Discovering Math: Shapes
Teacher's Guide

Grade Level: K–2	**Curriculum Focus:** Mathematics	**Lesson Duration:** Three class periods

Program Description

***Discovering Math: Shapes* —** From geometric shapes to spatial language to creating patterns, introduce young students to the basic properties and concepts of geometry.

Lesson Plan

Student Objectives

- Describe the basic properties of simple, two-dimensional shapes, use their understanding to name specific shapes, and identify similarities and differences among simple geometric shapes.
- Use the common language of spatial sense to describe the position of a specific object or shape.
- Identify simple geometric shapes within real-world context and create pictures using simple geometric shapes.
- Identify and create linear patterns made by combining simple geometric shapes.

Materials

- *Discovering Math: Shapes* video
- Scavenger Hunt List (see below)
- Spatial Sense Grid and Teacher Direction Sheet (see below)
- Drawing paper
- Crayons, colored pencils, or markers
- Pattern blocks

Procedures

1. Display or draw a square, circle, triangle, and rectangle. Ask students to list the attributes of each shape. Elicit responses relating to number of sides, angles, and corners.
    - Define each shape.

      Triangle — A three-sided figure with three angles and three corners.

      Rectangle — A four-sided figure with four right angles and four corners.

      Square — A special rectangle with four equal sides, four right angles, and four corners.

      Circle — A round shape with no straight sides, no angles, and no corners.
    - When students are comfortable with the shapes, tell them they will participate in a scavenger hunt. Explain that a scavenger hunt is a game where they are given a list of objects to find within a certain area. Students can work independently or in pairs. Give each student the Scavenger Hunt List. They will search the chosen area to find the shapes on the list. Once students have found all the shapes, they can share with the class where they located each shape.

      For non-readers, pictures of the shapes can be substituted for words in the Scavenger Hunt Grid.

      As an extension have students research five-, six-, seven-, and eight-sided figures, identify their names, and give an example within the classroom.
2. Review simple geometric shapes (circle, square, rectangle, and triangle). Tell students that these shapes can be found in everyday life. Refer to images in the video or have students look through magazines to find pictures of objects with easily recognizable shapes (house = square and triangle; clock = circle; tractor-trailer = rectangle and circles). Have students share their findings with the class.
    - Tell students that they will now create their own pictures using geometric shapes. Display or draw a square, rectangle, circle, and triangle. Students are to use each shape at least once in their drawing. Remind them that they can combine shapes to make a bigger shape.
    - When students have completed their pictures, have them trade a partner. Ask students to identify the circles, squares, triangles, and rectangles in their partner's picture.

      As an extension have students use five-, six-, seven-, and eight-sided figures in their drawings.
3. Ask three students to come to the front of the room. Place the students in a line. Ask questions to elicit knowledge of spatial sense.

    Who is in the front of the line?

    Who is behind [student name]?

    What is above the students' heads?

What is below the students' feet?

Who is standing to the right of [student name]?

Who is standing in the middle?

Discuss and model the meaning of the terms above, below, on the right, and on the left.

- Give each student a Spatial Sense Grid. Each grid has black dot in the middle space. Read the directions to the students (see Teacher Direction Sheet). The students should use the clues from the directions to place the objects within the grid.
- Once the grids are complete students can describe the shapes and objects on the grid using spatial-sense vocabulary.

  As an extension have students write their own directions to share with the class.

4. Ask the students what they know about patterns. Explain that patterns can be seen everywhere. Remind students of patterns from the video.

   Discuss how geometric shapes can be used to make patterns. Start a simple pattern of square, triangle, square, triangle, etc. on the board. Ask students what shape would come next, and how they know. Model other examples by identifying a pattern within the classroom. Ask students if they see any other patterns in the room.

   - Tell students that they will be using the shapes they have been learning about to create a pattern. They can choose any of the shapes they have been working with (square, circle, rectangle, or triangle). Students should draw their pattern on a piece of paper or use pattern blocks, if available.
   - Have students explain their patterns to the class. The patterns should reflect an understanding of repetition.
   - Have students create another pattern. When the beginning of the pattern is complete, have them switch with a partner to see if they can continue extending each other's patterns.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** The student clearly demonstrated the ability to identify and describe simple geometric figures; produced complete pictures using the specified shapes; used spatial-sense vocabulary to identify objects' positions; and used specified shapes to create and extend patterns.
- **2 points:** The student identified and described all but one of the shapes consistently; produced pictures using most of the specified shapes; used some spatial-sense vocabulary to identify objects' positions; and used specified shapes to create and extend some patterns.

- **1 point:** The student identified and described only one or two of the shapes consistently; produced complete pictures using some of the specified shapes; could not use spatial-sense vocabulary to identify objects' positions; and could not use specified shapes to create and extend patterns

Vocabulary

rectangle

Definition: A four-sided polygon that has four right angles and each pair of opposite sides is parallel and of the same length

Context: The student looked at the door that had four straight sides, four corners, and equal opposite sides and determined it was a rectangle.

square

Definition: A rectangle with all four sides of equal length

Context: The student determined that the top of her desk has four equal sides, so it must be a square.

triangle

Definition: A figure that has three sides and three angles

Context: The teacher asked the students to draw a three-sided figure with three angles. The students drew a triangle.

Academic Standards

Mid-continent Research for Education and Learning (McREL)
McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K–12 Education addresses 14 content areas. To view the standards and benchmarks, visit http://www.mcrel.org/compendium/browse.asp.

