Title: Will It Fly?

Link to Outcomes:

- **Problem Solving** Students will demonstrate the ability to solve math problems including those with open-ended answers, those solved in a cooperative atmosphere, and those solved with the use of technology.

- **Communication** Students will demonstrate the ability to communicate mathematically.

- **Reasoning** Students will demonstrate the ability to reason mathematically, make conjectures, gather evidence, and build arguments.

- **Connections** Students will demonstrate the ability to connect mathematics topics within the discipline and with other disciplines.

- **Estimation** Students will demonstrate ability to apply estimation strategies in computation (with the use of technology), in measurement, and in problem solving. They will determine reasonableness of solutions.

- **Measurement** Students will demonstrate and apply concepts of measurement using non-standard 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.

- **Number Sense & Numeration** Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe effects of operations on numbers.

- **Concepts of Whole Number Operations** Students will demonstrate the ability to solve problems using arithmetic operations with technology where appropriate.

- **Whole Number Computation** Students will compute using whole numbers.

- **Geometry and Spatial Sense** Students will demonstrate the ability to apply geometric relationships using one, two and three dimensional objects. They will demonstrate congruency, similarity, and symmetry and apply these concepts to the solution of geometric problems.

Brief Overview:

This unit will give students in a cooperative learning group situation the opportunity to create a kite using their understanding of geometry and measurement. This activity will require students to measure, predict, make and test a model, and read and interpret data. Each group's objective will be to produce the highest flying kite using the materials provided, and then explain their results. The activity can be integrated with science, social studies, and language arts/reading as introduction or extension.

Prerequisite Knowledge:

Students should :

- be familiar with folding paper with symmetry.
- recognize geometric shapes and their properties and relationships.
- be able to measure length in standard and non-standard units.
- be familiar with the concept of scale.

Objectives:

Students will:

- construct a model (a kite).
- apply whole and fractional units to the process.
- draw geometric shapes.
- enlarge or reduce a pattern using scale.
- predict outcomes.
- read and interpret data.

Grade/Level:

Grades 3-6

Duration/Length:

This lesson will take 3 to 5 days to complete.

Materials/Resources/Printed Materials:

- 8.5" x 11" unlined paper (one sheet per student)
- Pencils
- Rulers, yardsticks or meter sticks
- Chart paper or sheets of other large heavy stock paper (24" x 36" preferred)
- 1/16" dowel rods, 48" in length (At least one per group)

- Large plastic trash bags, cut to single thickness (approximately 24" x 36" or larger) and/or grocery bag paper, butcher paper, newspaper, brown paper, wrapping paper.
- Masking tape - 1" width or wider preferred.
- Paper punch
- Kite string - one spool per group
- Drinking straws (optional)
- Rolls of ribbon, crepe paper, or plastic strips for making kite tails
- Scissors - one pair per group
- Crayons or markers (if desired)

Development/Procedures:

Day 1: *Making the Pattern*

- Measure and cut an 8" x 6" rectangle on unlined paper. Fold this rectangle in half to make a 4" x 6" rectangle.

- Fold it again to make a 2" x 6" rectangle.

- Open to the original rectangle, now creased into four equal parts.

- Measure and mark the length of the fold line. Draw a line over each crease and write down the measurement.

- Fold each top corner of the rectangle to form a right triangle. The side of the triangle will match the fold line. (See small pattern.)

  Draw a diagonal line from the outside point of the triangle to the bottom of the fold line. What kind of triangle did you form? Measure to see that two sides are the same length (so that it is a true right triangle).

- Mark a point on each fold line, 2/3 down from the top. Draw a line to connect the points. Mark a point on the center fold halfway between your line and the bottom of the paper. Make a triangle by connecting this point to the points on the other folds. What kind of triangle would you call this?

- Draw a small circle near the point where your two folded triangles meet. (Not too close to the edge--this is where you will put a hole for the string later.)

Day 2: *Making the Kite* (This may take 1 or 2 class periods.)

- Meet in your group and compare your patterns. Decide if each pattern shows that the directions were carefully followed. If so, discuss what you know about kites and what makes them fly. Would there be an advantage to making the kite smaller or larger than the pattern?

- Discuss how you would enlarge or reduce the pattern using measurement. You may choose to make a kite half as large as your pattern or two or three times the size of your pattern. Be sure to consider the materials you have available.

- As a cooperative group, make one pattern on heavy paper for the size kite your group thinks will fly the highest. You will need two dowel rods cut to match the length of the fold line on your new pattern. Decide how long your rods need to be, then measure and cut them.

- When your new pattern is finished, carefully cut off the four triangles you folded (see pattern).

- Place the remaining pattern on the kite material you have chosen (trash bag, paper, etc).

- Tape the edges of the pattern to the material and carefully cut out the kite so it is exactly the same size and shape as the pattern.

- Using a paper punch, make the two holes for the bridle string where indicated.

- Fold along the center fold (with the pattern on the outside) . Keeping the kite and pattern together, cut out the center triangle you drew . Cut through the pattern and kite material, being careful not to go past the fold line.

- Remove the pattern from the kite material.

- Tape the dowel sticks along the left and right fold lines.

- Decorate your kite if that is part of your group's plan.

Stringing the Kite:

- Measure and cut a bridle string one and a half times the width of your kite. Tie each end through a hole, so that the string hangs from the under side of the kite.

