Unit 7 – Energy
Section 7.1: Work

Energy is something which cannot be ___created or destroyed___, only

transferred from one ___form___ to another or from one ___object___ to another.

Kinetic Energy (speed) ⟷ Gravitational Potential Energy (Height) ⟷ Heat

Kinetic Energy (speed) ⟷ Heat

Energy is also the ability to do ___work___.

$$W = F_{\parallel} \, d$$

Nm   N   m

Work is a ___scaler___, but it can be ___negative___ if ___F and___
___d are "antiparalllel" (in opposite directions)___
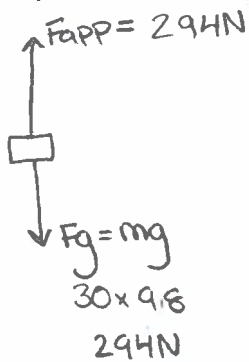
When you hold an object in the air, do you do work?

Do you do work?

Yes! Your heart does work on your blood. Your lungs do work on the air

Do you do work on the object?

No! Because the object doesn't move any distance.

Example: If you lift a 30 kg weight from the ground to a height of 1.5 m at constant velocity, how much work do you do on the weight?
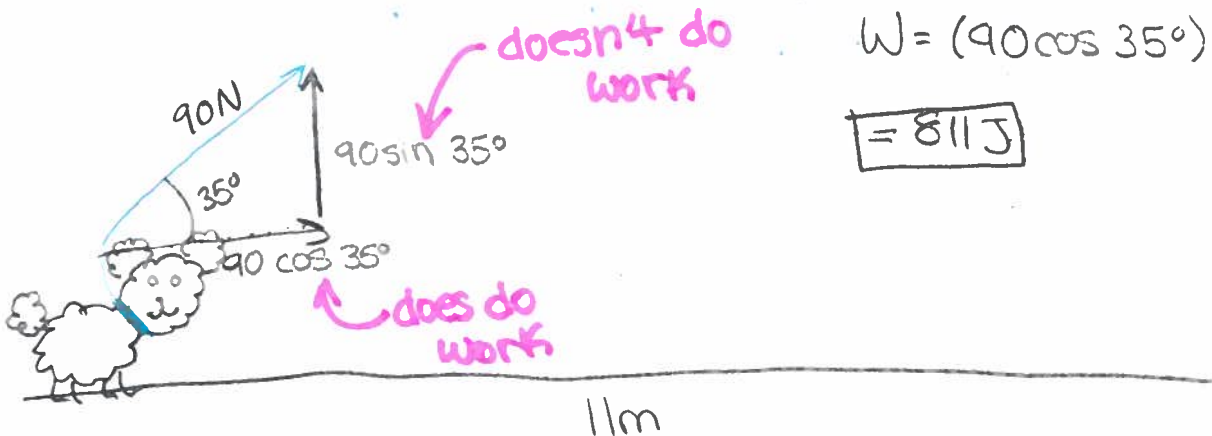
$F_{app} = 294N$

$F_g = mg$
30×9.8
$294N$

$W = F_{\parallel}d$

$W = F_{app\parallel}d$

$= (294)(1.5)$

$= 441 \text{ J}$

How much work does gravity do on the weight?

$W = F_{\parallel}d$

$= (294)(1.5)$

$= -441 \text{ J}$

negative goes in at end because F and d are in opposite directions.

Example: A stubborn poodle refuses to walk. His frustrated owner drags the dog back home along the 11 m driveway by its leash. If the leash makes an angle of 35 degrees with the horizontal and has a tension of 90 N, how much work does the person do on the poodle?

$W = F_{\parallel}d$

90N

35°

90 sin 35° — doesn't do work

90 cos 35° — does do work

11m

$W = (90 \cos 35°)(11)$

$= 811 \text{ J}$