National Aeronautics and Space Administration

Balloons

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Lesson 2: Balloons

The first people who took to the skies were balloonists. Balloons offer the opportunity to teach young children about **sinking** and **floating**, and to learn about early concepts of volume, density, buoyancy, and **weight**. In this module, students are read *Hot Air: The (Mostly) True Story of the First Hot Air Balloon Ride*. Children then re-create the hot air balloon ride with helium-filled balloons (latex or Mylar), an origami paper basket, and paper animal cut-outs of the first animals to ride in a hot air balloon: a rooster, a sheep and a duck.

Focus Storybook

Hot Air: The (Mostly) True Story of the First Hot Air Balloon Ride
Cover and illustrations from HOT AIR by Marjorie Priceman

Learning Goals

Language	• Vocabulary: Sinking, Floating. • Writing: Write the letter B.
Math	• Count animals of various types. • Identify objects as having more or less mass/weight.
Science / Engineering	• Identify objects as floating or sinking. • Identify and describe the properties of solids, liquids, and gasses. • Design a floating object/boat. • Launch a hot air balloon.
Fine Motor Skills	• Fold a simple origami cup.

Key Q's

What kinds of things sink/float? Why do some things sink/float? What is weight?
Primary Materials

Primary Materials

Balloons w/**air** and **w/helium** (mylar or latex)

Ribbon

Printer Paper

Stapler

Animal templates

Paper lantern

Heat source (hair dryer)

Streamer Paper

Animal templates

Resources

High Flyers e-Book

Science / Engineering: Pre-Reading Activities

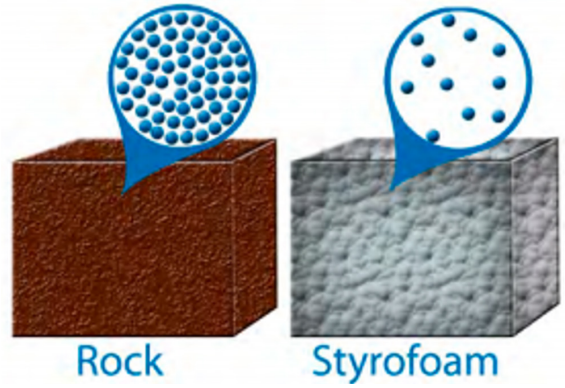
Allow students to investigate floating and sinking objects. On a simple level, ask students to describe what kinds of things sink, and what kinds of things float. Although this concept might be too advanced for some students, be aware that the real difference between sinking and floating objects is *density*, not just mass. The following are some possible supplemental activities to help students understand the concepts of sinking and floating:

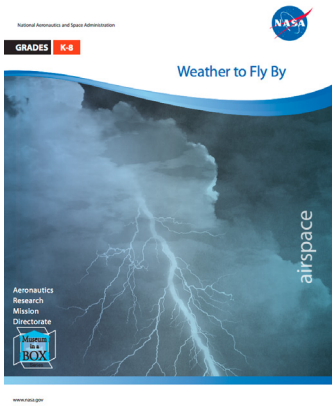
Investigation: Sinking and Floating Objects

Classify sinking and floating objects. Provide students with a variety of sinking and floating objects, along with a large tub of water. Allow students to classify objects as sinking or floating, and ask students to hypothesize why some things sink, and why some things float.

Interactive Demonstration: Soda and Oranges

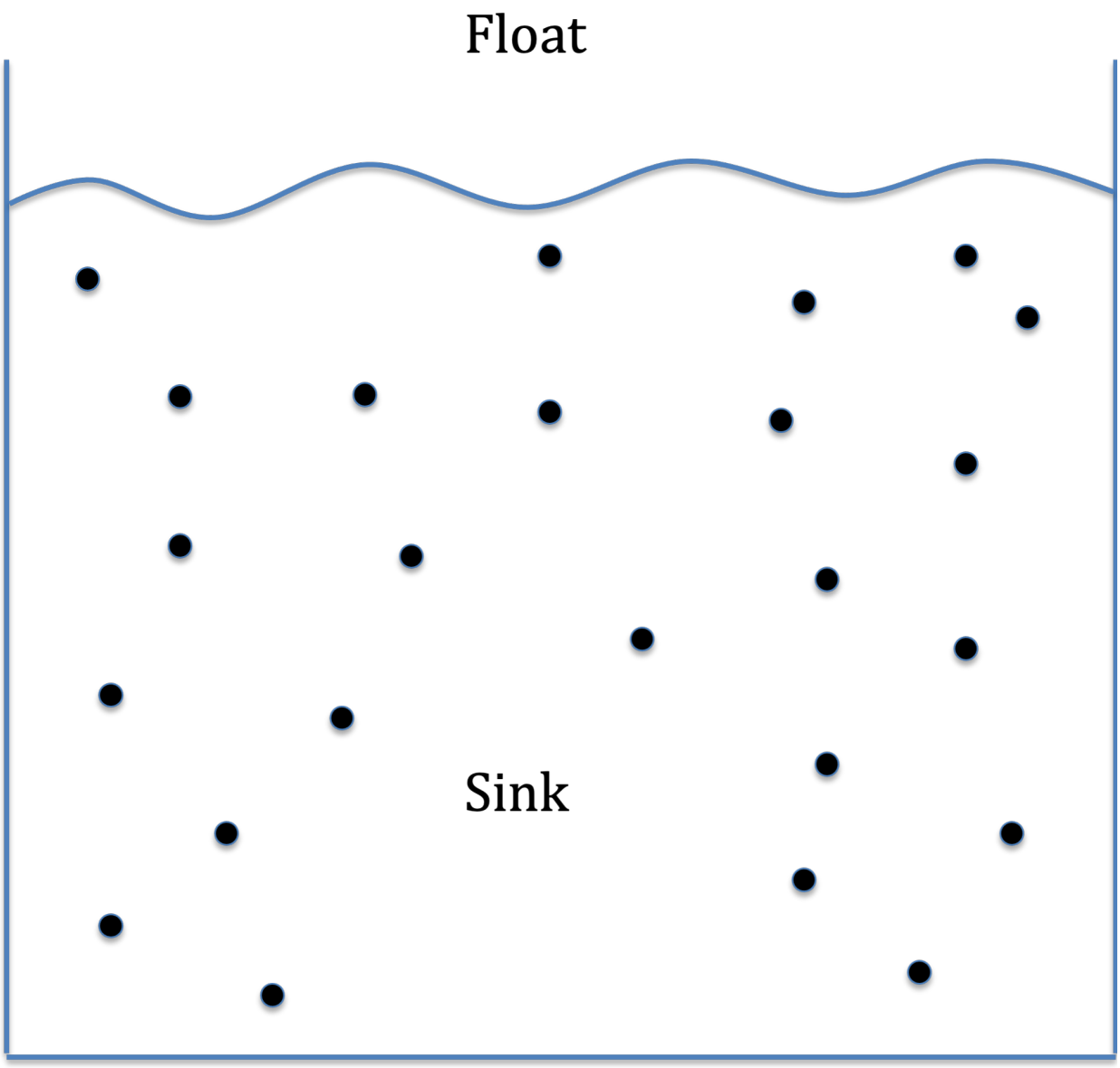
Provide a cognitive-dissonance activity about sinking and floating. Ask students what they think will happen (sink or float) to two similar objects: 1) a can of regular and can of diet soda, or 2) a whole orange with its rind and a whole orange without its rind. In both cases, one will sink, and one will float. To help students see why an unpeeled orange floats, have students look at the rind under the microscope – they should see small cells filled with gas.



