Work and Machines

Solve the following problems. <u>Show work to receive credit</u>. Do all work on a separate piece of paper:

1. If you push a box 40 m and it takes 224 J of work, how much force was needed to push the box?
2. If you used 500 N of force to push a car 30 m, how much work did you do?
3. If you are lifting weights, and are able to push 1,250 N a distance of 2 m in 3 s, how much power did you generate?
4. If a crane were to lift a steel roof panel that weight 35,000 N a distance of 25 m in 45 s, how much power did the crane have?
5. If a carpenter exerts a force of 250 N on a crow bar to move a stack of lumber that weighs 1200 N, what is the mechanical advantage of the crow bar?
6. What is the mechanical advantage of a ramp that is laying on the tailgate of a truck if the tail gate is 1.2 m high and the ramp is 2.7 m long?
7. What is the mechanical advantage if a painter used a fixed pulley to raise a can of paint 10 m?
8. What is the mechanical advantage of a screw driver, if the handle has a diameter of 4 cm and the shaft has a diameter of 0.8 cm?
9. How much power is created by a person if they use a 200 N force to move a bicycle 10 m in 5 s?

Define the following:

10. Effort force
11. Resistance force
12. Mechanical advantage
13. Efficiency

Answer the following problems:

14. What are two ways a machine can make work easier?
15. How does a hammer that is used to remove a nail from a piece of wood change the direction of the force?
16. What is ideal mechanical advantage
17. How is ideal mechanical advantage different form actual mechanical advantage?
18. What is a bar that is free to pivot on a fixed point?

19. What do you call an incline plane that is sloped on two sides?

20. What is a grooved wheel that has a rope running along the groove?

21. What type of a simple machine is a screw driver?

22. What is an inclined plane that is wrapped around something?

23. What simple machines are classified as levers?

24. What simple machines are classified as incline planes?

Solve the following problems. <u>Show work to receive credit</u>. Do all work on a separate piece of paper:

25. If a 700 W engine and a 300W engine can both do 20 J of work, which machine will do the work faster?

26. If a car engine is rated at 315 horsepower, how many watts of power does it generate (remember that about 746 W = 1 horsepower)?

27. If a generator says it is 5 hp, how many watts is this?

28. How many 60 W light bulbs would the generator in question 27 be able to light up?

29. It takes 125 N of force to push a box up a ramp into the back of a semi trailer (assume that the opening in trailer is 1.3 m above the ground). If the ramp is 3 m long how much work is done?

    a. If the box actually weighs 350 N and no ramp is available, how much work would it take just to lift the box into the trailer?

    b. What would take less work, the ramp, or just lifting?

    c. Which would be easier?

    d. What is the mechanical advantage of the ramp?