iFLY Post Field Trip Activities
(Grades 2-5)

Quick Concept Review (5 minutes)

Hold up two sheets of notebook paper. Crumple one sheet into a wad.

- What do you observe about these two pieces of paper? What is the same? (mass, weight) What is different? (size, shape, surface area)
- What do you predict will happen if I drop them from the same height at the same time?

Drop the wad and the flat sheet of paper.

- What did you notice? (the wadded paper fell faster than the flat sheet)
- Why do you think this happened? (the flat sheet has a larger *frontal area* than the wad, which made it fall slower than the wad.
- What forces are at work on the falling pieces of paper? (the force of *gravity* and the force of *drag* due to the air pushing up on the paper)

Investigation Extension (30 min-1 hour)

During the field trip to iFLY, students investigated how different variables affect a parachute's drop time. In this extension, they will take more measurements and construct graphs of the data.

Learning Objectives:

- Plan an investigation by choosing one variable to vary while holding other variables constant
- Construct a chart of collected data
- Graph data (in small groups or as a class) using x-y coordinates
- Use graph to describe relationship between data

At iFLY, the students worked in small groups to investigate just one parachute variable. Depending on the time you have for this activity, you can keep them in the same groups, or have them form new groups and investigate different aspects of parachutes.

If you will be creating one graph as a class, you should have all groups focus on the same variable. Every group will contribute data to the class graph.

Materials Needed:

- Scissors
- Tape
- Rulers/Yardsticks
- Pencils

- Investigation Worksheets
- Stopwatches
- Paper dinner napkins, trash bags, sheets of paper, thick plastic, scraps of fabric, and other materials to make parachutes
- Lightweight string or yarn
- Paperclips

Planning and carrying out investigations

As students begin to plan their investigations, circulate and ask to hear their plans. If groups are stuck or unsure what to investigate, point out the list of variables on their Investigation Worksheet. Which variable seems the most interesting to them? What are they curious about? If they are still stuck, suggest that they test out a variable the other groups haven't chosen.

As you check in with each group, ask to see their Investigation Worksheets. It is important that children record their process so they can discuss and reflect after the investigation.

Note: When children are planning their investigations, they often choose to change their variables by such a small amount, that it makes it difficult to see any difference in the results. For example, changing the string length from 12" to 11" will probably not make a noticeable difference in the parachute's descent. Instead, encourage children to go with a larger change, such as 8".

Collecting Data

Students can use the pre-made chart on their worksheet to collect their data. Collecting at least 4 data points will make it easier to view relationships once the data is graphed.

Note: Investigations often lead to more questions. For example, students investigating the effect of size on drop time may notice that a very big parachute folds over on itself. They may wonder, "What can we do to stop a big parachute from crumpling?" While these types of questions may deviate from the worksheet, they can also lead to rich investigations!

Graphing Data

Students can use the graph on their worksheet to plot their own data. Or you can graph the data as a class.

Using Data to Draw Conclusions

Ask students to look at their graphs or charts. What relationships do they see? *Example:* "*If the parachute is bigger, it falls more slowly."* Does any of the data not fit with the rest? Is anything surprising? *Example: "But a really big parachute fell fast. It was so big that it didn't open and crumpled to the ground."*

Examining the data may lead to interesting discussions. As you discuss the reasons for their results, you might refer to the following science concepts:

- In general, a parachute with a larger frontal area will "catch" more air and fall more slowly.
- In general, a heavier parachute will fall faster. (More mass increases the gravitational force)
- A parachute's size and shape will affect its frontal area.
- Making a parachute too big can actually make it fall faster because it will crumple over on itself before it has time to open, and won't be able to catch air. Increasing the weight of the load (paperclips) can help to make a large parachute open sooner.
- Longer strings pull the parachute tighter, and decrease the frontal area. This makes it fall faster.
- Materials that are porous allow air to escape from the parachute. This decreases the drag force and makes the parachute fall faster.
- If a parachute "rocks" back and forth, air will spill out and it will fall faster. A hole in the center of the parachute can help stabilize the parachute so it doesn't rock. This will actually make the parachute fall more slowly.

