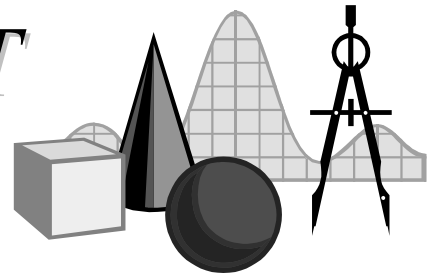


TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

Math Audit Team
Regional Professional Development Program
November 13, 2000 — Elementary Edition



How students see polygons has much to do with their understanding of those figures. They need to see a variety of shapes, sizes, and orientations to build a solid conceptual foundation. In the following paragraphs, we will examine some ideas to alleviate misconceptions and cement concepts about polygons.

Orientation: Look at Figure 1 and describe what you see. Yes, it's a triangle. Now look at Figure 2 and describe it. It is again a triangle but many students call it an "upside down triangle." In no mathematical dictionary or geometry text is the term "upside down triangle" defined. A triangle is defined as *a polygon of three sides*; nothing is mentioned about its orientation.

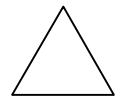


Figure 1

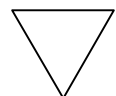


Figure 2

Very often we draw figures like triangles in the same alignment time after time. Students develop the misconception that a similar figure in another orientation has a different name. Therefore, students must be exposed to figures in various positions. (You've probably heard the story of students referring to \triangle as a right triangle and \triangleleft as a left triangle.) Figure 3 shows squares in various orientations and they are *all* squares, even though we may often refer to the second square as a diamond. Very few math references recognize the term *diamond*.

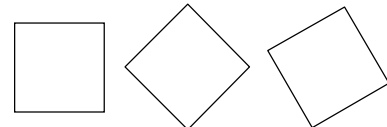


Figure 3

Regularity: A polygon is *regular* if *all sides are equal in length and all interior angles equal in measure*. This is typically the manner in which students see polygons. With the exception of triangles and quadrilaterals (see *Take It to the MAT*, January 24, 2000 and April 3, 2000), we usually draw regular polygons as shown in figure 4—pentagon, hexagon, and octagon. Students should be exposed to non-regular polygons, as in Figure 5 (again pentagon, hexagon, octagon), recognizing that a polygons name is based on the number of sides it has and that these sides need not all be the same length.

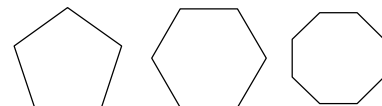


Figure 4

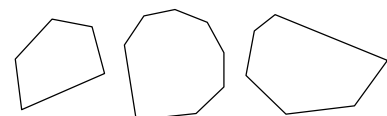


Figure 5

Convexity: Another way in which students only see polygons is as a convex figure. A *convex* polygon is one where *a line segment joining any two points in the interior of the polygon is entirely within the polygon*. A figure that is not *convex* is called *concave*. A way to remember this is that the figure has a "cave" or "dent" in it. Figures 1 through 5 show convex figures, and figure 6 shows a concave pentagon, hexagon, and octagon. Students should be able to recognize and identify both.

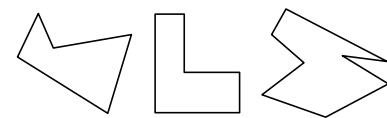


Figure 6

Students experience non-regular, concave polygons every day. Classroom experiences should support developing these concepts. Take a look around your classroom. Is it in the shape of a regular or non-regular polygon? Is it convex or concave?