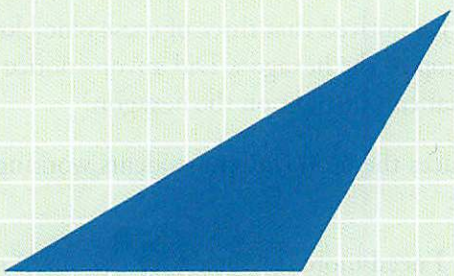
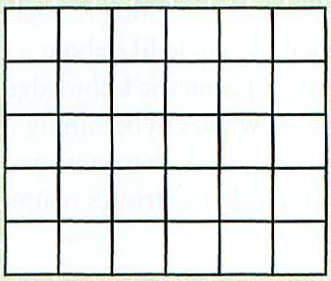
Learning to Name and Classify Shapes in Kindergarten

Geometry in the primary grades involves much more than learning to say the names of shapes. Young children certainly should hear words for common shapes (square, circle, triangle, rectangle, sphere, cube, cone, pyramid, and so forth) used correctly in context. However, building meaning for these words involves much more than seeing a few examples and memorizing the names of those shapes. To give you a sense of how difficult developing a thorough meaning for shape names can be, consider these two examples of what upper-grade teachers commonly report:

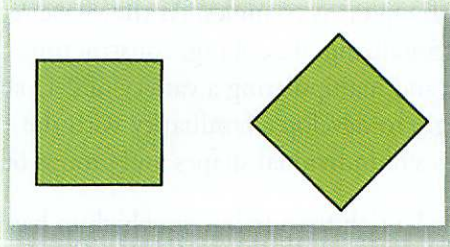
- Some fifth graders have trouble identifying an obtuse triangle as a triangle. Even though they can give an accurate definition of a triangle, they do not believe that the shape below is a triangle because it does not look the way they think a triangle should.



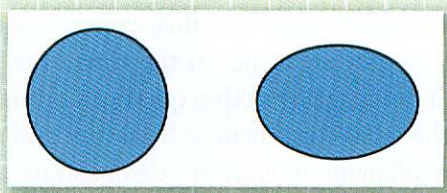
- Some third graders decide that a 5-by-6 array of tiles should be called a square because it "looks squarish." Again, these third graders "know" the definition of a square, but what they "know" and what they believe about squares are two different things. They have not yet completely thought through how to connect the definition with a range of examples.



Kindergarteners are just beginning to learn which shapes are described by words such as *square, circle, rectangle, triangle, cube,* and *sphere.* To do this, they have to figure out what characteristics make a difference in the classification system we use. For example, size and color do not matter when we classify a shape as a rectangle or a circle. Students seem to understand this quite early—a big triangle is still a triangle, and a small circle is still a circle. However, they may think that orientation does matter, thinking for example that a tilted square is not a square anymore but rather a diamond.



In addition, they may think of a shape that has some characteristics of a circle as a circle, even though it is actually an oval.



At this age, students often call 3-D shapes by the names of 2-D shapes that have some similarities; for example, they might call a sphere a circle or a pyramid a triangle. Keep in mind that these students are noticing something important: they are beginning to pay attention to the characteristics of these shapes. There is something triangle-like about a pyramid and something circle-like about a sphere. Part of the development of geometric knowledge is moving from seeing shapes as wholes to becoming more and more competent at analyzing their characteristics and making decisions about which characteristics matter in which situations.

How do students come to identify shapes and to know that orientation or size do not change a shape's name? It is not a matter of simply memorizing definitions. Consider how very young children learn about animals. Although they notice important attributes, they may overgeneralize and call every four-footed creature a dog. Or, they may think that *only* dogs that are just like the one they have as a pet qualify as dogs. As students come to understand 2-D and 3-D shapes and the language that is used to name and describe them, they will make similar mistakes. Students might call anything that is triangle-like a triangle or identify only very specific types of triangles, such as equilateral triangles, as triangles. As they have repeated experience visualizing, describing, constructing, combining, and manipulating a variety of 2-D shapes, students begin to develop a familiarity with the characteristics of individual shapes and groups of shapes.

Students need a rich foundation on which to base the development of meaning for language, including mathematical language, and interaction with adults is part of what helps them begin to sift through and organize these experiences. As you talk with students while they are working with shapes, enter into their conversations by using the same terms they are using. At the same time, help them develop their language by asking questions or making comments that challenge them to be clearer and more precise. The following interactions demonstrate how you might do this.

Sarah: I'm making a path with the diamonds.

Teacher: Are you going to use all blue diamonds, or are you going to use some of the tan diamonds?

Above, the teacher calls attention to the fact that even though blue and tan pattern blocks are not identical in shape, both can be described by the same name. The teacher makes a similar point to a student using the Geoblocks, which contain cubes in several sizes.

Raul: I'm using the square ones to build a wall.

Teacher: There are lots of Geoblocks like that. Are you going to use the tiny square ones or the bigger ones?

Such conversations offer the opportunity to introduce conventional mathematical names so that students hear these terms in context. For example, consider how this teacher introduces the term *hexagon*:

Jae: When I put three blue ones on top of the yellow one, they just fit.

Teacher: Jae noticed that three of these blue blocks can fit right on top of the hexagon. Did anyone notice any other blocks that can fit right on the hexagon?

She introduces the term *cubes* to students working with Geoblocks:

Rebecca: I need more tiny boxes for the top of my castle.

Teacher: Rebecca is looking for the tiny cubes. See how she's using them on her castle? Does anyone have some more of the smallest cubes that Rebecca could use?

Students are not expected to consistently use such geometric terms in Kindergarten. They will begin to learn them naturally, as they learn other vocabulary, by hearing them used correctly in context. Throughout the elementary grades, *Investigations* students will have many opportunities to name, describe, classify, and define shapes in both two and three dimensions.