GEOMETRY

SKILL: SHAPE RECOGNITION AND PROPERTIES

VKRP Virginia Kindergarten Readiness Program

WHAT IS IT?

Recognizing shapes involves distinguishing among shapes and associating shapes with shape names. Selecting a square from a group of different shapes and providing the name "square" is an example of recognizing a shape.

Understanding **shape properties** involves learning the defining characteristics, or attributes, of shapes. For example, properties of squares are that they have: 1) four equal-length sides, and 2) four equal 90-degree angles.

Key skills and concepts	Definitions
Comparing shapes	Students learn about shape properties by matching shapes by certain attributes and determining if shapes are the same or different.
Classifying shapes	Students learn to recognize shapes and about shape properties by classifying shapes. For example, if students sort shapes according to the number of sides that they have, they begin to understand a closed shape with three sides is called a triangle.
Describing shapes	Students learn about shape properties by describing shapes. By describing attributes of shapes, such as the number of angles and the number of sides of various different shapes, they begin to associate these attributes with the shapes. This provides an opportunity for students to notice which attributes are unique to given shapes, leading them to discover properties of those shapes.
Representing and constructing shapes	Representing and constructing shapes involves creating shapes. Constructing a given shape requires that students think carefully about its attributes because in order to make a particular shape, students have to think about all the parts of the shape and how they go together. Students can also learn about shape properties while creating a target shape because in order to avoid making a shape other than a target shape, they need to consider the properties of the given shape.
Composing and decomposing shapes	Students combine two or more shapes to compose new shapes. Students separate two or more shapes to decompose a shape into new shapes. By composing and decomposing shapes, students can further learn about shape properties by noticing how both the shape name and the shape's associated properties change through the composition or decomposition.

WHY IS IT IMPORTANT?

Students' understanding of shape properties and recognition add to their understanding of the world. In fact, understanding shape is foundational to cognitive development, as infants mostly use shape to learn names of objects. Additionally, shape is important because it has applications in everyday life, like in thinking about home projects, and in various careers, like architecture.

Understanding how to compose and decompose shapes is especially important because these understandings provide the foundation for understanding other areas of mathematics, especially number and arithmetic, like part-whole relationships and fractions.

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HOW DOES IT DEVELOP?

At this age	Children can typically:
4	• Recognize some nontypical squares and triangles (like a triangle with two long sides and one very short side) and may recognize some rectangles, but usually not rhombuses (diamonds). Often, students don't differentiate sides/corners. • Represent a shape by making a shape "look like" a goal shape. For example, students can make a rectangle when asked to make a rectangle with sticks. • Judge two shapes to be the same if they are more visually similar than different. For example, when presented with a circle and an oval, students may judge the shapes to be the same. • Say that two shapes are the same after matching one side on each. • Look for differences in attributes, but may examine only part of a shape (only the top halves of two shapes are similar).
5	• Recognize more sizes and orientations of rectangles. • Recognize properties of shapes (e.g., sides and angles) and recognize sides as distinct geometric properties. • Recognize angles as separate geometric properties. For example, when asked, "why is this a triangle," the student may say "it has three angles" and count them, pointing clearly to each vertex (corner). • Recognize most basic shapes and typical examples of other shapes, such as hexagons, rhombuses and trapezoids. • Put several shapes together to make one part of a picture using trial and error.
6	• Name most common shapes, including rhombuses, without making mistakes like calling ovals circles. • Recognize right angles, so can distinguish between a rectangle with right angles and a parallelogram without right angles. • Match angles concretely. For example, given several triangles, the student may find two with the same angles by laying the angles on top of each another. • Make new shapes out of smaller shapes.

THE LINGO

Attribute – Characteristic of a shape
Nonexample – Illustrates what a concept is not. Nonexamples are teaching tools designed to illustrate the difference between two things, and in turn, to help students learn the boundaries of a concept.
Properties – Characteristics of shapes that describe relationships between parts of the shape

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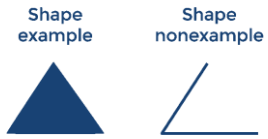
STRATEGIES TO SUPPORT DEVELOPMENT OF SHAPE RECOGNITION AND PROPERTIES

Use varied examples and nonexamples of shapes.

