

Title: Flying Data**Link to Outcomes:**

- **Problem Solving** Students will use problem-solving approaches to investigate data collection and the organization of this data.
- **Statistics** Students will demonstrate their ability to collect, organize, and display data and will interpret information obtained from displays. They will write reports based on statistical information.
- **Measurement** Students will demonstrate and apply concepts of measurement using nonstandard and standard units and metric and customary units. They will estimate and verify measurements. They will apply measurement to interdisciplinary and real-world problem-solving situations.
- **Probability** Students will demonstrate the basic concepts of probability such as predicting and finding probabilities.
- **Communication** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

Brief Overview:

This activity allows students, working in pairs, to conduct investigation through scientific method and data analysis. Students will perform a variety of tasks to collect and analyze data. They will construct a bar graph, develop a stem and leaf plot, and use a Venn diagram. As a conclusion, students will demonstrate their knowledge by expressing their findings in written form.

Grade/Level:

Grades 3 - 5

Duration/Length:

The activity should take 3 days. The activities may be adjusted to take 2 or 4 days depending on the ability level of the group and classroom time.

Prerequisite Knowledge:

- Students should have a working knowledge of scientific method.
- Students should be able to construct a bar graph.
- Students should be able to use a Venn diagram.

Objectives:

- Make predictions.
- Collect and interpret data.
- Estimate measurement to the nearest centimeter.
- Compute the median of data set.
- Construct and interpret a stem and leaf plot.
- Communicate data analysis through written response.

Materials/Resources/Printed Materials:

- One thousand centimeter tape or meter sticks
- Paper
- Airplane construction directions (Student Resource #1)
- Collection chart (Student Resource #2) (1 for each two students)
- Graph paper (Student Resource #3)
- Venn diagram (Student Resource #4)
- Exploring Data., James M. Landwehr and Ann E. Watkins, Dale Seymour Publication, Palo Alto, California; 1996.
- Stem and leaf plot (Teacher Resource #1)

Development/Procedures:

Day 1 Students will construct a paper airplane and make a prediction concerning the distance of their flights.

- Review with students the process of scientific method.
- Explain to students the procedures for collecting and organizing data.

Communicate to the students that they will be constructing and flying a paper airplane down a centimeter runway for five trials. They will record the measured flight distances on a student record sheet and compute the median distance of the five flights. (Have centimeter runway available for students to observe during this explanation.)

- Make a prediction about how far your airplane will fly and record your prediction on student record sheet.
- Construct paper airplane using provided directions (Student Resource #1).

Day 2 Students will conduct their test flights and collect, display, and analyze data.

- Review criteria for constructing a bar graph.
- Students will fly their airplanes for five trials and record their centimeter distances (Student Resource #2).

- Students will construct bar graphs displaying the results of their five flights on Student Resource #3.
- Students will compute the median distance of their five trials and record on student record sheet (Student Resource #2).

Day 3 Students will make a classroom stem and leaf plot, recording median distances of flight trials and indicating right or left handed flights. They will analyze data and give a written response (Example in Teacher Resource #1).

- Students will predict whether the right or left-handed throws produced the farthest flights.
- Create classroom stem and leaf plot, recording median distances as well as left or right-handedness. (Call students up in the order of their medians, recording the distances on the right side of the stem and an R or L for handedness on the left side of the stem.)
- Analyze and discuss any correlation between distance and right or left handedness.
- Rotate stem and leaf plot 90° to the left, and promote classroom discussion concerning the resemblance to their bar graph.
- Divide into cooperative groups of four, and make a comparison of the similarities and differences between the students' bar graphs and the classroom stem and leaf plot using a Venn diagram (Student Resource #4).
- Construct a large classroom Venn Diagram using group responses about similarities and differences.
- Write a paragraph stating three pieces of information from the classroom's stem and leaf plot. Also include a sentence explaining how the class results compare to your flight prediction.

