**Carting Around**

**Purpose:** To determine the relationship between Force, Mass and Acceleration

**Materials:** cart, force meter, scale, tape measure

**Prediction:**

**Procedure:**

1. Gather the materials
2. Weigh the mass of your cart and rider.
3. Using masking tape, mark a finish line and a starting line for you cart, at least 10m long.
4. Using 20N of **consistent** force, measure the time it takes the cart to move between the starting line and the finishing line.

\*It is important that the rider is being pulled with a horizontal force and not on an angle.

1. Repeat the experiment using 30N of force and then 40N of force.
2. Change the mass of the rider by adding masses or changing riders.
3. Repeat the experiment with the 4 different amounts of force.
4. Complete the Analysis, Discussion Questions and Conclusion. You will have to attach these on an additional piece of paper.

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| --- | --- | --- |
| Force (N) | Time (s) | Acceleration (m/s2) |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Data:**

Mass:\_\_\_\_\_\_\_\_\_\_\_(cart + rider) Mass:\_\_\_\_\_\_\_\_\_\_\_(cart + rider)

Distance:\_\_\_\_\_\_\_\_\_ Distance:\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Force (N) | Time (s) | Acceleration (m/s2) |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
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**Analysis:**

1. Draw a Free Bodied Diagram for each rider.
2. Plot a graph of Force vs. Acceleration for Rider 1. Force is on the Y axis and Acceleration is on the X axis.
3. Draw a line of best fit and determine the slope and y‐intercept (include units). Do all your work on the graph paper.
4. On the same axis plot a graph of F vs. A for Rider 2. Draw a line of bet fit and determine the slope and y‐intercept (include units).
5. Analyze your results and determine the relationship between force and acceleration.
6. Analyze your results and determine the relationship between acceleration and mass.

**Discussion:**

1. Should the lines you plotted go through (0,0)? Explain.
2. The relationship between force and acceleration is given by Newton’s 2nd Law **Fnet = ma.**

In this case this becomes:   **Fapp – Ff = ma.**

a. Rearrange this formula to fit the equation of a straight line:   y = mx + b

b. What does the y‐intercept represent?

c. What does the slope represent?

**Conclusion:**

\*See rubric for criteria on what to include