2$$

$$v_f^2 = v_i^2 + 2ad$$

look familiar? :)