How do you give something energy?

By doing work.

$$W = (\text{Force})\left(\begin{array}{c}\text{displacement}\\ \text{in the}\\ \text{direction of}\\ \text{the force}\end{array}\right)$$

So if the force is in the x-direction:

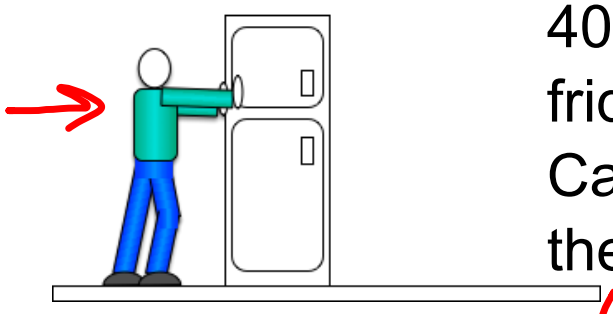
$$W = F\Delta x$$

But if the force is in the y-direction:

$$W = F\Delta y$$

Unlike many of the things we've learned about this year, Work is not a vector.

In other words, it is not directional. It's just an amount.



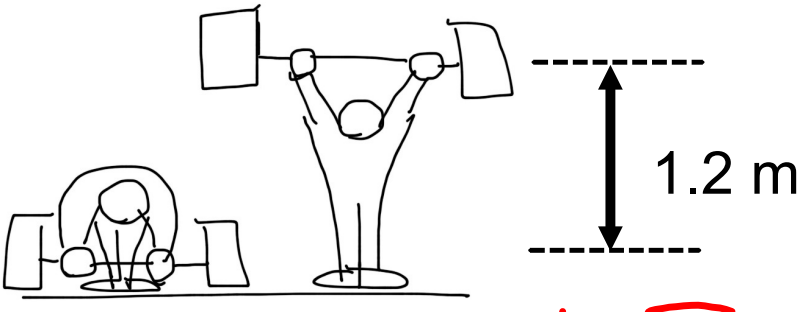
The person uses a force of 40 N to push the 100 kg fridge 4 meters to the right. Calculate the work done by the person.

$W = F_x \Delta x = (40\ N)(4\ m) = 160\ Nm$

$160\ J$

Joule

In the x-direction, weight is irrelevant.



The weightlifter lifts 100 kg 1.2 meters. Calculate the work done by the weightlifter.

100 kg → 1000 N

$W = F_{\Delta y} = (1000\,N)(1.2\,m)$

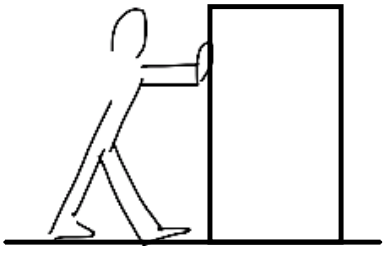
$= 1200\,J$

When you lift something, you use a force approximately equal to its weight.

Work is the transfer of energy.

Doing 10 J of work means:

- **You lose 10 J of energy**
- **Whatever you did the work on gains 10 J of energy.**



The person uses 30 N of force to push the box 10 m to the right. At the same time, the box experiences 5 N of friction.

a) How much work was done by the person?

b) How much energy must the person have used up to do the work?

c) What form did the used up energy start as in the person?

d) How much work was done by friction?

e) How much Heat was generated?

f) How much KE did the box gain?

a) $W = F\Delta x = (30\,N)(10\,m) = 300\,J$

b+c) 300 J of Chem PE

d) $W = F\Delta x = (5\,N)(10\,m) = 50\,J$

e) 50 J of Heat

f) 250 J