



# Archery Engineers Pre-visit

## Classroom Activities

### Synopsis

Form equals function. Students will construct several paper airplanes then test their design by measuring the distance they fly. By manipulating the basic design of the airplane students will get to see first hand how the shape and construction of the airplane affects its flight. This activity is similar to what students will be doing with a bow and arrow in “Archery Engineers.”

**Ages:** Designed for 5th—8th grade

**Time Considerations:** 40 minutes

### Materials:

- Scrap paper
- Basic paper airplane template (Worksheet 1)
- Data Sheet (Worksheet 2)
- Scissors
- Pencil/Pen
- Paperclips
- Scotch tape
- Tape measure (optional)
- Masking tape (optional)

### Vocabulary:

Aerodynamics, average (mean)

### Outcomes, students will:

1. Students will construct several paper airplanes then test their design by throwing them as far as they can.
2. Students will find the average for the distances their airplanes traveled.
3. Students will understand how an object’s form affects its function.

### Minnesota Academic Standards:

**Science:** 5.1.1.2.2, 6.1.2.1.1, 6.1.2.1.4,

**Math:** 5.1.1.1, 5.1.1.4, 7.4.1.1,

**Language Arts:** 5.8.1.1, 6.9.1.1, 6.9.4.4

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### Set-up

- Gather plenty of scrap paper
- Find an open space for the students to test their airplane designs.
- Print a copy of “Worksheet 1 & 2” for each group.
- If a tape measure is available, lay it on the ground so students can determine the distance their airplanes traveled. Consider using masking tape to mark a start line on the ground.
- If a tape measure is unavailable, students can pace off the distance their airplane went. Just make sure the same person in each group does the pacing for consistency.

### Activity 1: Basic Airplane

Students will construct a basic paper airplane then determine how far it can fly.

### Procedures:

1. Divide the class into pairs and give each group several scrap papers and “Worksheet 1” (basic paper airplane template).
2. Instruct each group to use 1 piece of scrap paper to construct a basic plane.
3. Find an open space to throw the plane and record the distance it travels. Allow each student to throw the airplane 3 times.
4. Have the students record their measurements on “Worksheet 2.”

### Activity 2: Modified Airplanes

Students will modify their paper airplane’s design to try and increase the distance it travels.

### Procedures:

1. Using their pre-existing airplane, each group should manipulate the design of the plane to try build an airplane that goes farther than the first plane. Students may use Scotch tape or paperclips as weights or use scissors to modify the wings.
2. Groups should record the changes they made to their planes on the recording sheet.
3. Students may also choose to completely re-work the design of their airplane by starting over with a new piece of paper.
4. Each student should throw the airplane 3 times and record the distance it travels on “Worksheet 2.”



### Data Analysis

Once the group has finished collecting data for each of their airplanes, they should calculate the average distance their airplanes traveled and record it on “Worksheet 2.”

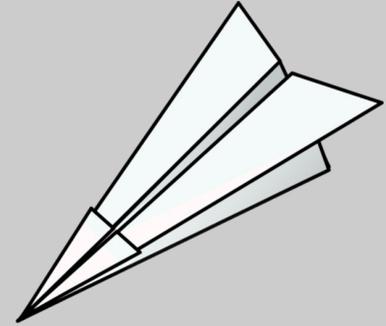
### Discussion

- Gather the groups together to discuss their findings. Consider organizing the class data into a chart on a chalk/white board.
- Have each group present their findings. Encourage the groups to show their modified planes to the class and elaborate on the changes they made to the basic plane design.
- Once each group has presented their findings have the students draw conclusions on what designs yielded the longest flight distances.