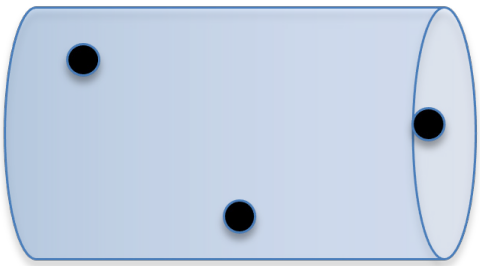


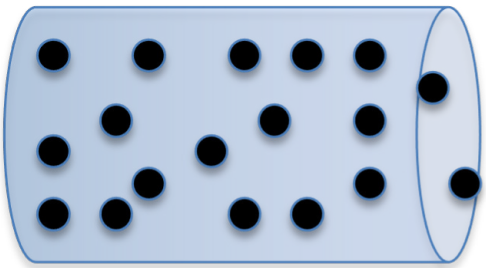
For more information on this soda can activity, please check out NASA's Museum in a Box, Weather to Fly By lesson for K-8

To help students visualize the difference in density of the two soda cans, use the following worksheet. Prepare cut-out examples of cans with varying densities, and ask students to demonstrate that they know which can would sink and which can would float. *Have students place the denser object on the bottom of the container of the fluid, and the less dense object near the surface of the fluid.* (Note: The denser object will sink, and the less dense object will float).



Cut out the two "cans" below, and ask students to place them on the image above where they would go if they were placed into the "tank of water."





Application: Density Column

Practice pouring in order to create a a colorful density column, and drop small items to see where they land within the column. Use liquids of varying densities (water, cooking oil, corn syrup, maple syrup) and food coloring to make a beautiful density column.

Interactive Demonstration: Sensory Bottles

Create water sensory bottles with colored water and oil, and add glitter, beads, or other small objects for appeal. In particular, ask students to predict how a very massive amount of oil will behave when mixed with a very small amount of water. Students are often surprised to see that the "heavy" oil still floats on top!

Experiment: Floating Boats

Using a container of water, aluminum foil, and small masses or coins, have students build the best boat possible to support the most weight. (Students who maximize volume while minimizing surface area – i.e. spherical boats – tend to hold the most mass!)

Interactive Demonstration: Salt Water

Demonstrate that a change in the surrounding fluid also can determine if something is going to sink or float. Add salt water to a container with an egg in it. As the salt dissolves in the water, and makes the fluid more dense, students will see the egg begin to float.

Interactive Demonstration: Floating and Sinking Balloons

Provide students with helium-filled and air-filled balloons without telling them that the gasses inside are different. (*Caution: Some schools prohibit the use of latex balloons. Mylar balloons can easily be substituted.) If appropriate, allow students to tug on the helium-filled balloons to feel the upward force, and to compare that to holding an air-filled balloon. Ask students to compare the two balloons.

