

## **INFORMATION FOR TEACHERS:**

Paper Takes Flight is the main program of The Balloon Explorium, a not-for-profit organization of volunteers with a passion for ballooning. We work primarily in New Mexico and, possibly, adjacent states. In most cases, we deliver materials to your school well ahead of time for you to build your balloons.

The PTF activity is intended primarily for Grade 5 classes. Students will cut out and assemble the five foot tissue paper balloons together. On your assigned "fly day", volunteers from The Balloon Explorium will come to your school to share information about lighter-than-air flight with your students and fly the tissue paper balloons on your field or large play area. As for all ballooning, this activity is weather dependent. If we need to reschedule due to wind or wet weather, we will contact you to arrange alternatives.

Here's the plan:

1. All materials will be provided for one balloon per four students. It takes 60-90 minutes to build the balloons. That time can be divided, and once the glue has dried, balloons can be stored in big trash bags.
2. Volunteers will be available to train teachers at your school. If you need this training, please contact us ahead of time and before you start building balloons with students.
3. Our volunteers will come to your school to launch the tissue paper balloons at a date and time convenient to you between November 15 and January 31. The duration of flying time is generally about one hour.

**The application phase will open on August 15, 2026, through the CONTACT tab on our website: [www.theballoonexplorium.org](http://www.theballoonexplorium.org) The application window closes on September 15, 2026. Schools will be chosen on a first come, first served basis. The number of schools will be limited.**

**NOTE:** Our November - January program is primarily for the Albuquerque metropolitan area. We do encourage others (other schools, museums, community events) to use CONTACT and Teacher Request to indicate interest in the program. We will do our best to accommodate everyone.

## **INSTRUCTIONS FOR MAKING THE BALLOONS:**

(See also the four Building Balloons videos on our YouTube link.)

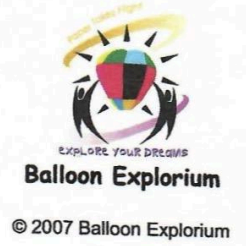
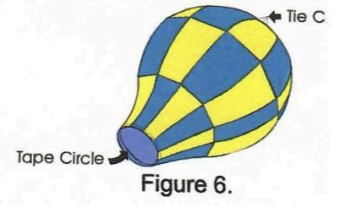
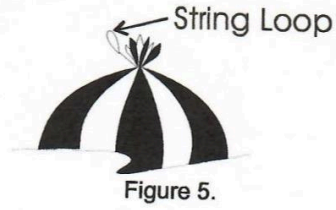
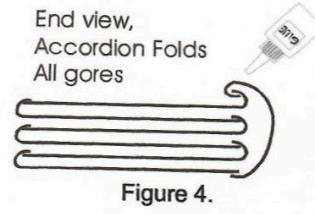
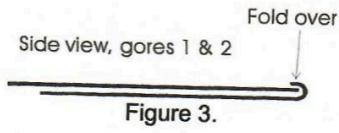
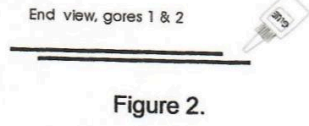
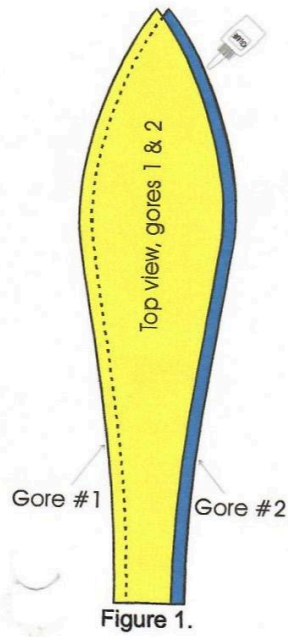
The balloon is made of seven "gores" of tissue paper. Two and one half sheets of tissue paper will make one gore. Each gore can be unique using different colors of tissue paper, or make gores all one color. Use your imagination!

Gores will be glued together, leaving openings at the top and bottom. A string will close the top, and a ring of dry wall tape attached at the bottom to create the throat, allowing for inflation. Gores can be decorated with scraps of tissue at the end of the building process, but be careful not to add too much weight or the balloon will not fly well.

