NAME_____

LIFTING A LOAD

Questions: Does it always take the same amount of force to lift a load?
Where should you press to lift a load with the least amount of force?

Materials:

Lever set up
Spring scale or force sensors
Weights

Part 1

Procedure:

1. Using the lever set up; put the load 10.0 cm from the fulcrum.
2. Put the spring scale or force sensor 25.0 cm from the fulcrum on the other side.
3. Measure the effort it takes to lift the load so that the lever is balanced. Record this information in the data table.
4. Move the spring scale or force sensor to 20.0 cm from the fulcrum. Leave the load at 10.0 cm from the fulcrum. Measure and record the effort.
5. Move the spring scale or force sensor to 15.0 cm from the fulcrum. Leave the load at 10.0 cm from the fulcrum. Measure and record the effort.
6. Move the spring scale or force sensor to 10.0 cm from the fulcrum. Leave the load at 10.0 cm from the fulcrum. Measure and record the effort.
7. Move the spring scale or force sensor to 5.0 cm from the fulcrum. Leave the load at 10.0 cm from the fulcrum. Measure and record the effort.
8. Move the spring scale or force sensor to 2.5 cm from the fulcrum. Leave the load at 10.0 cm from the fulcrum. Measure and record the effort.

Data:

Position of Effort (cm from fulcrum)	Effort (Newtons)
25.0	
20.0	
15.0	
10.0	
5.0	
2.5	

Graph your information.

Use your Science Handbook as a reference if necessary

Adapted from the FOSS Levers and Pulleys kit

Data Analysis:

Describe the relationship you observe (what does position of effort have to do with the force needed to lift the load?)

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Adapted from the FOSS Levers and Pulleys kit

Part 2

Procedure:

1. Using the lever set up, put the load 25.0 cm from the fulcrum.
2. Put the spring scale or force sensor 10.0 cm from the fulcrum on the other side. Measure and record the effort.
3. Move the load to 20.0 cm from the fulcrum. Leave the spring scale or force sensor at 10.0 cm from the fulcrum. Measure and record the effort.
4. Move the load to 15.0 cm from the fulcrum. Leave the spring scale or force sensor at 10.0 cm from the fulcrum. Measure and record the effort.
5. Move the load to 10.0 cm from the fulcrum. Leave the spring scale or force sensor at 10.0 cm from the fulcrum. Measure and record the effort.
6. Move the load to 5.0 cm from the fulcrum. Leave the spring scale or force sensor at 10.0 cm from the fulcrum. Measure and record the effort.
7. Move the load to 2.5 cm from the fulcrum. Leave the spring scale or force sensor at 10.0 cm from the fulcrum. Measure and record the effort.

Data

Position of Load (cm from fulcrum)	**Effort (Newtons)**
25.0	
20.0	
15.0	
10.0	
5.0	
2.5	

Graph this data.

Data Analysis:

Describe the relationship you observe (what does position of load have to do with the force needed to lift the load?)

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Conclusions:

1. What are the four parts of a lever system?

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2. In what ways can a lever provide an advantage?

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3. What is the relationship between the load and effort that gives a lever user the *greatest advantage* – makes it easier to do work?

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4. When the load is at a constant position on the lever arm, how can you make it easier to lift the load?

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5. What is the difference between the **weight** of the load and the **amount of effort** needed to lift it?

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6. How does your graph of Part 2 compare to your graph of Part 1? How are they alike?

7. **Predict**: How much effort would it take to lift a load at 10cm if the effort were applied at 22 cm? At 13 cm? At 30cm? (*hint: use your graph from part 1*) Explain your answers.

8. **Predict**: If a 4.0 N effort were required to lift the load at 10 cm, where was the effort applied? Explain your answer.

9. How did you use the graph to make your predictions?