Name:_____ Period:_____Date:_____

Parachute Lab

Problem: SpaceX (an aerospace engineering company) is having trouble with their rockets. After successful launches, their rockets descend back to the surface too quickly and break apart upon landing. They need your help designing a parachute that will help the rockets fall more slowly, and insulation on the rocket to help protect the rocket when it hits the ground.

1. **Question:** Which type of parachute will fall the slowest, i.e. take the longest time to fall? Think about the shape of the parachute, size of the parachute, and amount of parachutes attached to each other.

2. **Prediction:** I predict the parachute that will fall the slowest is the one that is _____ (*triangular/ circular/ square*), is _____ (*smaller/bigger*), and has _____ (*1/ 2/ 3*) parachutes attached together.

3. **Materials:**
   - Plastic grocery bag
   - String
   - Scissors
   - Ruler
   - Washers
   - Tape
   - Markers
   - Timer

4. **My Group is in charge of**

   _____

5. **Procedure:**

   Step 1. Sketch how your parachute will look like below. Remember to draw it flat and put a dot where you will tie the string to the parachute.

   Step 2. Cut one side away from the grocery bag so that you have a flat piece.
   Step 3. Use a marker to draw the parachute you were assigned.
   Step 4. Use scissors to cut out the parachute.
   Step 5. Use the scissors to make a hole at each corner of the parachute. (Use 4 evenly spaced holes if you are making the circular parachute).
   Step 6. Cut as many pieces of string as you need for each hole made in Step 5. Make sure the pieces are the same length.
   Step 7. Thread one end of each string through each hole of your parachute and tie securely. You may want to place a small piece of tape over the hole for reinforcement.
   Step 8. Tie the other end of each string to the washers.
   Step 9. Assign the roles for the testing:

Dropper: _____

Recorder:_____

Timer #1: _____ Timer #2:

_____

6. **Data Collection:**

My Group is in charge of _____ (*shape/size/amount*)

Your Parachute Shape/Size/Amount:_____

	TIMER #1	**TIMER #2**
	Time to Fall (Seconds)	Time to Fall (seconds)
Trial 1 (First Drop)		
Trial 2 (Second Drop)		
Trial3 (Third Drop)		
Average (add all times and divide by 6)		

Class Data

Parachute Shape	Average Time to Fall (seconds)
Triangle (Length = 30cm)	
Circle (Diameter = 30cm)	
Square (Length = 30cm)	

Parachute Size	Average Time to Fall (seconds)
Small Square (Length = 15cm)	
Big Square (Length = 30cm)	

Parachute Amount	Average Time to Fall (seconds)
1 Small Square (Length = 15cm)	
2 Small Squares (Length = 15cm)	
3 Small Squares (Length = 15cm)	

6. **Analysis:** Compare your Class Data and answer the following questions:
   a. Which parachute had the longest average fall time?_____What does this tell you about the parachute? _____
   b. Which parachute had the shortest average fall time?_____What does this tell you about the parachute? _____

c. Explain the characteristics of the best parachute. Make sure to use your data to back up your answer!

PART TWO:

Now use the best parachute from Part One to figure out the next question!

1. **Question:** How does the speed of the parachute change when the mass increases?

2. **Prediction:** I predict the speed of the parachute will _____ (*stay the same/increase/decrease*) when the mass increases.

3. **Materials:**
   - Plastic grocery bag
   - String
   - Scissors
   - Ruler
   - Washers
   - Tape
   - Markers

4. **Roles:**
   Dropper _____

   Recorder_____

   Timer #1 _____ Timer #2 _____

5. **Procedure:**
   Step 1. Cut one side away from the grocery bag so that you have a flat piece.
   Step 2. Use a marker to draw the parachute.
   Step 3. Use scissors to cut out the parachute.
   Step 4. Use the scissors to make a hole at each corner of the parachute. (Use 4 evenly spaced holes if you are making the circular parachute).
   Step 5. Cut as many pieces of string as you need for each hole made in step 4. Make sure the pieces are the same length.
   Step 6. Thread one end of each string through each hole of your parachute and tie securely. You may want to place a small piece of tape over the hole for reinforcement.
   Step 7. Tie the other end of each string to the 200g mass.
   Step 8. Drop and record the data three times.
   Step 9. Repeat Steps 7-8 for the 500g and 1000g masses.

6. **Data Collection:**

200g Mass	**TIMER #1**		**TIMER #2**	
	Height (meters)	Time to Fall (seconds)	Height (meters)	Time to Fall (seconds)
Trial 1 (First Drop)				
Trial 2				

(Second Drop)				
Trial3 (Third Drop)				
Average (add all times and divide by 3)				
Speed (distance/time)				

500g Mass	**TIMER #1**		**TIMER #2**	
	Height (meters)	Time to Fall (seconds)	Height (meters)	Time to Fall (seconds)
Trial 1 (First Drop)				
Trial 2 (Second Drop)				
Trial3 (Third Drop)				
Average (add all times and divide by 3)				
Speed (distance/time)				

1000g Mass	**TIMER #1**		**TIMER #2**	
	Height (meters)	Time to Fall (seconds)	Height (meters)	Time to Fall (seconds)
Trial 1 (First Drop)				
Trial 2 (Second Drop)				
Trial3 (Third Drop)				
Average (add all times and divide by 3)				
Speed (distance/time)				

7. **<u>Analysis:</u>** Compare your group data and answer the following questions:
   a. Which mass had the slowest average fall time?_____
   b. Which mass had the fastest average fall time?_____
   c. What happens to the speed of the parachute change when the mass increases? _____

   _____

   _____

d. How does this lab help us when we begin building our vehicle?_____

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