### Additional Resources

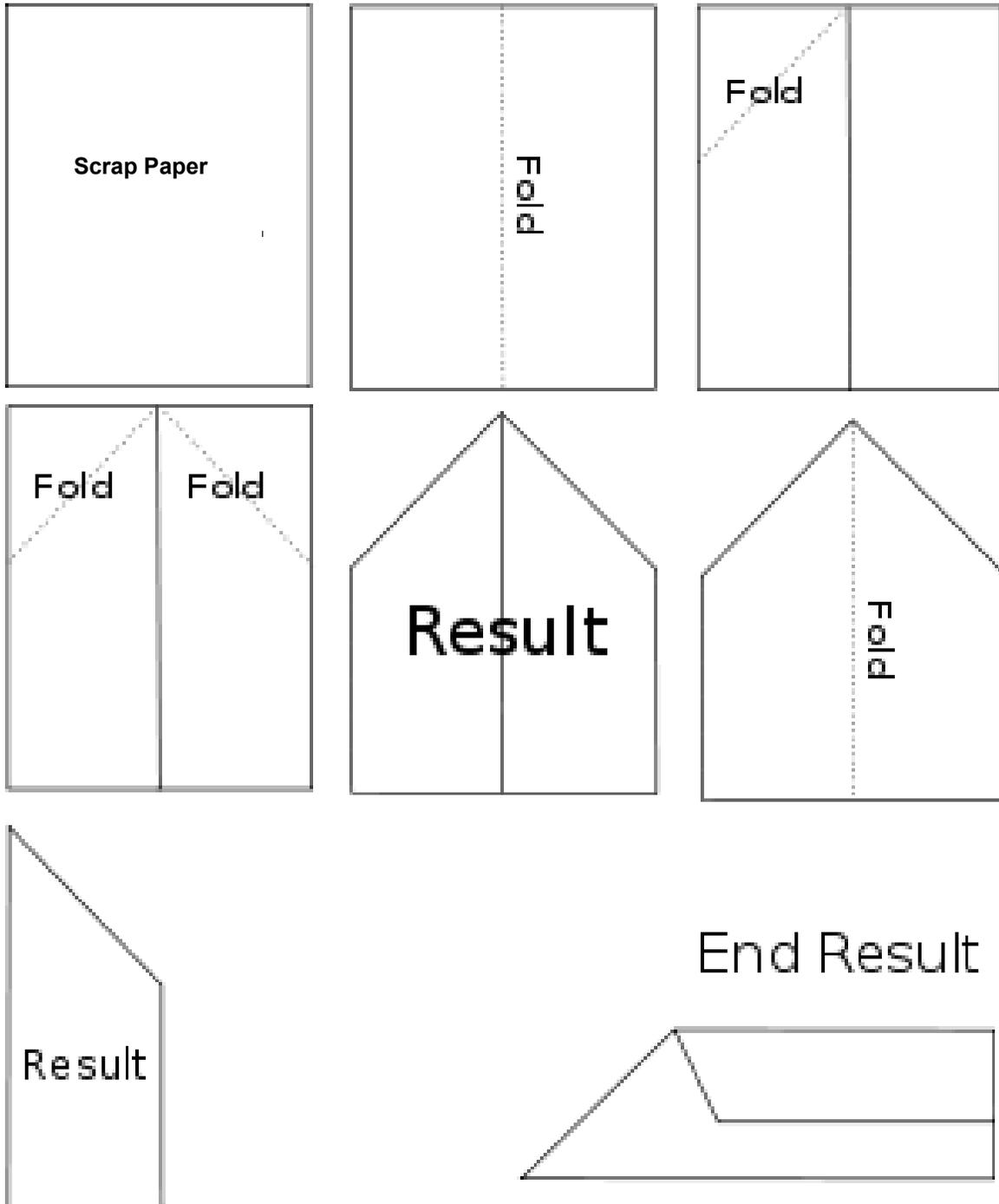
The following URL contains modified patterns for paper airplane designs. You may print out several of these for students to try as their second design.

<http://laughterizer.weebly.com/home/how-to-build-the-worlds-best-paper-airplanes>





### Basic Paper Plane Template





### Data Recording Sheet

#### Basic Paper Plane

Group Member 1

|          | Trial #1 | Trial #2 | Trial #3 |
|----------|----------|----------|----------|
| Distance |          |          |          |

Group Member 2

|          | Trial #1 | Trial #2 | Trial #3 |
|----------|----------|----------|----------|
| Distance |          |          |          |

Average:

#### Modified Paper Plane

Changes we made:

Group Member 1

|          | Trial #1 | Trial #2 | Trial #3 |
|----------|----------|----------|----------|
| Distance |          |          |          |

Group Member 2

|          | Trial #1 | Trial #2 | Trial #3 |
|----------|----------|----------|----------|
| Distance |          |          |          |

Average: