

Home Math Activity: Pattern Play

MATH SKILLS REINFORCED/TAUGHT:

Identifying shapes by name; recognizing patterns; creating and reproducing repeating patterns.

AGE: Recommended for children ages 4-6 years old (PreK-grade 1) with an adult. This activity can be adapted so it is more challenging.

NUMBER OF PLAYERS: 2 or more

MATERIALS NEEDED:

○ Copies of the Shape Sheets (Pages 3-10). Copies should be made on colored paper or cardstock. Shape Sheets include: 20 circles; 20 squares; 20 rectangles; 20 triangles; 20 rhombi; 20 trapezoids; 20 regular pentagons; and 16 regular hexagons (a total of 156 pieces). There are enough shape cut-outs to make two activity packets (78 pieces per child).

○ Envelope to store shapes (see page 11.)

INSTRUCTIONS:

1. Copy the Shape Sheets (pp. 3-10) onto colored paper (a different color for each page) then cut out the shapes. Laminating the shapes will preserve them.
2. In simple terms, talk to children about what a *pattern* is. In this case, a *pattern* refers to a design that repeats itself.
3. Introduce children to the shapes--the name of each one and its color, for example, "This is a *yellow circle*." The names of the shapes are written on them to expose students to print.
4. For students who are new to shapes, ask questions that will call attention to the shapes' attributes, for example, "What can you tell me about this shape?" "How many sides does it have?" "How many corners do triangles have?"

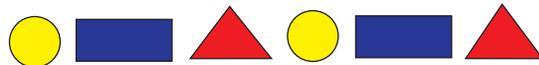
5. Have younger children sort the shapes. Let the children decide how to sort them at first. Then, ask them to sort by attribute, for example, have them put all of the squares in one pile. Asking questions such as, "How many triangles are there?" is one way to give young children practice counting.

6. On a flat surface, the adult begins the activity by making a repeating pattern using the shape cut-outs, for example:

Easy...



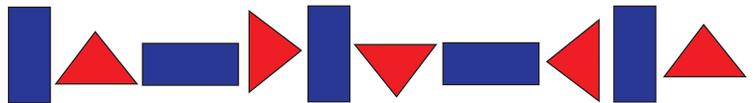
A little more challenging...



More challenging...



Advanced...



7. The adult asks the child, "Which shape comes next in this pattern?" Adults can ask children who are more familiar with making patterns, "What *three* shapes come next?" If children become confused, remind them that they want to choose a shape that will make the design continue to look the same.

8. The child then chooses, from the shape cut-outs, the next shape(s) in the pattern and places them in the line.

9. As children become more skilled with patterns, they can create a repeating pattern with the shapes for adults to complete!

Home Math Activity: Pattern Play

How does this activity reinforce some of the academic skills students need to learn?

There are five **strands** within the Massachusetts Mathematics Curriculum Framework (2000).

- Number Sense and Operations
- Patterns, Relations, and Algebra
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

Within these five strands, there are many **learning standards**. Each learning standard outlines a specific skill that students should know by each grade level, from PreK-Kindergarten through grade 12.

GRADES PREK-K

PATTERNS, RELATIONS, AND ALGEBRA STRAND

Learning Standard K.P.1: “Identify the attributes of objects as a foundation for sorting and classifying, e.g., a red truck, red block, and a red ball share the attribute of being red; a square block, a square cracker, and a square book share the attribute of being square.”

Learning Standards K.P.2: “Sort and classify objects by color, shape, size, number, and other properties.”

Learning Standard K.P.3: “Identify, reproduce, describe, extend and create color, rhythmic, shape, number, and letter repeating **patterns** with simple attributes, e.g. ABABAB...”

(Massachusetts Mathematics Curriculum Framework, 2000; page 28.)

GRADES PREK-K **GEOMETRY STRAND**

Learning Standard K.G.1: “Name, describe, sort, and draw simple two-dimensional shapes.”

Learning Standard K.G.2: “Describe attributes of two-dimensional shapes, e.g, number of sides, number of corners.”

(Massachusetts Mathematics Curriculum Framework, 2000; page 36.)

GRADES 1-2

PATTERNS, RELATIONS, AND ALGEBRA STRAND

Learning Standard 2.P.1: “Identify, reproduce, describe, extend, and create simple rhythmic, **shape**, size, number, color, and letter **repeating patterns**.”

(Massachusetts Mathematics Curriculum Framework, 2000; page 30.)

