Flipping Physics Lecture Notes:

Introduction to Work with Examples

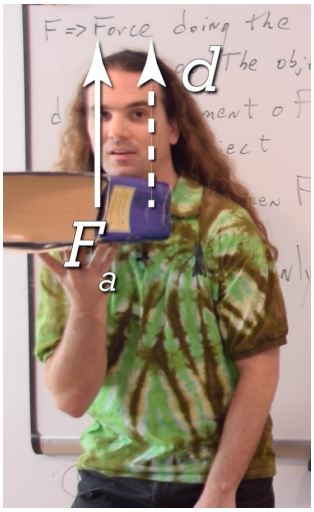
$\boxed{W = Fd\cos\theta}$

- W is Work
- F is the force doing the work on the object
- d is the displacement of the object
- θ is the angle between F and d
- When using this equation use the Magnitude of F and d, it is the cosine of the angle between F and D that determines if work is positive or negative.

Work is a scalar, which means it has magnitude only, it does not have direction.

Dimensions for Work: $W = Fd\cos\theta \Rightarrow N \cdot m = Joules, J$

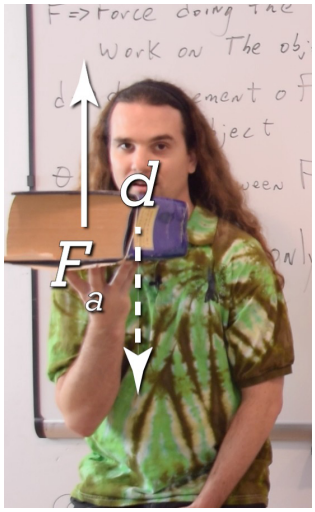
Example #1: Lifting the book up.



$$W_{F_a} = F_a d\cos\theta$$
$$\Rightarrow W_{F_a} = F_a d\cos(0)$$
$$\Rightarrow W_{F_a} = F_a d(1) > 0$$

I do positive work on the book via the force applied as I lift the book upward.

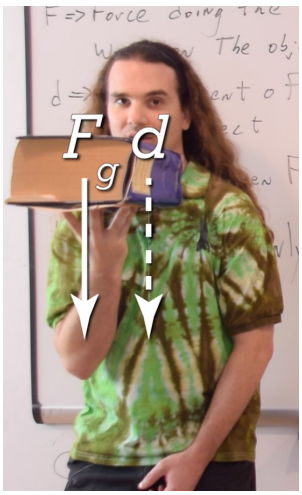
Example #2: Lowering the book down.



$$W_{F_a} = F_a d\cos\theta$$
$$\Rightarrow W_{F_a} = F_a d\cos(180°)$$
$$\Rightarrow W_{F_a} = F_a d(-1) < 0$$

I do negative work on the book via the force applied as I lower the book down.

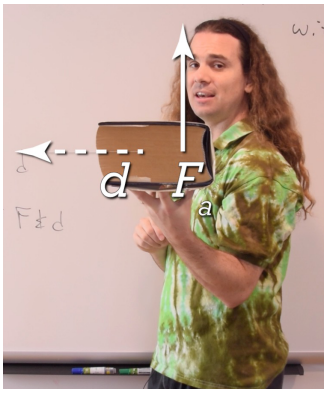
Example #3: Lowering the book down.



$$W_{F_g} = F_g d\cos\theta$$
$$\Rightarrow W_{F_g} = F_g d\cos(0)$$
$$\Rightarrow W_{F_g} = F_g d(1) > 0$$

The Earth does positive work on the book via the force of gravity as I lower the book down.

Example #4: Walking to the left at a constant velocity while holding the book.



$$W_{F_a} = F_a d\cos\theta$$
$$\Rightarrow W_{F_a} = F_a d\cos(90°)$$
$$\Rightarrow W_{F_a} = F_a d(0) = 0$$

I do zero work on the book via the force applied as I walk to the left at a constant velocity while holding the book.