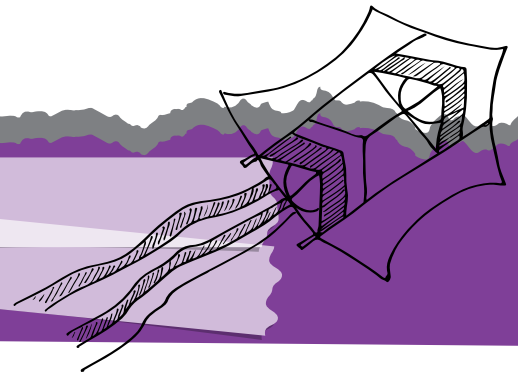


# ACTIVITY 1

Let's build a tetrahedron kite! A polyhedron is a three-dimensional solid (or you may call it a 3-D shape) that's made up of other polygons (2-D shapes). For example, a cube is a polyhedron made up of squares. A tetrahedron is a polyhedron made up of four triangles. As you make your kite, can you find the tetrahedron? (Here's a hint: you'll have more than one!)

## LET'S MAKE



## GATHER YOUR SUPPLIES

### INCLUDED

**KAZOON  
KITE KIT**



**PIPE CLEANER**



### NOT INCLUDED

**SCISSORS**



**TRANSPARENT  
TAPE** (optional)



**PENCIL**

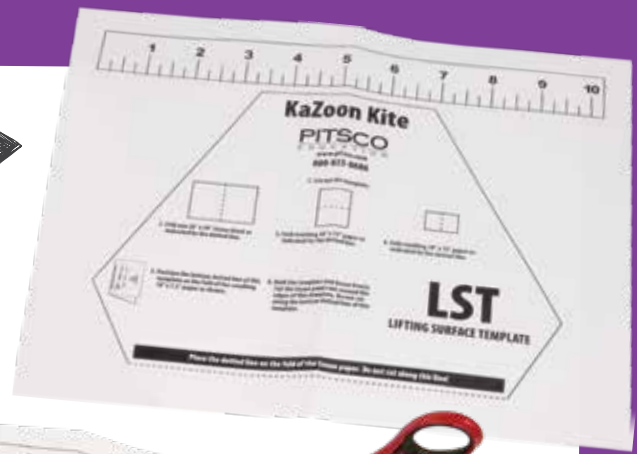


# TIME TO MEASURE!



## STEP 1

Open up your KaZoon Kite kit and find the Lifting Surface Template with the ruler on it.



## STEP 2

Carefully cut out the ruler on the solid black line.



## STEP 3

Tape the ends of the ruler to a flat surface such as a table or a countertop.

**Note:** This step is optional, but if the ruler is attached to something that doesn't move, it makes measuring a lot easier!



## STEP 4

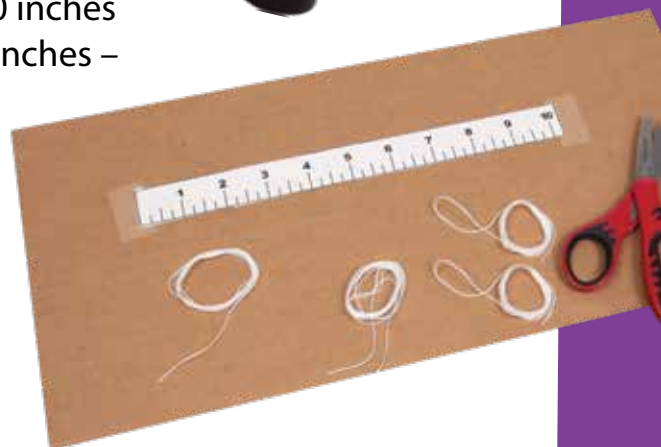
Locate a spool of kite string from the package.



## STEP 5

Cut a piece of string that's 40 inches long.

Here's a math problem for you! Your ruler is 10 inches long, but you need a piece of string that's 40 inches – how do you do it? There are a few ways you could do it, but one way is to take a piece of string and measure 10 inches. Now, hold your fingers where the 10 inches end and measure the 10 inches again. Do this four times and you have 40 inches!

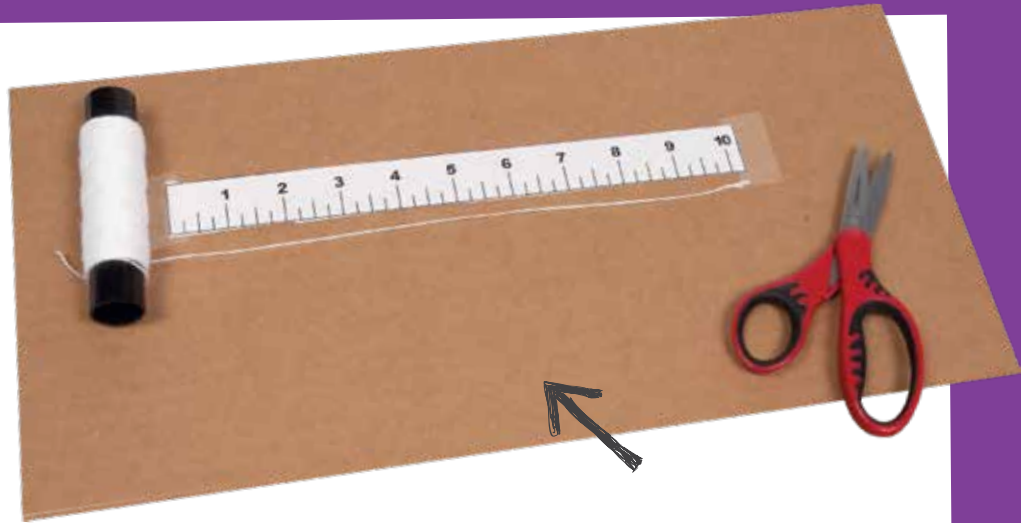


**10 INCHES X \_\_\_\_\_ = 40 INCHES**



### STEP 6

Repeat Step 5 three more times so you have four pieces of string that are 40 inches long.



### STEP 7

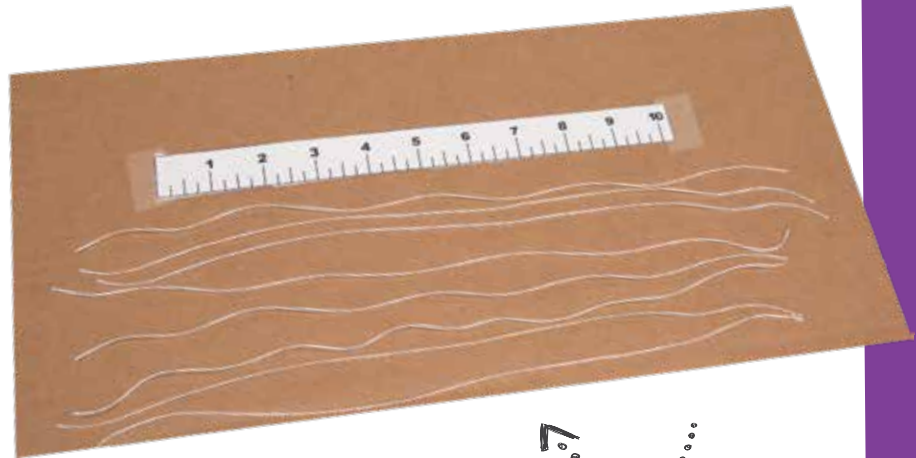
Cut a piece of string that's 14 inches long.

