NATIONAL MUSEUM OF THE UNITED STATES AIR FORCE™

# Sled Kite: Perimeter, Parallel and Perpendicular

*Students will practice the basic math skills of measuring perimeter and recognizing parallel and perpendicular lines and geometric shapes while building a basic sled kite.*

LESSON PLAN

***Learning Objectives:***

The students will:
- Build and fly a basic sled kite
- Measure the perimeter of their sled kite
- Identify and describe triangles, quadrilaterals and other shapes
- Identify instances of parallel and perpendicular lines

***Purpose:***

This class is designed to allow students to practice some basic math skills while having fun building and flying an easy-to-make and easy-to-fly sled kite.

***Background:***

The sled kite is a standard workshop kite which can be made in a variety of sizes and with a variety of materials. The kite is simple to make and is an excellent flyer. There are three main forces that affect the flight of a kite. They are: lift, gravity and drag. Lift causes the kite to rise. Gravity causes the kite to fall. Drag is the pull on the kite by the passing air. When all three of these forces are balanced, the kite will fly.

A kite has many parts that help keep lift, gravity and drag balanced. The flying line holds the kite so that it will not fly away in the wind. The bridle connects the flying line to the kite at two points. The actual flying line is connected to the bridle at its tow point. The bridle sets the angle of the kite in the wind. If the bridle is not set at the correct angle the kite will not fly properly. The spine (backbone) and struts (or spars) of a kite provide the framework for the kite. The sail cover, or skin of the kite, is the material that covers the structure and makes up the body of the kite. The best weather conditions for flying a sled kite is light to moderate wind (approximately 6 to 18 miles per hour) with blue skies. Do not attempt to fly a kite in wet or stormy weather.

Symmetry is an important concept in kite building. If the kite is out of balance it may not fly at all or may only fly for a short period of time.

**Grade Level: 3 – 4**

**Ohio Learning Standards/Mathematics (2017)**

*Measurement and Data*
3.MD.8: Solve real world problems involving perimeter
4.MD.3: Solve real world problems involving perimeter

*Geometry*
3.G.1: Describe triangles, quadrilaterals, etc.
4.G.1: Identify parallel and perpendicular lines

**Materials Required:**

- (2) 1/8" diameter Dowel Rods (24" long)
- Plastic trash bag for kite “skin”
- Kite string
- Scissors
- Strapping or packing tape
- Hole punch
- Markers (optional)
- Measuring tool (ruler or meter stick)

***Procedure:***

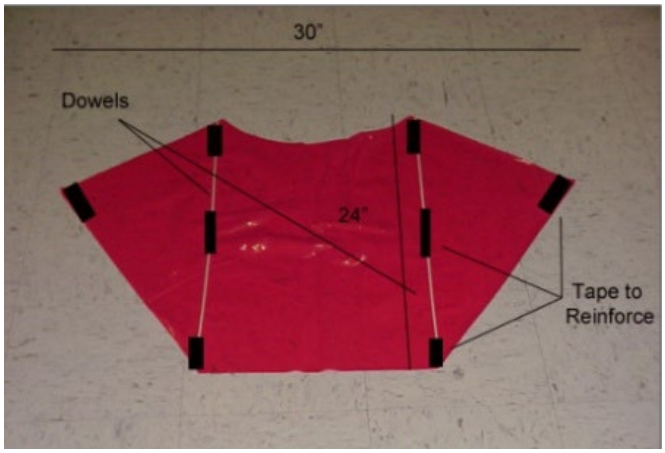
1. You may want to give a brief history of kites from the information available at the links in the Resources section. Of particular interest is the fact that kites helped to lead to the invention of the airplane! The Wright brothers first experimented with a kite (and then gliders that they flew as kites) to develop the ability to control an aircraft in flight.

2. Have a number of different types of kites on display or use images of kites from online. Discuss all the shapes the students can find. Look for parallel lines or perpendicular lines (especially with the spars). If appropriate, use the kites to discuss symmetry, balance, similarity and congruence. Some of the different types of kites you can use are sled, box, delta, diamond, cellular – just to name a few!

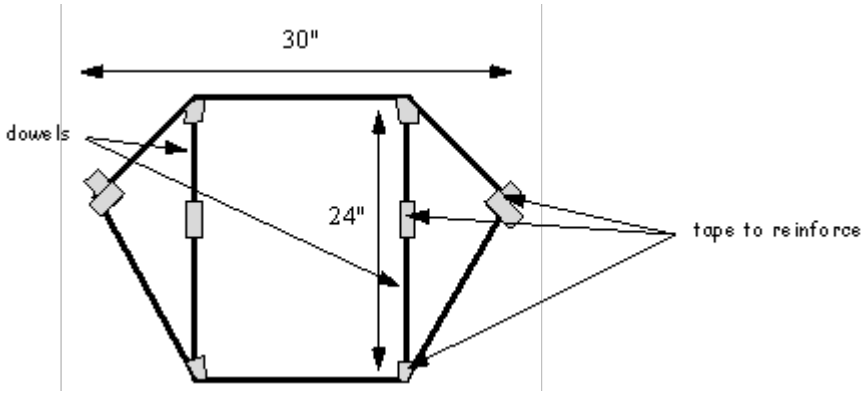
3. Give the students their kite "skins". Discuss the concept of perimeter and have the students measure the perimeter of their kites. Your sled kite may or may not have a curved edge at the top (see below). If it does, you may want to see if the students can work out a way to accomplish that measurement (using the string).

