

National Aeronautics and Space Administration



# Kites

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# Lesson 4: Kites

Kites (a type of glider) provide an opportunity to teach young students about early concepts in **material science** and **lift**. In this module, children read a story about the creation of a kite in *The Kite Festival*, a story that includes a simplified engineering process including design, material selection, testing, and optimization (improving the design). Afterward, students create their own kite for flying, as well as a craft kite suncatcher.

## Focus Storybook

### Kite Festival

Cover and illustrations from KITE FESTIVAL by Leyla Torres

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Farrar, Straus, and Giroux

## Learning Goals

Language	<ul style="list-style-type: none"><li>• Vocabulary: kite, glider.</li><li>• Writing: Practice writing the letter “K.”</li></ul>
Math	<ul style="list-style-type: none"><li>• Use visual guidance to fold a glider.</li><li>• Measure the distance flown by a glider.</li></ul>
Science / Engineering	<ul style="list-style-type: none"><li>• Compare materials based upon their weight (light vs. heavy).</li><li>• Compare materials based upon their strength (weak vs. strong).</li><li>• Choose materials that are most appropriate for building a kite.</li></ul>
Art	<ul style="list-style-type: none"><li>• Decorate a kite “suncatcher” with a variety of colors and shapes.</li></ul>

## Key Q’s

What materials are needed to make a good kite? What is lift?

## Primary Materials

**Paper (printer, cardstock, and tissue)**

**Cardboard samples**

**Scissors**

**Tape**

**Straws**

**Feathers**

**Popsicle sticks**

**Fabric belt**

**Map**

**Napkins**

**Band-Aids**

**Ball of yarn**

**Kite**

**String**

**Tissue Paper**

**Wax Paper**

**Iron**

## Resources

High Flyers e-Book

## Science / Engineering: Pre-Reading Activities

### Inquiry Experiment: Build and Test a Simple Straw Glider

Build a number of other types of gliders to demonstrate how many different shapes can sail across and through the air.

1. Provide each child with a “non-bendy” straw.
2. Provide each child with 1-inch thick strips of paper about 4.5 and 6 inches in length.
3. Help each child make loops with their paper strips, and then to tape them to a straw, as shown in the figure above.
4. See Loop Airplane for more information.
5. Test the Simple Straw Glider by changing different aspects of the glider:
  - a. Throw the glider with either the small loop or large loop facing forward.
  - b. Throw the glider side-ways.
  - c. Move the loops to different positions along the straw.
  - d. Plug the front end or back end of the straw with a bit of modeling dough or clay.
6. Students will find that changing any of the variables on their straw glider influence both the center of mass (i.e. balance) of the glider, as well as the amount of lift that is produced.



## Reading: The Kite Festival

Cover and illustrations from KITE FESTIVAL by Leyla Torres

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Read *The Kite Festival*. As you read the story, encourage engagement by using the following strategies.

- Hand each child one object in order to role-play throughout the story. To ensure that all children can participate, prepare duplicates of as many items as possible.
  - Popsicle sticks (wooden sticks purchased by the grandfather)
  - Ball of string/yarn (string from the pull-toy)
  - Fold-up paper map (map used to make the paper kite)
  - Band-Aids (Band-Aids from the car used as an adhesive)
  - Fabric belt (fabric belt from the mother's dress)
  - Napkins (from the picnic basket, to make the tail)
- As the story is read, choose one student to be the main character. As the child in the story receives different materials, allow the student to collect the appropriate items from the "audience" members. Once the kite is created, have the child pull out a kite for the other children to see.
- This story is about the resourcefulness of the family, who depend upon their creativity and their ability to reuse and recycle. Ask children what kinds of things they do to reuse and recycle.



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This is also a story that incorporates aspects of the engineering process. A simplified view of the engineering process is shown below, taken directly from the Next Generation Science Standards framework. Encourage students to identify the parts of the engineering process in the story:

- **DEFINE:**

- The characters of the story needed to design a kite using only wooden sticks and the materials they had with them.

- **DEVELOP SOLUTIONS:**

- Identify criteria (a kite should have a large area but not weigh very much; it should be stable).
- Identify available materials and select materials for the task (materials that were purchased or available).
- Build the kite.

- **OPTIMIZE:**

- Test-fly the kite. When the kite was first flown, it was unstable because it had no tail.
- Design a tail, build it, and test-fly it again.

