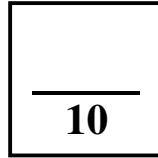
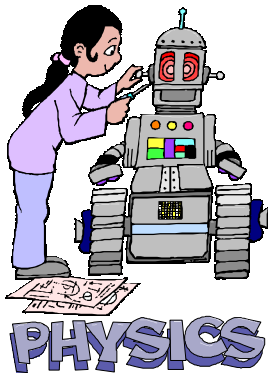


Science 9-Physics

Activity 19D—Doing Work with a Ramp



Name _____

Due Date _____

Show Me Hand In *Correct and Hand In Again By* _____

Purpose: To compare three different methods of raising an object.

Materials:

1 Cart	1 Spring scale	Meter Stick
1 Ring stand	1 Long Ramp Board	String
1 clamp	300g weights	Tape

Procedure:

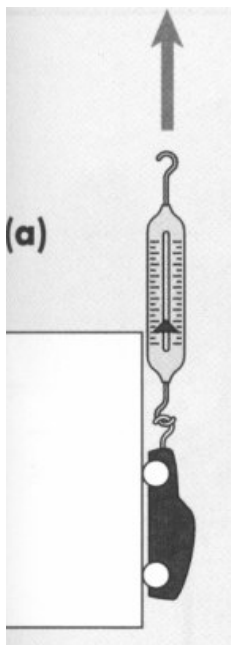
Work in pairs.

ONE REPORT IS TO BE HANDED IN PER PAIR.

- Using the spring scale, measure the mass of the cart. If your cart is less than 300 grams, add about 300 grams of weight. Secure the weights with two (2) pieces of tape.

What is the **mass** of your cart (and weights if needed) _____ g

- Check that the axles of the cart run smoothly.
- You will be pulling your cart up the ramp with the spring scale. If the spring scale is going to interfere with the smooth running of the axle on your cart, tie a piece of string through the hole in the front of the cart to create a loop to attach the spring scale. **Be sure that the string is not too long.**
- Using the meter stick, measure and make a **mark in pencil 25 cm** from the beveled end of the long ramp board. **Record this distance in the Table on page 3 where it reads “No Ramp”.**
- Set the beveled edge of the ramp board on the edge of the table so the board is straight up and down.

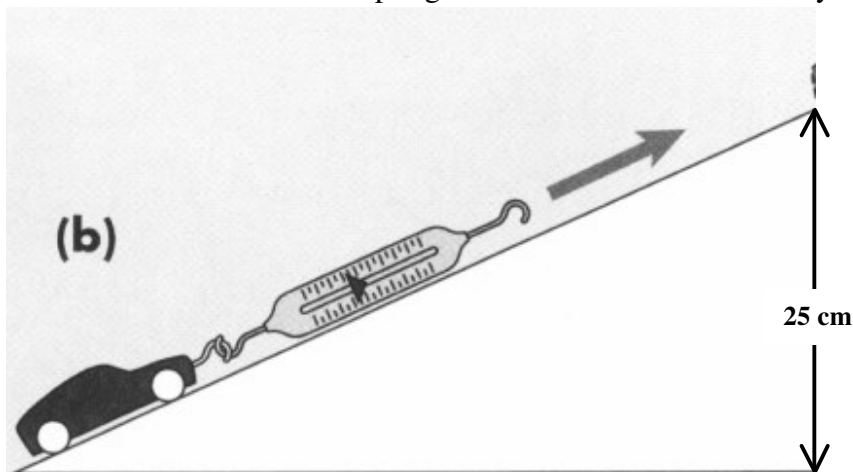


6. Attach the cart to the spring scale.
7. Hang the cart over the edge of the table with the back wheels of the cart just touching the bottom of the ramp board. Start to slowly and smoothly raise the cart until the **back wheels** pass your 25 cm mark. **Record the force required to lift the cart in the Table on page 3 where it says “No Ramp”.**

8. **Set up a SHORT RAMP.**

Place the clamp 25 cm up the ring stand. Be sure to measure from the table top.