Here's another math problem! How can you use a 10-inch ruler to cut a piece of string that's 14 inches long? Can you use the method you used in Step 5 to do this cut?



### STEP 8

Repeat Step 7 seven more times so you have eight pieces of string that are 14 inches long.



## **PHEW! DONE WITH THE MEASURING. LET'S MAKE SOME TRIANGLES!**



### STEP 1

Find one of your strings that is 40 inches long.

## STEP 2

Remove three straws from your kit and thread them onto the 40-inch string.

**TIP: HAVING A HARD TIME GETTING THE STRING TO THREAD THROUGH THE STRAW? USE THE PIPE CLEANER TO PUSH IT THROUGH!**

## STEP 3

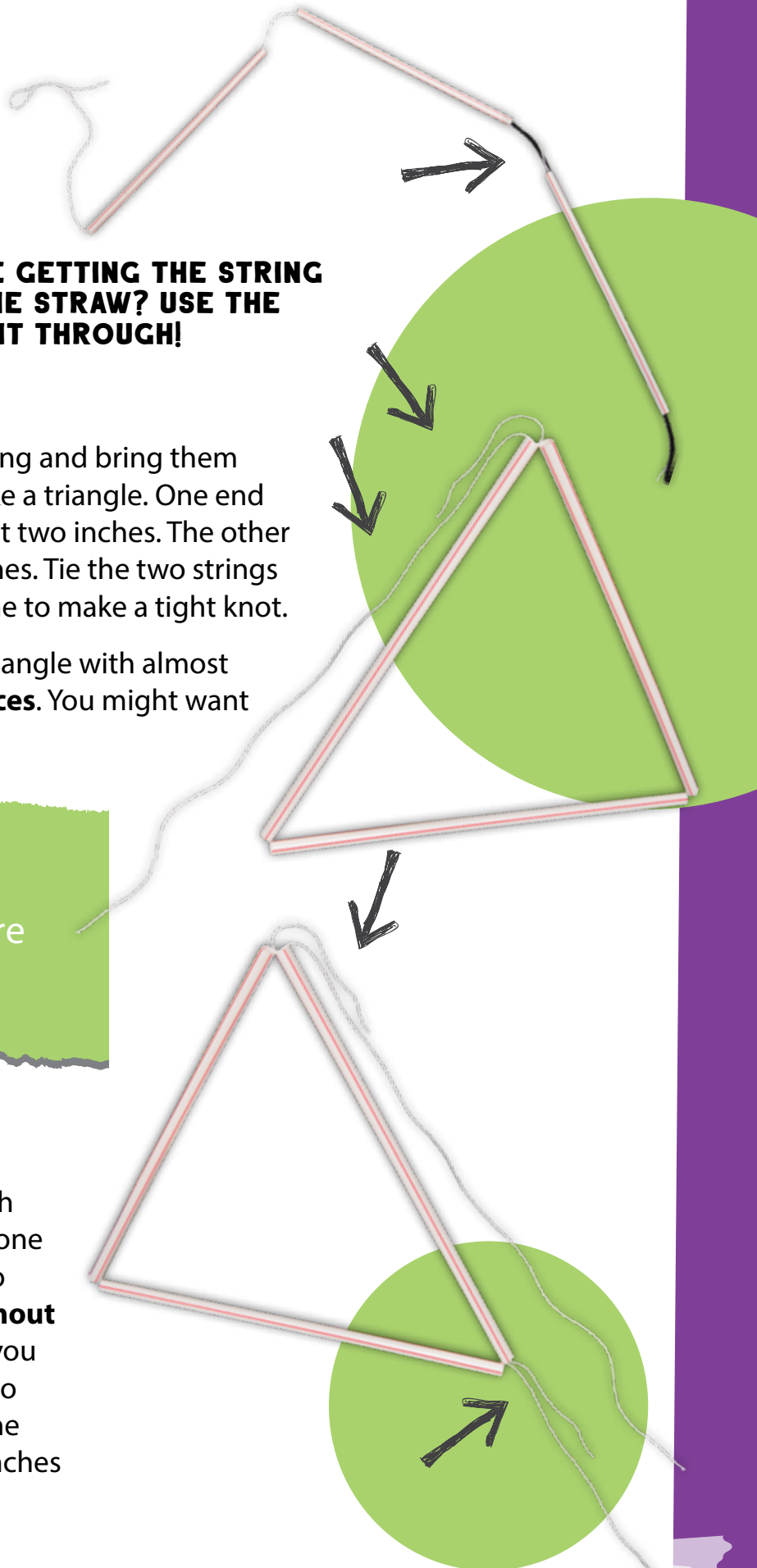
Take the two ends of the string and bring them together so your straws make a triangle. One end of the string should be about two inches. The other end should be about 12 inches. Tie the two strings together. Tie it one more time to make a tight knot.

The straws should make a triangle with almost no space between the **vertices**. You might want someone to help you tie it.

A vertex (plural: vertices) is formed when two or more edges come together. You might know it as a corner.

## STEP 4

You now have one vertex with a long and short string. Take one 14-inch string and attach it to a vertex on your triangle **without** a string hanging out. Again, you want one end to be about two inches from the vertex and the other string to be about 12 inches from the vertex.





### STEP 5

Tie the string in two knots.



### STEP 6

Repeat Steps 4 and 5 with the other vertex.



