Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Comparing Levers**

In this lab, you should test models of one natural lever and one man-made lever.

Lever 1:

Sketch a picture of each lever. Label the **Fulcrum**, **Input Force** (spring scale), and **Output Force** (weights)

|  |  |
| --- | --- |
| Lever 1:  | Lever 2: |

Measure and record:

Lever 1: Lever 2:

|  |  |
| --- | --- |
| Distance from input force to fulcrum | Distance from input force to fulcrum |
|  |  |
| Distance from output force to fulcrum | Distance from output force to fulcrum |
|  |  |

Slowly add 3-4 weights to your lever model. After adding each weight, record the distances traveled by the input and output, in the data table on the next page. Then, calculate the ratio of output distance to input distance and input force to output force (weight)

Lever 1: Name of lever:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Circle One: Natural / Manmade

Distances:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Weight Added or **Output Force** (N) | Starting Output Position (mm) | New Output Position (mm) | **Change in Output Position** (mm) |  | Starting Input Position (mm) | New InputPosition (mm) | **Change in Input****Position** (mm) |  | **Change in** **Output Position** *divided by* **Change in Input Position** |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | ⇑ all same |  |  |  | ⇑ all same |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Weight Added or **Output Force** (N) | Starting Input Force (mm) | New Input Force (mm) | **Change in Input Force** (mm) |  | **Change in Input Force** *divided by* **Output Force** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  | ⇑ all same |  |  |  |  |

Lever 2: Name of lever:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Circle One: Natural / Manmade

Distances:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Weight Added or **Output Force** (N) | Starting Output Position (mm) | New Output Position (mm) | **Change in Output Position** (mm) |  | Starting Input Position (mm) | New InputPosition (mm) | **Change in Input****Position** (mm) |  | **Change in** **Output Position** *divided by* **Change in Input Position** |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | ⇑ all same |  |  |  | ⇑ all same |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Weight Added or **Output Force** (N) | Starting Input Force (mm) | New Input Force (mm) | **Change in Input Force** (mm) |  | **Change in Input Force** *divided by* **Output Force** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  | ⇑ all same |  |  |  |  |

Graphs:

Plot two line graphs on each graph below. For graph one, plot output force (y-axis) vs. input force (x-axis) for your natural and man-made lever examples:



For graph 2, plot output distance (y-axis) vs. input distance (x-axis) for your natural and man-made lever examples:

Comparisons:

Which of the two levers that you studied requires a smaller amount of input force for the same amount of output force? How do you know?

Which of the two levers that you studied can produce the greatest change in output distance for the same amount of input distance? How do you know?

What might an engineer trying to make the man-made lever better learn from the natural lever?