

Name: _____

Date: _____

Mechanical Engineering Unit Test Review

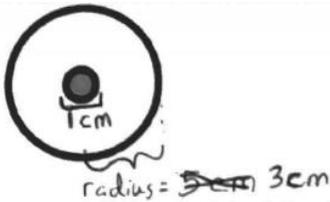
1. What is Mechanical Engineering?
2. What are the six types of simple machines? What is an example where each one might be used? What are the formulas you need to know to calculate ideal and actual mechanical advantage for each?
 - a) _____
Example of use:
Formula(s) for IMA:
Formula(s) for AMA:
 - b) _____
Example of use:
Formula(s) for IMA:
Formula(s) for AMA:
 - c) _____
Example of use:
Formula(s) for IMA:
Formula(s) for AMA:
 - d) _____
Example of use:
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 - e) _____
Example of use:
Formula(s) for IMA:
Formula(s) for AMA:
 - f) _____
Example of use:
Formula(s) for IMA:
Formula(s) for AMA:
3. What is the difference between actual mechanical advantage and ideal mechanical advantage?
4. As it relates to mechanical advantage, is it possible to have an efficiency greater than 100%? Why or why not? What about a negative efficiency?
5. For the following scenarios, choose a simple machine (or machines) you would use to accomplish this task and briefly explain how you would apply this machine
 - a) A heavy rock needs to be lifted three stories up the side of a building.
 - b) A screw is rusted and is difficult to unscrew.

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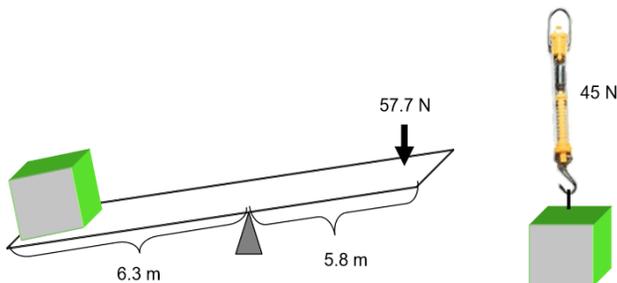
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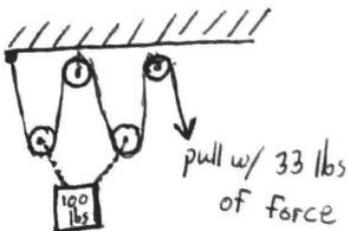
- c) You're stuck behind a door being held shut by two people. How can you use a simple machine to overpower them?
6. A crate of bananas weighing 3000 N is shipped from South America to New York, where it is unloaded by a dock worker who lifts the crate by pulling with a force of 200 N on the rope of a pulley. What is the actual mechanical advantage of the system?
7. Clyde, a stubborn 3500 N mule, refuses to walk into the horse trailer, so Farmer Brown must drag him up a 5.0 m ramp, which stands 0.5 m above the ground. A) What is the ideal mechanical advantage of the ramp? B) If Farmer Brown needs to exert a force of 450 N on the mule, what is the actual mechanical advantage of the ramp? C) What is the efficiency of the ramp?
8. What is the ideal mechanical advantage for the following wheel and axle?



9. Find the efficiency of the following simple machine:



10. Find the efficiency of the following simple machine:



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11. What are the five different types of materials, and what are the advantages and disadvantages of each?

a) Type #1:

- Advantages:

- Disadvantages:

b) Type #2:

- Advantages:

- Disadvantages:

c) Type #3:

- Advantages:

- Disadvantages:

d) Type #4: **Ceramics**

- Advantages: xxxxxx
- Disadvantages: xxxxxx

e) Type #5: **Composites**

- Advantages: xxxxxxxx
- Disadvantages: xxxxxxxx

12. For the following scenarios, choose the primary type of material you would use and justify your reasoning.

a) Quickly building several dozen single-story homes in a suburban neighborhood

b) You are part of a team designing a part which will be on a NASA satellite (think \$\$\$\$) which will need to handle extremes in temperatures and be highly durable.

c) You are making a small gearbox with many small gears/parts which need to precisely align with each other.

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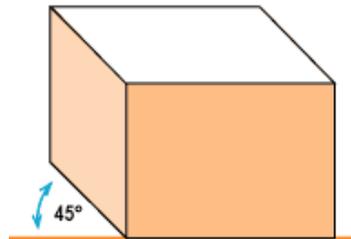
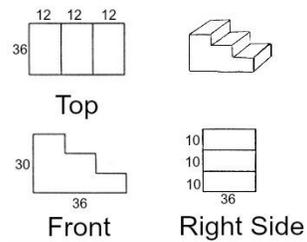
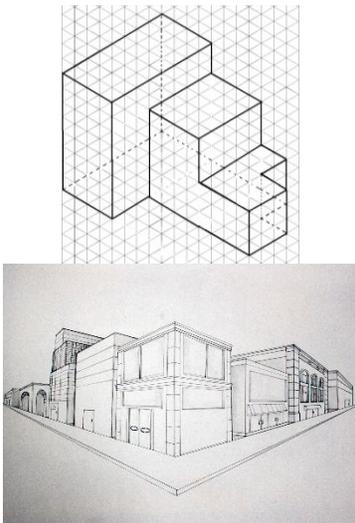
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13. For the four different types of 3D images we learned, what characterizes each?

- a) Orthographic:
- b) Isometric:
- c) Oblique:
- d) Perspective:

Match the 3D image to the four 3D views above:



e) What are each of the following AutoCAD commands and what they are used for?

- Line:
- Circle:
- Trim:
- Extend:
- Arc:
- Array:
- Fillet:
- Chamfer:
- Dynamic input:

14. Know the steps to the Engineering Design process (Doesn't matter if it's 5 steps, 7 steps, 12 steps, whichever one you prefer). You **WILL** have a question where you will need to explain/apply the engineering design process. I recommend looking up and listing a set of steps below, and if you are unsure of what any of them mean to clarify this before Monday.