Evaluation:

Students can be evaluated based on the following criteria:

- Group participation and performance. Check daily for individual participation, accountability in assigned roles, and on-task behaviors.
- Accurate completion of Flying Data Student Record Sheet.
- Accurate completion of individual flight bar graphs.
- Writing activity. Check for adherence to MSPAP standards which includes FATP. Also check for the proper use of data analysis language and the inclusion of specific items stated in the writing prompt.

Extension/Follow Up:

These activities could be extended by using a different paper airplane pattern or by constructing from a different type of paper. A manipulated variable can be added *i.e.*, weight to the airplane, different location for activity, introduction of wind, or student performance of activity with least dominate hand.

Students may construct independently a stem and leaf plot from a given or collected set of data. Also, double stem and leaf plots may be used to compare two different data sets *i.e.*, dates of pennies and nickels.

Ask the students to read accounts of the early attempts of flight and compare the early aircraft with those in use today.

Students may go on a field trip to the Goddard Space Flight Center.

Students may design their own airplanes and then conduct these activities.

Use line plot to show mean of flight. Upper level students will find mean, mode, and range.

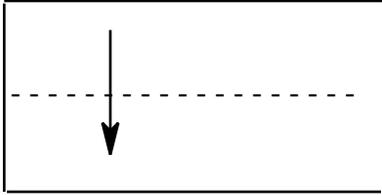
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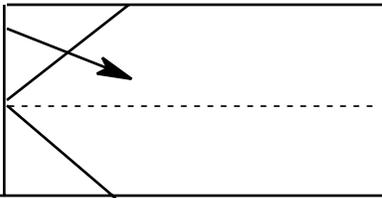
CONSTRUCTING THE PAPER AIRPLANE



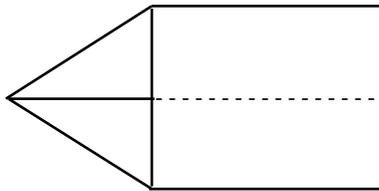
STEP 1



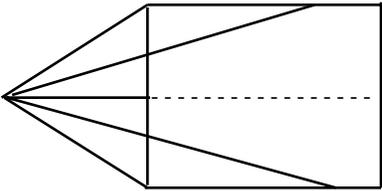
STEP 2



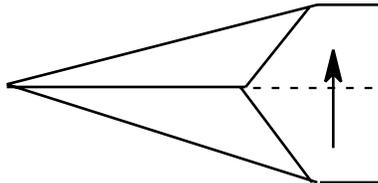
STEP 3



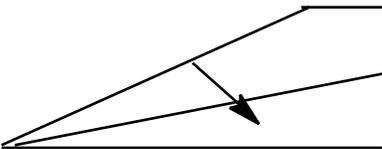
STEP 4



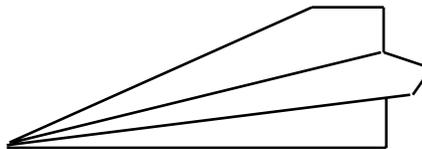
STEP 5



STEP 6



STEP 7



STEP 8

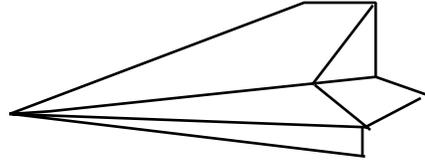
NAME _____

DATE _____

**Flying Data
Student Record Sheet**

EXPERIMENTATION

FLY!!!!