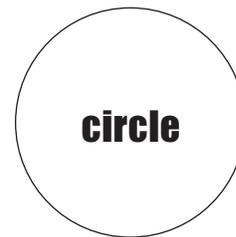
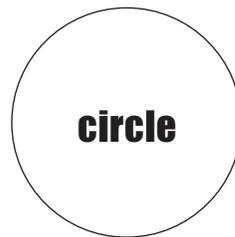
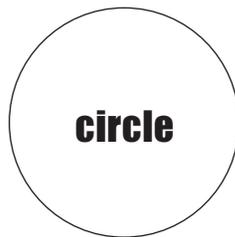
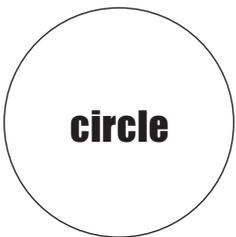
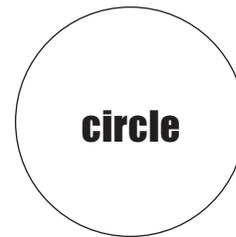
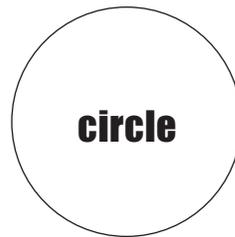
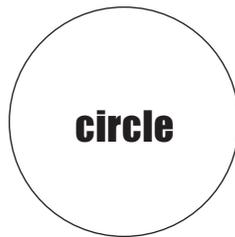
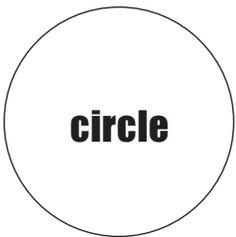
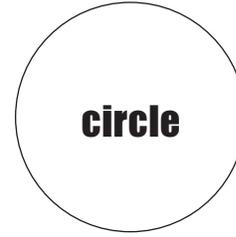
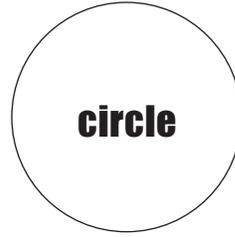
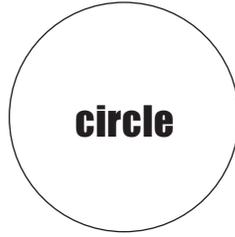
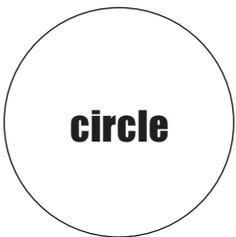
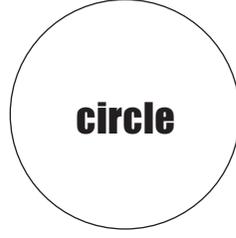
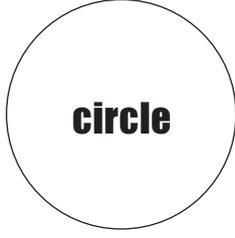
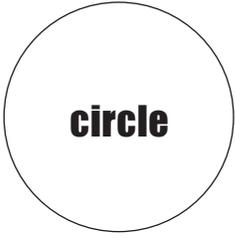
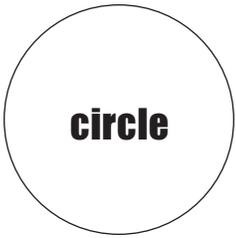
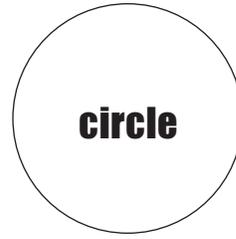
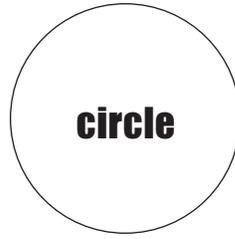
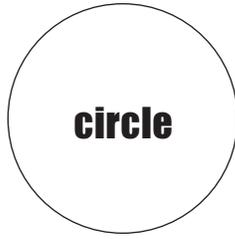
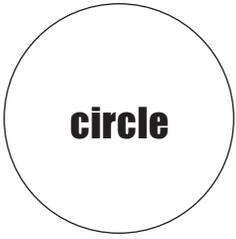
GRADES 1-2 **GEOMETRY STRAND**

Learning Standard 2.G.2: “Identify, describe, draw, and compare two-dimensional shapes, including polygonal (up to six sides) and curved figures such as circles.” (Massachusetts Mathematics Curriculum Framework, 2000; page 38.)