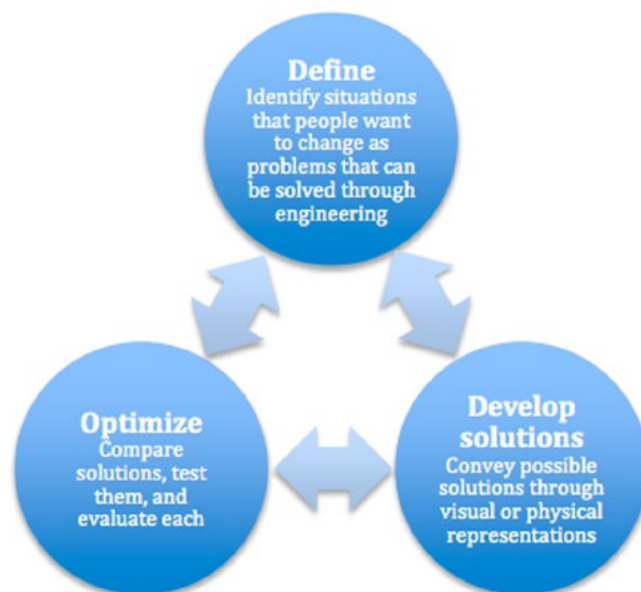


Image credit: NGSS

## Science / Engineering: Book-Based Activities

### Discovery Lab: Materials Science

In the book, *Kite Festival*, the family had to make many decisions about the types of materials to use to accomplish their task to build a working kite. This activity will help students to consider both weight and strength as determining factors for building their own kite.

One of the things that helped the Wright brothers to be the first people to successfully fly a controlled and powered heavier-than-air aircraft was that they were experts in working with materials that were both strong and lightweight (they both owned and worked in a bicycle shop before they began building airplanes). In fact, one of the most important aspects of engineering is choosing the right materials for the job. Gliders must be both light and strong.

1. Provide each student with a bird feather (synthetic is fine, but a real bird feather is best). Allow them to toss the feathers into the air, to feel them, and to “weigh” them in their hands. Ask the children why they think birds fly so well. *Help students to recognize that feathers are very LIGHT. In fact, a real bird feather is hollow inside the main rib. Likewise, bird bones are hollow inside to make them lighter. Bird feathers also act a bit like a parachute, because they can “catch” air easily. Bird feathers are also very STRONG for their light weight. In the same way, building a kite or building airplanes requires the use of materials that are both light and strong.*
2. Provide the children with a set of materials for making a simple kite. Provide them with:
  - Printer paper
  - Cardstock
  - Construction paper
  - Cardboard
  - Tissue paper
3. Encourage them to rank the papers based upon WEIGHT. Ask students to hold equal sizes of paper in each hand, and to compare them. *Children should classify tissue, printer, and construction paper as relatively light, while cardstock and cardboard as relatively heavy.*
4. Next, ask students to rank the papers based upon STRENGTH. Allow children to take designated test strips of print paper, cardstock, construction paper, cardboard, and tissue paper, and attempt to break them by pulling. (Most kites will undergo a stress that is much similar to the material being pulled apart rather than torn). *With the exception of tissue paper, children will find that most of the materials are actually rather difficult to break when being pulled evenly apart!*

5. Considering that materials to build a kit must be both *light* and *strong*, ask students to determine which materials would be best for building their own kite! *Printer paper is the best option for this task, and is used in the activities noted below.*