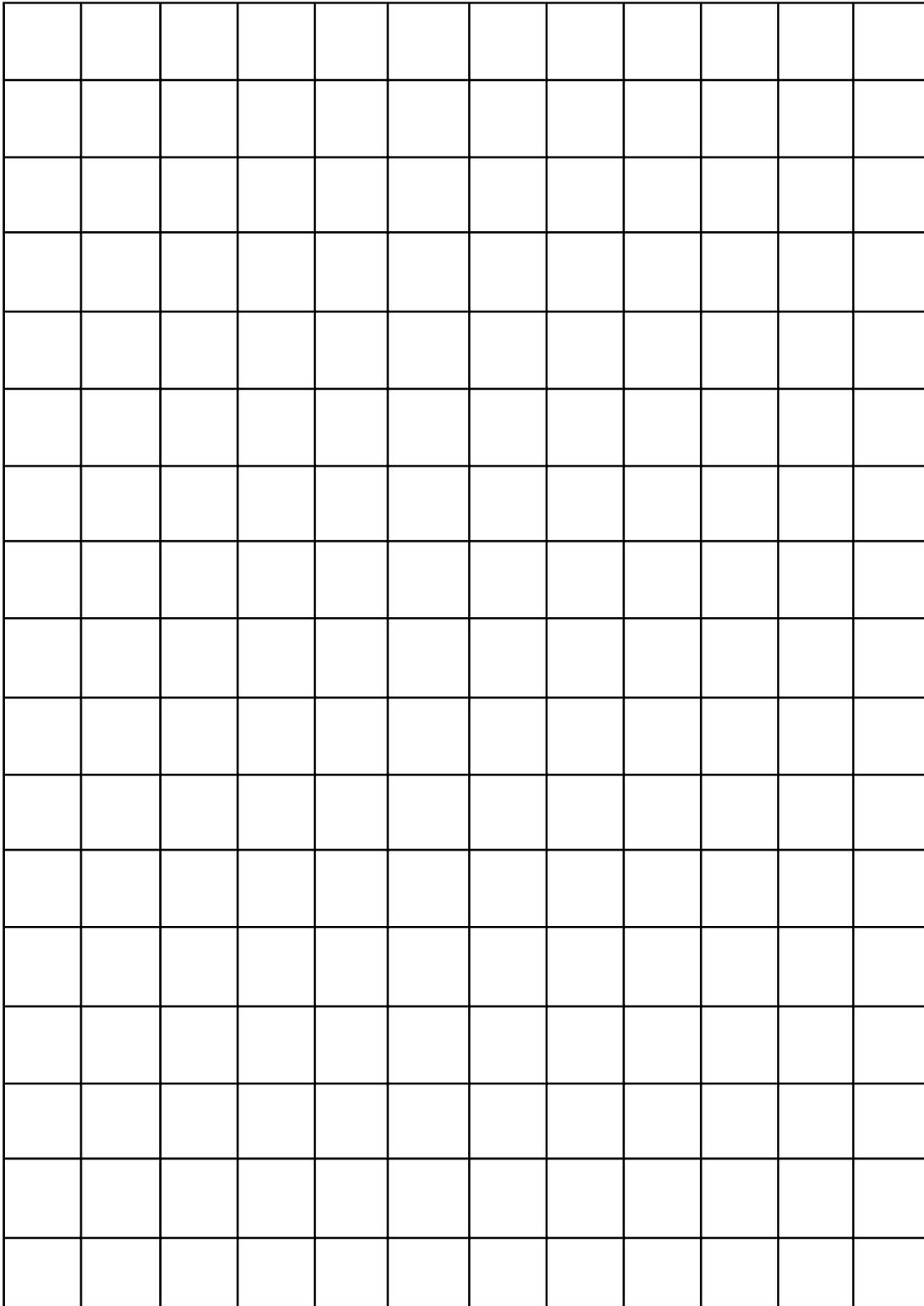


Make a prediction explaining the distance of your flights in centimeters, and explain why you think this will happen.

Record your distance for each flight in centimeters.