Reading Hot Air: The (Mostly) True Story of the First Hot Air Balloon

Cover and illustrations from HOT AIR
by Marjorie Priceman
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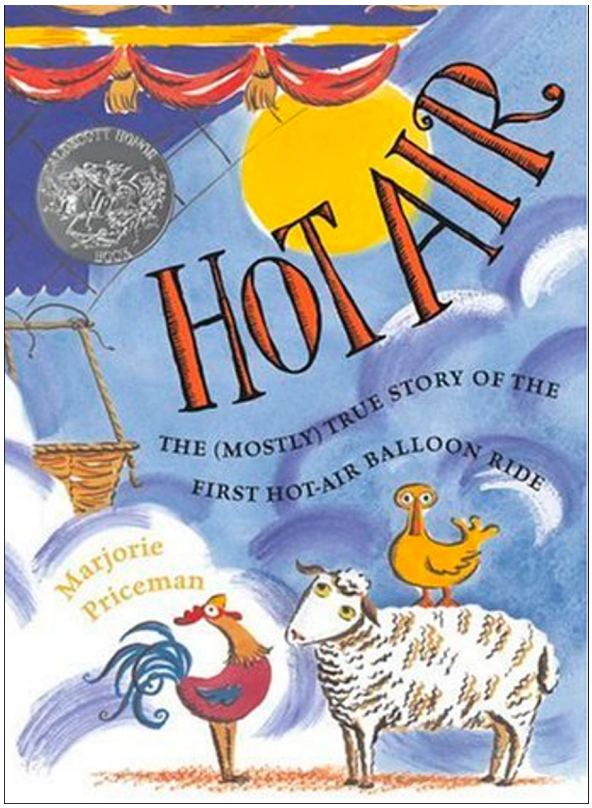

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Read *Hot Air: The (Mostly) True Story of the First Hot Air Balloon Ride*. While there is some significant amount of text within the first few pages, and on the last page, most of the story is visual. If possible, ask students to help narrate the story based upon the clues they get from the book.

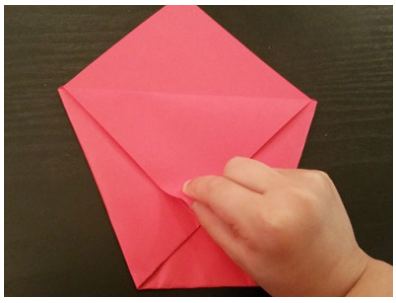
Use some of the following strategies to engage children:

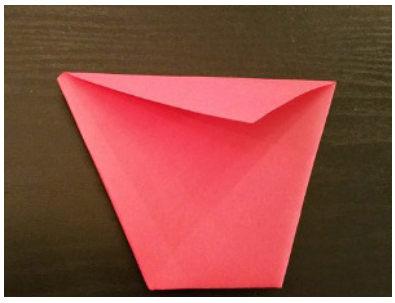
- On the first page of the book, the large balloon is displayed, surrounded by smoke. Ask children:
  - Why is there smoke around the bottom of the hot air balloon? *The first hot air balloon was filled using a large bonfire.*
- On the second page of text, there is an image of a servant preparing some food for a dog. As he removes the cloche covering the food, steam is shown to be travelling upward. Ask children:
  - What does the purple swirl represent? *The swirl represents steam rising upward.*
  - Why is it going up? *This is a key concept to help students understand that hot air rises, as with the hot air balloon!*
- Have students interact with the animal sounds by repeating them as they are read. *Allow students to make "baa," "quack," and "cock-a-doodle-doo" sounds. Students will be surprised and delighted to hear the rooster go "moo" in the story!*
- Midway through the flight, a group of birds passes by the hot air balloon. Do birds fly in the same way as hot air balloons? What is different? *Hot air balloons float, but birds must flap to stay aloft.*
- Ask students why the balloon first went up. *It was filled with hot air, which is less dense than the surrounding air, so it floats.*
- Ask students why the balloon came back down. *A small bird popped the balloon with its beak, releasing the hot air, and causing the balloon to sink back to the ground.*

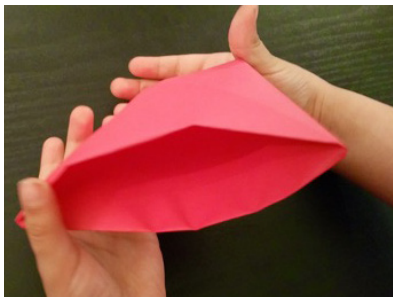
Science / Engineering: Book-Based Activities

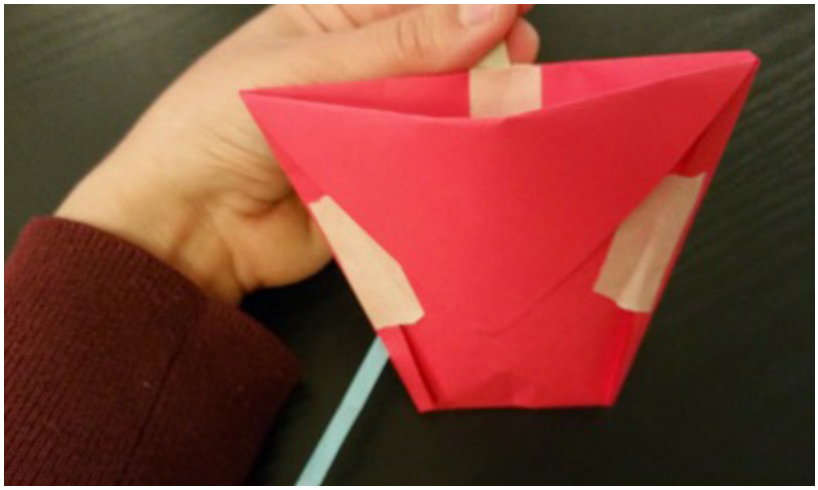
Experiment: Helium Balloon Activity

Model the use of balloons to lift up weight by creating a model air balloon with one or more of the helium balloons. Either create a "basket" or have students create a basket by making an origami cup. (Note: To lighten the weight of the "basket," consider cutting off any excess flaps.) Staple or tape the balloon basket to the ribbon of the balloon.