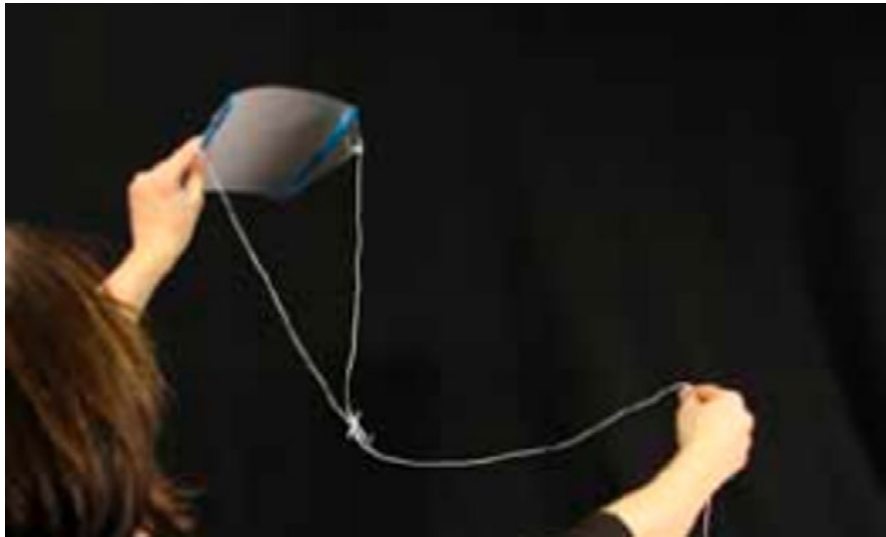
In the back of the book, *The Kite Festival*, has some excellent and clear instructions for building a robust, stable hexagonal kite. Although it would be nice to display the construction of such a kite to children, very small children can assist building a simpler sled kite.

For small children, the teacher should provide a pre-cut template and pre-cut straws.

## Application Lab: Kite Building

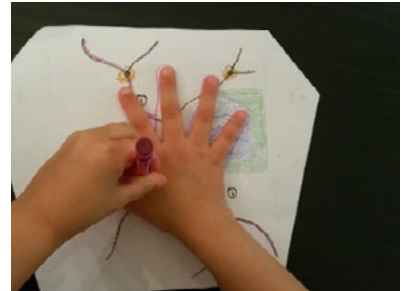
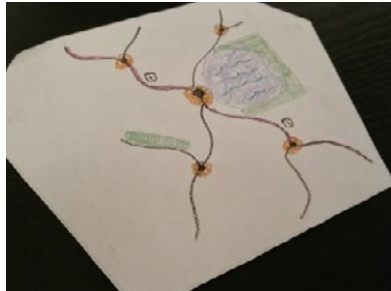


Before building a sled kite, carefully demonstrate the use of a small kite in a safe area outdoors away from electrical lines, or inside a large gymnasium. Prepare to have a child try to safely run/pull tight on the kite. Then, if appropriate, show how it can be easier to fly a kite using a constant flow of air (with a fan). Consider using NASA Museum in a Box [First Flyers](#) for additional activities.



In The Kite Festival, the main character makes a kite from paper from a road map. This is a wonderful opportunity for children to learn about the purpose of maps and their geographic features.

1. Provide each student with a sled kite template.
2. Show children an actual road map. Ask students to identify major features of the map (roads, cities, bodies of water, parks, major attractions, etc.).
3. Ask children to create a map of their own design, and to include some of the features discussed.
4. To add another element of The Kite Festival, encourage children to personalize their map by outlining their hand and filling it in with color.



5. After decorating the kite, place tape in the designated spots to reinforce the paper and use a hole punch to make holes on either side of the sled kite.
6. Use tape to secure two straws at the appropriate location.
7. Attach 12-inches of string through each of the holes, and attach those two strings to a longer string for kite-flying.



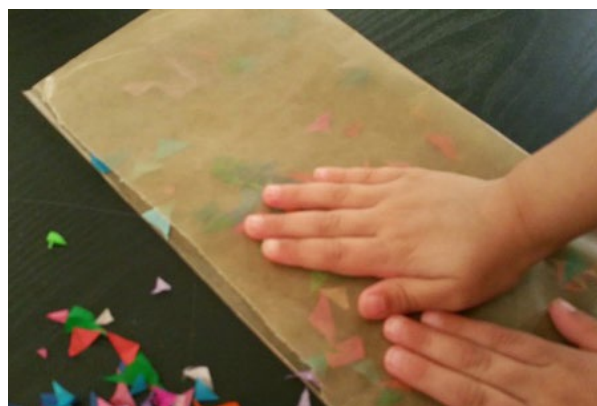
8. Allow students to try flying their kite using a constant breeze or even a fan.
9. Encourage students to try making different sized kites to compare their lift ability and stability. A number of simple sled kite kits can be purchased online.