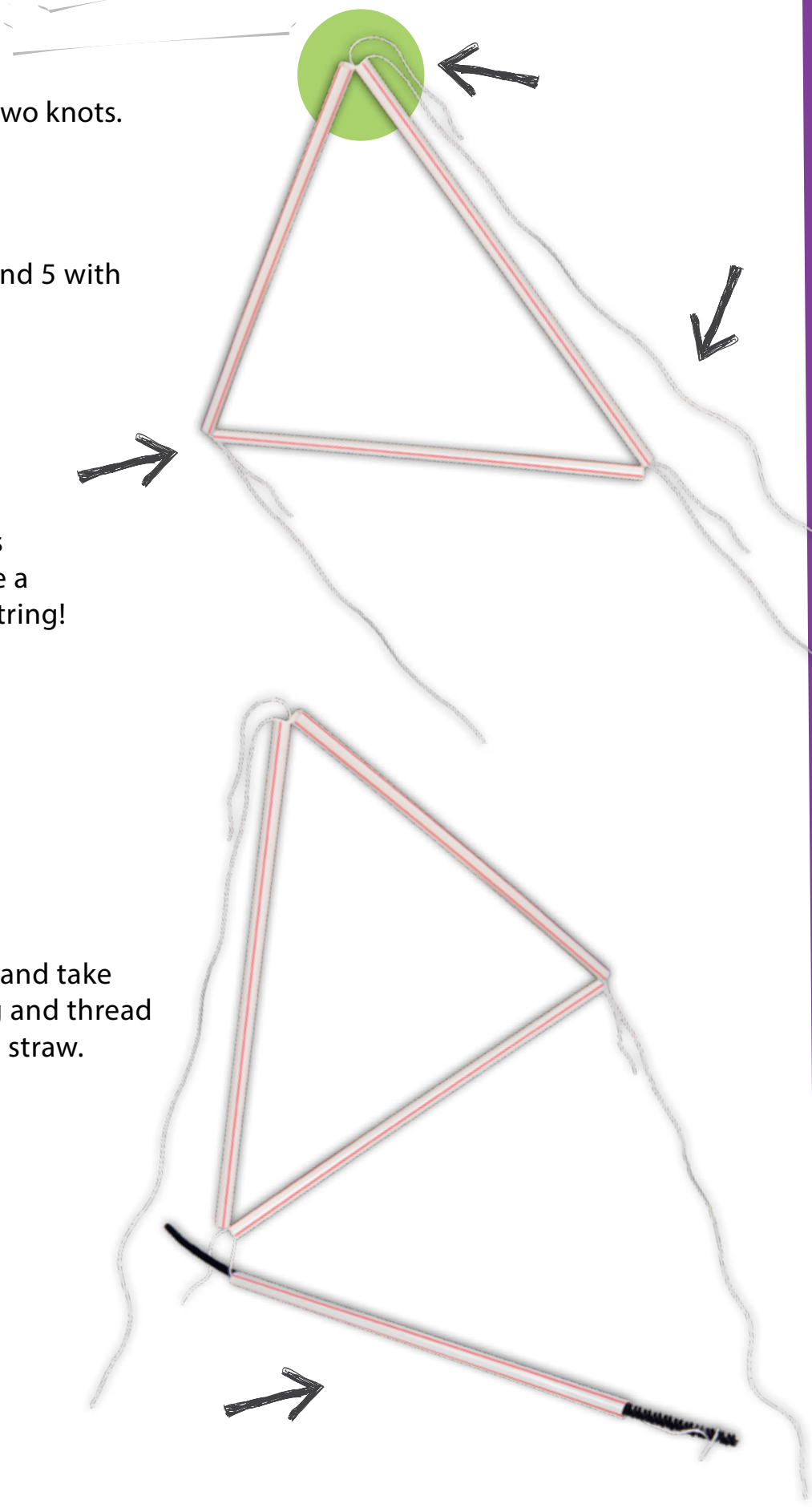
### STEP 7

All three vertices should now have a short and long string!



### STEP 8

Choose a vertex and take the longer string and thread it through a new straw.





### STEP 9

Choose a different vertex, take the longer string, and thread it through another straw.

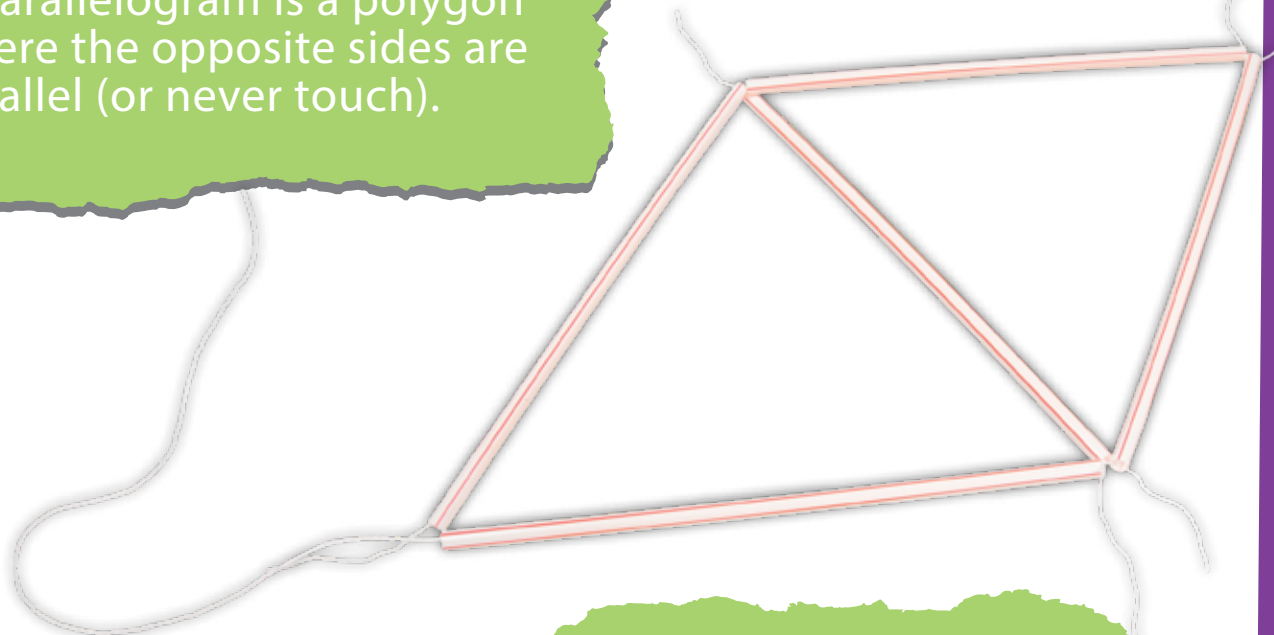


### STEP 10

Tie those two straws together using the string sticking out from the end of the straws. You now have a **parallelogram** (and it's also a **rhombus**!) made out of two connecting triangles! Set your parallelogram to the side.



A parallelogram is a polygon where the opposite sides are parallel (or never touch).



### STEP 11

Repeat Steps 1-10 three more times so you have a total of four parallelograms.

A rhombus is a parallelogram that has four sides that are the same length.

# CUT THE TISSUE PAPER



## STEP 1

Locate the Lifting Surface Template paper (the one you cut the ruler from). Cut out the template.



## STEP 2

Fold your piece of tissue paper following the instructions on the template.



**FOLD ONE 20" X 30" TISSUE SHEET AS INDICATED BY THE DOTTED LINE.**



**FOLD RESULTING 20" X 15" TISSUE SHEET AS INDICATED BY THE DOTTED LINE.**



**FOLD RESULTING 10" X 15" TISSUE SHEET AS INDICATED BY THE DOTTED LINE.**



## STEP 3

Place your template on the folded tissue paper measuring 7.5" x 10" with the dotted line of the template on the longest fold as shown.

**Note:** This is REALLY important – if the dotted line isn't on the longest fold, you won't get the pieces in the right shape. Ask someone for help if you need it!



## STEP 4

Place the paper clips along the dotted line to keep the template in place.



