SHAPEY

This problem can be made appropriate for students in Grades 1 and 2 as well. See Customizing the Project, page 17.

Grade Level: Kindergarten

Overview

A letter arrives from outer space. It is from a strange, but friendly, alien named Shapey. His mother's birthday is coming up soon, and he wants to give her a picture portrait of himself as a gift. He needs help to make it. Students use their artistic and mathematical skills creating and manipulating shapes to make portraits according to the description Shapey provides.

Objective

- To explore measurement, symmetry, and basic geometric shapes in a problem solving context

The Mathematics

- *identifying geometric shapes*
- *creating geometric shapes*
- *counting*
- *standard measurement*
- *symmetry*
- *patterning*

Time Needed four to five 40-minute periods

Grouping This problem is very good for individual independent work, but it can be done by partners or in small groups. There are enough tasks to keep a small group active if the workload is divided among group members.

Preparation and Materials

Day 1

- Shapey letter, 1 per student, page 19 (Make individual letters and/or copy the letter onto a class chart for group reading.)
- Large envelope decorated with outer-space art in which to deliver the Shapey letters (You may instead wish to create a "flying saucer" to hold the letters. Do this with two pie plates. Place folded letters in one plate and place the other plate upside down on top of the first to create a saucer shape. Cover the saucer with foil and decorate. If you choose to have the letter on a class chart, the chart can be rolled up and delivered to the class in a decorated mailing tube or simply rolled up and secured with a rubber band.)
- Sample of a decorated frame (optional)

Days 2, 3, and 4

- Colored construction paper, 1 ream of assorted colors
- Crayons, 1 set per student
- Scissors, 1 per student
- Glue, as needed
- Large white construction paper, 1 sheet per student

- Rulers, 1 per student
- Templates, such as Attribute Blocks, for tracing shapes (optional)

Day 5

- Thank-you notes, 1 per student, page 20
- Thank-you shapes, 1 per student (You can make these from any material that is handy, but colored metallic paper seems to enchant young students and has an "outer-spacey" feel to it. Place the shapes in the thank-you note.)

PROJECT: SHAPEY

Day 1: Special Delivery

Deliver

"Discover" a mysterious, strangely decorated envelope (or mailing tube or flying saucer) in the schoolyard and bring it into the classroom. It might be fun to have an accomplice (perhaps another teacher or a former student who is now in an upper grade) discover the envelope outside and bring it up to your window. Or, you may want to return from lunch or gym and find it lying in the middle of the classroom floor. Open it slowly and carefully. Remember that it may be from outer space. Ask students what they think it might be. Distribute the letters to students or display the chart letter.

Read

Read the letters or the chart letter aloud to the class. Students who are readers can join in and help read aloud as much as possible. Discuss vocabulary and terminology that might be new to students.

Discuss

The problem is woven into the context of the letter. To help students interpret the letter and understand the task, ask

1. So, what's the problem?

Use some or all of the following questions and narrative to guide the discussion and analysis of the letter.

Who wrote you the letter? (Shapey, a friend from outer space)

Why did he write to us? (He wants our help in making portraits of him for his mother.)

You may want to show some examples of portraits.

What is a portrait? (It is picture of a person. It could be the person's face, whole head, body from shoulders up, or whole body.)

So, he wants us to make a picture of him. What did he say he wanted to put the picture in? (A frame)

Hold up a frame or describe for students.

It might be fun to make a picture of Shapey. How big should it be? Did he say how big he is? (Yes, he said he is 10 inches tall and 8 inches wide.)

How big is that? Can you show with your hands? How do we know?

This could be a good opportunity to do a mini-lesson on measurement with inches and rulers. The problem has supplied students with a real reason and an immediate

need for this information. You can present the mini-lesson beforehand to prepare students for dealing with the problem, or you can present it as they work through the problem.

What else did Shapey tell us about himself? Why is he called Shapey? (He is made of lots of shapes. He is made of 4 rectangles, 2 circles, 5 triangles, and 1 square. He also has 2 eyes shaped like stop signs, a 5-sided nose, and a crescent smile.)

What do you know about shapes? (Allow time for students to share and discuss what they know to help build a connection to previous knowledge and make the problem more motivating.)

You may want to discuss the shape names, *octagon* and *pentagon*, if appropriate for your class.

This is an opportunity for a discussion of shape concepts if introduced previously or an opportunity for a mini-lesson, either now or as the problem solving process continues. The motivator, again, is that this is information students need and want.

I noticed Shapey said he is symmetrical. Does anyone know what that means? (It means both sides of Shapey are the same and even, pretty much the way we are.)

