WHAT MAKES THIS STEM?
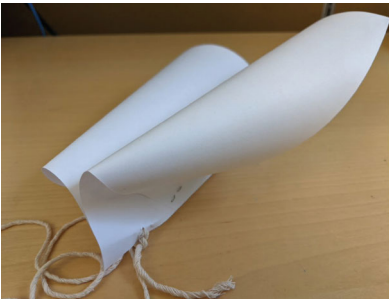
Kites fly by harnessing the force of the wind, using the **lift** provided from a gust to push the kite up. The design of your kite will determine how much **force** from the wind is captured versus the amount of **gravity** the kite needs to overcome, so consider the shape and materials of your kite as you make it. Some kite designs include a tail, which provides **drag** by increasing **air resistance**. This helps to stabilize the flight of the kite so it doesn't spin out of control when flying.

There are 3 designs to try in this kit, do you think you can guess which one will fly the best?

DESIGN #1	MATERIALS
	• Sheet of paper (8.5"x11") • String • Pen, sharpened pencil or hole punch* • Tape or stapler* • OPTIONAL: Markers, crayons, stickers to decorate the kite*

* These materials are not provided in the kit. If you would like to make your kit in the library, ask a librarian to use their craft materials.

HOW TO DO IT

(Optional step) Before you begin, you can decorate your kite, if desired. But this could affect the flight of your rocket.

1. Fold the sheet of paper in half, with the shorter edges meeting (hamburger style). Now is the time to decorate the kite if you like.

2. From the edge opposite the crease, take one corner of the top layer and, without folding the paper, bend it down so the corner meets the creased edge of the paper, almost like you're making a cone. Do NOT fold the paper.

   NOTE: There isn't a specific position you need to bring the corner to but depending on where the corner meets the creased edge, your kite will fly differently. This is a chance to experiment!

3. Repeat on the other side, matching the second corner to where you have the first corner held down.

4. While holding the two corners of the paper and sandwiching the creased edge between them, you can either tape or staple the corners in place.

5. With adult assistance, use your pen or sharpened pencil to poke a hole through the paper at the creased edge somewhere between the taped or stapled corners and the top of the kite (where the paper is curled the most). Alternatively, you can also just tape or staple the string to the paper without making a hole, just make sure the string is secure, so it doesn't detach from the kite. Then you can also skip Step 6.

   NOTE: Another chance to experiment! You can place the hole where you like as long as it's between the taped corners and edge of the paper where it's curled down the most.

6. Thread one end of the string through the hole and tie it into place. Your kite is ready to fly!

   NOTE: If you'd like to keep your string neat and handle it more easily while flying your kite, you can wind the string around the pen or pencil before you fly the kite and let it unspool as needed while flying.
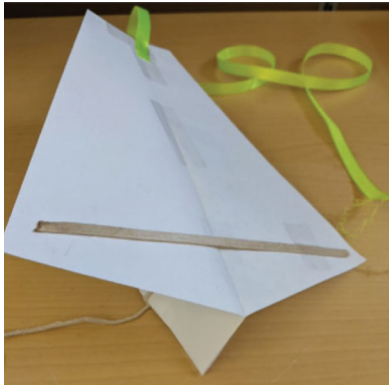
| DESIGN #2	MATERIALS
	• Sheet of paper (8.5"x11") • Wooden dowel • String • Ribbon • Pen, sharpened pencil, or hole punch* • Scissors* • Tape* • OPTIONAL: Markers, crayons, stickers to decorate the kite*

* These materials are not provided in the kit. If you would like to make your kit in the library, ask a librarian to use their craft materials.

HOW TO DO IT

(Optional step) Before you begin, you can decorate your kite, if desired. But this could affect the flight of your kite.
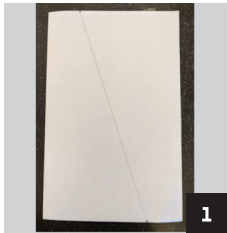
1. Fold the sheet of paper in half, with the shorter edges meeting (hamburger style).
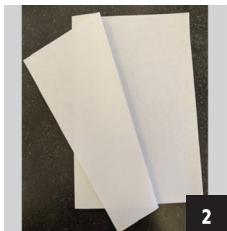
2. With the folded edge to one side, mark a point about one inch away from the folded edge at the top of the paper and then another mark on the bottom about an inch away from the open edge of the paper. Draw a line connecting the two marks.