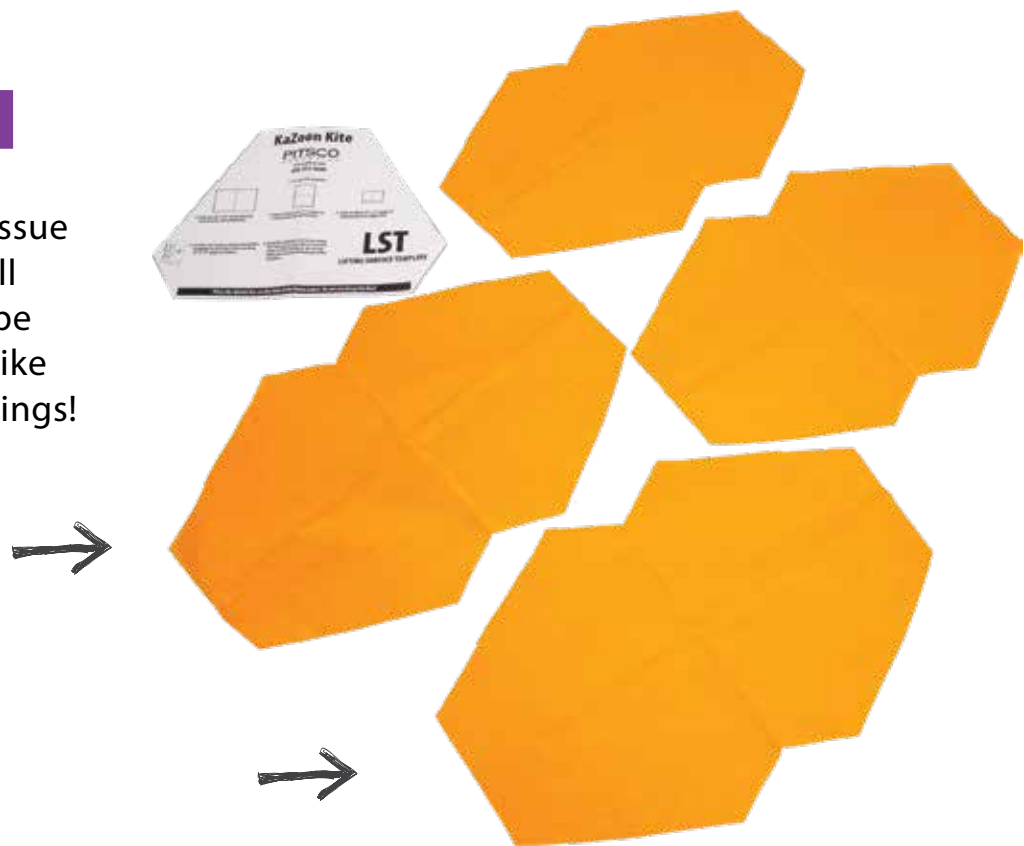
## STEP 5

Carefully cut along the outside of the template. It might help to have someone hold the template while you cut around it.



## STEP 6

Unfold the pieces of tissue paper. You'll have a shape that looks like butterfly wings!



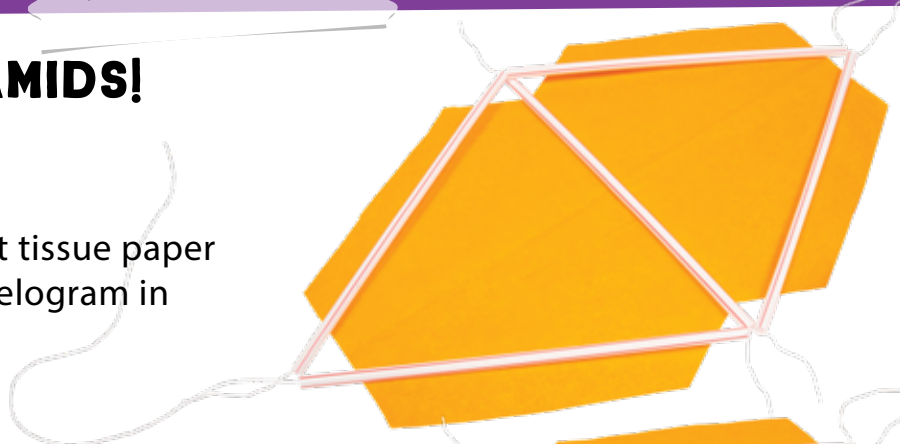


## CREATE THE PYRAMIDS!



### STEP 1

Take one piece of cut tissue paper and place one parallelogram in the center of it.



### STEP 2

Use your glue stick to place a line of glue on the strip of tissue paper outside the straw.



### STEP 3

Fold the tissue paper (with glue) over the straw and smooth it out. It's like a straw-and-tissue-paper taco! Just don't eat this one.



### STEP 4

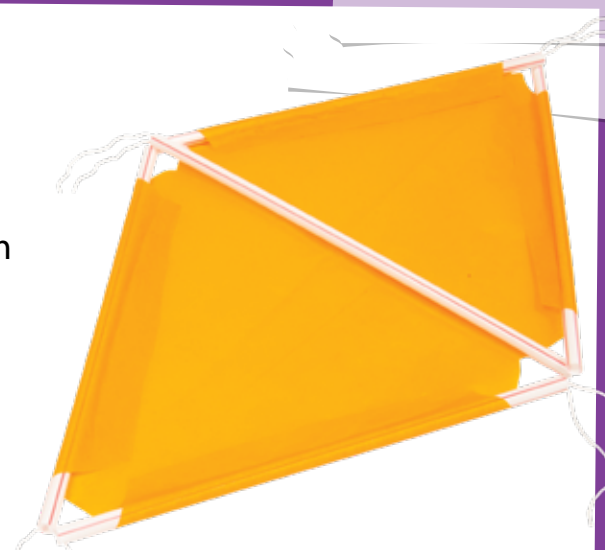
Repeat the process with the other three edges of your straws and tissue paper. Do your best to pull the tissue paper tight to make a smooth flat surface. (But be careful you don't rip the paper!)





## STEP 5

Now that your parallelogram is covered with tissue paper, we have one last straw to attach. Find the vertex of your parallelogram with a 12-inch string.



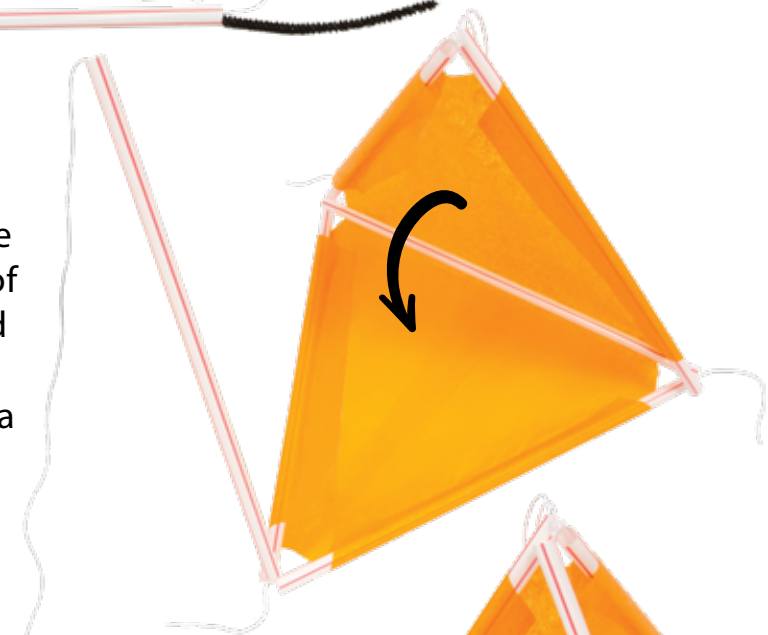
## STEP 6

Thread the string through another straw.



## STEP 7

Tie the end of the string to the string at the opposite vertex of the parallelogram. This should make your parallelogram into a tetrahedron (also known as a triangular pyramid).



## STEP 8

Tie two knots in the string to keep the tetrahedron together.



## STEP 9

Repeat Steps 1-8 with your other three parallelograms.



