Geometry

Anne Jacobs and Sharon Rak

The "Math by the Month" activities are designed to appeal directly to students. Students may work on the activities individually or in small groups. No solutions are suggested so that students will look to themselves as the mathematical authority, thereby developing the confidence to validate their work.

These activities invite students to explore mathematics with a focus on geometry. Students explore geometry as a means to describe the physical world and learn to recognize and name shapes; examine, sort, and classify attributes of plane and solid geometric figures; identify similar and congruent figures and lines of symmetry; and develop spatial sense. Connecting geometry with our world lets students experience a physical and visual sense of mathematics. A strong sense of spatial relations and patterning helps students relate to the patterning of our number system. Consider adapting these activities from one grade level to another, coordinating them with other mathematical topics, and integrating them with other subjects.

References

Burns, Marilyn. *The Greedy Triangle.* New York: Scholastic, 1994.

MacCarone, Grace. *The Silly Story of Goldie Locks and the Three Squares.* New York: Scholastic, 1996. ▲

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WEEKLY ACTIVITIES

GEOMETRY: K–2 **FEBRUARY 1999**

1 **Shape hunt.** Walk around your school or playground with paper and pencil, and draw the shapes that you see making up the building or equipment. In the classroom, decide together how to sort the shapes that you discovered. Can you find other ways to sort and classify the shapes? Go on a shape hunt at home. Do you find similar shapes?

8 **Straw shapes.** Connect flexible drinking straws to create shapes. Bend a straw at the "elbow," pinch the long end, and insert it into the short end of another straw. Connect three straws to make a triangle and four straws to make a square. How many straws would it take to make a hexagon? What other shapes can you make with the straws? Compare the shapes you made with the shapes that Goldie Locks finds in *The Silly Story of Goldie Locks and the Three Squares,* by Grace MacCarone (1996).

15 **Symmetry.** Using pictures collected from books or magazines, make an album of product logos, natural objects, or other common objects. Explore line symmetry by folding your pictures in half to determine whether each half looks the same. On each album page, write about the symmetry of each picture.

22 **Simon Says.** Play Simon Says with partners. When the leader asks you to make a shape, first see whether you can make it by yourself, using your hands, arms, and legs. If you cannot make it by yourself, work with your partner. Remember not to make your shape unless you hear "Simon says." Which shapes could you make by yourself? For which shapes did you need to work with your partner? Did you find any shapes that need more than two people to make?

WEEKLY ACTIVITIES

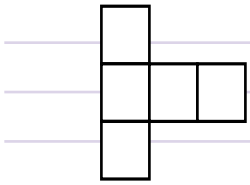
GEOMETRY: 3–4 **FEBRUARY 1999**

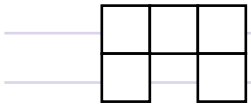
1 **Box patterns.** Collect various small boxes and containers. Choose a container, and count the surfaces, edges, and corners. Create a class chart of these data. Cut a box along its edges so that the parts stay together and the box can be flattened. Label the names of the shapes you see, and color congruent shapes with the same color. Can you construct new containers from any flat patterns that you create?

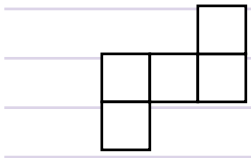
8 **Straw cubes.** Using the same technique as in the K–2 activity "Straw Shapes," make a square with four straws. Work with a partner to make a cube. Hold two squares at right angles. Tape the two squares together about one inch from the corners. Continue adding squares to the four sides in turn, then add the top. How many corners and faces does the cube have? How many triangles does it take to make a tetrahedron? What other solids can you make?

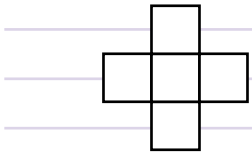
15 **Tangrams.** Trace a set of tangrams, and number the pieces from 1 to 7. Name the pieces that are *similar,* having the same shape. Find those that are *congruent,* having the same size and the same shape. Can you make one of the seven original shapes by combining two or more pieces? Are any of the pieces congruent or similar to any object in your classroom or at home?

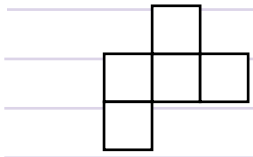
22 **Pentominoes.** Use graph paper or square tiles to make as many different shapes as possible by connecting five squares so that connected squares share a common edge. Rotations and reflections are considered the same. Can you make the twelve *pentominoes?* Why do you think that they have this name? What is the area of each pentomino? What is the perimeter? How many are symmetric? Which pentominoes can be folded into open cubes? How many hexominoes can be made with six squares?

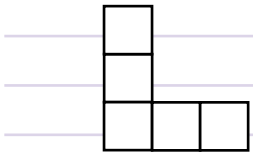


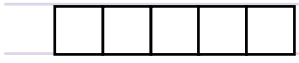


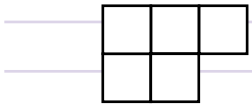


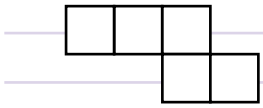


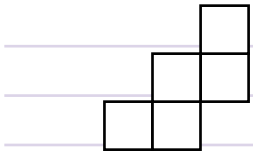


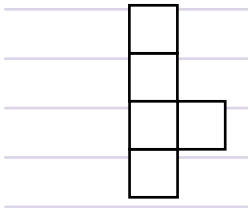


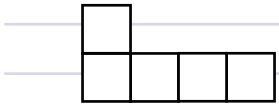












WEEKLY ACTIVITIES

GEOMETRY: 5–6 **FEBRUARY 1999**

1 **Tessellations.** Cut a three-square-by-two-square template from inch-square grid paper. Draw a curve from the bottom-left to the bottom-right corner. Cut along the curve. Slide the cutout shape to the top of the template. Be sure that the graph-paper lines match exactly, and tape the cutout shape in place. With a pencil, trace your design on a solid-colored shirt. Repeat this design, making sure that you leave no gaps or spaces in the pattern. Add details, and outline the tessellated picture with fabric paint. Could you make a tessellated picture if your template was a pentagon, a hexagon, or a circle?

8 **Gum drops and bubbles.** Create a triangle by using three gum drops and three toothpicks. At each corner—gum drop—place another toothpick. Angle the three toothpicks so that they all meet. Attach them with another gum drop. What solid did you create? How many toothpicks did you need to make this solid? How many gum drops? How many faces does this solid have? Completely dip the solid into bubble solution, and slowly take it out. Describe the shapes formed by the bubble solution. Do you see fewer or more faces than you expected? Predict the results if you were to dip a cube in bubble solution.

15 **House designs.** In small groups, explore what shape a single-level home should have to give the most interior floor area when the perimeter is constant, say, 24 units. Test your choices by laying them out with loops of string. Use grid paper to make proportional, top-view drawings of your homes, and invent ways to calculate the area of each home. What shape has the greatest area? Throughout the world, who builds round homes? Why might this practice exist, and what does it say about how mathematics is embedded in daily living practices?

22 **Polygons and diagonals.** Draw a three-sided polygon. Draw its diagonals. How many does it have? Draw a four-sided polygon and its diagonals. How many does it have? Repeat for a five-sided polygon. What shapes are formed by the diagonals? Predict how many diagonals a six-sided polygon has. As the number of sides increases, what does the polygon begin to resemble? *The Greedy Triangle,* by Marilyn Burns (1994), helps illustrate this concept.