SCIENCE

NAME: PERIOD: DATE:

**WORK & SIMPLE MACHINES PRACTICE**

## For all calculations:

**Show the formula. Show your substitutions. Label & circle your answer.**

Non-verbal communication?

1. Write out the formula for work. (Words, not letters for this one.)

2. What are the units for: *(when using this formula in science class)*

work - force - distance -

3. If I push on an object with a force of 220 Newtons, and I push it a distance of 8 meters, how much work did I do?

4. If I did 10,800 Joules of work on a 400 Newton object, how far did I move it?

5. If I drop a 10 N ball from the top of a 2 m tall ladder, how much work have I done?

6. If I carry that ball back up that ladder, how much work have I done? (ball and ladder from previous problem)

7. How much force would it take to do 176 J of work and move the object 11 m?

8. **Explain** how much work is done if I push with a force of 216 N on a tree, and it doesn't move.

9. What is a **machine**? *(Science definition, please.)*

10. What are the 2 primary ways that a machine helps people with their work? *(Give an example for each.)*

a.

Ex.

b.

Ex.

11. The statement below is incorrect. **Explain** why.

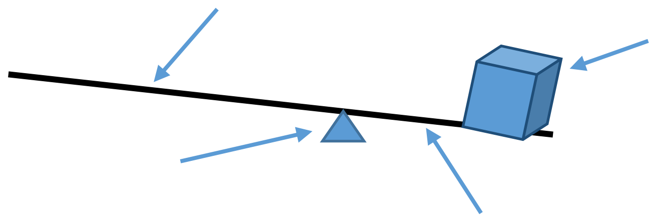
*“A machine can help you by giving you more work.” – Dwight McGoofus*

12. **Explain** how the formula below applies to a machine.

$$\mathbf{Work_{(IN)} = Work_{(OUT)}}$$

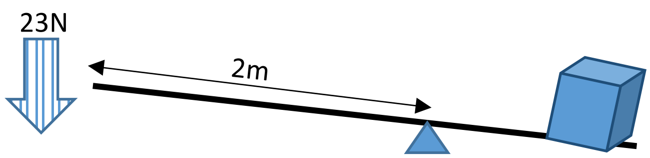
13. How does a machine get put into the category of **“simple machine?”**

14. Use the given labels, and **label** the parts of the lever below.



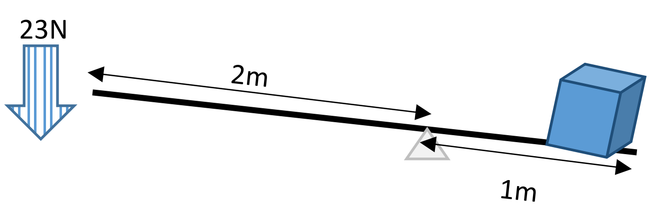
| Use these labels: |
| --- |
| fulcrum |
| effort arm |
| resistance arm |
| load |

15. How much work will be done on the effort arm side of the lever below? *(This is a calculation.)*




16. **Explain** how much work will get done on the resistance arm side of the lever above?
*(Hint: $Work_{(in)} = Work_{(out)}$ turns into $[Force_{(in)} \times distance_{(in)}] = [Force_{(out)} \times distance_{(out)}]$ )*

17. Using the new information, how much force will be applied to the load? *(This is a calculation.)*




18. If weight of the load was 50 N, would the current force on the effort arm be enough to lift the load?

**Why or why not?** *(Hint: 23 N is the current force on the effort arm)(You should be showing the math.)*

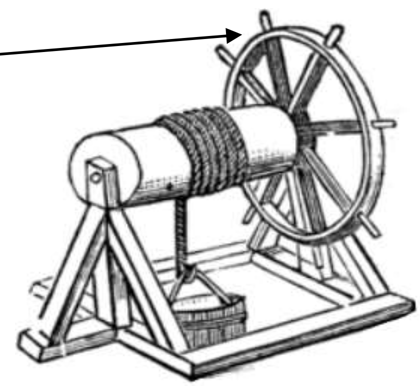
What's the minimum force needed to lift the load? *(You should be showing the math.)*

19. What is **mechanical advantage**?

20. What are the **units** of mechanical advantage?

21+. In the picture to the right:

the wheel's radius is 0.6 m
the axle's radius is 0.2 m



Use that information to answer the following questions:

21. If I turn the wheel with 30 N of force, how much will the **Work**$_{(in)}$ be?

22. **Explain** how much will the **Work**$_{(out)}$ be?

23. How much **force** will be put on the load (bucket)?

24. What is the **mechanical advantage** of this machine?

25. If the bucket is full of water, and weighs 24 N, how much **force** will I have to put on the wheel to lift the bucket?

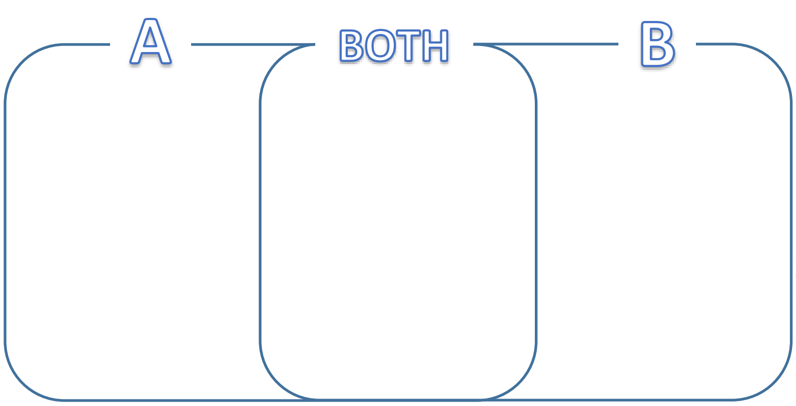
26. The kids in the picture to the right love to 'whoosh' down the slide. When I asked them why, they said, "We like the feeling of falling fast." I told them they would fall faster without friction and I had them just jump off the top of the ladder instead of using the slide.

While they were in the hospital and I was in jail, I had time to think about the Physics involved. Maybe you can figure out why their way of using the slide is more enjoyable?

*(Hint 1: The slide is an inclined plane.)*
*(Hint 2: The pain comes from the force involved.)*
*(Hint 3: Pretend there's no friction or air resistance.)*

27. The simple machine to the right is a pulley. How does 1 pulley make work easier?

28. Examine the pulley systems to the right. Fill in the Venn diagram about them.*

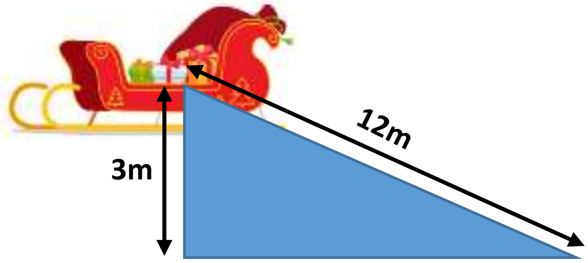





*include their mechanical advantages in the Venn diagram

Santa wants to get his cart of gifts up and into the sleigh. If he had to lift the cart straight up it would take 2,000 Joules of work.

29. If he uses the ramp, how much work will it take to get the cart up to the sleigh?




30. If he lifts the cart of toys straight up and into the sleigh, how much force will he need?

31. If he uses the inclined plane (ramp) to roll the cart up to the sleigh, how much force will he need?

32. What is the Mechanical Advantage of the inclined plane?