Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour: \_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Mechanical Advantage**

Do Now: Classify each of the following pictures as one of the simple machines we learned about yesterday

  

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* A *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* is a device with moving \_\_\_\_\_\_\_\_\_\_\_\_\_\_ that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ together to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a good example.
* The *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* includes everything \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ to make the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ accomplish a \_\_\_\_\_\_\_\_\_\_\_\_, like \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the bicycle \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* is what the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ does for \_\_\_\_\_\_\_\_\_\_\_\_\_\_, like going fast or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a steep hill.
* A *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* is an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mechanical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, such as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Machines \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* is the ratio of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force.
* MA = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **÷** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are useful because you can arrange the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_* and *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_* to adjust the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the lever

*Mechanical Advantage of lever = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*\_**÷*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

* *A \_\_\_\_\_\_\_\_\_\_\_\_\_\_* is a simple machine that allows you to \_\_\_\_\_\_\_\_\_\_\_\_\_ a heavy object with \_\_\_\_\_\_\_\_\_\_\_\_\_\_ force than you would need to lift it \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ up.

The mechanical advantage of ramp = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **÷**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Practice**

1. If the handle of a crowbar is 40 centimeters and the foot is 2 centimeters, what is its mechanical advantage?
2. A construction worker uses a board and log as a lever to lift a heavy rock. If the input arm is 3 meters long and the output arm is 0.754 meters long, what is the mechanical advantage of the lever?
3. A 500-newton cart is lifted to a height of 1 meter using a 10-meter long ramp. You can see that a worker only has to use 50 newtons of force to pull the cart.
4. A lever used to lift a heavy box has an input arm of 4 meters and an output arm of 0.8 meters. What is the MA of the lever?
5. What is the mechanical advantage of a lever that has an input arm of 3 meters and an output arm of 2m?
6. A rake is held so that its input arm is 0.4 meters and its output arm is 1.0 meter. What is the mechanical advantage of the rake?
7. A 5-meter ramp lifts objects to a height of 0.75 meters. What is the mechanical advantage of the ramp?
8. A child makes a ramp to push his toy dump truck up to his sandbox. If he uses 5 newtons of force to push the 12-newton truck up the ramp, what is the MA of the ramp?
9. A ramp with a MA of 6 is used to move a 36-newton load. What input force is need to push the load up the ramp?
10. A mover uses a ramp to pull a 1000-newton cart up to the floor of his truck (0.8 meters high). If it takes a force of 200 newtons to pull the cart, what is the length of the ramp?