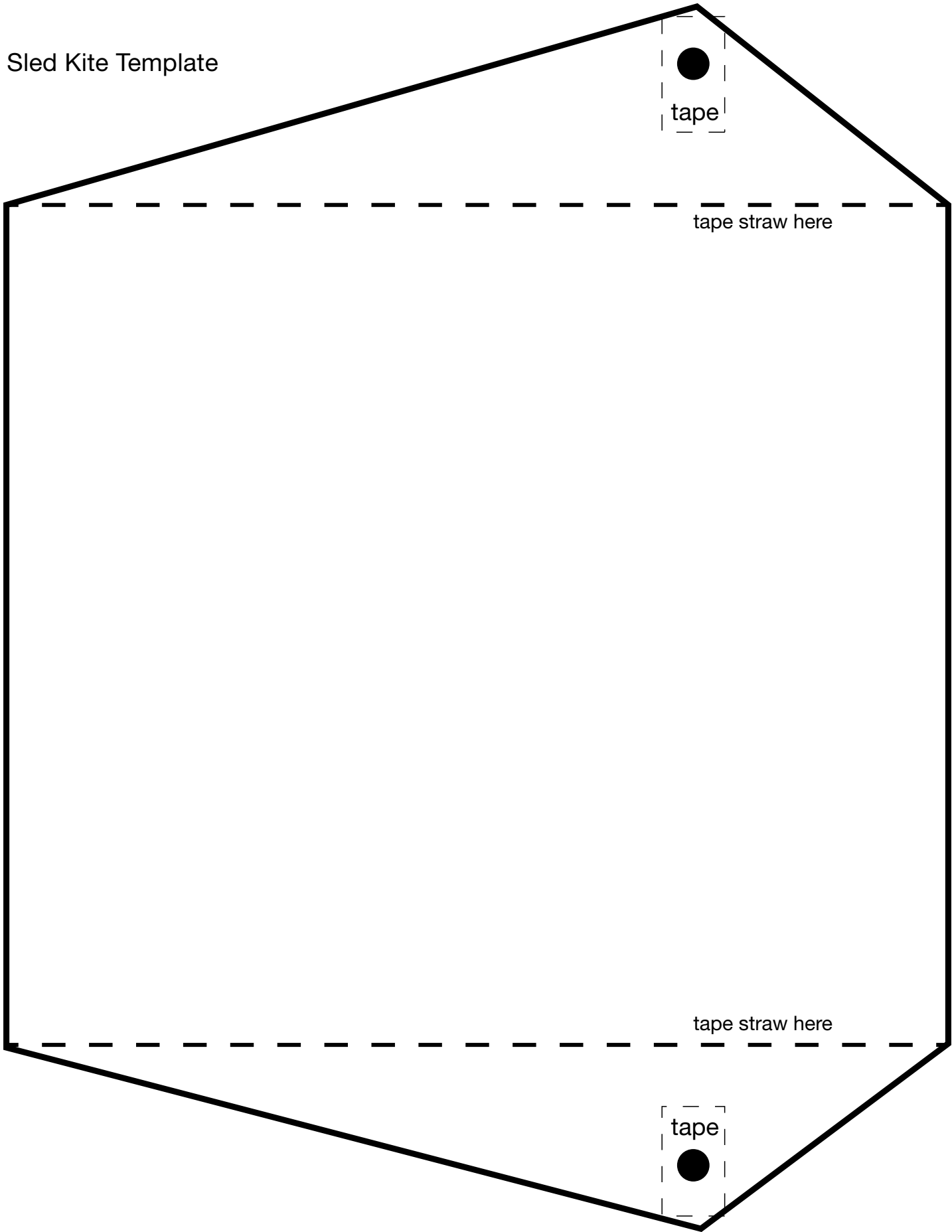
### Art Project: Suncatcher

Design a kite suncatcher. Allow children to practice cutting tissue paper to make kite suncatchers. The flat bits of tissue paper can be placed between two pieces of wax paper, and quickly heated with an iron until they are melted together (do not overheat, or the wax will no longer stick).

The suncatcher can then be affixed to a window for a beautiful display of colors.



