Work

"Work work work work work work" – Rihanna

pg 31–32



Right Side – Teacher Input

*Remember that all notes must be on the right side and this ENTIRE lesson must be on this page only

I Can...

- Calculate the efficiency of a mechanical device in multiple ways.
- Identify work input and work output for a mechanical device.

WHAT IS FORCE?



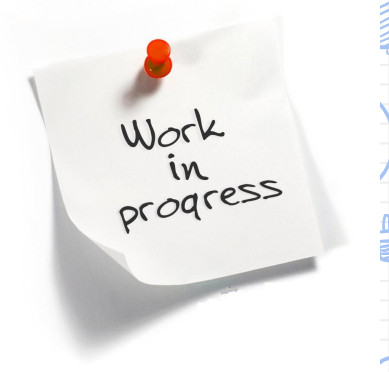
CONTACT FORCE



NON-CONTACT FORCE

Work workworkworkworkwork

- What is work? What do you think of when you think of someone doing work?
- The scientific definition of **work** is when force acts on an object to make the object move.
- The key is that movement is needed before you can say that work as been done. If you just lift an object and stay in place, you may think you are doing work because it may feel like you are doing something, but work is not being done so long as there is no movement



Work

- As much as it may seem that these people pushing against this car are doing work, if the car doesn't move no work is being done according to the scientific definition



Calculating Work

- We calculate work by looking at the force exerted on an object and the distance the object is moved because of the force.

$$Work = Force \ x \ Distance$$

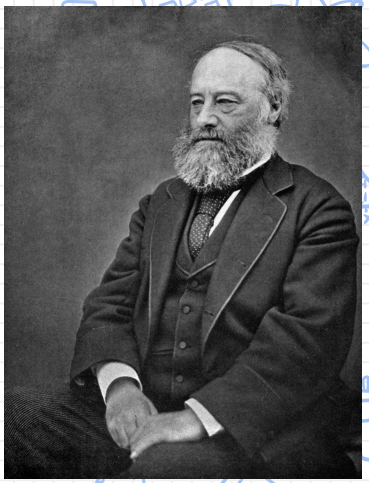


Examples

If you lifted your chair onto your desk, how much work would you do assuming that you have to exert a force of 50N to lift the chair and your desk is 0.4m high?



Units of Work



- We calculated work as a N•m or a Newton meter or what we call a Joule – after James Prescott Joule
- A joule can be defined as the amount of work done on an object when 1 N of force is applied to move the object 1m
- A joule is also used to measure energy!

Energy and Work

- ✘ Without energy, there would be no work!
- ✘ Back to the bike – you use energy to push the pedals that move the wheels of your bike. Work is being done because the force you apply also causes the bike to move
- ✘ Machines help us do work by transferring energy – the machine transfers energy from the source to the object, causing the object to move



Machines and Work

- We talked about machines helping us do work BUT it's important to note that using a machine does not mean you are doing less work!

- You are applying less force to do the same task, but the amount of work that is needed does not change

- To understand this, we can look at $Work_{input}$ and $Work_{output}$



Calculating Work

- Work input is the work needed to use or operate the machine:

$$Work_{input} = Force_{input} x\ Distance_{input}$$

Work output is the work done by the machine:

$$Work_{output} = Force_{output} x\ Distance_{output}$$



Examples

If the student pushing exerts a force of 320N for a distance of 5m:

The machine has lifted the student in the wheelchair up 2m and the downward force of the student on the machine was 800N:



Are input and output always the same?

Friction and Work

- The reason that work input and work output are not the same is due to friction – similar to the way that friction affects MA and SR
- Because of this, you can also use work input and output to calculate efficiency!

$$Efficiency = \frac{Work_{output}}{Work_{input}} x\ 100\%$$



Left Side – Student Input

Left Side Page – Requirements

MA/SR Practice? Turn it into Work!

- ✘ Answer the questions from yesterday's handout in your ISJ!
- ✘ Show all of your work.