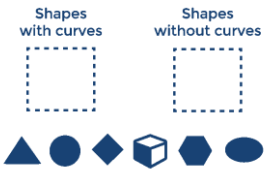


A nonexample of a shape lacks one or more of the properties of a shape. Showing examples and nonexamples allows students to make distinctions about the basic attributes of shapes. For example, show a nonexample, such as an open triangle or one that doesn't have straight sides next to a triangle. Ask students to identify which is an example of the shape and which is not. Students will begin to understand properties of shapes.

THE NEXT STEP

After providing opportunities for students to work with examples and nonexamples of circles, triangles, squares and rectangles, introduce examples and nonexamples of other shapes, such as hexagons, rhombuses and trapezoids.

Provide opportunities for students to sort and classify 2-D and 3-D shapes.



Provide students with a variety of shapes and ask students to sort by attributes, such as curved sides and straight sides or more than three sides and three sides or less. Encourage students to discuss shapes, including their attributes and properties, as they sort. Provide geometric language as students share their observations, including language related to names of shapes and language related to attributes of shapes, such as sides and angles.

THE NEXT STEP

Scaffold students from recognizing shapes by how they look as wholes to describing properties of shapes. For example, ask questions, such as "How do you know it's a square?" and provide language related to attributes, such as "This shape has three sides. It's a triangle."

Model how to compose and decompose shapes and provide opportunities for students to compose and decompose 2-D and 3-D shapes.

In addition to using already made wooden, plastic and/or paper shapes (such as pattern blocks, tangram puzzles and geoblocks), students can use their own drawings, geoboards with rubber bands, physical materials (such as straws, newspaper rods, paper, twist ties, modeling clay) and computer models to make shapes and to explore how shapes fit together to form larger shapes and how shapes can be broken down to form smaller shapes.

THE NEXT STEP

Support students in moving from using trial and error to combine or break down shapes to using clues associated with the task. For example, if trying to combine pattern blocks to make the yellow hexagon pattern block shape, students use clues about the length of the sides of the hexagon and the size of the angle of the hexagon in order to choose smaller shapes. If trying to create smaller shapes from a given shape, such as making two smaller shapes from a square, encourage students to consider how they could cut the rectangle to make shapes with certain numbers of sides (cut along the diagonal to form two triangles, each with three sides or cut across the middle to form two rectangles, each with four sides).

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INTEGRATING SHAPE RECOGNITION AND PROPERTIES THROUGHOUT THE DAY

ROUTINES 	Calendar: for each day on the calendar, have a card with both the numeral and a shape (either the simple shape or a drawing of an object in the real world that is a given shape). When you turn over the card for each day, have students describe what they see and support their thinking with geometric language and by reinforcing properties of shapes. Have students identify an object in the classroom that is also the shape that is on the card for the day. Also have students compare the shapes on different cards.
TRANSITION 	As students clean up the block area, encourage them to sort the blocks according to shape properties.
MEALS 	Point out shapes of food. For example, say, “an orange is like a ball. Another name for its shape is sphere. Can you find other foods that look like spheres?”
OUTDOOR TIME 	Go on an all-shape scavenger hunt outside. Have students go on a walk and look for various shapes outside and around the school.
CENTERS 	Provide opportunities for students to build with blocks. This provides opportunities for students to put together 3-D shapes to create new 3-D shapes. While students are building, introduce vocabulary by using words to describe what they are doing. Consider providing problems for students to solve, such as asking students to build a structure with walls that are at least two blocks high and include an arch.

SAMPLE ACTIVITIES THAT SUPPORT SHAPE RECOGNITION AND PROPERTIES

Building Triangles and Rectangles
Available as PDF
MTP M/S©

Guessing Shapes
Available as PDF
MTP M/S©

Solid Sorting I
Available as PDF
MTP M/S©

Sorting Shapes
Available as PDF
MTP M/S©

The Shapes Game
Available as PDF
WWC Report

Feel for Shapes
https://earlymath.erikson.edu/feel-for-shapes/
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