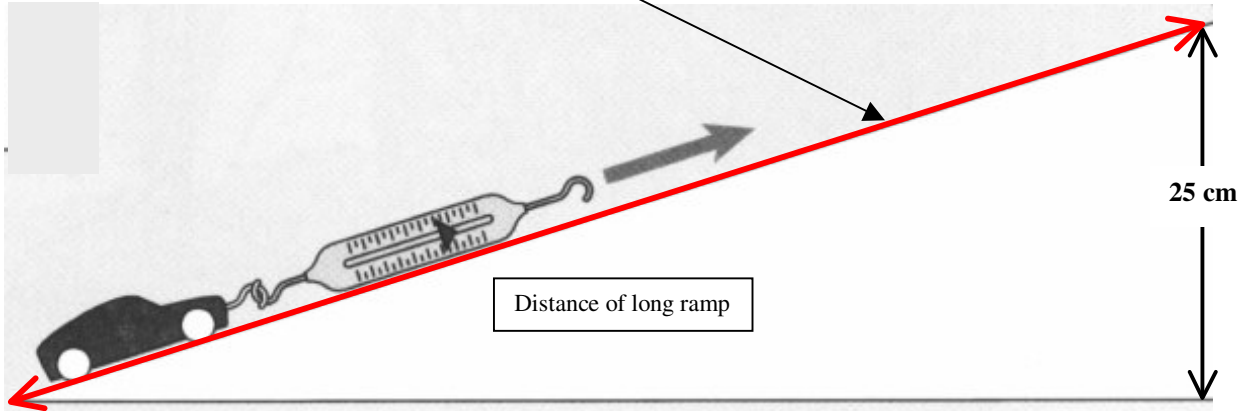
9. Measure the board and make a mark exactly half the length of the ramp. **Record this distance in the table on page 3 where it says Short Ramp.**
10. Using the clamp, clamp the ramp board to the ring stand at this half length mark. Be sure that the beveled end of the board is resting on the table. You will likely have to use the adjustments on the clamp to get the board secured at the right angle.
11. Attach the cart to the spring scale. Start with the cart fully on the ramp with the wheels just touching the table top. Slowly and steadily pull the cart up the ramp. Record in Table on page 3 the **force** needed to pull the cart up the **short** ramp **after the cart has begun to roll up the ramp.**



12. Continue up the ramp until the back wheels have passed the clamp.

13. Set up the **LONG RAMP**.

Leave the clamp at 25 cm above the table top. Clamp the non beveled end to the ring stand. Measure the distance from the table top up this long ramp to the clamp. **Record this as the distance of the Long Ramp on the Table on page 3** . (The length of the entire ramp board)



14. Attach the cart to the spring scale. Start with the cart fully on the ramp with the wheels just touching the table top. Slowly and steadily pull the cart up the ramp. Record in Table on page 3 , the **force** needed to pull the cart up the **long ramp** after the cart has begun to roll up the ramp.

15. Continue up the ramp until the back wheels have passed the clamp.

Observations

1. Mass of the cart (and weights if necessary) in kgs.: _____.
2. TABLE - Complete the table using the equation:

$$\text{Work (J)} = \text{Force (N)} \times \text{distance (m)} \quad (W = F \times d)$$

Calculate the **work** done to move the cart up the three ramps:

Ramp	Force (N)	Distance (m)	Work done on the load (J)
No Ramp			
Short Ramp			
Long Ramp			

3. Which set up required the least **force** to raise the cart? _____

4. Does it take approximately the same amount of **work** to raise the cart up the three ramps? _____
5. Why might it take **more work** to raise the cart up the longest ramp? Think of what force might be acting to oppose the motion.
6. All three set ups raised the cart up to the same height (25 cm.) If the **work** required to move the cart up to the height of the block is approximately the same, **what is the advantage** of using a ramp?
7. What is the **ability to do the same work with less force** called? _____

8. Is a ramp a **simple machine**? _____ Why?
9. Describe some uses of **ramps** in everyday life.