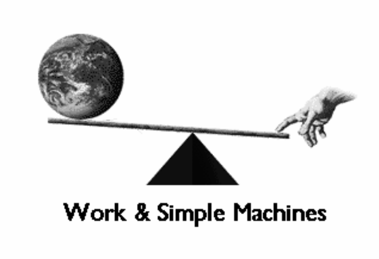

NAME_______________________________________

Learning About Levers

Questions: What is a lever?
What are the three types of levers?
How do levers work?

Background Information: A lever is a simple machine that allows us to do work with less force. It will not save you any work. As with all simple machines, the **lever trades distance for force**. It involves moving a load around a pivot called a **FULCRUM** using a force or **EFFORT**.

Draw a diagram of each type of lever.

There are three types of levers:

- ☑ 1st class levers – the fulcrum is between the effort force and the load force.
- ☑ 2nd class – levers – the load force is between the fulcrum and the effort force.
- ☑ 3rd class levers – the effort force is between the fulcrum and the load force.

The most common types of levers are 1st class and 2nd class because they give you a **MECHANICAL ADVANTAGE**. This means you can move a large load using a small effort.

The mechanical advantage (MA) of a machine is the number of times the machine multiplies the effort force we use to do a job.

The mechanical advantage of a lever tells you how much the lever is helping beyond the force it would take you to lift the load force directly.

3rd class levers are not used as often because their mechanical advantage is less than 1. This means the effort force needed to use them is greater than the load force they can move.

Vocabulary to know and use:
Effort force – often referred to as effort; the force needed to move the load

Load force – often referred to as load; the object that is being moved by the lever

Materials:

- Lever set up
- Weights
- Spring scale

Procedure:

1. Using the lever set up, put the load 10.0 cm from the fulcrum.
2. Put the spring scale 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 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 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 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 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 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 Load Force (cm from fulcrum)	Effort Force (Newtons)
25.0	
20.0	
15.0	
10.0	
5.0	
2.5	

Graph this information using a line graph:

Why is using a line graph a good way to show this data?

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To do this you must remember: the independent or goes on the X-axis, the dependent goes on the Y-axis. Number each axis in **even** intervals. Intervals are determined by looking at the smallest and largest numbers in the data table.

Label each axis with the variable (position of effort, effort) and the units used to measure the variable (cm, newtons).

Give the graph a title that describes the information in the graph.

Remember TAILS & DRY MIX

Title ______________________________________

Data Analysis:

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

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Part 2

Procedure:

1. Using the lever set up, put the load 25.0 cm from the fulcrum.
2. Put the spring scale 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 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 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 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 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 at 10.0 cm from the fulcrum. Measure and record the effort.

Data

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

Graph this data using the same guidelines you followed in the last investigation.

Title ____

Data Analysis:

Describe the relationship you observe (what does position of load force have to do with the effort 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 relationship between the load force and effort force that gives a lever user the greatest advantage (makes it easiest to move a load)?

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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 or move the load?

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

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6. How do your two graphs compare?

9. 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? Explain your answers.

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