Provide students with an adequate number of cut-outs of the animal templates provided. Use standard printer paper, so that multiple animals can be supported by the balloon in the basket before sinking. Allow students to add one animal at a time, to see how many animals can be supported by the balloon until it begins to sink.

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Have students count the animals of each type that fit into the basket.

Supplemental activities to go further:

a. Compare balloon sizes (volumes). Using the same animals, see how the size of balloons affects the number of animals that can be held. (Bigger balloons tend to hold more.)

b. Compare animal sizes. Using one animal of each type per trial, see how many animals can be held when filling the basket only with ducks, roosters, and sheep. (Balloons should hold fewer of the larger animals, due to their mass, and the equivalent mass of the larger paper).

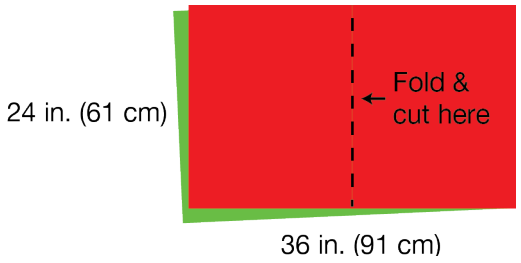
Interactive Demonstration: Hot Air Balloon

However, in this case of Hot Air, the helium-filled balloon does not work as hot air balloons do. To demonstrate this, launch a hot air balloon. Paper balloons can be easily built with tissue paper, or purchased as Chinese lanterns. (Caution: Use a hair dryer or other safe heating device – never launch a Chinese lantern for lessons using the provided candle sold with commercial Chinese lanterns, as this could be both dangerous as well as interfere with FAA regulations.)

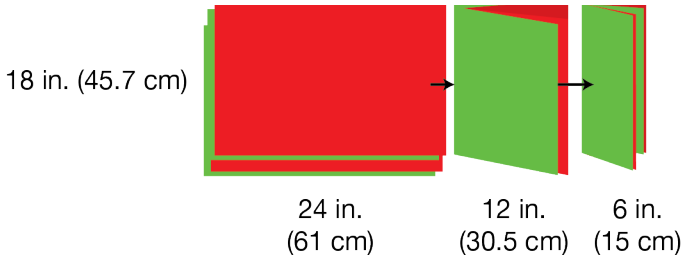
See instructions on the following page for how to build your own hot air balloon from tissue paper.

To make your own hot air balloon in advance of lesson, follow these instructions, and visit The Courage to Soar: Lesson 14 – Discovering the Properties of Air. Note: Ensure that this hot air balloon is capable of flying before trying with the class! It might be necessary to use a heat source much more powerful than a hair dryer. Instructions for heating the hot air balloon with a grill and stovepipe are included in the referenced document. Please consider safety when doing such activities with very small children.

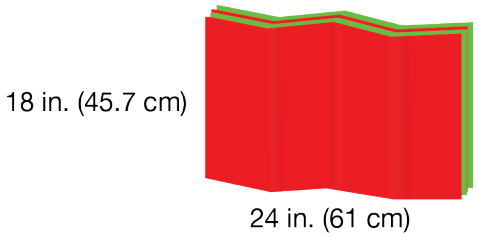
1. Fold two sheets of different colors of tissue paper in half. Cut both sheets on the fold.



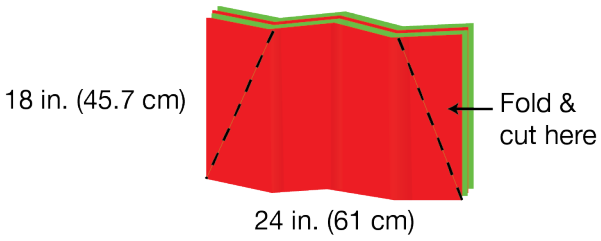
2. Place these four sheets on top of one another, and fold in half again. Then fold in half (lengthwise, again).



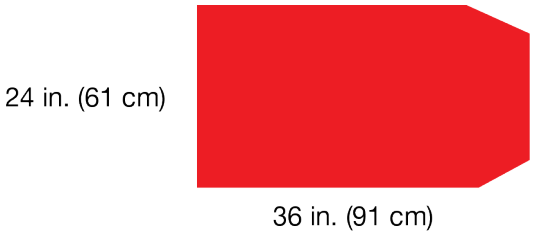
3. Open. There should be three vertical folds dividing the paper into four equal panels.



4. On the far right panel, make a diagonal fold from the bottom right corner to the top of the nearest fold. One the far left panel, make a diagonal fold from the bottom left corner to the top of the nearest fold. You should now see the shape of the trapezoid. Cut on the outer diagonal folds to make four trapezoids.

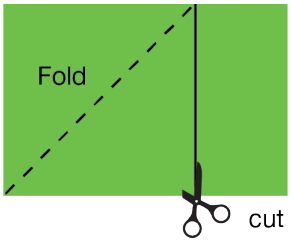


5. Lay a large (uncut) sheet of tissue paper on the table. Glue the long side of the trapezoid to the bottom of the sheet. They should match up to be the exact length. Repeat this process until each of the four large sheets has a trapezoid glued to the bottom. Make sure the glue is thick and continuous so that no air can escape.



