

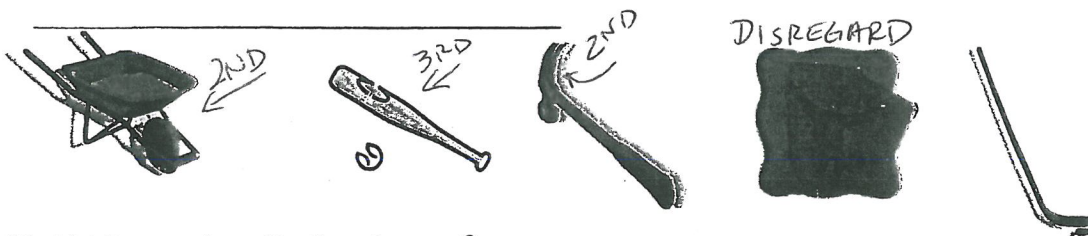
Homework Practice Problems #2—Simple Machines, Efficiency & Mechanical Advantage

Calculations

1. A 100N effort force is applied to a machine lifts a 400N object. What is the MA of the machine? $400/100 = 4$
2. What is the percent efficiency of a machine in which work input is 4800J and work output is 3600J? $3600/4800 = 75\%$
3. A machine moves a 600N object 6m. If the amount of work put into the machine is 4500J, what is the efficiency of the machine? First find the work output of the machine and then find efficiency! $3600/4500 = 80\%$
4. A machine has a mechanical advantage of 3. If a 20N force is applied to the machine, how much force will the machine produce? $3 \times 20 = 60N$
5. A machine used to lift crates of oranges has an efficiency of 65%. If a crate of oranges weighing 1300N is lifted 50m, how much work must be put into the machine? $1300 \times 50 = 65,000J / .65 = 100,000J$
6. A force of 10,000N is applied to a stationary wall. How much work is performed? 0 None
7. A 950N skydiver jumps from an altitude of 3000m. What is the total work performed on the skydiver? $950 \times 3000 = 2,850,000J$
8. A bulldozer performs 80,000N-m of work pushing dirt 16m. What is the force of the dirt? $80,000/16 = 5000N$
9. An ant does 1N-m of work dragging a 0.002N grain of sugar. How far does the ant drag the sugar? $1/0.002 = 500m$
10. A horse performs 15,000J of work pulling a wagon for 20s. What is the horse's power? $15,000/20 = 750W$
11. A 750N pole vaulter lifts himself 5m high in 2.5s. What is his power? $750 \times 5 = 3750 / 2.5 = 1500W$
12. A pump drains a small pond by performing 120,000J of work. The power rating of the pump is 1000W. How long does it take the pond to drain? $120,000/1,000 = 120s$
13. A tow truck pulls a car out of a ditch in 6.5s. If 6000W of power is used, how much work does the truck do? $6000 \times 6.5 = 39,000J$
14. An elevator lifts five passengers 30m in 24s. The power is 15,000W. What is the total weight of the elevator and passengers? $15000 \times 24 = 360,000J / 30 = 12000N$
15. Find the kinetic energy using 20 kg and velocity of 2 m/s? $1/2 (20)kg \times 4 = 1/2 (80) = 40J$

Circle the term that does not belong in each group of words below.

16. wedge, pulley, inclined plane, screw
17. sled, barber's chair, rescue ladder, auto lift
18. work input, buoyancy, efficiency, work output
19. mechanical advantage, joule/second, power, watt
20. ramp, fulcrum, lever, seesaw
21. Newton-meter, watt, joule, work ~~SKIP~~
22. shovel, steering wheel, block and tackle, typewriter ~~SKIP~~
23. machine, multiplies force, multiplies work, redirects force
24. greatest efficiency, least friction, most friction, well lubricated
25. density=mass/volume, work=force x distance, power=work/time, efficiency=work output/work input



26. List 3 examples of inclined planes: Ramps, escalator, conveyor belt
27. List 3 examples of pulleys: flagpole, crane, bicycle lift, block & tackle
28. List 3 examples of wedges: axe, a needle, saw, scissors, icepick
29. List 3 examples of screws: wood screw, water tap wrench, propeller
30. List 3 examples of wheel and axles: bike, skateboard, roller blades