

Understanding Math

Southern Nevada

Regional Professional Development Program



Characteristics of Polygons

www.rpdp.net

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

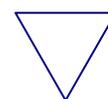


Figure 2

Very often we draw figures like triangles in the same orientation 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*.

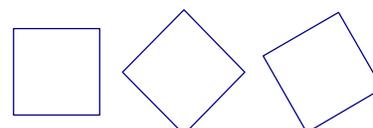


Figure 3

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 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.

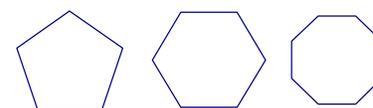


Figure 4

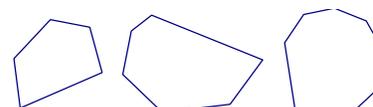


Figure 5

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 convex and concave polygons.

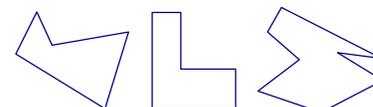


Figure 6

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?