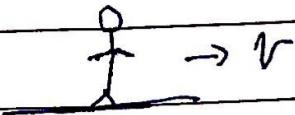
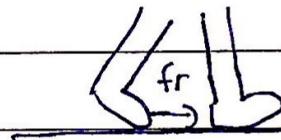


* Friction force is always against the direction of motion of the ~~surface~~ surface which is in contact with ground



The box is in contact with the surface, so the friction is in the opposite direction of box's motion. This person is moving to the right but it doesn't matter because he isn't in contact with the ground. His feet what we really care about

When the person walks forward, one foot pushes the ground backward which is the action. According to Newton's III law,



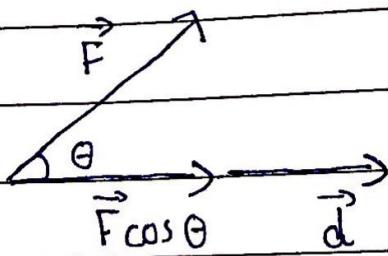
There is a force from ground to person's foot which is the reaction (friction)

This foot is stationary with respect to the ground, so this friction is static friction

Work done = magnitude of the displacement times the (scalar) component of the force parallel to the displacement

$$W = \vec{F} \cdot \vec{d} = \vec{F} \cdot \vec{d} \cos \theta \rightarrow \text{angle between force and displacement}$$

Work is a scalar quantity can be (+, -, zero)



~~Work is a scalar quantity~~

+ → if $90^\circ > \theta \geq 0^\circ$

- → if $180^\circ \geq \theta > 90^\circ$

zero → if $\theta = 90^\circ / F = 0 / d = 0$

* The sign of work doesn't represent direction

$$[W] = N \cdot M = J \text{ (Joule)}$$

unit of work

~~work~~ work when a force ~~acts~~ of 1 Newton acts on object and moves it a distance of 1 meter along the direction ($\theta = 0^\circ$)

If $W=0$ → stationary (no displacement / ~~no~~ net force = 0)
 or → no linear acceleration
 or → centripetal acceleration

Linear acceleration

Centripetal acceleration

Changing in velocity magnitude

magnitude of velocity is constant
but the direction changes
(constant speed)

There is work

No work (because $\theta = 90^\circ$)

Work done by a variable force:

We can evaluate it by finding out the area, (integration) in
Force - ~~displacement~~ graph under the curve
Position