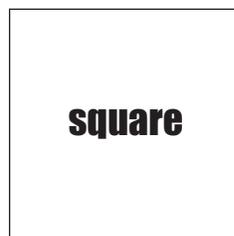
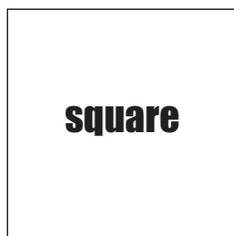
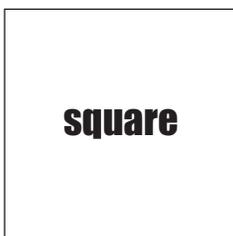
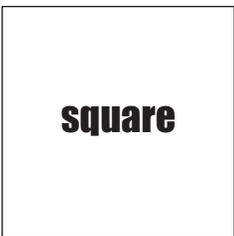
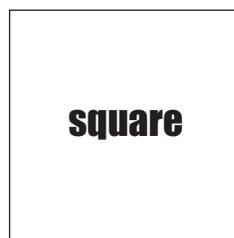
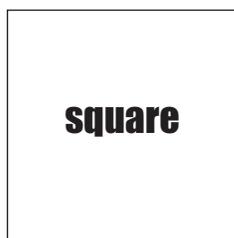
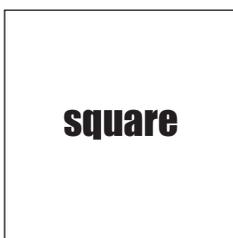
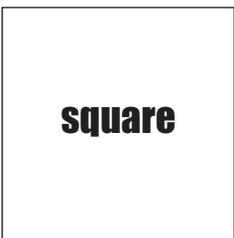
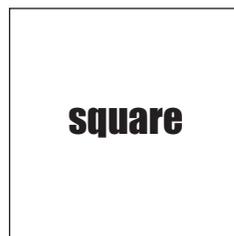
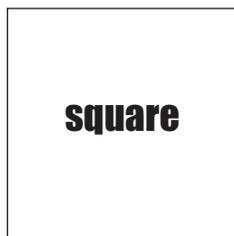
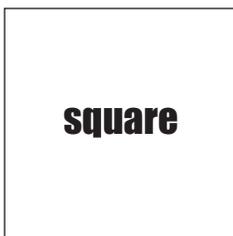
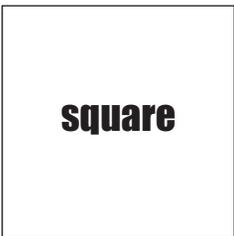
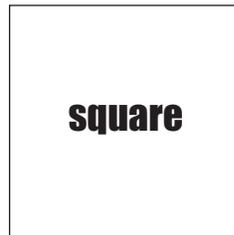
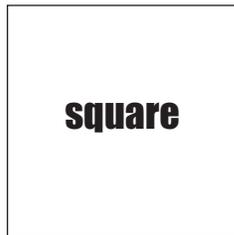
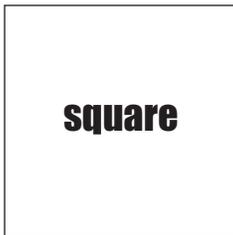
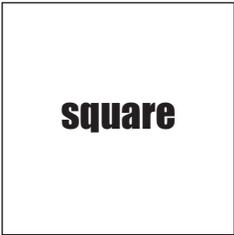
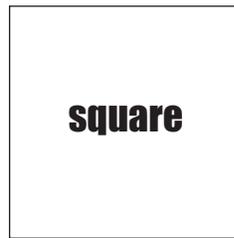
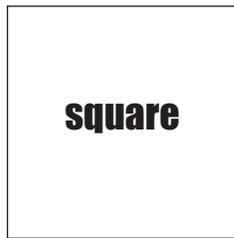
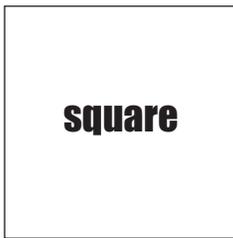
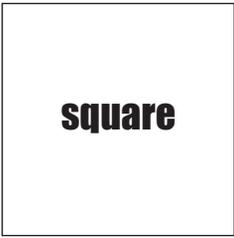
The ability to recognize patterns is a mathematical skill that students will need throughout their education!

The strands and learning standards represented above are a few of the benchmarks students must achieve. To view the complete Frameworks with all of the skills students are expected to acquire by each grade, visit the Massachusetts Department of Education Website at www.doe.mass.edu.