# ASSEMBLE YOUR KITE!



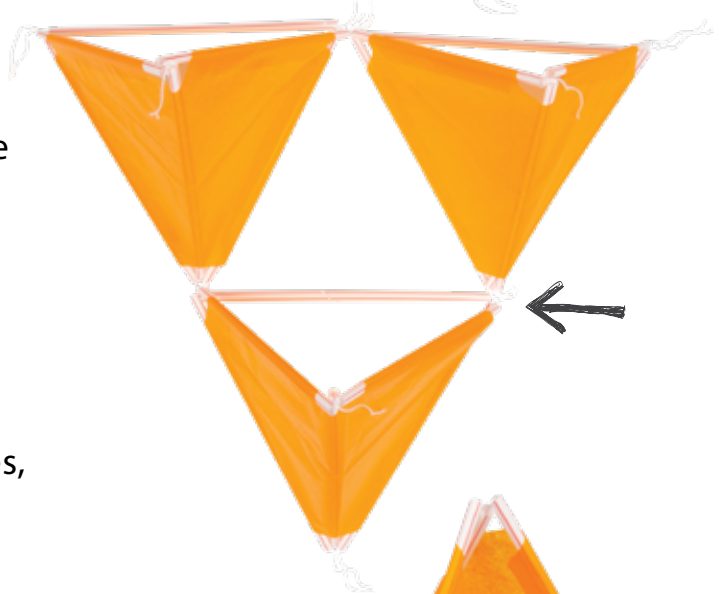
## STEP 1

Place a tetrahedron in front of you so the covered sides are facing you (the uncovered faces will be on the bottom and in the back).



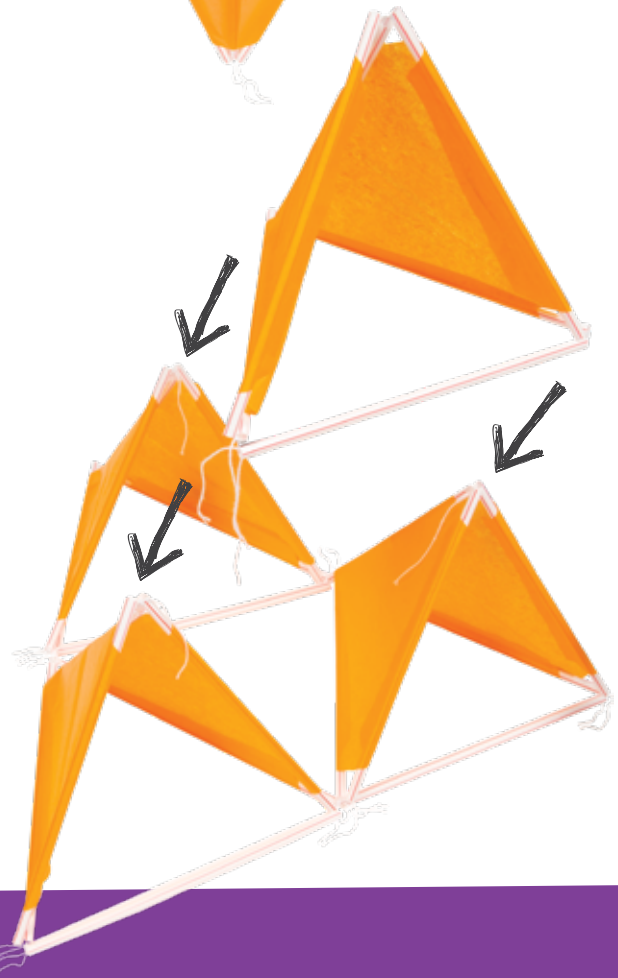
## STEP 2

Place two more tetrahedrons behind the first one (facing the same direction as the first) so the vertices touch.



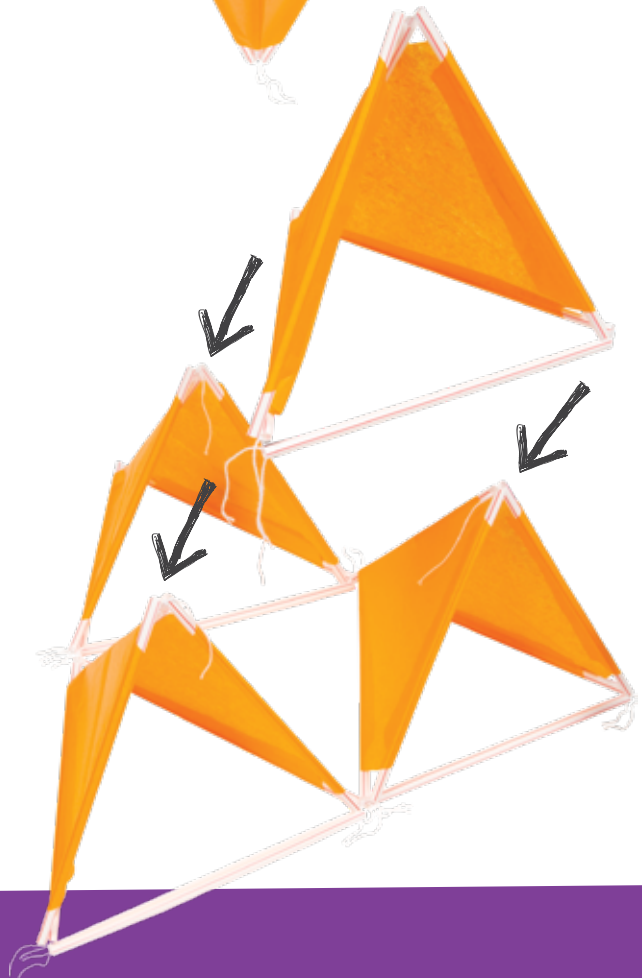
## STEP 3

Using the strings at the vertices, tie the corners of those three tetrahedrons together.



## STEP 4

Place the fourth tetrahedron on top of the other three. Make sure the uncovered faces are on the bottom and in the back.





### STEP 5

Use the strings at the vertices of the three base tetrahedrons to connect the top tetrahedron at the vertices.



### STEP 6

Locate your spool of kite string. Tie it onto the vertex at the base of the front bottom tetrahedron.

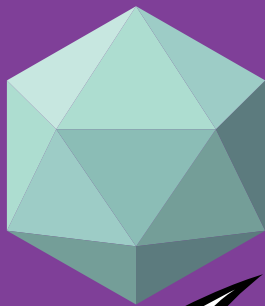
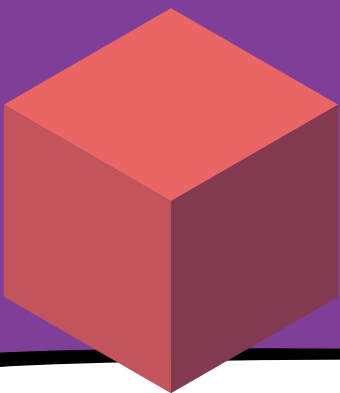


### STEP 7

Go out and fly your kite!



## THINK ABOUT IT



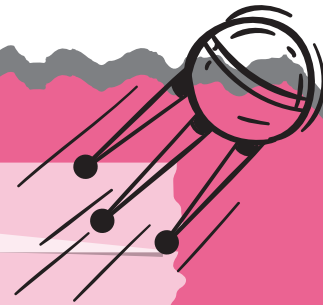
A tetrahedron is a polyhedron. There are other polyhedrons as well. Can you identify three more polyhedrons? Do you think they would make good shapes for kites? Explain why or why not.

Think about the four forces that create flight. (You can read about them in the "STEAM On Dream On" section of this booklet called *Taking Flight with STEM*.) Can you identify them when your kite is in the air? Explain them to a family member or friend.

# ACTIVITY 1

In this activity, you will assemble a Stomp Rocket Launcher as well as construct a rocket to launch. Get ready to blast off!

