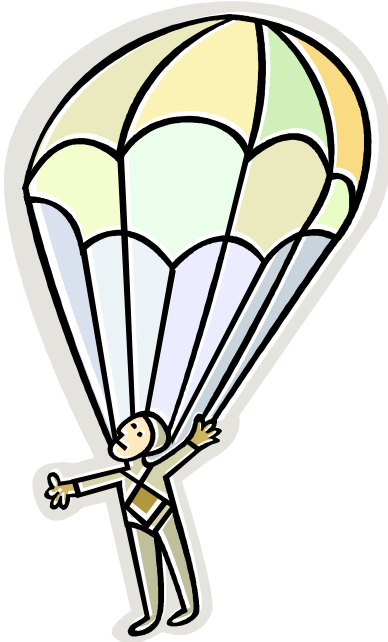


Name _____ Date _____ Block _____

Free Falling**Problem:** Does the size of the parachute affect how slow it falls?

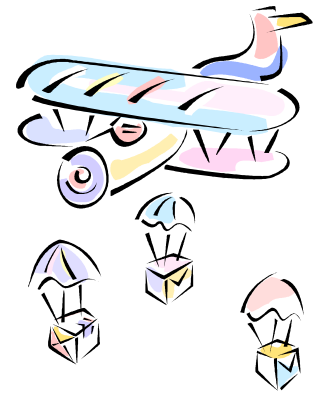
Background: In the sport of skydiving, a person jumps out of an airplane from a very high altitude, flies through the air, and releases a parachute to help them fall safely to the ground. The parachute slows down the skydiver's fall so that they can land on the ground at a safe speed. How does the parachute do this?

As the skydiver is falling, the force of gravity is pulling them towards the earth. The force of gravity can make an object fall very fast! The parachute slows the skydiver down because it causes air resistance, or drag. The air pushes the parachute back up, and creates a force opposite to the force of gravity, slowing the skydiver down. As the skydiver falls slowly to the earth, these "push and pull" forces are nearly in balance. The drag force from the parachute is slightly less than the force of gravity, so the skydiver floats slowly to the ground. (From sciencebuddies.org)

Hypothesis:

If

then _____

Materials:

3 Garbage bags

Metric ruler

Scissors

Washers

String

Timer

Adapted by G. Baker www.thesciencequeen.netOriginal lesson at http://www.sciencebuddies.org/science-fair-projects/project_ideas/Aero_p017.shtml

Procedure:

1. Each parachute will be made out of the garbage bag material, so first cut open the garbage bags to make a flat sheet of plastic.
2. You will make a series of parachutes of different sizes, from small to large. Each parachute will be square in shape, so the four sides will each be of the same length. A list of sizes to use are shown in the data table below:

Parachute	Length of Each Side (cm)	Surface Area (cm ²)
1	20	400
2	30	900
3	40	1600
4	50	2500

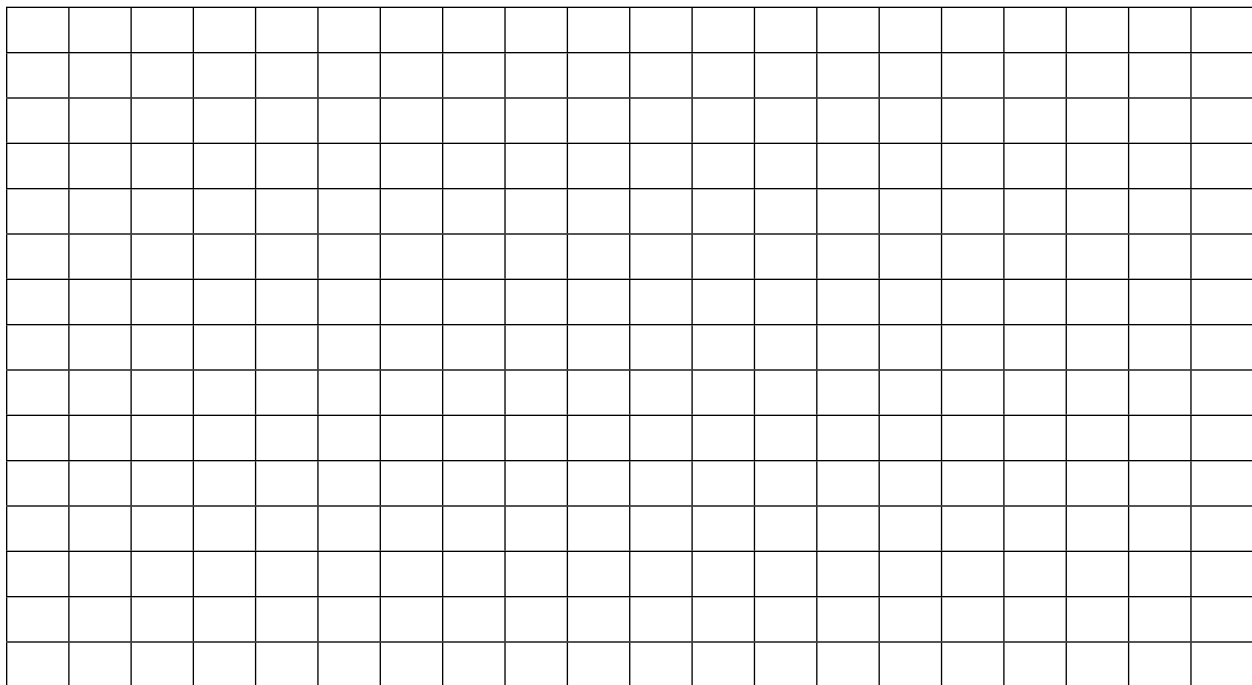
3. Cut out each of the four differently sized parachutes from the garbage bag material.
4. Tie a knot in each of the four corners of your square. The knots will be used to anchor your string.
5. Cut out four pieces of string for each parachute. Each piece of string should be 30 cm long.
6. Tie one end of each piece of string around one of the four knots, positioning the string right above the knot.
7. Hold the center of the plastic sheet in one hand and pull all strings with the other to collect them. Tie the free end of the strings together with an overhand knot:
8. Attach 4 washers to the bundle of strings. Be sure that each parachute has the same number of washers attached, or this will alter your results!
9. Drop the parachute from the ladder. The top of the ladder is where you should release the parachute from.
10. Using your timer, time how long it takes in seconds for each parachute to fall to the ground. If the parachute does not open during a trial, just do that trial over so that when you are finished you have five trials which all worked. Test each parachute five times, and make an average of your data. Calculate the average by adding together your five data points, and then dividing your answer by five.

Data:

Parachute Size	20 cm sides	30 cm sides	40 cm sides	50 cm sides
Trial 1				
Trial 2				

Trial 3				
Trial 4				
Trial 5				
Average (total of all trials/5)				

Graph your averaged (reduced data).



ANALYZE your data: What story does the graph tell? What do you know about the effect of the independent variable on the dependent variable? Do you see a relationship?

