Newton’s 2nd Law Lab

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

**Purpose:**

1. Determine the relationship between the amount of mass an object has and how much Fweight will accelerate it.

2. Calculate the acceleration from Weight for different masses.

3. Practice several quantitative problems to see how much an object will accelerate.

4. Determine whether “the wall” is real in weight-lifting, or does acceleration have a regular relationship to increases in force?

**Pre-lab question:**

1. Create a force diagram at right for an object hanging

motionless from a stretched spring.

2. Pretend that the spring on the object created a force of 50 N.

What would the weight of the object be? Describe how you know.

3. Use the following equation, a=F/m. How much would an object with a mass of 10 kg accelerate with a force of 60 N applied to it? Show your work.

**Materials Needed:**

Hanging Masses set Spring Scales of various colors Calculator

**Procedures**

1. Calibrate all of your spring scales by holding them upright and tightening or loosening the screw until the plunger is level with 0 N.

2. Choose one mass that is smaller and hang from a spring scale that is appropriate in strength. Remember the Goldilocks rule: Not too strong, not too weak, just right.

3. Record the mass and force used by the mass to make it move at a constant velocity of 0 m/s (also 0 acceleration).

4. Repeat this procedure with at least 9 other masses (you may combine masses).

5. With the masses and their corresponding forces, calculate how much the force of Weight is accelerating the object (a= F/m).

6. Graph the Force and mass of a line graph to see the relationship between them is.

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| Mass of Object (grams) | Force applied (N) | Acceleration created (a=F/m) |
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Newton’s Second Law Lab (Spring Scale Lab)

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

Force vs. Mass For a hanging object

F

O

R

C

E

(N)

MASS (g)

Analysis:

1. How much would the Weight force accelerate any object if the Tension from the springs were not present? (HINT: What did you calculate in the data table?).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m/s2

\*\*\* Weight is a “funny” force, because it accelerates all objects at the same rate, no matter their mass. However, all other forces will accelerate objects at different rates according to the mass of the object and the force applied.

1. Which of the following would cause a bigger acceleration for an object?(circle one from each pair).

a) Large Force Small force

b) Large Mass Small Mass

3. Pretend you are a sumo wrestler, wanting to beat your opponent. Which of the following would you want to create a bigger force? (circle one from each pair).

a) Fast Acceleration Slow acceleration

b) Large Mass Small Mass

4. Create a force diagram for a school bus that has an applied force of 2000 N right, friction of 1500 N, and a Weight of 10,000 N. (\*HINT\*Don’t forget that the bus is not falling through the ground).

5. If the bus had a mass of 1000 kg, what would the acceleration be? (a=F/m)