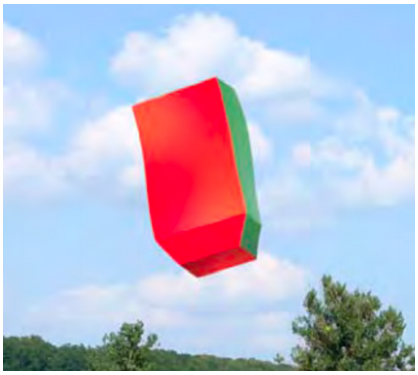
6. Glue the four panels together so that they become the sides of the balloon. Then glue the four trapezoids together so that they form a funnel-like opening at the bottom. Again, make sure that the glue is thick and continuous

7. Using the last sheet, take the upper right corner and fold it over diagonally until it touches the bottom edge and the two bottom edges line up. Cut along the left edge of this folded triangle so that the rest of the panel becomes detached. Open the triangle to produce a square. Thoroughly glue this square onto the four panels to form the top of the balloon.



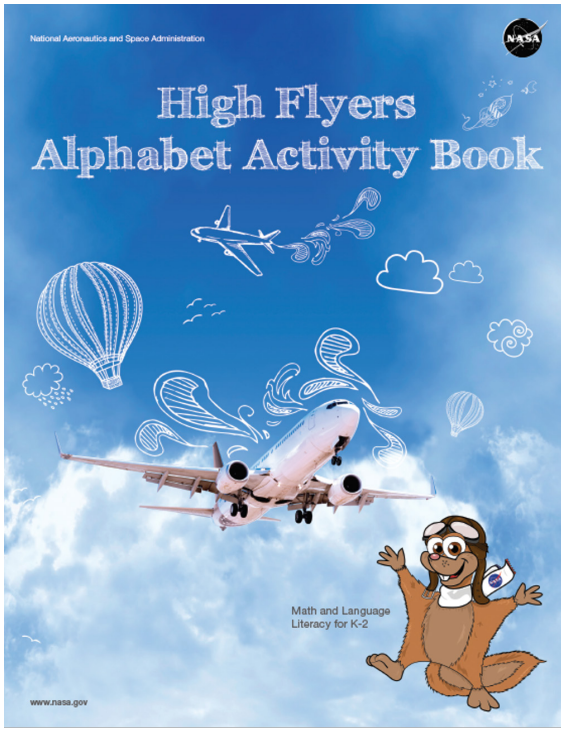
8. Tape four pennies or paper clips at the bottom where the edges of each trapezoid meet.

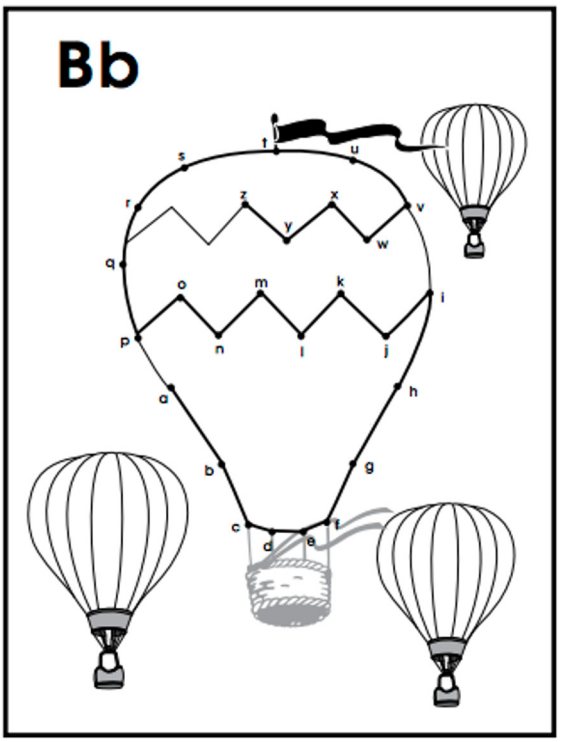
9. Let the glue dry overnight.



Writing: “B”

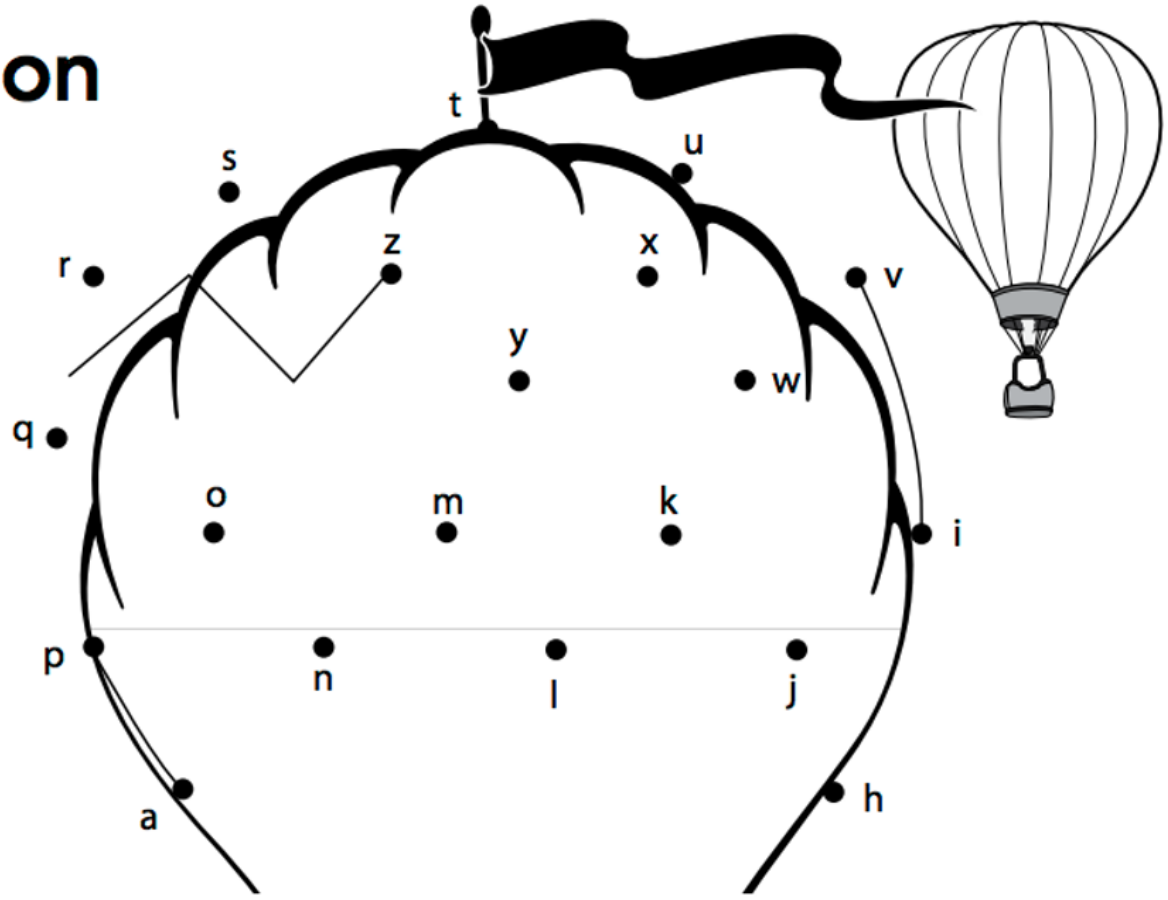
Practice writing the letter B. Use NASA’s High Flyers Alphabet Activity Book.

