



Sled Kite Proportions

Students will construct a basic sled kite and make any necessary adjustments to insure a successful flight. Prior to the lesson, students will be given information about fundamental principles which contribute to successful kite flying.

LESSON PLAN

Learning Objectives:

The students will:

- Use proportions to enlarge a pattern
- Design and build a sled kite
- Identify the line of symmetry and congruent angles
- Recognize the relationship between doubling the side of a quadrilateral and the corresponding increase in area
- Successfully fly a kite

Purpose:

This class is designed to introduce the history of kites, safety guidelines for flying kites, and the basics of building and flying a kite.

Introduction:

Each pair of students will be given a 6"x 8" paper pattern of a sled kite, two dowel rods (each 48" long), and a 48"x 48" piece of plastic.

The task will be to enlarge the paper pattern proportionately in order to make a kite. Students will have to decide how large they want to make their kites. The length of the dowel rod and size of kite material will dictate how large they can make the kites. They may choose to make two 24" kites, a 30" and 18" kite, or one large 48" kite. After choosing which kite(s) to make, students will enlarge the pattern in order to make the kite(s).

Students will explore angles and lines of symmetry, while building the kites. The culminating activity will be flying the kites.

Grade Level: 6 – 8

[Ohio Learning Standards/Mathematics \(2017\)](#)

Geometry

6.G.1: Solve real-world and mathematical problems involving area, surface area, and volume

7.G.1.a: Compute actual lengths and areas from a scale drawing and reproduce a scale drawing at a different scale

8.G.4: Understand a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations

[Ohio Learning Standards/Social Studies \(2018\)](#)

History Topics Grades K – 8

[Historical Thinking and Skills](#)
[Heritage](#)

Materials Required:

- Wire cutters or small saw
- Sled kite pattern
- 1 (48"x 48") sheet of plastic garbage bag (preferably white so that it can be decorated)
- 2 dowel rods per kite (1/8" diameter) 48" in length
- Heavy tape – such as strapping tape
- Kite string – one roll per kite
- Permanent markers
- Scissors
- Hole punch

Background:

1. Give a brief overview of how kites have been used throughout history.
 - a. China is usually considered the place of origin of the kite. Although no one knows for certain when or how the world's first kite was flown, a favorite theory is that a Chinese farmer whose hat blew off in the wind was so fascinated to see that his hat could "fly" that he later attached a string to it and launched it as a kite. We do know for certain that kites existed in China 2,000 to 3,000 years ago.
 - b. Another early Chinese legend related to the origin of kites is that a Chinese general in 206 BC was faced with the difficult problem of how to conquer a well-fortified palace with just a handful of men. General Han Hsin decided to build a kite and fly it over the palace walls; he then carefully marked the length of string that was needed for the kite to fly over the wall. His soldiers were then able to determine how long a tunnel they should dig to get inside the wall and take their enemies by surprise. They accomplished this and the palace became part of the Han dynasty.
 - c. In 1749, in Scotland, Thomas Melville and Alexander Wilson attached thermometers to kites for meteorological purposes. Kites have been used for weather observation by the U.S. Weather Bureau, and the kite stations that obtained data on temperature, wind velocity, and altitude were in existence until 1933.
 - d. In June 1752, Benjamin Franklin flew a kite during a thunderstorm and collected ambient electrical charge in a Leyden jar, enabling him to demonstrate the connection between lightning and electricity. Franklin became interested in electricity in the mid-1740s, a time when much was still unknown on the topic, and spent almost a decade conducting electrical experiments. He coined a number of terms used today, including battery, conductor and electrician. He also invented the lightning rod, used to protect buildings and ships.
 - e. In 1826, George Pocock developed a way to pull carriages up to 20 MPH using kites.
 - f. In the late 1840s, engineers wanted to build a suspension bridge over the Niagara River, so they initiated a kite flying contest to see who could get a kite across the river and purposefully get it caught in a tree. This would allow the engineers to lay the first cable across the river. Homan Walsh, a young boy, won the contest on the second day.
 - g. Near the turn of the century, Wilbur and Orville Wright built a kite that was similar to the box kite and flew at Dayton, OH. They then built gliders (larger versions of the kite) and flew them first as kites in Kitty Hawk, NC. From their extensive experiments with these kites, the Wright Brothers learned the key elements of airplane flight and control.
 - h. Today, people use kites primarily for pleasure, enjoyment and relaxation.
2. Safety Guidelines from the American Kitefliers Association
 - a. Gloves should be worn to protect your hands from cuts and burns by the kite line, especially when flying a hard-pulling kite.
 - b. Never fly a kite in wet or stormy weather; keep your line dry.
 - c. Never fly kites around power lines, transmission towers or antennas; should a kite get tangled with power lines, do NOT attempt to free it; contact the local power company to report the situation.
 - d. Do not use wire or metal in kite construction or line.