This is a another mini-lesson opportunity. Paper folding or looking at partners can help bring across the idea of symmetry.

Thinking about the frame again, does Shapey want some kind of special frame? (Yes, it should be decorated with a pattern that uses at least 3 different shapes.)

What does Shapey say at the end of the letter? (He would like to visit us to see the portraits and thank us in his own special way.)

There is a lot to remember here. I think I will post the information (leave the chart up) for everyone to see while we work, so it can remind us of what Shapey has asked us to do.

Once you have finished reviewing the information in the letter, ask

2. What materials do you think you will need to solve the problem?

List responses on the board. Ask students to justify their thinking regarding the need for each material. This process helps students to think about strategies and approaches. Assure students that all necessary materials will be ready for them the next day or whenever the Day 2 session will take place.

Day 2: Let's Get to Work!

Have all materials ready for students. Briefly review the questions and information from Day 1 so everyone is clear on the task and parameters. Have students begin work. Circulate, assist, and observe.

Common Student Approaches

Students often begin by making the shapes and pasting them down on background paper. It is a good idea to remind those who choose this approach that they will need to think about measurement at some point early on in their work. How to make the shapes fit in the measured space is an important part of their discovery learning. Students may want to use stencils or shapes to trace from as they create their shapes.

Rather than tracing and cutting out shapes, some students will choose to draw the shapes. In this case, it is common for these students, particularly older ones, to produce rough drafts and then refine the work in a final draft.

Teacher Role

While students are working, circulate, assist, and observe. In addition, use this time to begin assessment. Keep these assessment questions in mind:

What math are students using?

What organizational ideas are students using?

What tools are students using?

What are students doing well?

What difficulties are students having?

Day 3: Time to Share

Begin with a whole class discussion to give students the opportunity to think about their partial solutions in light of what their peers share. Have students sit in a circle with their work. Ask the following questions and discuss answers together:

What did you (or your group) do first? (Let students discuss pros and cons of various suggestions.)

What has worked well for you?

What problems have you had?

Has anyone used a ruler yet? Why or why not?

How do you use a ruler? Who can demonstrate?

How did you make your shapes?

How do you know how many shapes you have made?

How do you know which shape is which? Describe the shapes you've made.

How do you keep track of what you are doing? How do you know what has been done?

Did anyone start on the frame yet?

What are some of the patterns we have so far on frames? (Let students share pattern ideas.)

After the discussion, direct students to continue working. Again, as you did yesterday, circulate, assist, observe, and assess.

Day 4: Still Working

Begin with a whole class discussion and share session. Have students bring up all work in progress. Allow students to share their work so far. Ask the following questions and discuss:

What has worked well for you?

What problems have you had? How are you trying to solve these problems?

After discussion and shared answers, have students return to work. Continue to circulate, assist, observe, and assess.

Day 5: Closure

Have all students display their portraits. Leave them on display so Shapey can come and visit some time when students are out of the room. When students return to class, they will find evidence that Shapey has visited in his thank-you note and the "thank-you shape" he has left each student.

You may want to take photos of the portrait

Use these questions to help summarize the week's work:

Was there any one right way to make Shapey? Explain.

Do we know exactly what Shapey really looks like? Why or why not?

He did need to have certain things in his portrait though, didn't he? Like what?

Customizing The Project

This can be a very challenging problem for many kindergartners. Consider eliminating certain parameters to best suit the needs and abilities of your group. Do try, however, to retain some aspects of both measurement and basic shapes so students can have the experience of manipulating both in the same problem environment.

The Shapey letter has a number of parameters for creating the portrait. These can be easily altered to meet the needs of various age and ability levels. For example, the measurements can be shifted from standard to non-standard units; the type or number of shapes used can be changed; colors can be added to the description; the concept of symmetry can be eliminated.

The other kindergarten problem in this book, *A Very Special Zoo*, also explores patterns, and measurement. Shapey explores some of the same elements but in a more directed fashion. Depending on your group, your style, and what you are working towards with them, *Shapey* may be a good follow-up, precursor to, or alternative to *A Very Special Zoo*.

Assessment

Review completed portraits. Consider these questions as you review the final product and the process you observed over the course of the project:

For additional tips on assessment see Appendix 1, Assessment, pages 97-99.

How do Shapey's height and width compare to the requirements?

How do the number and type of shapes used compare to the requirements?

Is Shapey symmetrical?

Does the frame have a consistent pattern using at least three different shapes?

How complex is the pattern? Is the complexity of the pattern something you want students to work towards?

To what degree did the student participate in the process? How much assistance was needed from the teacher?

