

Magic Hexaflexagons

Veronica Krug

Do you ever feel you have to be a magician to keep students focused on what you are attempting to teach? I have just the thing for you—a magic hexaflexagon.

It all began when I hired a magician to come to our summer art program and he used a “magic color mixer”—a two-sided hexagonal shape that was red on one side and yellow on the other.

“Ladies and gentlemen,” he said, “I have in my hands the colors of the rainbow.” “Red,” he showed the red side, “yellow,” he flipped it to show the yellow side, “and what is the third primary color?”

“Blue!” I shouted. I was lost in the moment and forgot that the kids were supposed to answer that one. The

magician deftly flipped it over to show blue. I was amazed. How did he do that?

“Let’s mix these colors,”

he said as he showed red and yellow again. “I’m going to mix red and yellow to get what color?”

Students yelled out “Orange!” With a flip there it was. He continued to dazzle us with green and purple, too. He would just turn and flip that hexaflexagon to create his magic.

I bought one from him to learn how to dazzle my own captive audience. My students loved it so much that they wanted to create their own. The one I bought used twenty equilateral tri-

angles folded in a complicated way. It used a lot of paper and many complex folds. After playing around with the shapes and design I discovered I only needed ten triangles to create a pattern similar to that of a kaleidoscope.

How to Build a Hexaflexagon

First, trace an equilateral triangle with 4" (10 cm) sides ten times onto a strip of 3½ x 24" (9 x 61 cm) tag board or construction paper.

Have students lightly number the triangles one to ten. Trim the corners of the tag board off to create a parallelogram. Carefully fold along each line to make it flexible.

Fold triangle number three behind triangle number four. Fold number seven in front of number six. You will see numbers four and five. The hexa-

gon will have triangle number ten hanging below it. Hold onto the triangle above number ten, and tuck number

nine behind number one. Fold number ten up and glue only to number one. Be sure not to let the glue ooze over the edges or the hexagon won’t flex.

You just created a three-sided shape. Designs drawn on each side will change twice for a total of six times. Shapes and designs drawn on the folds change the best. After you have drawn and colored designs on the two sides, you will see it is now time to flex it.

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How to Flex

You will notice that the surface of your hexaflexagon has three gaps. Squeeze two triangles together with your fingers so that the gap is in the middle and push the rest in to form a “T.”

Gently use the palms of your hands to open the hexaflexagon from the top. You can put your thumbs in the gap to help open the third side. You now have a new blank side to design. Flip over your hexaflexagon and your design has changed.

I used the work of M.C. Escher to support this project because of his use of tessellations and other mathematical puzzles in art. Middle-schoolers really enjoy this project and it keeps their hands busy! Once mastered, the hexaflexagons can be used for geometry terms such as “reflection,” “rotation,” and “translation.”

Assessment

- How well can the student manipulate the hexaflexagon?
- How well do the triangles fit?
- Does the design change six times?
- Is it carefully done?
- Does the student understand basic geometric terms?

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NATIONAL STANDARD

Students intentionally take advantage of the qualities and characteristics of art media, techniques, and processes to enhance communication of their experiences and ideas.

WEB LINKS

hexaflexagon.sourceforge.net
www.mcescher.com