

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ calculate work done using $E_w = F \times d$
- ☐ convert a mass into a weight ($F = mg$)
- ☐ rearrange the formula to find force or distance
- ☐ give answers to two significant figures

I DO**Key ideas and worked example** Read this first

$E_w = F \times d$

Work done = force applied $\times$ distance moved

- Force F in newtons (N)
- Distance d in metres (m)
- Work done E_w in joules (J)

Remember

If you are given a mass, change it into a weight first: $F = mg$, with $g = 9.8 \text{ N/kg}$ (the data booklet gives 9.8 m s^{-2} , which is the same thing).

Rounding and significant figures

All figures are significant except zeros at the front or the end. 1234 has four significant figures; 0.012 and 1200 both have two. Round only your final answer. $3.6 \times 10^3 = 3600$ and $3.6 \times 10^{-3} = 0.0036$.

A lift raises a mass of 1000 kg to the next floor of a shopping centre, 20 m up.

Example Calculate the minimum work done by the winch.

Worked answer set out every step like this

$$F = mg = 1000 \times 9.8 = 9800 \text{ N}$$

$$E_w = F \times d = 9800 \times 20$$

$E_w = 196\,000 \text{ J (196 kJ)}$

WE DO**Guided practice** Follow the steps to help you

A trolley is pushed 25 m with an average force of 400 N.

1 Calculate the work done. (2 marks)

Steps

1. Write the formula: $E_w = F \times d$
2. Substitute: $E_w = 400 \times 25$
3. Calculate and give the unit (J or kJ)

YOU DO

On your own Give answers to two significant figures. Show your working.

2 Calculate the work done when lifting each of these masses to a height of 2 m.

a) 0.5 kg

b) 2.1 kg

c) 3.2 kg

d) 3.5 kg

3 A force of 150 N pulls a 50 kg bag of sand 20 m along the ground. Calculate the work done.

4 *During loading, a forklift truck lifts a 740 kg pallet of bricks to a height of 2 m.*

a) Calculate the minimum work the truck must do.

b) Suggest why the actual work done will be greater than this.

5 A gardener pushes a lawnmower 42 m with an average force of 230 N. Calculate the work done.

6 A car is brought to rest over 24 m by a frictional force of 980 N. Calculate the work done.

7 A parent pushes a pram 768 m. The total work done is 210 kJ. Calculate the average force applied.

8 A car tows a caravan 12 km. The total work done is 30 MJ. Calculate the average force.

9 A tug boat does 205 MJ of work by exerting an average force of 15 kN on an oil rig. Calculate how far the rig is towed.

10 *A person of mass 50 kg runs up a flight of stairs with a vertical height of 8 m.*

a) Calculate the weight of the person.

b) Calculate the work done.

Check and reflect

Mark your answers with the answer sheet. Which “I can” statement above still needs work? Look back at the notes for that topic on the site.