## LET'S MAKE



## GATHER YOUR SUPPLIES

### INCLUDED

#### STOMP ROCKET KIT



#### SAFETY GLASSES



### NOT INCLUDED

#### EMPTY PLASTIC CONTAINER

such as a water bottle, a gallon or half-gallon milk jug, or a two-liter soda bottle. Just make sure the material is thin enough that it will collapse when you stomp on it!



#### SCISSORS



#### CRAYONS OR MARKERS

#### TRANSPARENT TAPE (optional)



## SAFETY NOTE

In this activity, you will be working with objects that launch. Make sure you have enough room to launch your rocket (outdoors is best) and wear eye protection. When your rocket is launched, make sure that the flight path of the rocket (where the rocket is going) is clear. **And never attach sharp objects to this rocket.**

## LET'S MAKE A ROCKET!

### STEP 1

Find the "Rocket **Fuselage**" papers in your Stomp Rocket Kit. For this activity, you'll only use one. Save the others for Activity 3.



### STEP 2

Decorate your rocket to your preference! You'll be rolling the rocket around a PVC pipe, so the whole page won't be showing.



The fuselage is the body of a rocket or plane.

### STEP 3

Take one of the long PVC pipes and *loosely* roll the fuselage paper around the pipe. You want it to be loose enough that it can easily slide off the pipe. If you wrap it too tightly, your rocket might not launch as well.





## STEP 4

When the rocket is launched, air will be quickly pushed from the launcher to the rocket when you stomp on the container. The air will be trapped in the rocket and will force the rocket to fly. The more air you trap, the better rocket launch you will have. When making your rocket, your goal is to stop air from escaping the rocket. We'll use tape to plug up any holes where air can escape.



## STEP 5

Tape the fuselage closed (it's easier to tape if you leave it on the PVC pipe). You can use the duct tape provided or transparent or masking tape you have at home. Completely tape the seam of the paper so no air can escape.



## STEP 6

While your rocket is still on the PVC pipe, place tape over the top of the rocket fuselage. You may need to place several pieces of tape over the end.



## STEP 7

After your taping is done, remove the rocket from the PVC pipe and gently blow on the untaped end of the rocket. Do you feel any air escaping from your rocket? If so, place a piece of tape over the hole. The more air that is trapped means more pressure on the launch!



## STEP 8

Find the "Rocket **Nose Cone**" paper and cut out one of the circles.

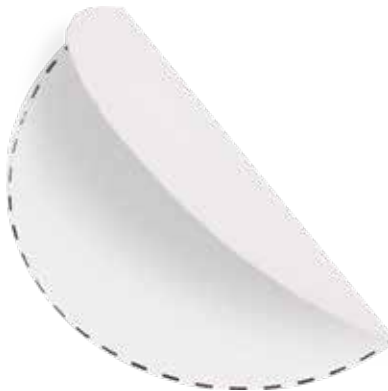
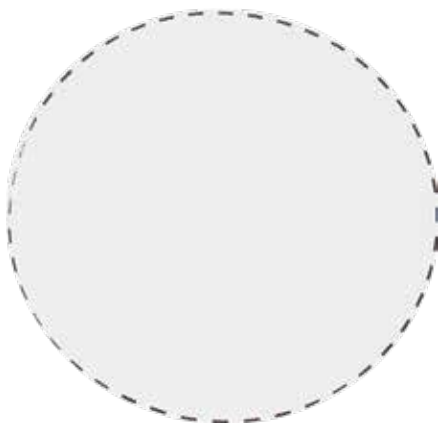


The nose cone is the front tip of a rocket or plane. It helps the rocket or plane fly faster.



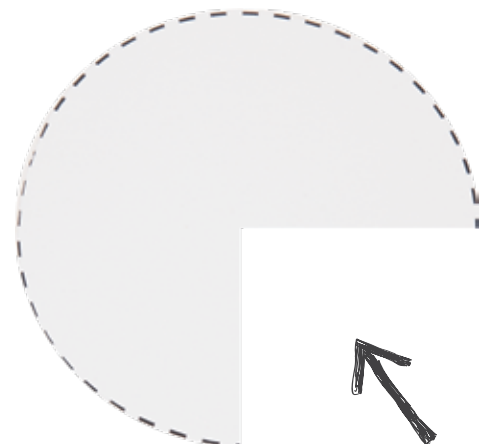
## STEP 9

Fold the circle in half and then rotate the circle 90 degrees and fold it again. Your circle should now be in fourths (four equal parts).



## STEP 10

Cut out one of the fourths by cutting along the folded lines.

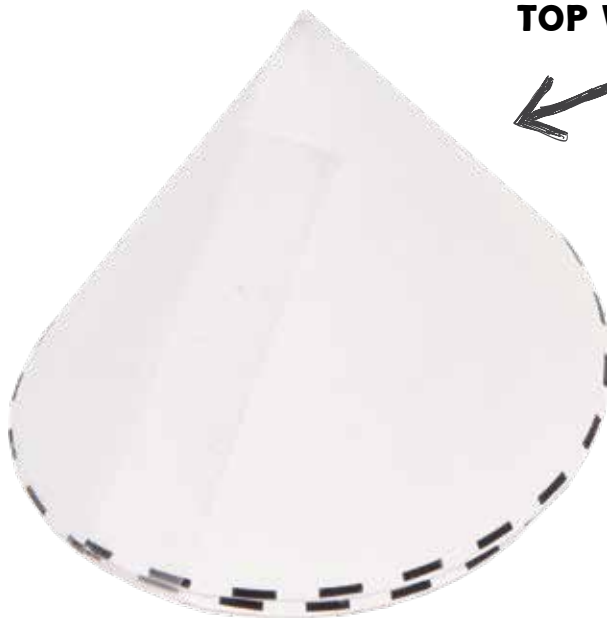






## STEP 11

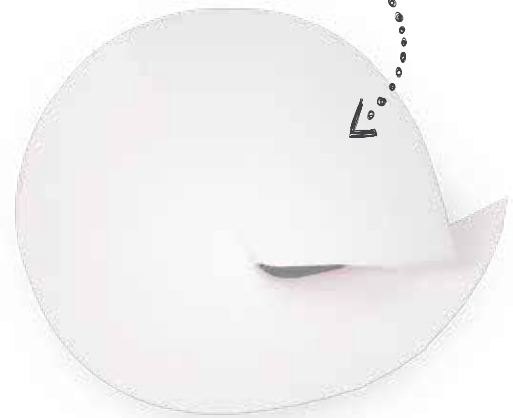
If you want to decorate your nose cone, now is the time! When you are finished decorating, take the two ends of the nose cone (where you cut out the piece) and bring them together until they overlap to form a cone shape. Place a piece of tape over the seam.



TOP VIEW



BOTTOM VIEW



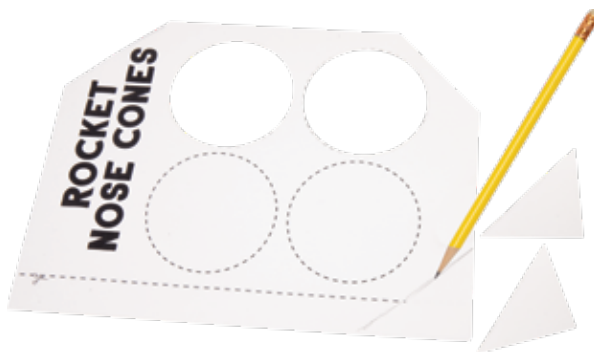
## STEP 12

You now have a nose cone! Tape the nose cone onto the taped end of your rocket. Your nose cone probably hangs over the side of the fuselage. You can place tape under the nose cone attaching it to the fuselage. Or, use your creativity to attach it in another way!