- e. Do not fly from or over public streets and highways.
- f. Do not fly near airports and air traffic patterns.
- g. Do not fly maneuverable kites close to bystanders; this applies to the flying line as well as the kite.
- h. Check the flying field for holes, gullies, rocks, broken glass, and other debris that might trip you.
- i. Do not fly near trees; if your kite should get caught in a kite-eating tree, don't pull at it or climb the tree; let the wind blow it out.
- j. Use caution when launching, flying and landing large kites.
- k. Do not fasten kite lines to yourself unless you have a quick release system

Warm Up:

1. Review the concept of proportion with the students. This activity assumes some prior instruction in this area.
2. Review the rule that if the sides of a quadrilateral are doubled then the area is increased four times.
3. Review concepts of congruent angles and line of symmetry.

Safety Instructions:

Remind young students to keep the plastic away from their faces, and to be careful while using the scissors. The adults will use the hole punch, making sure that both the student's and their own fingers are clear of all moving parts, to make holes in the reinforced corners connection points.

Activity:

1. Students will be working in groups of two.
2. Give each group a pattern and the instructions for the sled kite. Explain that each pair of students must make at least one kite. They may enlarge the pattern to any size they choose. They may make two 24" kites, a 30" and an 18" kite, one 48" kite, or any other sizes that are applicable to the materials they have been given.
3. Build the sled kite using the directions below. Students can follow along with the Student Instruction Sheet.

NOTE: Have a sample available of a previously built sled kite as well as all the materials needed for the kites.

1. Lay the plastic skin flat.
2. Place the dowels parallel to one another.
3. Place tape on the end of the dowel (about half the length of a piece of tape hanging over)
4. Fold over the back of the kite to secure the dowel.
5. Press down firmly around the dowel and repeat at the other end.

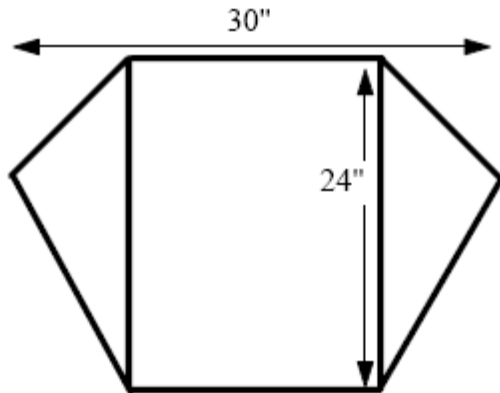
6. By wrapping the tape from the front to back, the ends of the dowels are more secure.
7. Once both dowels are taped in place, put one piece of tape (lengthwise) in the center of the dowel to hold the middle.
8. At the outside corners, place tape on the front (about half the length of a piece of tape) and fold toward the back of the kite.
9. Use another piece of tape and repeat the procedure, but tape in the opposite direction to reinforce the corner.
10. Fold the kite in half, match the reinforced corners and punch holes through the reinforced corners.
11. To make the bridle, cut a piece of string that is five times the length of the dowel. This proportion works for all sled kites. If this string is cut too short the kite will not open wide enough to catch the wind.
12. Tie one end of the string through each hole. Square knots work the best.
13. Match the holes and find the exact midpoint of the string. This is a critical step. If the loop is not at the midpoint, the kite will dive to one side.
14. Now tie a knot, leaving a small loop.
15. Tie your flying line to the loop and you are ready to fly.