Math Journal Writing or Interviews

Ask students to answer one or more of the following questions either in writing or orally:

What math ideas did you use to make Shapey?

How did you find out how big to make Shapey?

What is symmetry?

Draw a triangle (rectangle, circle, square). How do you know it is a triangle (rectangle, circle, square)?

What is one good way to start to make Shapey? What would you do first if you did it again? Why?

Curriculum Connections

Literature *Space Case*, by James Marshall, is a good picture book to read aloud with this problem. A strange visitor from outer space is featured in a colorful story. The artwork is very "shapely."

Math Have students explore further the idea of symmetry. One way to do this is to have one student use Attribute Blocks to create "half of a design" along the edge of a ruler while a partner tries to complete the design in a symmetrical manner.

Art Share portraits done by noted artists. Show students a variety of styles and types. Discuss self-portraits. Supply mirrors and let students try to make self-portraits.

Music Listen with students to Hap Palmer's song about *Shapes*.

Language Arts Have students write or dictate a story about Shapey. Ask students to imagine what his planet is like and what he likes to do there.

Social Studies Discuss these ideas with students: Shapey asked for our help and we helped him by making portraits. Are there other ways we can help people we know? Are there people who help us? Who are they? How do they help us?

Science Ask students to think about our planet. Ask them to name the planet on which we live. Have students describe some aspects of Earth that Shapey might be interested in knowing about.

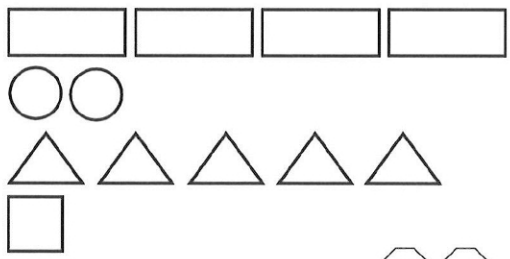
Dear Students,

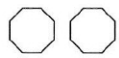
My name is Shapey, and I live on a planet far away in outer space. I have heard that you earthlings are good problem solvers and that you are also very nice and helpful. Well, I have a problem and need your help.

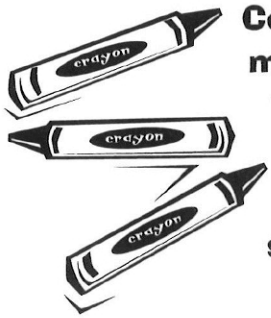
My mother's birthday is coming soon. I would like to give her a portrait of me as a birthday present. I cannot make the portrait because I am not very artistic. Could you please help me by making the portrait?

Here is some information to help you make my portrait.

- **I am 10 inches tall.**
- **I am 8 inches wide.**
- **People say I'm very "shapely."**
  I am made of 4 rectangles,
  2 circles,
  5 triangles,
  and 1 square.



- **People say that my 2 stop-sign-shaped eyes are cute.** 
- **I have the same 5-sided nose as my father.** 
- **I have my mother's crescent smile.** 
- **I am symmetrical.** 



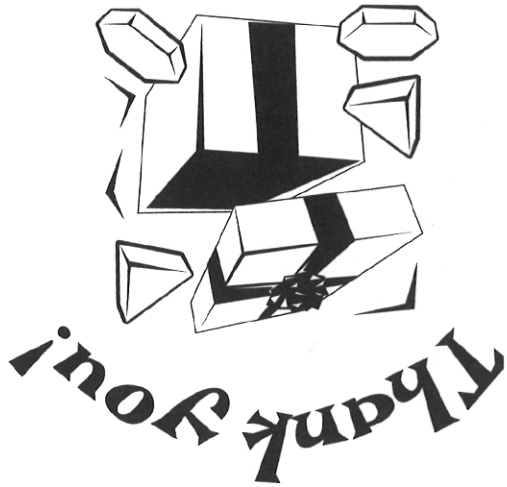
Could you also put my portrait in a frame? I think that my mom would really love a frame decorated with a pattern that uses at least 3 different shapes.

Good luck and thank you for all your help. I can't wait to see my portraits. I'll be visiting soon and will say thanks in my own special way.

Your friend from Space,

SHAPEY

Fold



Designed especially for you by Shapey.

Dear Students,

Thank you for the lovely portraits. While you were out, my mother and I beamed down to your planet to see your pictures. She was very surprised and happy. You are very good artists and great friends.

I am including a special thank you for all your hard work. It is a spacey shape direct from my planet. I hope you like it and will think of me when you look at it.

Thanks from your friend in Space,

SHAPEY

Place a shape in lower right quadrant. See Preparation and Materials, Day 5, for instructions.