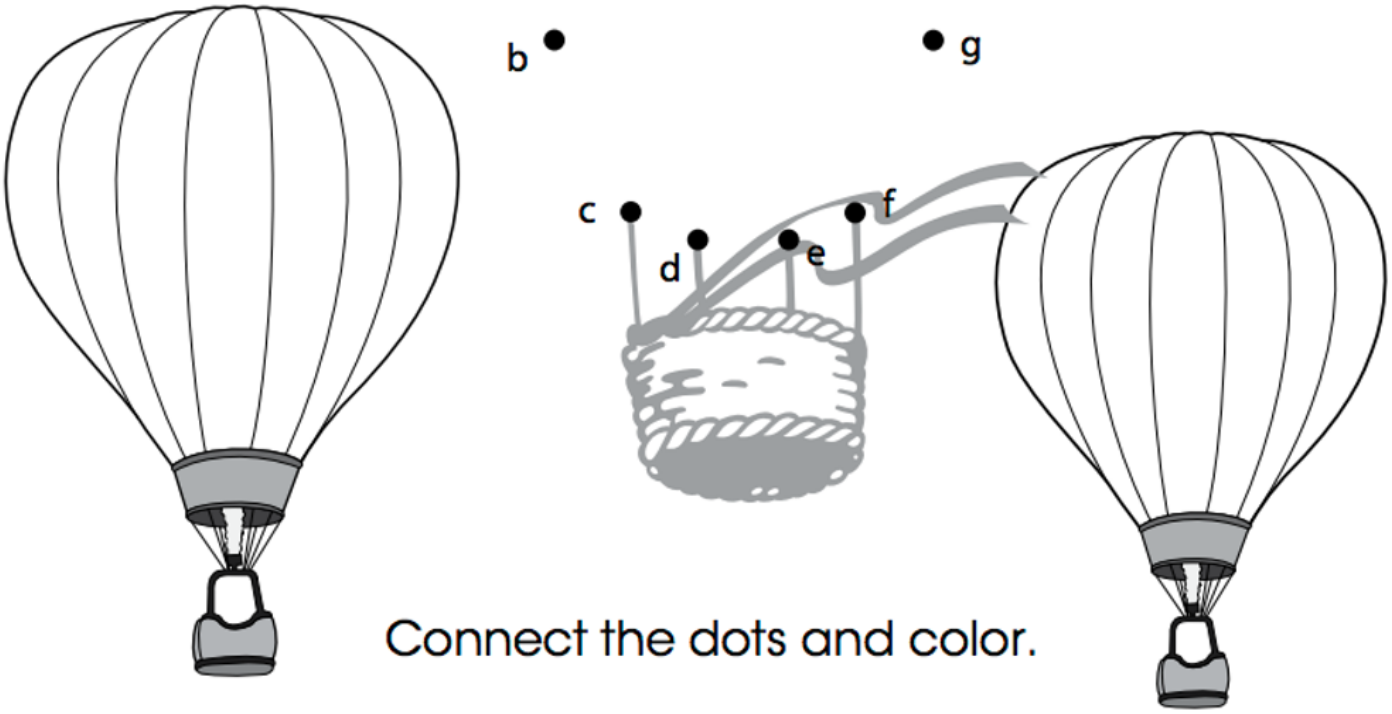




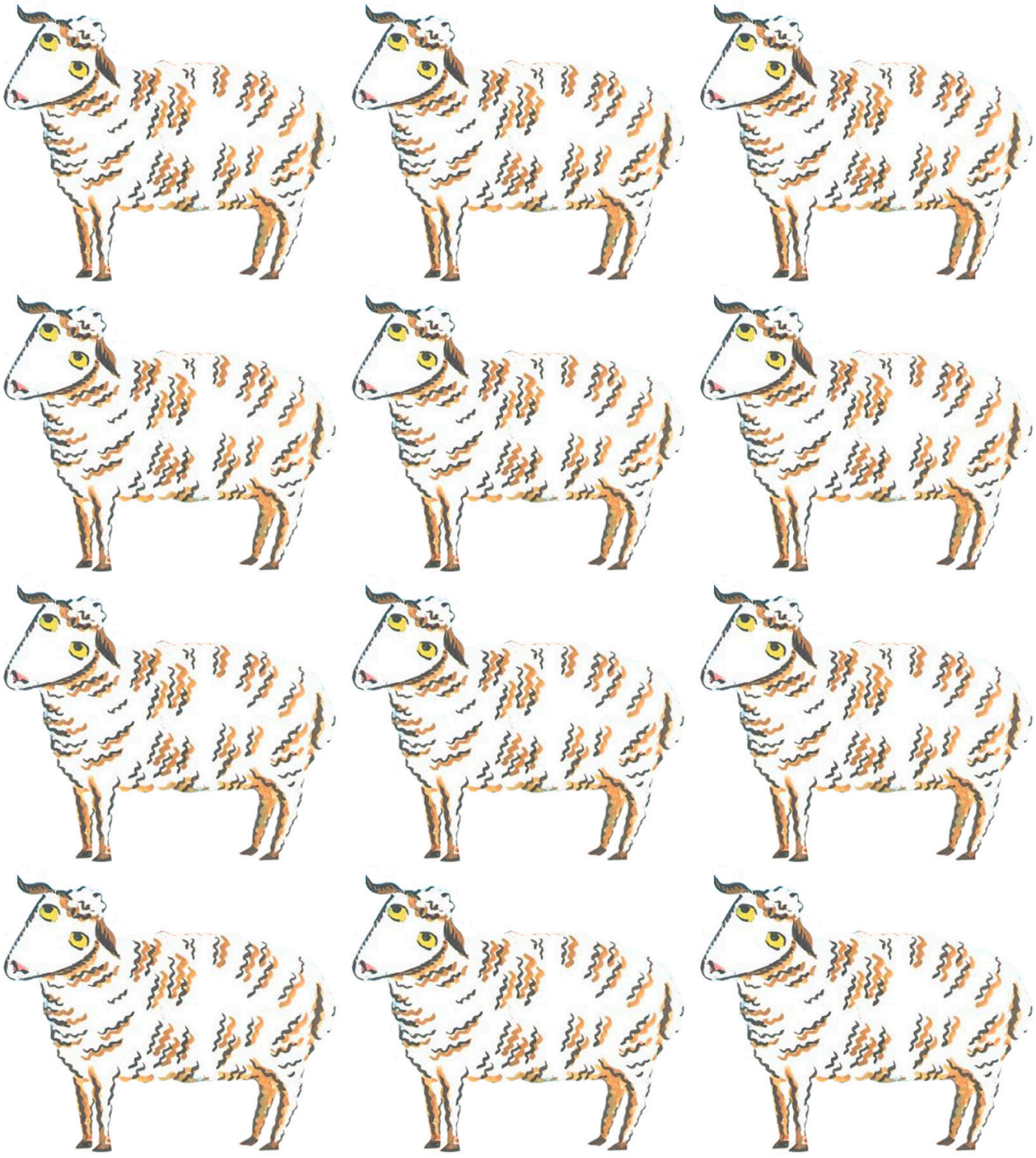
Bb Bb

balloon