- Measure and cut two kite tails from the materials your group has chosen. Each tail will be three times the length of the kite.

- Attach each tail with tape below the cut-out triangle at the bottom of the kite.

- Attach the kite string to the center of the bridle string with a small loop.

Day 3: *Flying the Kite!*

- Discuss with your class how to find out which kite flies the highest. There will be one kite for each group and a time limit set for flying the kites, probably about 5 minutes. You may decide on practice time before the official flight. One way of determining how high a kite flies is to mark the string with a small piece of tape to show how much string was let off the spool. Decide how your class will record the height of the kites.

- Fly them!

- Record and compare the heights of all the kites that were flown. Discuss why certain kites were successful and why differences may have occurred.

Evaluation:

Teachers and students will evaluate the kite project using the following criteria:

- Accuracy of enlargement or reduction of model
- Did it fly?
- Height of flight

Note: Scoring is 1 to 4 points, with 4 being the highest for each criterion.

Students will independently evaluate the project by writing a descriptive paragraph about what was learned.

Suggestion: *Complete the kite evaluation within cooperative learning groups, and have the class develop the rubric*.

Extension/Follow Up:

This math activity can be extended into other curriculum areas in many ways. Some suggested topics are:

- Science: principles of flight, materials and their properties, weather

- Social Studies: Japanese culture and traditions, local festivals

- Language Arts/Reading: poetry, haiku, storytelling (*see childrens' literature suggestions in addendum*)

- Art: kites as an art form, origami

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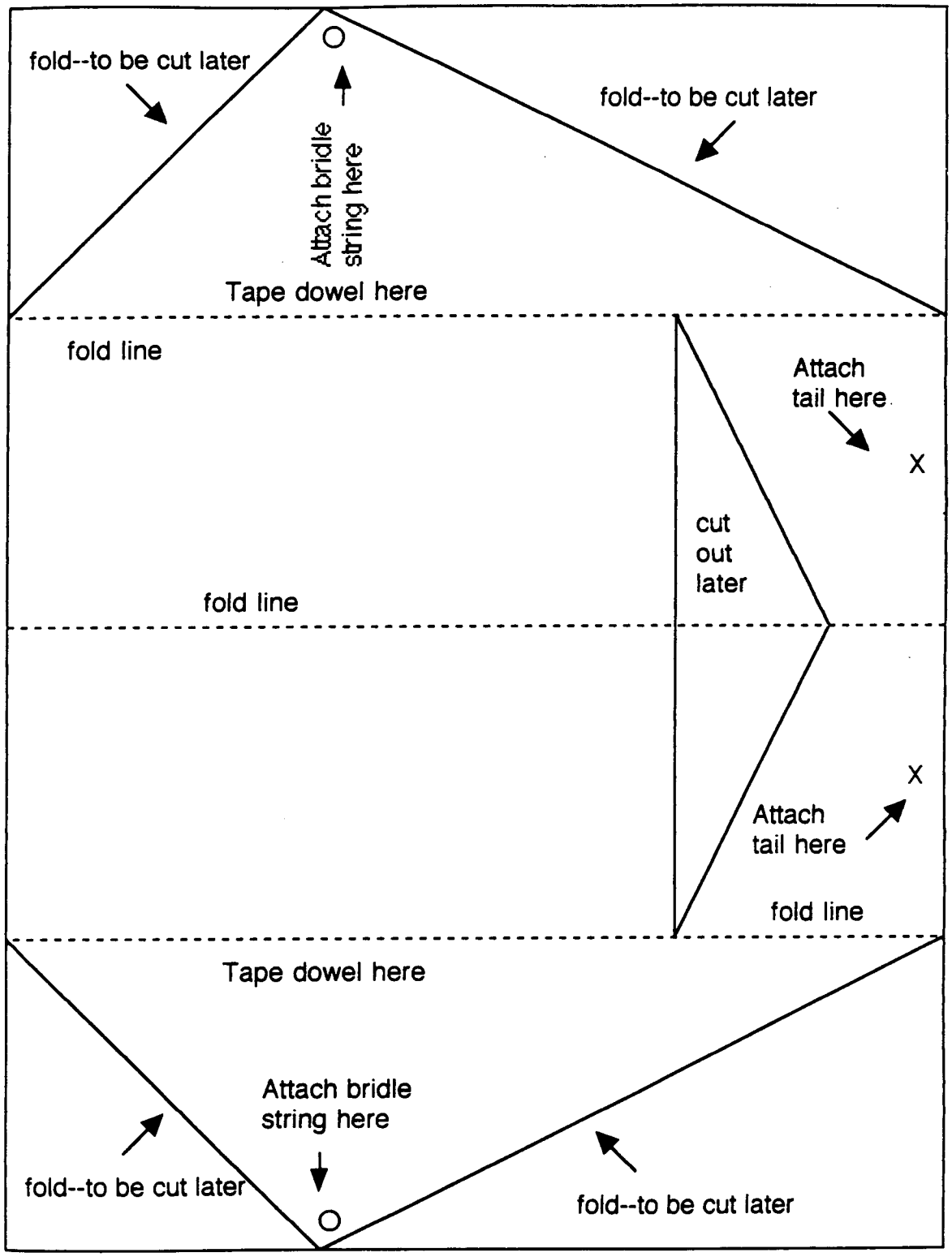
Will It Fly? Pattern