This lesson plan addresses the following benchmarks:

- Mathematics: Understands and applies basic and advanced properties of the concepts of geometry.

National Council of Teachers of Mathematics (NCTM)
The National Council of Teachers of Mathematics (NCTM) has developed national standards to provide guidelines for teaching mathematics. To view the standards online, go to http://standards.nctm.org.

This lesson plan addresses the following standards:

- Recognize, name, build, draw, compare, and sort two- and three-dimensional shapes.
- Describe attributes and parts of two- and three-dimensional shapes.

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- http://school.discovery.com/teachingtools/teachingtools.html

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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How to Use the DVD

The DVD starting screen has the following options:

***Play Video*—**This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

***Video Index*—**Here the video is divided into chapters indicated by title. Each chapter is then divided into four sections indicated by video thumbnail icons; brief descriptions are noted for each section. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

***Quiz*—**Each chapter has four interactive quiz questions correlated to each of the chapter's four sections.

***Standards Link*—**Selecting this option displays a single screen that lists the national academic standards the video addresses.

***Teacher Resources*—**This screen gives the technical support number and Web site address.

Video Index

I. Geometric Shapes (6 min.)

Geometric Shapes: Introduction
Geometric shapes are all around us, but we may not notice them until we look for them.

Example 1: Triangles
Triangles have three straight sides and three corners. They can be seen in houses, bridges, diamonds, and other objects all around us.

Example 2: Rectangles
Rectangles have four straight sides and four square corners, and their opposite sides are the same length. They can be seen in doors, books, windows, and many other objects, natural and artificial.

Example 3: Squares
A square is a rectangle with all sides the same length. Squares can be seen in floor tiles, windows, the faces of number cubes, and chain-link fences, among many places.

II. Shapes and Relationships (5 min.)

Shapes and Relationships: Introduction
Geometric shapes can be used to describe many objects and situations, both natural and made by humans. The spatial relationships of objects can be described in words.

Example 1: Simple Shapes
Simple shapes can be seen in many objects that include triangles, other polygons, circles, and simple three-dimensional shapes like spheres.

Example 2: Complex Shapes
Complex shapes include spirals and compound shapes made up of more than one simple shape.

Example 3: Relation Shapes
Relationships of objects in space can be described in words like these: above, below, in front of, and behind.

III. Patterns From Shapes (5 min.)

Patterns From Shapes: Introduction
Look at examples of shapes arranged in repeating patterns..

Example 1: Simple Patterns
Some patterns involving shapes are simple, made of different arrangements of lines or the same shape. Different patterns and shapes result from adding or subtracting shapes.

Example 2: Patterns From Many Shapes
Spain's Alhambra and another colorful room exhibit shapes in complex designs.

Example 3: Complex Patterns
A kaleidoscope displays complex patterns of simple shapes and their changes.

Quiz

I. Geometric Shapes

1. What shape can you see in a round pizza?
   A. circle
   B. square
   C. triangle
   D. rectangle

   Answer: A

2. What shape has three sides?
   A. square
   B. circle
   C. triangle
   D. rectangle

   Answer: C

3. How many sides does a rectangle have?
   A. 3
   B. 4
   C. 5
   D. 6

   Answer: B

4. What shape has four sides of the same length?
   A. square
   B. circle
   C. triangle
   D. cylinder

   Answer: A

II. Shapes and Relationships

1. Which of the following is an example of a flat geometric shape?
   A. cube
   B. sphere
   C. square
   D. cylinder

   Answer: C

2. What shape is a round ball?
   A. cube
   B. sphere
   C. cylinder
   D. rectangle

   Answer: B

3. What shape are the coil springs inside a mattress?
   A. square
   B. cube
   C. spiral
   D. triangle

   Answer: C

4. Describe the two objects: ΔO.
   A. The triangle is next to the circle.
   B. The circle is under the triangle.
   C. The triangle is under the circle.
   D. The circle is on top of the triangle.

   Answer: A

III. Patterns from Shapes

1. What is a pattern?
   A. a group of trees
   B. a set of repeating shapes
   C. a picture of some shapes
   D. a set of shapes that do NOT repeat

   Answer: B

2. What shape comes next in the pattern? □OΔ□OΔ
   A. Δ
   B. O
   C. □
   D. >

   Answer: C

3. A colorful pattern starts with a blue line, then has a green line, a yellow line, and a red line. If the pattern repeats, what color line would come next?
   A. red
   B. blue
   C. green
   D. yellow

   Answer: B

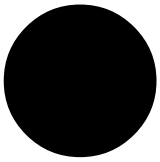
4. Dean has a tube-shaped instrument that makes patterns when mirrors reflect bits of colored glass. What does Dean have?
   A. telescope
   B. kite scope
   C. microscope
   D. kaleidoscope

   Answer: D

Scavenger Hunt List

Shape	Where did you find it?
Circle	
Square	
Rectangle	
Triangle	
A square larger than your hand	
A triangle smaller than a book	
A rectangle larger than you	

Spatial Sense Grid

Teacher Direction Sheet

1. Place a circle in the box over the black dot.
2. Place a square underneath the black dot.
3. Place a triangle in the box in front of the circle.
4. Place a rectangle in the box underneath the triangle.
5. Place a smiley face in the box behind the circle.
6. Place a star in the box below the smiley face.
7. Place a straight line in the box below the rectangle.
8. Write your name in the box underneath the star.