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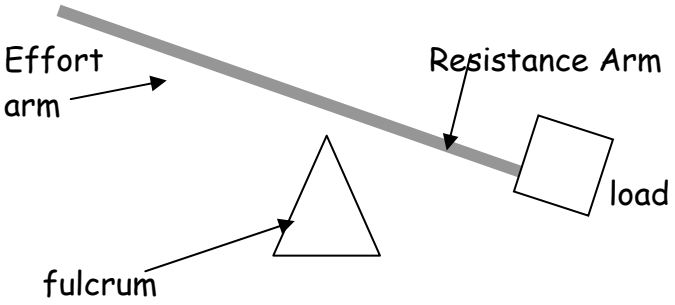
Learning About Levers

Introduction: A lever is a simple machine that makes work easier. Levers are all around us. A lever has parts that are labeled below:



In this reading you will answer the question:

What is the relationship between the length of the lever arms and the force needed to lift the load?

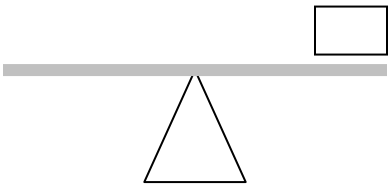
Inference Questions:
What is the relationship between the length of the lever arms and the force needed to lift the load?

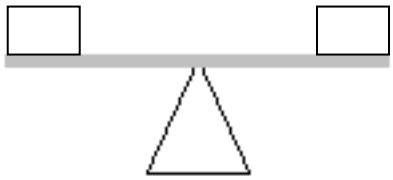
How does changing the loads position change the force.

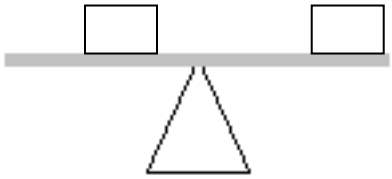
Moving the fulcrum will change the force and the loads relationship. Describe this change.

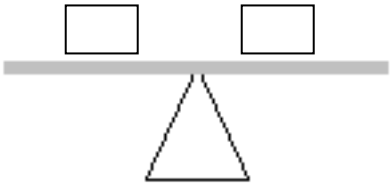
Draw an arrow to show what you believe will happen in each of the following situations:

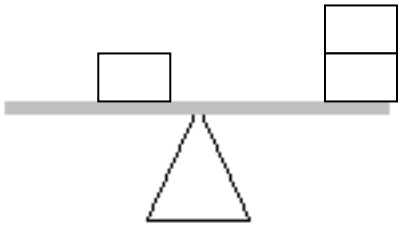
a.

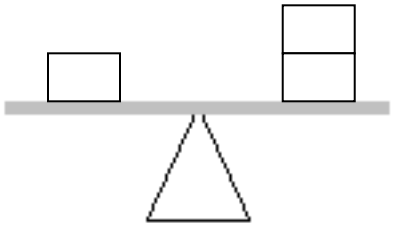




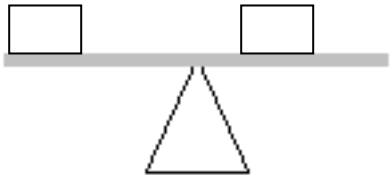






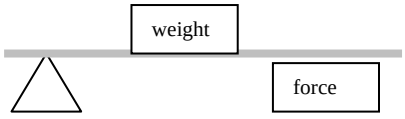


3. A 10 gram weight was added to the weight on each side of this lever. The lever was balanced before the weight was added. What will happen to the lever?

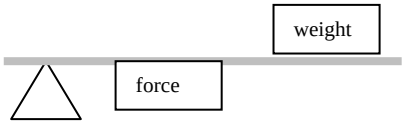


4. The fulcrum changes to a different position. Place and arrow and a short explanation of what you think will happen.

a.



b.



MECHANICAL ADVANTAGE OF LEVERS AND INCLINED PLANES

MATERIALS: meter stick, books, spring scales, weights (metal density blocks work well), three pencils taped together for a fulcrum

LEVER PROCEDURE:

I. Tape your fulcrum to the table and place 50 cm mark of the meter stick on the fulcrum. **The fulcrum will stay at 50 cm**.

II. Place the weight on the indicated places and push down on the indicated places. Everyone needs to push to feel the force needed. Measure the distance for input and output; write that in your table. Calculate the mechanical advantage for each lever and write it down in the data table.

Block used for experiment	Input placement cm (finger)	Output placement cm (weight)	Input distance (fulcrum to input)	Output distance (fulcrum to weight)	M.A. Show your work on the calculations.
	10	90			
	10	75			
	10	60			
	25	90			
	40	90			
	25	75			

Analysis:

1. What is the formula for the M.A. of a lever?

2. What is the definition of M.A.?

3. At which positions was it easiest to lift the weight? How does that compare with the M.A.?

4. At which positions was it most difficult to lift the weight? How does that compare with the M.A.?

5. What level is this at? Can you design and draw the other two levels?

INCLINED PLANE PROCEDURE:

I. Stack 3 science books on your table. Place the meter stick against the books so that 0 cm is on the table and the ramp length number is at the edge of the books. Use the spring scale to slide the weight up the ramp.

II. Record necessary findings in your table and calculate M.A.

Height of books	Ramp length (cm)	Force (N)	M.A. Show your calculations
	30		
	40		
	50		
	60		
	75		
	90		

Analysis:

6. What is the formula for the M.A. of an inclined plane?

7. At which positions was it easiest to lift the weight? How does that compare with the M.A.?

8. At which positions was it most difficult to lift the weight? How does that compare with the M.A.?

9. Describe the qualities of a "good" lever, one that would increase your force the most.

10. Describe the qualities of a "good" inclined plane, one that would increase your force the most.