Name:_____

Post-Field Trip
Parachute Investigation Worksheet

The **variables** of a basic parachute:

SHAPE:	square
SIZE:	12”x12”
STRING LENGTH:	12”
WEIGHT:	one paperclip
MATERIAL:	thin plastic

PLANNING THE INVESTIGATION

The **one variable** my group will change is:

This is how I will change it:

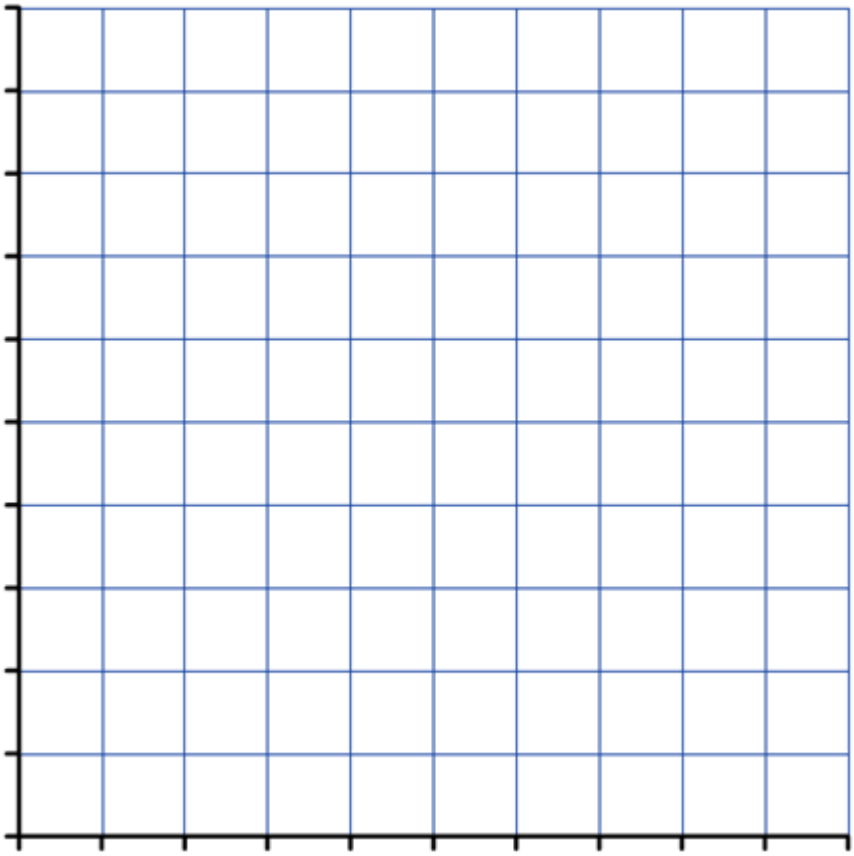
This is what I think will happen:

COLLECTING DATA:
Use the chart below to collect your data.

Variable Value (x)	Drop Time (y)

GRAPHING DATA:

Use this space to graph your data.



DRAWING CONCLUSIONS:

Take a look at your graph. What do you notice? How did changing your variable change your parachute's drop time?

Was this what you expected?

Why do you think you got these results?

Name:__Joanna Smith_____

Post-Field Trip
Parachute Investigation Worksheet

The **variables** of a basic parachute:

SHAPE:	square
SIZE:	12”x12”
STRING LENGTH:	12”
WEIGHT:	one paperclip
MATERIAL:	thin plastic

PLANNING THE INVESTIGATION

The **one variable** my group will change is:

size

This is how I will change it:

We are going to make one very small parachute, one really big one, and the rest will be different by 4 inches on each side.

