Names:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Class: \_\_\_\_\_\_\_\_\_\_\_\_

**Newton’s Laws: Force, Acceleration, and Mass**

**Making a Model: Parachutes**

**Newton’s 1st Law:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Newton’s 2nd Law:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Newton’s 3rd Law:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Objective:** Investigate Newton’s 3 laws by constructing a parachute that will minimize the force at which a skydiving egg hits the ground and slows the acceleration of gravity.

**Materials Needed:**

 Parachute Materials: string, plastic, straws, tape, construction paper, fake egg

 Stopwatch

**Other Vocabulary:**

 **Acceleration of Gravity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Speed:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Terminal Velocity:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Balanced Forces**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **Unbalanced Forces:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Procedures:**

You will need to brainstorm and come up with a way you can make your parachutes and be able to test them in a timely manner.

1. Decide on the dimensions of your parachute. Using a square or a circle, you will need to calculate the surface area. (square = length x width, $circle=πr^{2}$)
2. Record your surface area.
3. Obtain a fake egg and the stuffing needed for the correct mass (you want it as close to the mass of a real egg as possible, 1 medium chicken egg = 50 grams)
4. Record your skydiver mass.
5. Construct your parachute and your basket.
6. Drop your parachute from the ceiling (must be from the same height every time) for at least 3 timed trials.
7. Record your time and then calculate your average time.
8. Next calculate your speed. Speed = Distance/Time. Use your average time and the distance is the height of the ceiling in meters.
9. Calculate the force the “egg” hits the ground by taking mass x acceleration (which is your speed for this experiment).
10. Modify your parachute to make it better or make a new one. Redo steps 1-9
11. **Do 3 trials with each parachute and a free fall. Record the data in your table.**

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***Data Tables**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Mass of Egg:\_\_\_\_\_\_\_ (grams) /1000 kg = \_\_\_\_\_\_\_\_\_ kg

Surface Area of parachute: \_\_\_\_\_\_\_\_$cm^{3}$

Height of Ceiling: \_\_\_\_\_\_\_\_\_ m

 **Free Fall**

|  |  |
| --- | --- |
|  | Time |
| Trial 1 |  |
| Trial 2 |  |
| Trial 3 |  |
| Average Time |  |

**Speed=**

**(acceleration**)

**Force=**

 **With**

 **Parachute**

|  |  |
| --- | --- |
|  | Time |
| Trial 1 |  |
| Trial 2 |  |
| Trial 3 |  |
| Average Time |  |

**Speed=**

**(acceleration**)

**Force=**