

Chapter 14 Class Notes 2015-2016:

- Please make sure you place your name and date as heading of notes
- Please make a new table block for your notes. Do not add to another person's notes.

Jada Steffes

12/22/15

I. Work and Power

A. Work=product of force and distance

1.  $w=fxd$
2. Work requires motion
  - a. force must act in the same direction as movement

Work is done if the object you push moves a distance in the direction towards which you are pushing it.

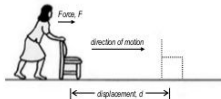


Figure 1. A girl pushing a chair

No work is done if the force you exert does not make the object move.

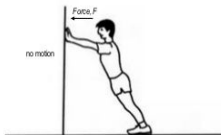


Figure 2. A boy pushing a wall

No work is done if the force you exert does not make the object move in the same direction as the force you exerted.



Figure 3. A waiter carrying a tray

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3. Depends on direction

- a. Any force that does not work in the direction of the motion = NO WORK

4. Unit = Joules OR "J"

1. Define Work?

2. What is the formula for work?

3. What does work require?

4. Can you explain or describe a situation where an object moved but no work is done? (remember Mrs Glass walking around the room with books in her arms)

5. What is the unit for work?



The man applies an upward Force on the box when raising it from the ground to chest height. Work is done because the force is applied in the same direction that the box moves. However, as the man walks from left to right while holding the box at chest height, he does no more work on the box. The force he uses to support the box acts in a different direction than the box is moving.

6. Apply force but not doing any work?

B. Power = rate of doing work

1.  $P = \text{work} / \text{time}$
2. Unit = Watts OR "W"
3. Increase Power you can:
  - a. Increase work
  - b. Reduce time

\*Remember Power lab

7. What is the formula for power?
8. What is the unit for power?
9. How can you increase power? (two ways)

Bre Greene 1/7/2016

## II. Work and Machines

### A. Machine

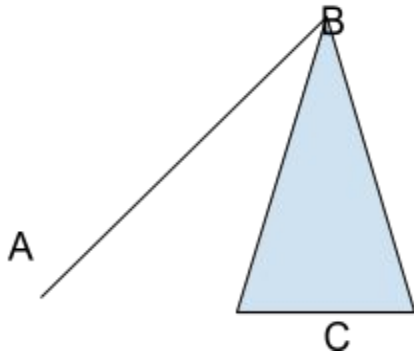
1. There are 3 ways that work is made easier.
  - a. change the size of the force needed (make it less by increasing the distance force is applied)
    - i. ex. carjack
  - b. changing the distance (making it bigger) over which force is added
    - i. ex. oar

1. What are three ways work is made easier?
2. How does a carjack make work easier?
  - a. what increases and what decreases?
  - b. you are exchanging a benefit in what but at the cost of what?
3. How does an oar make work easier?

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| <p>c. change the direction<br/>i. ex. mini blinds</p> <p><b>B. Work input and output</b></p> <ol style="list-style-type: none"> <li>1. Work done by a machine (work out) is always LESS than the work done on a machine. (work in )       <ol style="list-style-type: none"> <li>a. = because there is always friction (inefficiency).</li> </ol> </li> <li>* work input &gt; work output</li> <li>2. Refer to Lever lab       <ul style="list-style-type: none"> <li>- vocab :</li> <li>a. input force - the force applied to a machine. (like a lever)</li> <li>b. input distance - distance from fulcrum to input force</li> <li>c. output force- the force the machine exerts on a object</li> <li>d. output distance- distance from fulcrum to output force (where the machine is doing the work)</li> </ul> </li> </ol> | <ol style="list-style-type: none"> <li>4. How does mini blinds make work easier?</li> <li>5. Why is work out less than work in?</li> <li>6. Can you label vocab in a diagram</li> <li>7. Can you calculate work input and work output?       <ol style="list-style-type: none"> <li>a. what is the formula</li> </ol> </li> </ol> |
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Carissa Tank 1/22

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| <p>III. Mechanical Advantage &amp; Efficiency</p> <ol style="list-style-type: none"> <li>A. Mechanical advantage:       <ol style="list-style-type: none"> <li>a. number of time the machine increases the force.</li> <li>b. greater mechanical adv. means less force needed</li> </ol> </li> <li>B. Actual Mechanical Advantage       <ol style="list-style-type: none"> <li>a. always less than ideal because of friction</li> <li>b. formula: A.M.A.= output/input</li> </ol> </li> <li>C. Ideal Mechanical Advantage       <ol style="list-style-type: none"> <li>a. moutian example on next page</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>1. What is Mechanical adv.?</li> <li>2. How do you calculate AMA?</li> <li>3. Why is AMA always less than IMA?</li> <li>4. How do you calculate IMA?</li> <li>5. Can you make up your own diagram with #'s to calculate the IMA?</li> </ol> |
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Given:  
 AB= 200 m  
 BC= 800m

What was found:

- a. IMA= 200/600 = 2.5 MA
- b. 6000n X 2.5= 15000N  
 (because of friction it would be >15000)

D. Efficiency: % of work in, that becomes work out

Formula: Work out/work in

$$\text{Efficiency} = \frac{\text{use output work (joules)} \times 100\%}{\text{input work (joules)}}$$

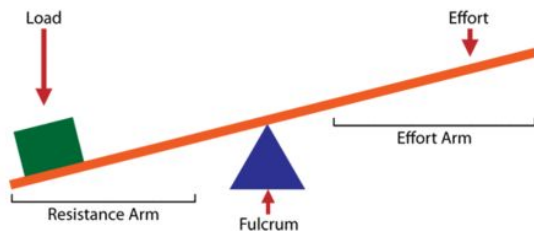
$$\text{Efficiency} = \frac{W_{\text{out}} \times 100\%}{W_{\text{in}}}$$

2. Ways to increase efficiency:

- a. Reduce friction
- b. reduce micro wells
- c. reduce surface area

Example to figure out efficiency of ski lift:

1. 100- 86%= 14%
2. 6000 X .14 = 840N
3. 6000-840= 516N



Link for good clip on mechanical Adv:

<https://www.youtube.com/watch?v=pfzJ-z5lj4>

6. Example?

- a. What is the IMA of the ski lift?
- b. If it takes 6,000N to use ski lift then how many N would it take to lift C to B?

7. What is efficiency?

8. What if the ski lift has an efficiency of 86%, how many newtons does it really take to lift from point A to point B?

9. How do you calculate efficiency?

10. How can you make efficiency better?

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Link for efficiency:

<https://www.youtube.com/watch?v=U8IOOdw>

EGbM