This is what I think will happen:

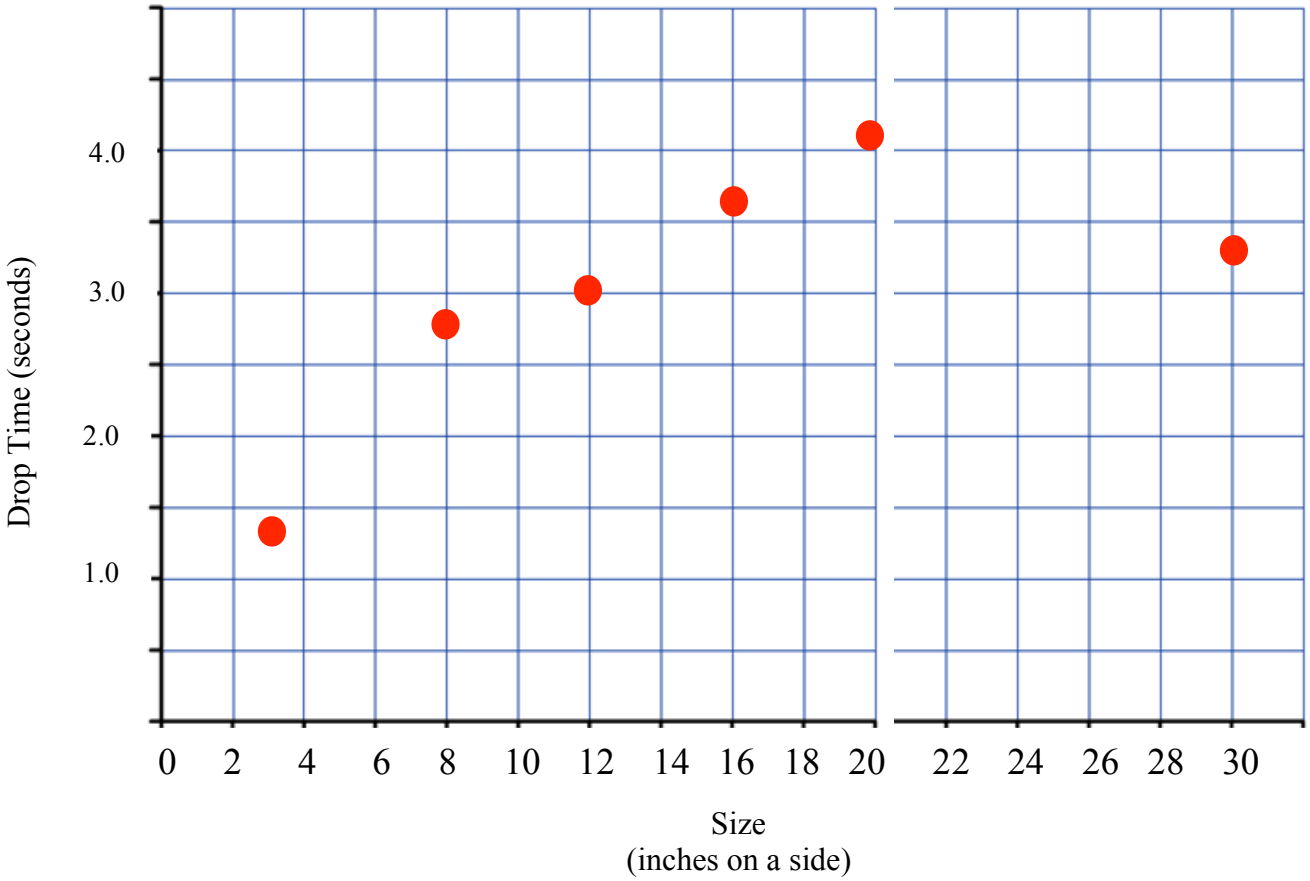
The bigger parachutes will float down slower than the small ones.

COLLECTING DATA:
Use the chart below to collect your data.

Variable Value (x)	Drop Time (y)
3” x 3”	1.3 seconds
8” x 8”	2.7 seconds
12” x 12”	3 seconds
16” x 16”	3.6 seconds
20” x 20”	4.1 seconds
30” x 30”	3.3 seconds

GRAPHING DATA:

Use this space to graph your data.



DRAWING CONCLUSIONS:

Take a look at your graph. What do you notice? How did changing your variable change your parachute's drop time?

Bigger parachutes fell slower than small ones. But the biggest parachute didn't work very well. It fell fast.

Was this what you expected?

Most of the results turned out how we predicted. But we didn't think the big parachute would fall so fast.

Why do you think you got these results?

We think the bigger parachutes can catch more air because they have a bigger frontal area. But the biggest parachute was so big that it folded up on itself and didn't open at all.