

Chapter 14 Lesson 1 Day 1

Work and Power

I can explain how force relate to the movement of objects.

What Mastery Looks Like

A student performed 50 joules of work by raising an object 2 meters with a pulley.

$$\text{Force} = \frac{\text{work}}{\text{distance}}$$

$$F = \frac{W}{d}$$

What was the force on the object?

F 25 newtons

G 48 newtons

H 52 newtons

J 100 newtons

I. What is Work?

- Work is done when a force causes an object to move in the same direction that the force is applied.
- What are some ways you have done work today?



- <http://http://www.brainpop.com/science/motionsforcesandtime/work>

Is work being done or not?



- Mowing the lawn
 - Weight-lifting
 - Moving furniture up a flight of stairs
 - Pushing against a locked door
 - Swinging a golf club
- YES
 - YES
 - YES
 - NO
 - YES

Work Cont.

A. Work and Motion

To do work, two things must occur.

1. You must apply a force to an object.
2. The object must move in the same direction as the applied force.

See Figure 1

Explain why the girl does no work on the bags of groceries if she is standing still. **P. 426 TB**



Work Cont.

B. Applying Force and Doing Work

See figure 2 on p.427.

Are both pictures demonstrating work? Explain your answer to your shoulder buddy.

Read the section:

Applying Force and Doing Work

How do you know when work is being applied?

Give real world examples of doing work based on what you read.

*No work is done, when the motion of an object is at a right angle to the applied force.



Work Cont.

C. Force in Two Directions

- See Figure 3 : What happens when pushing a lawn mower
 - Only part of the force exerted moves an object.
 - Part of the force is to right, and downward.
- *Only the part of the force that is in the same direction as the motion of the mower does the work.



Figure 3 When you exert a force at an angle, only part of your force does work—the part that is in the same direction as the motion of the object. **Compare** the sizes of the total force and the forward force exerted on the mower.

II. Calculating Work

- More work is done when force is increased or the object is moved a greater distance.
- Work does NOT involve time, only force and distance.
- No work is done when you stand in place holding an object.
- Work Equation $W=Fd$ or

work = force x distance

- Work is measured in **joules**.
 - Force in **newtons**.
 - **Distance in meters**.

- 1 newton-meter is a quantity known as a *joule* (J).
 - named after British physicist James Prescott Joule.

- <http://science360.gov/obj/video/c5be5456-2e39-49a7-8118-218868df89eb/work-energy-power>



Applying Math

Solve a One-Step Equation

WORK A painter lifts a can of paint that weighs 40 N a distance of 2 m. How much work does she do? *Hint: to lift a can weighing 40 N, the painter must exert a force of 40 N.*

 GLE 0706.2.1

Solution

1 This is what you know:

$$\text{force: } F = 40 \text{ N}$$

$$\text{distance: } d = 2 \text{ m}$$

2 This is what you need to find out:

$$\text{work: } W = ? \text{ J}$$

3 This is the procedure you need to use:

Substitute the known values $F = 40 \text{ N}$ and $d = 2 \text{ m}$ into the work equation:

$$W = Fd = (40 \text{ N})(2 \text{ m}) = 80 \text{ N}\cdot\text{m} = 80 \text{ J}$$

4 Check your answer:

Check your answer by dividing the work you calculated by the distance given in the problem. The result should be the force given in the problem.

Practice Problems

1. As you push a lawn mower, the horizontal force is 300 N. If you push the mower a distance of 500 m, how much work do you do?
2. A librarian lifts a box of books that weighs 93 N a distance of 1.5 m. How much work does he do?

Turn to page 428, Complete 1 and 2 with partner.

Exit Ticket

How are work and force related?