Connect the dots and color.



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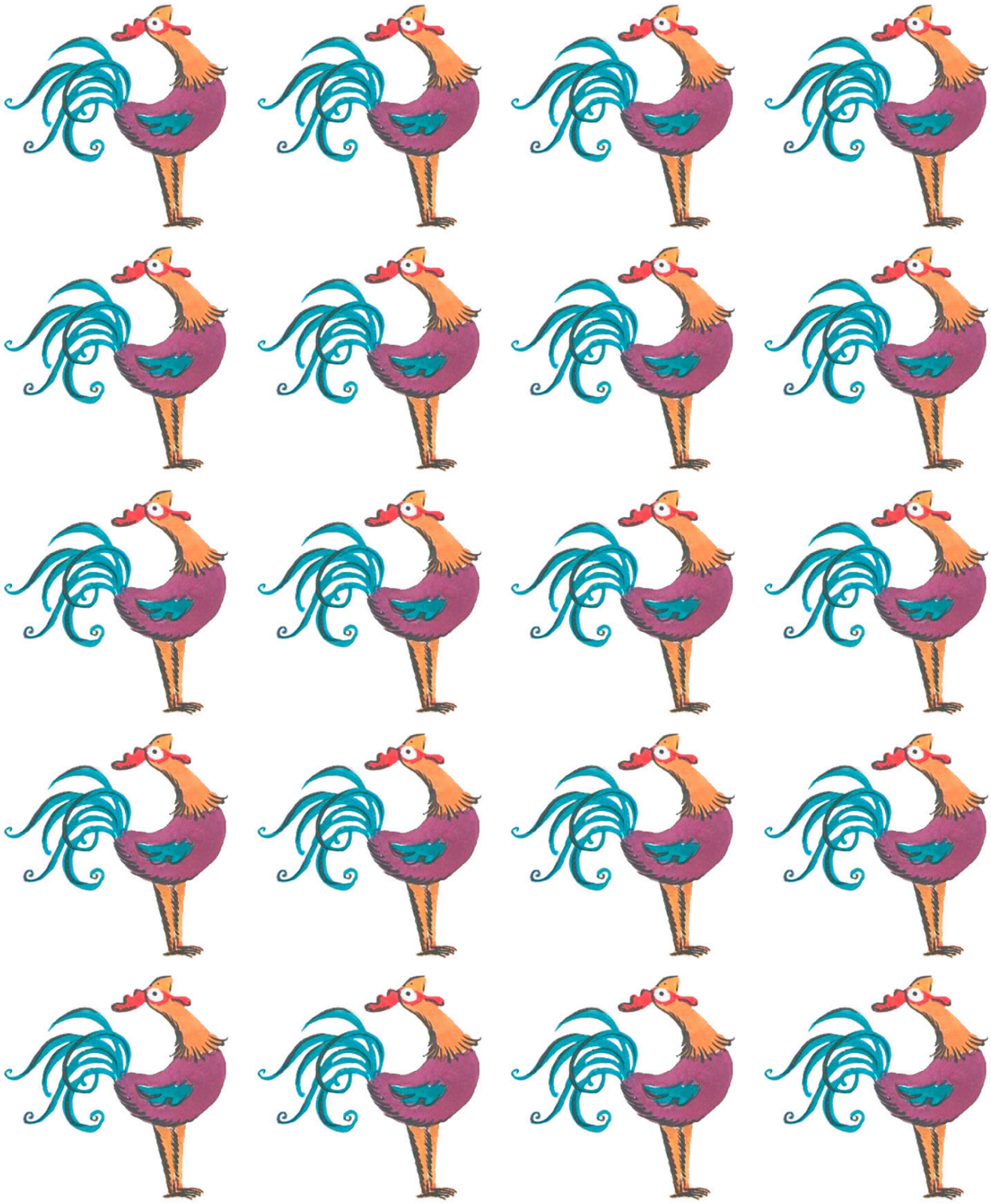

