

Work

- Work is equal to a change in energy.
- We calculate work by multiplying the force exerted on an object by the distance the object moves in the direction the force acts



If the wall doesn't move,

no work has been done

Work

- Work = **Force × Distance**
- The amount of work applied depends on:
 - how much force is applied (**Newton**)
 - how far the force causes the object to move (**meter**)

The unit of work is a **Newton-meter** (N·m) or a **Joule (J)**

Work

1) How much work is needed to lift an object that weighs 30 N to a height of 5 m?

$$W = F \times d$$

$$W = 30 \text{ N} \times 5 \text{ m}$$

$$W = 150 \text{ J}$$

Work

2) How much work is needed to lift an object that weighs 150 N to a height of 2 m?

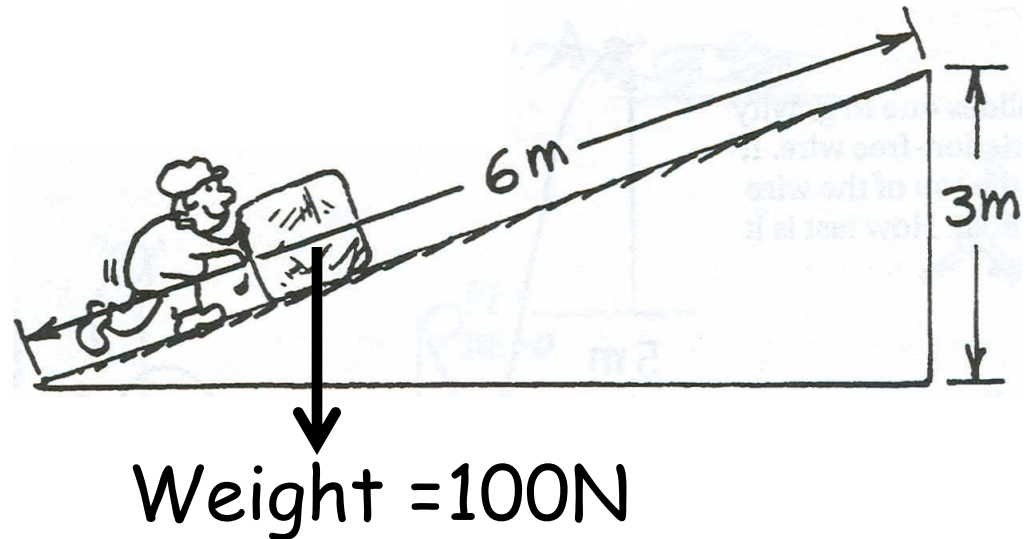
$$W = F \times d$$

$$W = 150 \text{ N} \times 2 \text{ m}$$

$$W = 300 \text{ J}$$

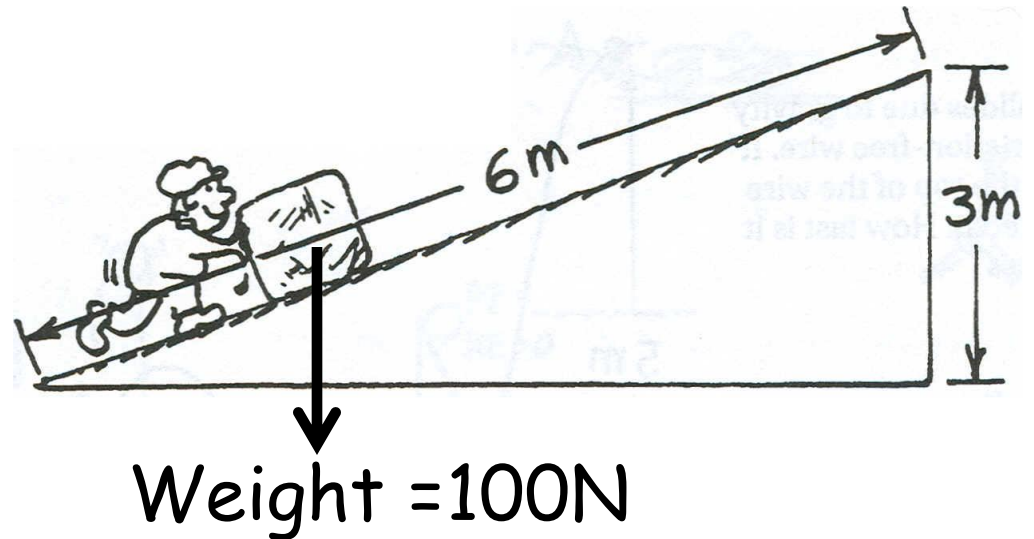
Work

3) How much work is done if the 100N box is lifted to a height of 3 meters?



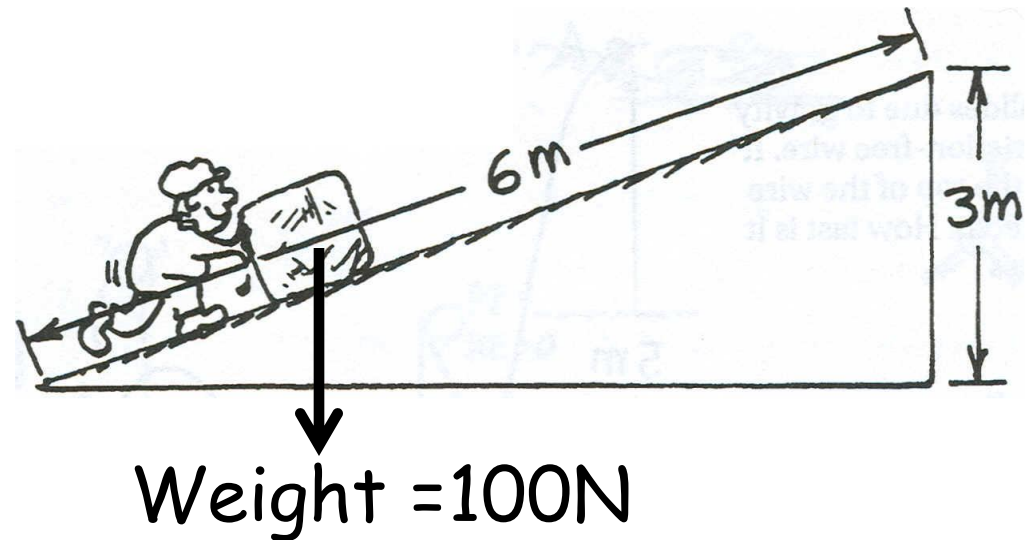
Work

4) Does he have to apply the same force to slide it up the ramp?



Work

5) How much force would it take?



Power

- Power is **the rate at which work is done**
- The equation for power is

$$\text{Power} = \frac{\text{Work}}{\text{Time}}$$

- The unit for work is **Joule**
- The unit for time is **second**
- The unit for power is **Joule/second** which is called a **Watt**

Power

1. 400 Joules of Work are completed in 5 seconds. What is the power?

Power

2. A force of 300 N acts through a distance of 2 meters in 4 seconds. Calculate the work and the power.