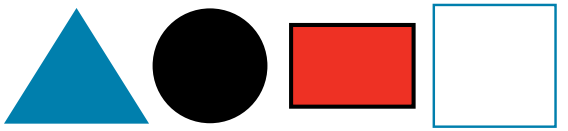
Module 2 The Why Behind the Lesson Design

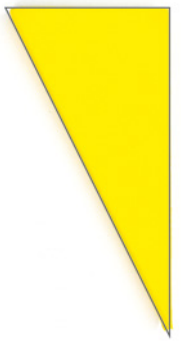
Why do students explore many examples of two-dimensional shapes in this module?

Young children base their understanding of shapes on examples they can see, touch, and manipulate. Students benefit from early exposure to shapes in different sizes and orientations so they can develop flexible ideas about shape. Unfortunately, typical children's books and media often show a limited set of shapes, generally symmetric, regular shapes, called exemplars. Young children often base their early mental images on this small subset of shapes.



Typical Exemplar Shapes

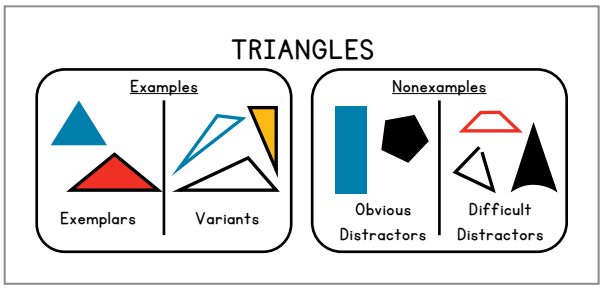
However, concepts of shape do not build like number concepts. If students start with a small set of exemplar shapes and gradually encounter variants and distractors over time, they sometimes develop limited and inflexible ideas about shape that are hard to unlearn. Reliance on typical exemplar shapes can lead students to misclassify shapes because they do not look as expected. For example, a student may look at a rotated triangle and say, "That's not a triangle. It doesn't have a point on top," or "It's too skinny."



Working with a variety of examples and nonexamples of each shape category helps students identify shapes in kindergarten and grade 1 based on a set of defining attributes rather than on how the shape looks.

What are exemplars, variants, and distractors?

Within each shape category—for example, triangles—students are exposed to examples and nonexamples. This exposure helps students form an internal picture, or concept image, of different shapes. Use the chart on the right to better understand the intentional selection of two-dimensional shapes.

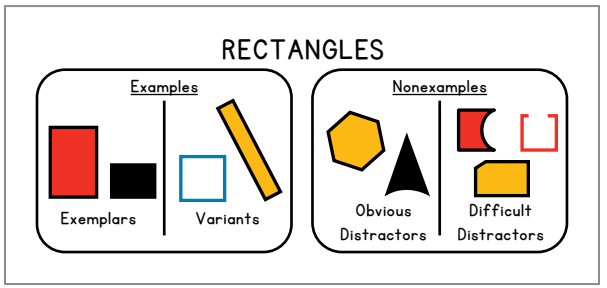


The example group is separated into exemplars and variants.

- Exemplars are the shapes that young children typically visualize. They are often symmetrical with a horizontal base.
- Variants are other examples of a shape that are less frequently encountered, especially in children's books and media. To name these shapes, students must pay close attention to defining attributes, such as the number of straight sides.

The nonexample group is separated into obvious distractors and difficult distractors.

- Obvious distractors do not look much like the exemplars and are easier for children to categorize as nonexamples on sight. Obvious distractors rarely require further investigation.
- Difficult distractors look more like the exemplars, but they do not have all the defining attributes of the target shape. Difficult distractors require students to attend to defining attributes with more precision.



Of course, it is not necessary for students to distinguish between exemplars and variants or obvious and difficult distractors. The inclusion of these shapes supports young students as they look for and make use of structure (SMP.7) to support their ideas about each shape category.

Why is the term *square rectangle* used with students?

Young students often see the square and rectangle as discrete, unrelated shapes. Using the term *square rectangle* connects the shapes. This language is continued in kindergarten. In grade 1, students use the term *square* and identify it as a "special kind of rectangle" with 4 corners and 4 sides that are all the same. This relationship paves the way for classifying quadrilaterals by their properties in elementary school.