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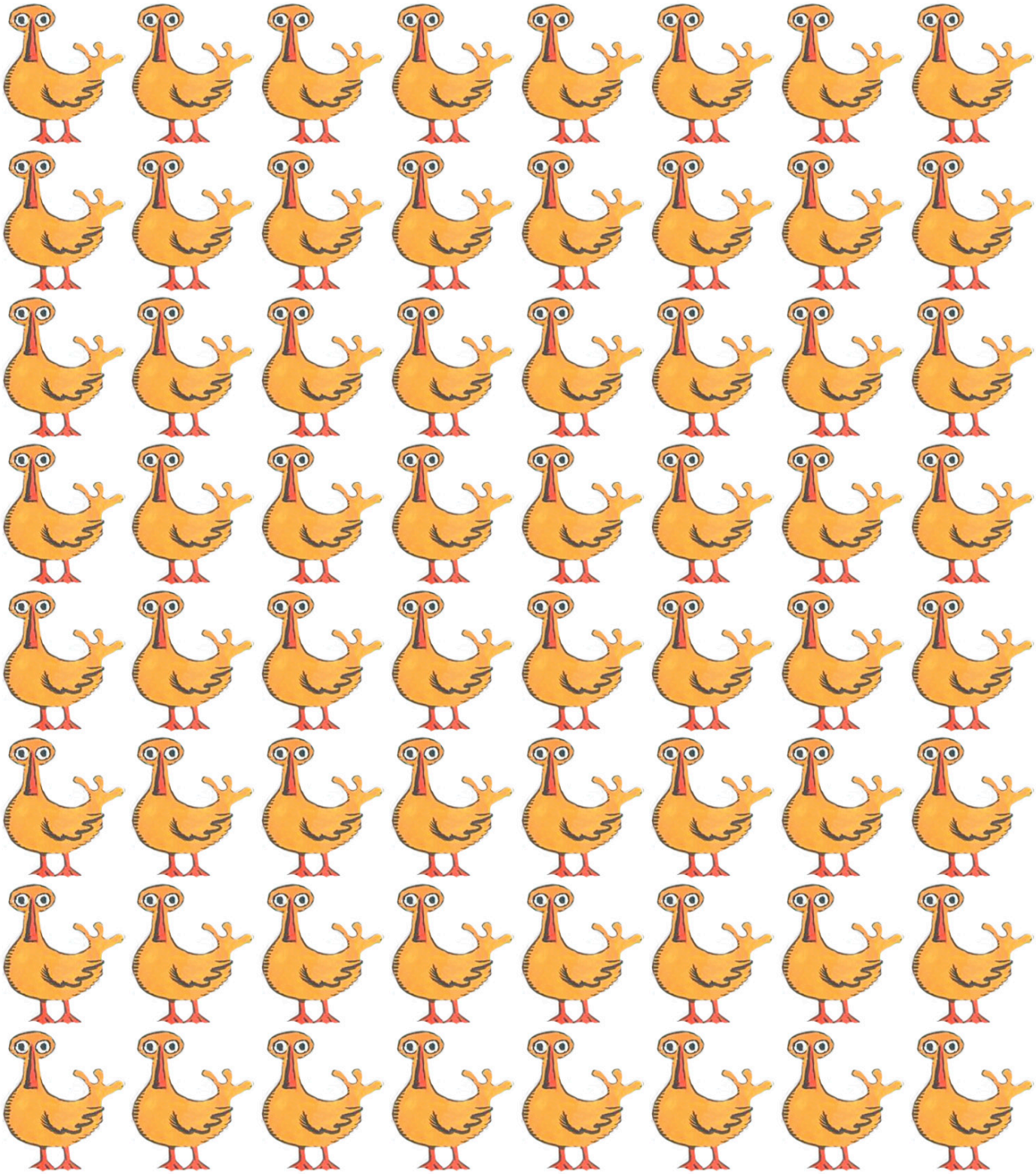

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