Instructions:

1. Glue short ends of 2 ½ sheets together to make one large rectangle approximately 75" long and 20" wide. Repeat 6 more times, making a total of 7 long rectangles.
2. Use the pattern provided to cut out 7 gores from the rectangles built in step 1. Stack all seven rectangles and cut all at one time. Save the scraps to use for repairs.
3. Select two gores. Set the others aside. Lay one on top of the other, allowing a ½" margin to show on the bottom gore (figure 1).
4. Apply the glue stick heavily to the margin of the bottom gore #1 (figure 2). Do not skimp on the glue. You want a solid seam. Fold this ½" up over the edge of gore #2 as you go along (figure 3). Press firmly together.
5. Place gore #3 on top of gore #2, allowing a ½" margin to show on gore #2 on the *opposite*, unglued side. Repeat gluing as in the previous step.
6. Glue up the remaining 4 gores using the above method (accordion fashion). Pull the bottom gore (#1) out a bit. Glue the free edges of gore #1 and gore #7, to join all gores (figure 4). This will make a circle when opened.
7. During and after gluing, carefully separate all folds to keep them from sticking together. This is Important!
8. Tie off the top of the balloon with string, about 3" back from the top to close the hole at top of the balloon. (figure 5).
9. Your drywall tape has already been stapled together to form a ring for a 9" throat. Do not make the ring smaller than the 9" diameter as it needs to be this size to fit over the burner and to launch properly.
10. Open the hole in the bottom of the balloon and shape the bottom to fit the 9" throat by making tucks or gathers. Place the ring inside the opening and fold paper over it about 1", gluing into place (figure 6). Gently hold the balloon by its top and pull it open to its round shape. This helps ensure the layers do not stick to one another and lets you check for any seams that are not well glued. We suggest you give your balloon a name and write your names on the inside of the throat.
11. Let the balloon dry thoroughly. You can inflate with a fan or hair dryer to check for holes, loose edges, etc. Make necessary repairs with glue and paper or tape. A fan or hair dryer is not sufficient to launch the balloon. Your balloon can be gently rolled or folded and stored on a shelf or in a trash bag until your fly day.

**YOUR BALLOON IS NOW READY FOR LAUNCHING!**



## Extensions:

1. Have students determine the surface area of the balloon and compare the duration of the flight in relationship to the surface area.
2. Have students pretend they are in charge of picking the animals that will fly in the first balloon. What animals will you pick and why? (K-4)
3. Have students draw what they think the first balloon would have looked like if they had been Etienne and Joseph Montgolfier. (K-4)
4. Have students write a story about what it was like to fly in a Montgolfier balloon. Focus on what it felt like to take off, fly and land and what they saw. (K-4) and (5-8)
5. Discuss the difference between flying in a balloon and flying in an airplane. Include such concepts as steering, runway vs. going straight up, wings and lift, knowing where you are going to land, and basket vs. inside a plane. (5-8)
6. Discuss why students think ballooning became so popular in the 1800s in Europe? (K-4)
7. Discuss which gas you think is the best one to use in a long distance balloon flight and why? (5-8)
8. Explain why a gas balloon rises and falls with changes in outside temperature. (5-8)
9. Discuss the concept of hypoxia and what changes it makes in the body. (5-8)
10. Research the fashions, music and entertainment of the Victorian Age related to balloons.(5-8)
11. Discuss why students think people designed and built special shape balloons? Which is your favorite? (K-4)
12. Name the parts of a balloon and their function. (5-8)
13. Design your own balloon and a pin to go with it. (5-8)
14. Fly the same tissue paper balloon several times, but hold it over the heat for different periods of time before each flight (60, 75, 90, 105 seconds). The longer the balloon is held over the heat the hotter the air inside the balloon. Measure the duration of each flight. Graph the differences with the "Y" axis as the duration of the flight and the "X" axis as the length of time the balloon was heated.
15. Use your template to make balloons out of different materials (paper bag, newspaper, plastic trash bag\*, etc). By making these test balloons all the same size, the air volume will be the same in all balloons. Have the students weigh the balloons. Hold each balloon over the heat source the same length of time and fly them. Better yet, use a digital meat thermometer inserted in the top of the balloon to launch all balloons at the same temp.

Be certain to find a thermometer that will measure up to 200 degrees celcius. Use a watch to measure the duration of each flight. Graph the differences with the "Y" axis as the duration and the "X" axis as the material used. Did all the balloons fly? What is the weight of the heaviest balloon that flew?

\*Instead of glue, use masking tape to seal the seams gores made of plastic.

## Math Integration:

Make balloons of different sizes. Weigh each one. Find the volume of each balloon. How does the ratio of weight to volume affect the balloon's flight? How would you graph the results?

Steps to find the volume of a balloon

- Measure the equatorial circumference of each balloon when inflated.
- Divide the circumference by pi (3.1416) to get the diameter.
- Divide the diameter by 2 to get the radius (r)
- To find the balloon's volume cube the radius (r x r x r)
- Multiply that number by pi (3.1416)
- Multiply that number by 4 and divide by 3

Formulas used

Volume of a sphere =  $(4/3) * \pi * r^3$

Circumference = diameter \* pi

Note - This process would be exact if your balloon was a perfect sphere, which it is not. However, it will provide you with accurate enough numbers for your experiments.