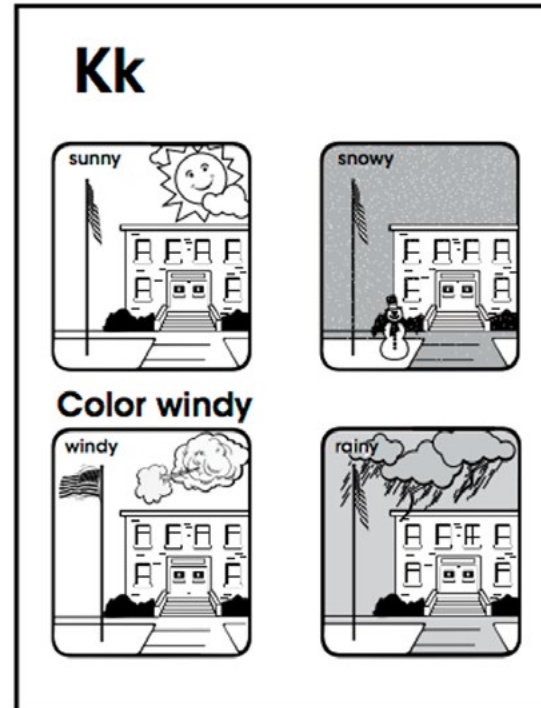
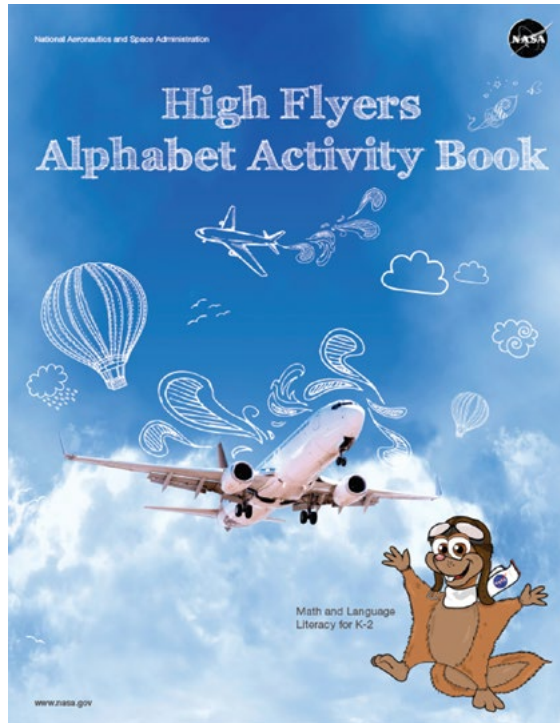
Sled Kite Template





## Writing: “K”

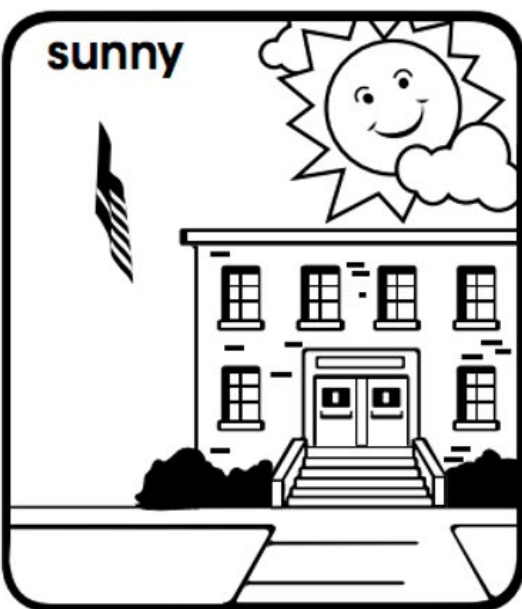
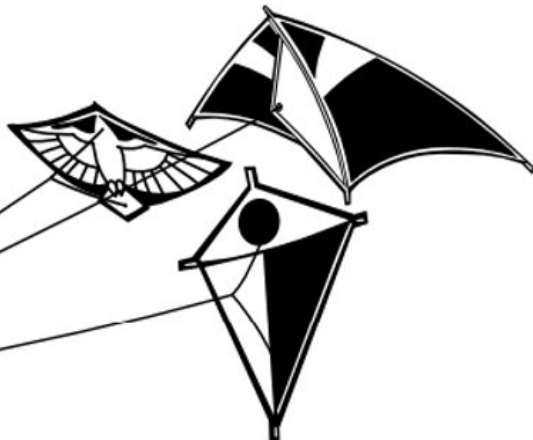
Practice writing the letter K. Use NASA’s [High Flyers Alphabet Activity Book](#).



Kk Kk

# kite

Color which type of day would be best for flying a **kite**.





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