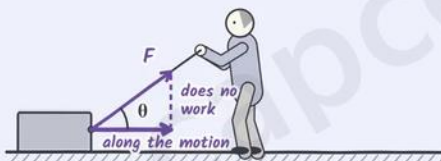
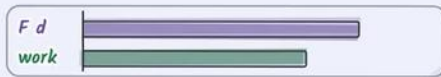


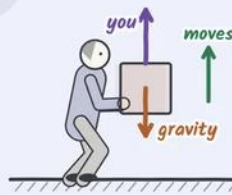
work loads energy in, power says how fast, collisions decide what is left after

Work, defined properly

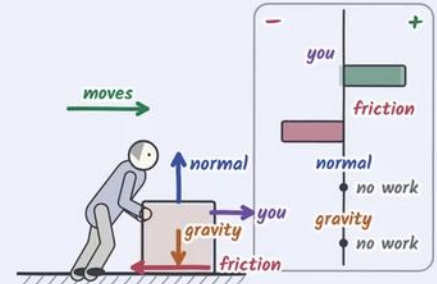
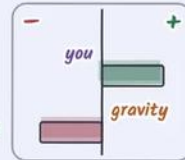
- work needs a force and a displacement along it
- only the part of F along the motion does work
- across the motion: none. work is a scalar: +, - or 0
- lifting: you +, gravity -. pushing: you +, friction -



the pull splits: only the part along the motion works



lifting: you +, gravity -



pushing: you +, friction -, the rest none

Work, the numbers *

a constant force, angle θ to the displacement

$$W = F \cdot d = Fd \cos \theta$$

the part of F that works

$$F_{\parallel} = F \cos \theta$$

you lift a body a height h , steadily

$$W_{\text{you}} = +mgh$$

gravity, over that same lift

$$W_g = -mgh$$

$\theta = 0$ gives the most work, 90° none, 180° the most negative

Kinetic energy and the theorem

kinetic energy

$$K = \frac{1}{2} mv^2 = \frac{p^2}{2m}$$

net work equals the change

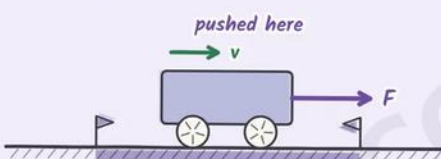
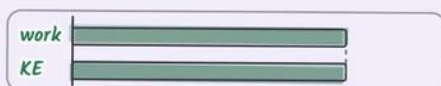
$$W_{\text{net}} = \Delta K = K_f - K_i$$

braking with a steady force f over d

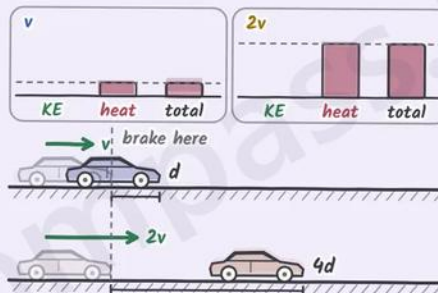
$$-fd = 0 - \frac{1}{2} mv^2$$

The work-energy theorem

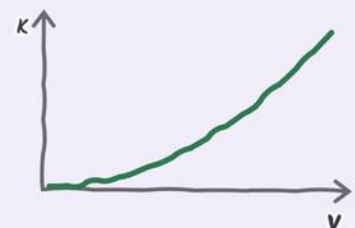
- the net work on a body is the change in its kinetic energy
- it holds for any force, constant or changing, on any path
- add the work of every force: the net force sets the change



the work equals the KE gained



v and $2v$: stops d and $4d$, the KE all heat



KE grows as the speed squared