### STEP 13

The last thing you'll want to add to your rocket is fins. These will help the rocket fly straighter. The easiest way to make fins is to cut off the corner of a paper. You can use a piece of scrap paper or the corners from the "Rocket Nose Cone" paper. You'll want them to be about as long as your finger. And the fins **MUST** be a triangle with a right angle (which is why a corner works so well!). You can decorate your fins, if you want.



**TRIANGLE WITH  
A RIGHT ANGLE**



### STEP 14

When you have three fins about the same length, attach them to the bottom of the rocket's fuselage. Place a piece of tape half on and half off the triangle.



### STEP 15

Attach the tape and fin to the fuselage.

### STEP 16

Place a piece of tape on the other side of the fin to secure it to the rocket.

### STEP 17

Repeat Steps 14-16 with the other two fins.

### STEP 18

Your rocket is done!

# LET'S BUILD THE LAUNCHER!



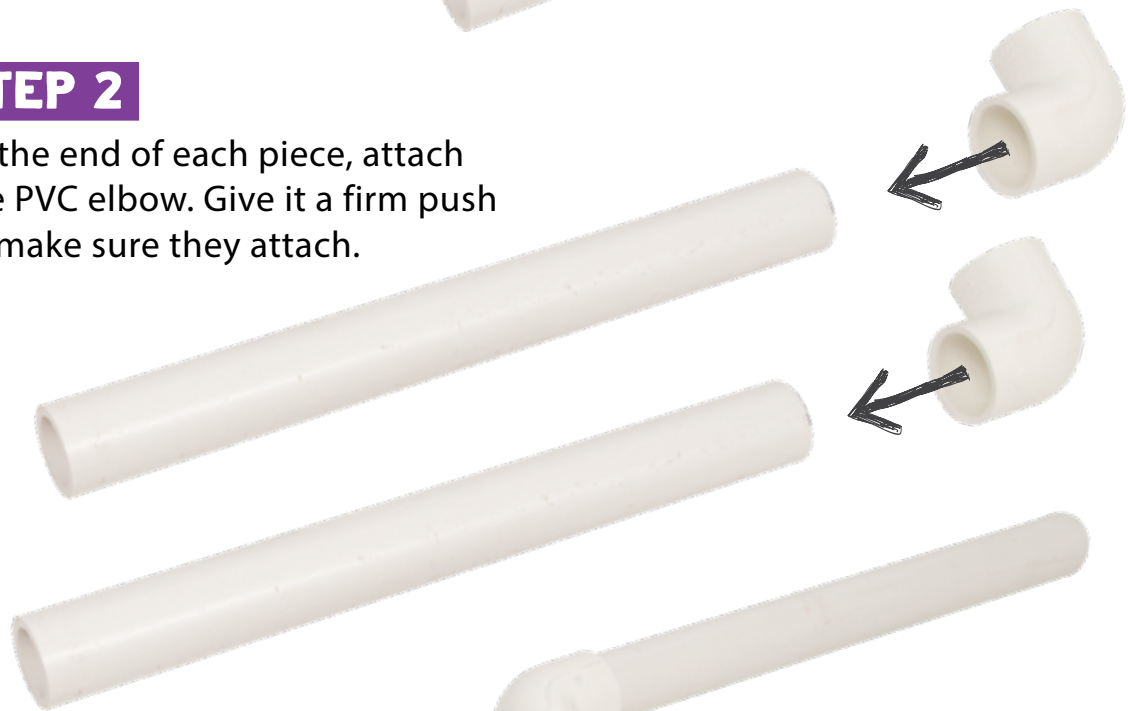
## STEP 1

Find the two long pieces of PVC pipe.



## STEP 2

At the end of each piece, attach the PVC elbow. Give it a firm push to make sure they attach.



## STEP 3

Connect the small piece of PVC pipe to each elbow.



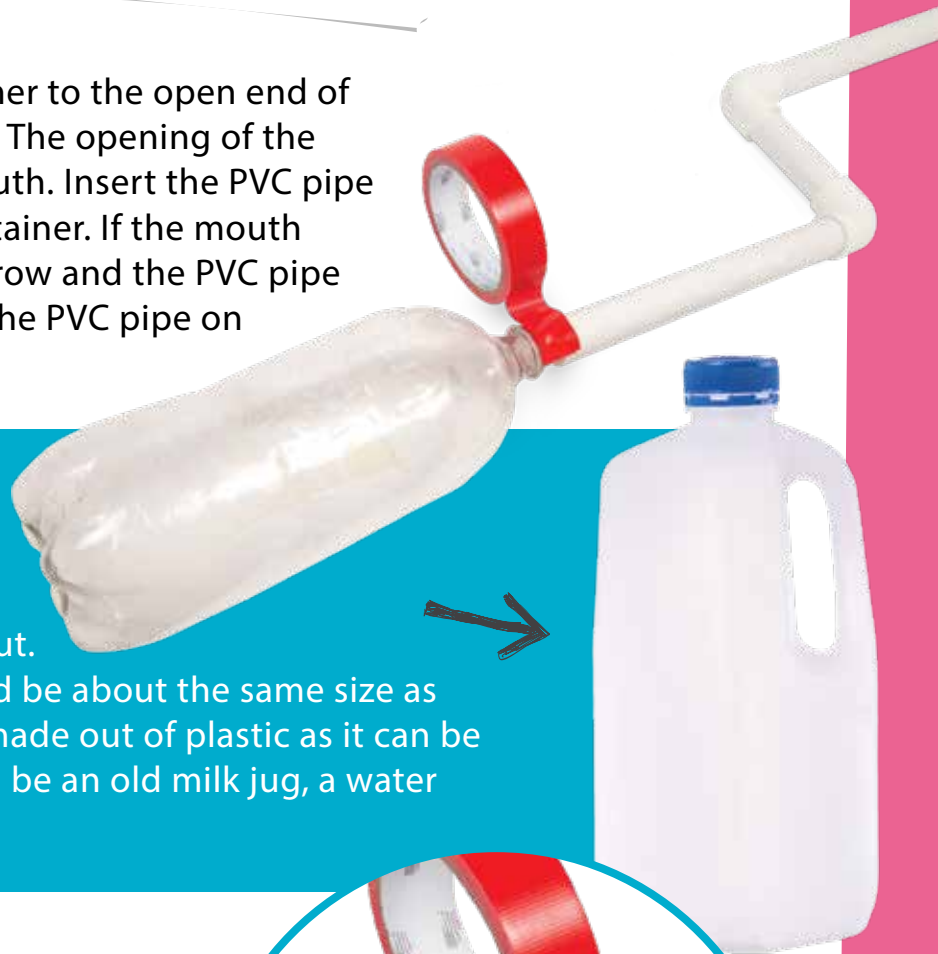
## STEP 4

Attach your empty container to the open end of one of the long PVC pipes. The opening of the container is called the mouth. Insert the PVC pipe into the mouth of the container. If the mouth of the container is too narrow and the PVC pipe cannot fit inside it, stack the PVC pipe on top of the mouth.

## TIP

Your container needs to have flexible sides so when you stomp on it, it collapses, forcing the air out.