3. Fold the top layer of paper along the line you just drew.

4. Flip the paper over and fold the other side of the paper to match the first layer.

5. Unfold one flap so you can lay your kite flat and see both flaps.

6. Tape along the center seam.

7. Tape the wooden dowel across the center seam, over the widest part of the flaps.

8. Turn your kite over so the dowel side lies face down and the "spine" sticks up at the center.

9. From the top of the kite, the side closer to where the dowel is taped, make a mark about a third of the way down the "spine" and about an inch away from the folded edge.

10. Poke a hole through the paper where you made the mark. You can use a hole punch, scissors, or even a sharpened pencil. Put some tape over the mark before you poke the hole to reinforce it if you like. Please have an adult help if you need.

11. Thread one end of the string through the hole and tie it securely.

12. Tape the ribbon to the bottom of your kite, the end that is narrowest. This is the tail of the kite.

    NOTE: Another chance to experiment! You can choose how long to make the tail and see which length flies best.

For easy video instructions and other challenges, visit *on.sfpl.org/stem-challenge.*

DESIGN #3	MATERIALS
	• Sheet of paper (8.5"x11") • 2 Wooden Dowels • String • Ribbon • Scissors* • Glue* • Ruler* • OPTIONAL: Markers, crayons, stickers to decorate the kite*

* These materials are not provided in the kit. If you would like to make your kit in the library, ask a librarian to use their craft materials.

HOW TO DO IT

(Optional step) Before you begin, you can decorate your kite, if desired. But this could affect the flight of your rocket.

1. Cut your paper in half through the long edge so you end up with two 8.5"x5.5" sized sheets.

2. Glue the two halves together so you get one sturdy sheet of paper. Smooth out the paper so that there are no bubbles between the sheets of paper.

3. Draw a diamond shape using as much of the paper as you can. Use a ruler to make sure the sides are straight and even.

4. Cut out the diamond shape.

5. Make a cross shape with your dowels so that the ends meet the corners of your diamond.
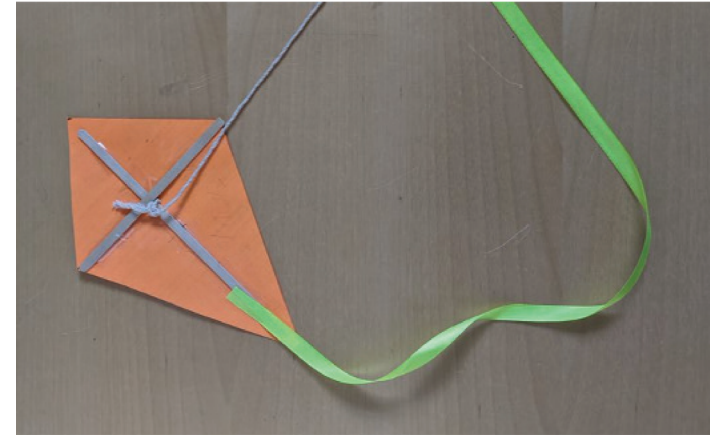
6. Tie the string around the vertical dowel where it crosses with the horizontal dowel.

7. Glue or tape the cross in place on the kite.

8. Cut a length of ribbon to attach to the bottom of your kite using glue, tape or stapler. With the tail attached, your kite is ready to fly!

CHALLENGES

Design your own kite(s):

• What shapes do you think will be the best at catching the most air and using the force of wind better?

• What if you made the tail longer/shorter?

• What if you add more than one tail?

• How big or small can you make a kite and still fly it?

For easy video instructions and other challenges, visit *on.sfpl.org/stem-challenge*.

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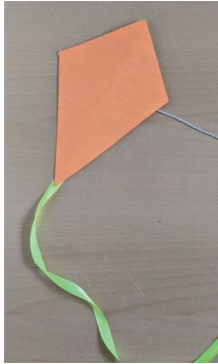All programs at the Library are free. Supported by Friends of the San Francisco Public Library.