Summary:

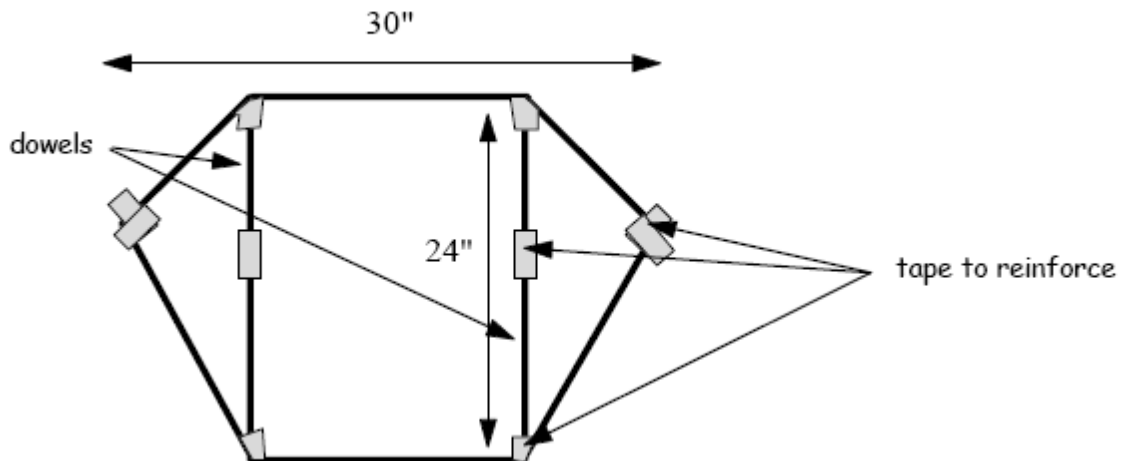
1. Today we introduced the history of kites, safety guidelines for flying kites, and the basics of building and flying a kite.
2. Let's Go Fly A Kite! - (time and weather permitting)
Stand with the wind to your back. If you are not sure which way to stand, look at the leaves or a flag. Your partner should hold the kite up (you should see the dowels) then let go of the kite and let the wind carry it. If your kite is constructed properly it will fly. If the kite seems to fall to one side, check the midpoint of the bridle again. You do not need to run to get your kite up in the air.

Sled Kite Proportions Student Instruction Sheet

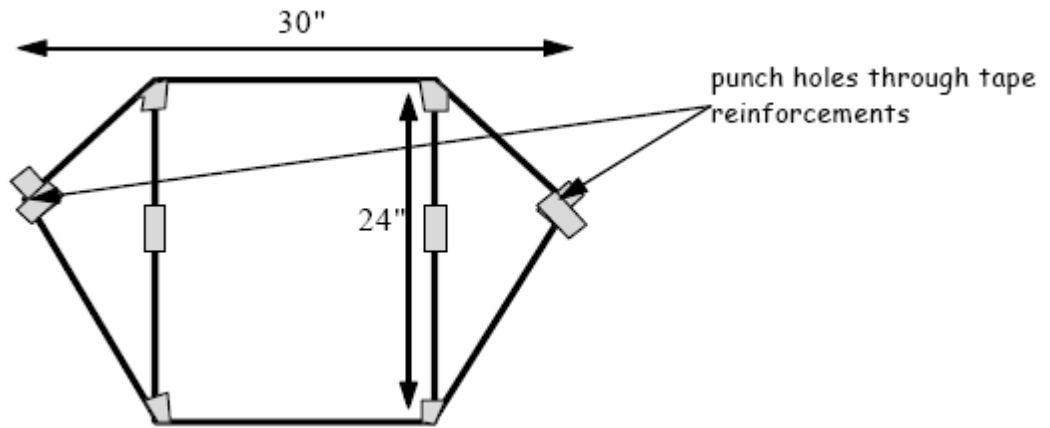
1. Compute the measurements for the size of the kite that you are going to make. Make a paper pattern.
2. Trace the pattern onto the plastic garbage bag. Example:



3. Cut out your kite. Look for symmetry in the kite.
4. Cut the dowel rods to the appropriate lengths with a pair of wire cutters or a small saw. It is important to make accurate measurements before cutting.
5. Tape the dowel rods into place. Cut tape into approximately 2" sections. Place a piece of tape lengthwise on the center of the dowel rod then tape to the material. Place about half of the length of tape at each end of the dowel. Tape the dowel to the material then fold the remaining tape over and attach to the other side of the material. Tape the corners with two pieces of 2" tape on the outermost corners as shown below. The tape should fold back and attach to the other side of the material.



6. After the tape is applied, punch a hole through both corners at the same time. The tape is there to reinforce these corners.



7. Cut a length of string 5 times the length of the dowel rod. Tie the string through the holes using a square knot. Bring the holes together and find the exact midpoint of the string. Tie a knot, leaving a small loop. It is very important that this loop is exactly in the center. If it is not, the kite will not fly straight. Now, tie your flying line in the loop and you are ready to fly!