The mouth of the container should be about the same size as your PVC pipe. It also helps if it's made out of plastic as it can be inflated after each launch. It could be an old milk jug, a water bottle, a soda bottle – you decide!



## STEP 5

Use the duct tape to secure the pipe and container together. You'll want to make sure no air is able to escape from this seal.



## STEP 6

The PVC pipe without the container attached is where your rocket will go. You can rotate the PVC pipe around the elbow to change the launch angle.

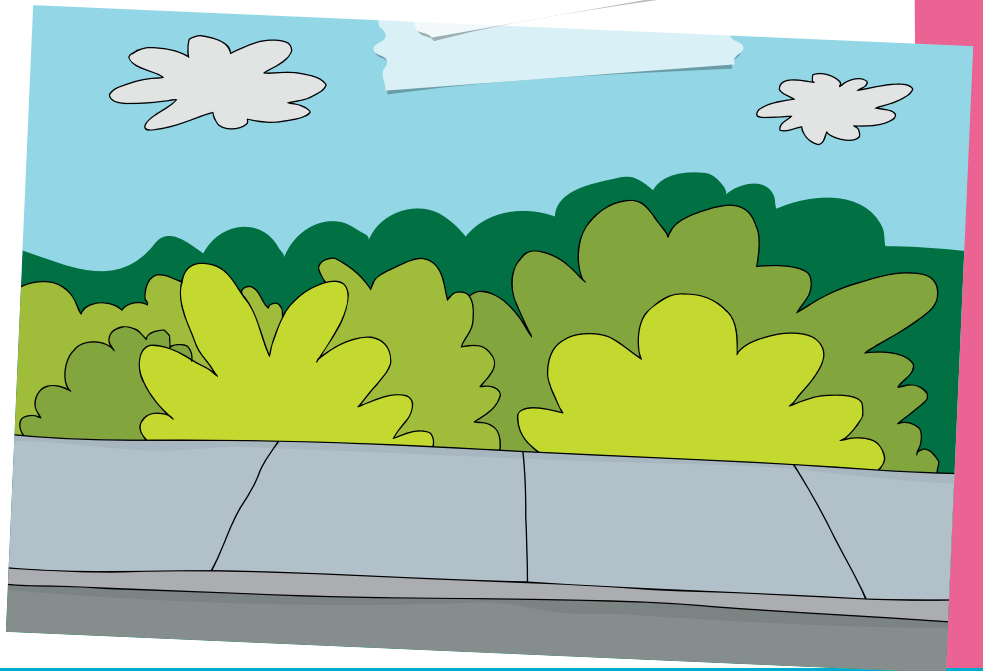


## LIFT OFF!



### STEP 1

Place your rocket launcher on a firm, flat surface. A cement sidewalk or wood deck is a great location!



### SAFETY TIP

Avoid launching from uneven places such as grass because the launcher can turn when the container is stomped on. This can be dangerous as it might send your rocket in an unexpected direction. And don't forget to put on those safety glasses before launching!



### STEP 2

Place your rocket on the launcher. Make sure the rocket is loosely placed on the pipe – it needs to easily launch for the best result.



### STEP 3

Stand by your container and check your launch area one last time to ensure that it's clear.





### STEP 4

STOMP on your container to send your rocket into the sky!



### STEP 5

To launch your rocket multiple times, cup your hand around the pipe where the rocket launches from. Blow into your hand to inflate the container. Don't blow directly onto the pipe unless you've washed the pipe off and you are the only one blowing on it.



### STEP 6

Launch your rocket as many times as you'd like. Try moving the pipe the rocket is launched from and see how different angles affect the rocket's flight path.

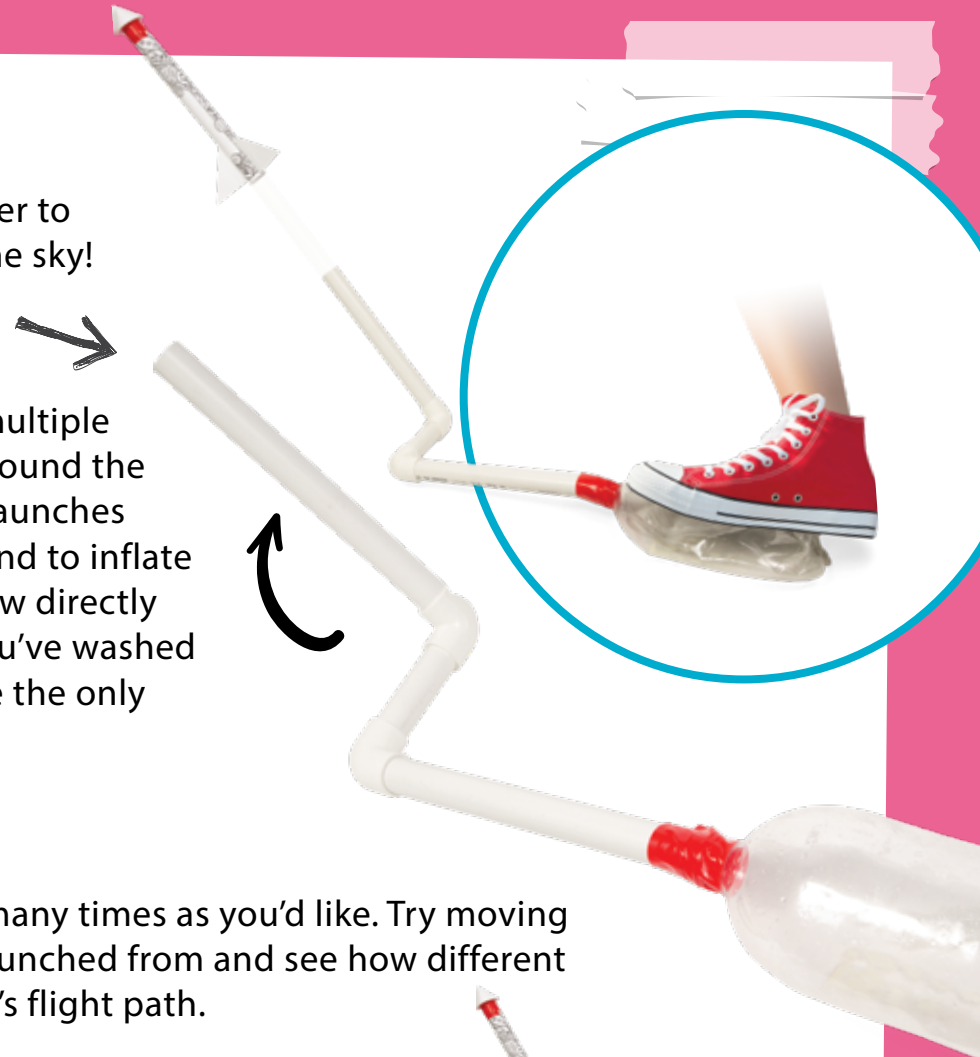


### STEP 7

Save your rocket for the next activity.

### EXTENSION ACTIVITY

Use the template and the cardboard box this kit arrived in to enhance your launcher with decorations as well as a way to measure the launch angle!



# THINK ABOUT IT

Why do you need to put tape over the top of the rocket before putting on the nose cone? What would happen if you didn't?

Space exploration is expanding more and more. Head over to [Spaceplace.nasa.gov](https://www.spaceplace.nasa.gov) and see what NASA is currently doing to explore the skies!