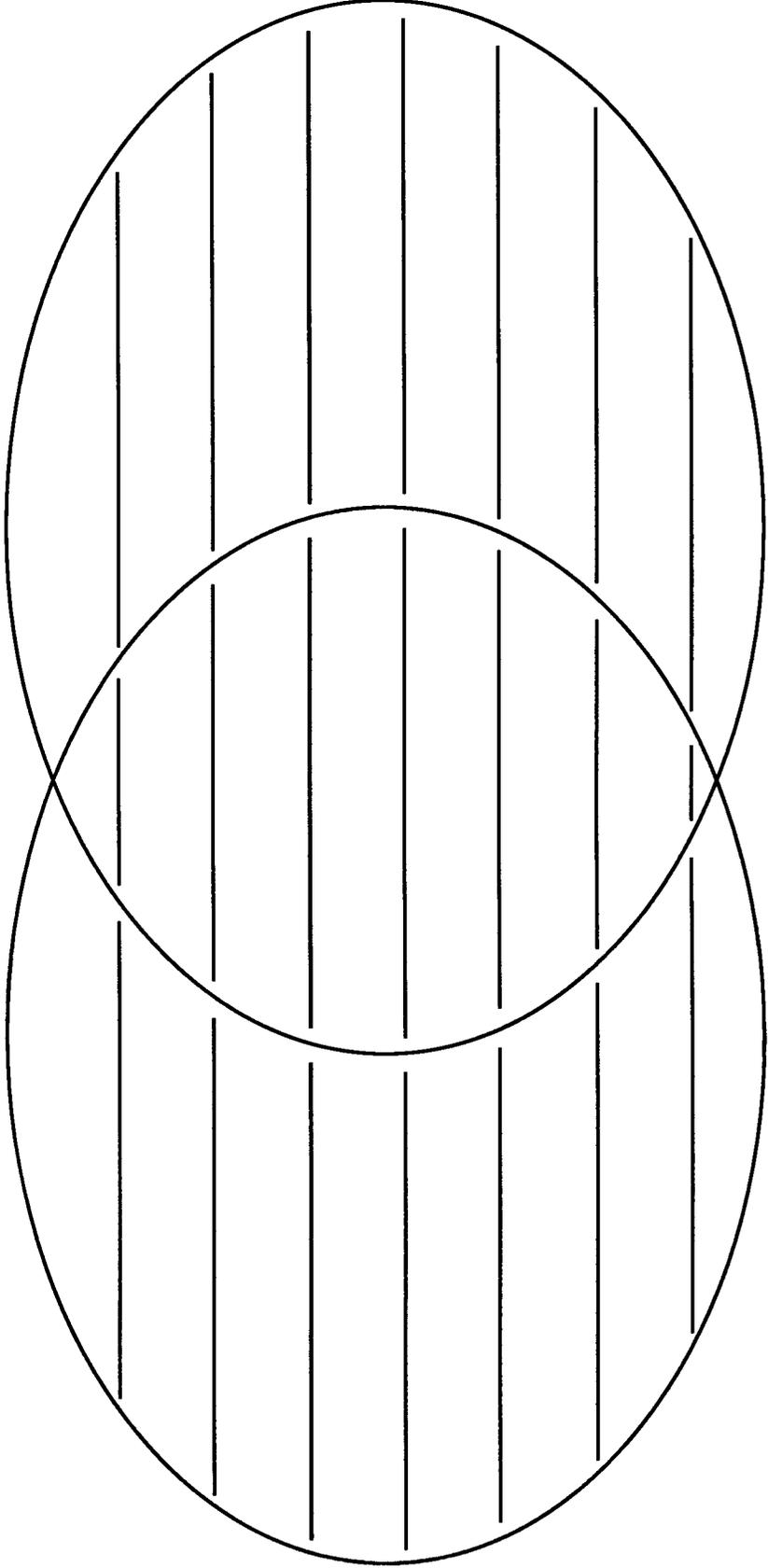
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Median
Student 1						
Student 2						

Explain how you found the median.



MY BAR GRAPH

CLASS STEM AND LEAF



Teacher Resource #1

Handedness					Median flight distance						
					1	9	32	81			
		R	R	R	2	7	42	78			
					3						
					4						
		R	L	L	5	10	66	92			
					6						
					7						
			R	R	8	7	23				
					9						
			R	R	10	3	66				

key 8 / 23 = 823 cm

EXAMPLE OF STEM AND LEAF PLOT