4. Build the kites, using the instructions below:

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




    - Once both dowels are taped in place, put one piece of tape (lengthwise) in the center of the dowel to hold the middle
    - 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
    - Use another piece of tape and repeat the procedure, but tape in the opposite direction to reinforce the corner




    - Fold the kite in half, match the reinforced corners and punch holes through the reinforced corners

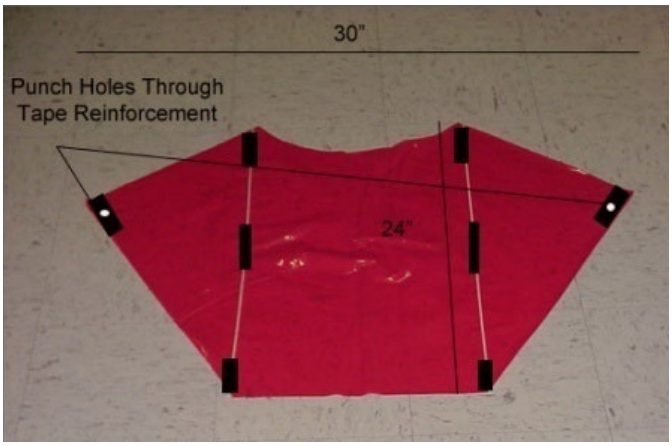
- To make the bridle, cut a piece of string that is five times the length of the dowel (about 10 feet). This proportion works for all sled kites. If this string is cut too short the kite will not open wide enough to catch the wind.

- Tie one end of the string through each hole. Square knots work the best.

- 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.

- Now tie a knot, leaving a small loop.

- Tie your flying line to the loop and you are ready to fly.




5. Make sure to discuss the 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

6. Weather conditions that are best to fly a kite

   a. You can fly a kite any time of year when the wind is right and there are no storms. Although spring is the traditional kite flying season, the spring winds are often too strong or too gusty. The best conditions for flying kites are blue skies and gentle to moderate winds (about 8-18 mph).

| ***Material*** | ***Wind (mph)*** | ***General Range*** |
|---|---|---|
| Light paper | 4-12 | Light to Gentle |
| Light plastic | 8-24 | Gentle to Fresh |
| Light cloth | 8-31 | Gentle to Strong |
| Heavy plastic | 13-31 | Moderate to Strong |
| Heavy cloth | 13-31 | Moderate to Strong |
| ***Kite Type*** | ***Wind (mph)*** | ***General Range*** |
| Fighter | 4-12 | Light to Gentle |
| Sled | 6-18 | Light to Moderate |
| Diamond | 6-18 | Light to Moderate |
| Delta | 6-18 | Light to Moderate |
| Box | 13-31 | Moderate to Strong |

   b. In 1806, British Admiral Sir Francis Beaufort devised a wind velocity scale. It measures how fast the wind is moving by how it is affecting the environment. This version is adapted for kite flying

| ***Scale Number*** | ***Wind Speed*** | ***Forecast Description*** | ***Observable Effects*** |
|---|---|---|---|
| 0 | 0 | Calm | Smoke rises vertically |
| 1 | 1-3 | Light air | Smoke drifts slowly |
| 2 | 4-7 | Light breeze | Leaves rustle |
| 3 | 8-12 | Gentle breeze | Small flags fly |
| 4 | 13-18 | Moderate breeze | Small branches move |
| 5 | 19-24 | Fresh breeze | Small trees sway |
| 6 | 25-31 | Strong breeze | Large branches sway |

7. Activity - Let's Go Fly A Kite! (time and weather permitting)

    a. To fly the kite, stand with the wind at your back and ask someone to lift your kite up (the dowels should be on the ground side) and let the wind carry it. No running is needed.

    b. Special Instructions: Here are some trouble shooting hints for successful kite-flying.

        1) If the kite does not rise there may not be enough wind or the bridle may be too short.

        2) If the kite flies and then crashes, you may need to lengthen the bridle.

        3) If the kite tends to spin or wobble, you may need to check the midpoint of the bridle.

***Resources:***

https://kite.org/

https://kite.org/education/history-of-kites/

http://www.awindofchange.com/lessons/lesson1-3.html

https://www.kite-festival.org.uk/different-types-of-kites/

https://www.my-best-kite.com/types-of-kites.html

https://www.my-best-kite.com/how-to-build-a-sled-kite-s.html