SHAPE SHEET -- CIRCLES



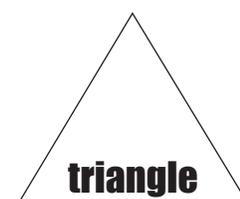
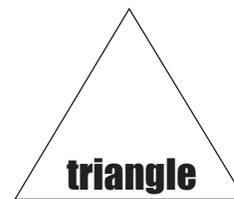
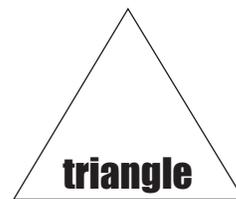
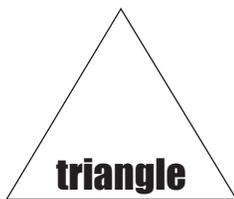
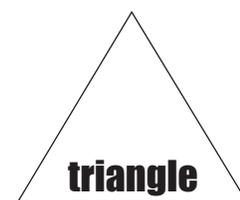
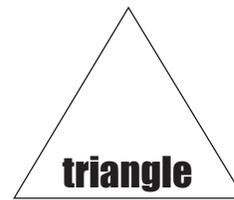
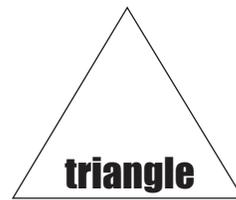
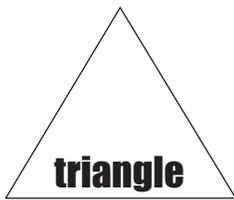
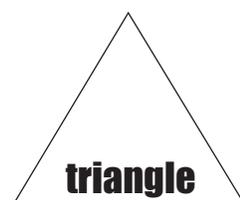
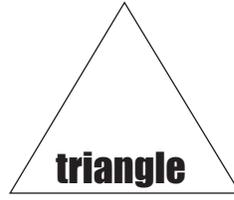
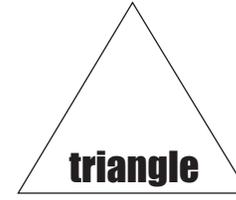
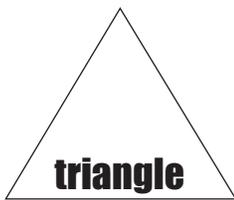
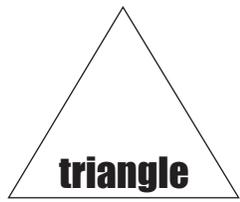
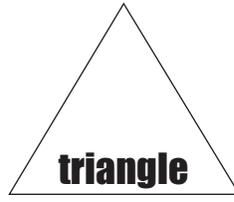
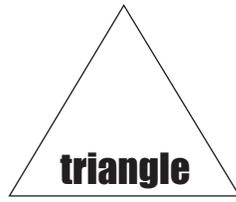
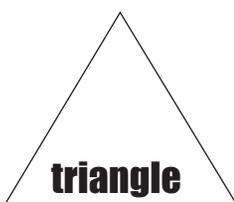
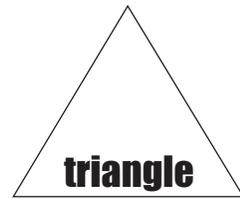
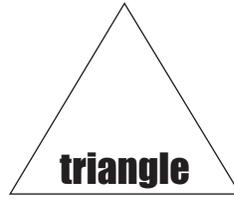
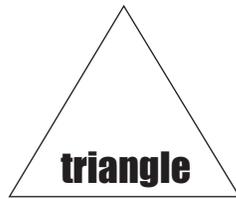
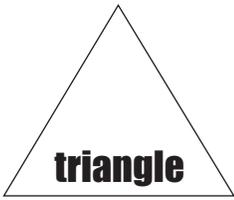
SHAPE SHEET -- SQUARES



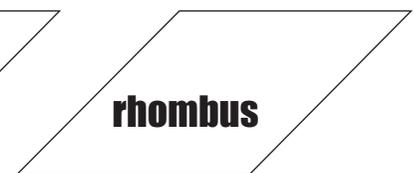
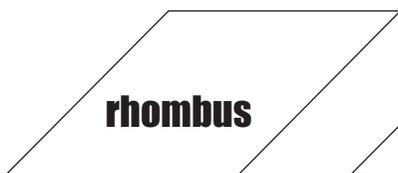
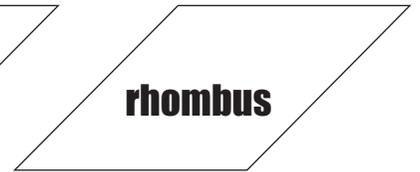
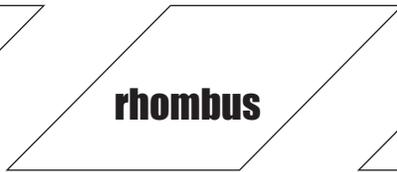
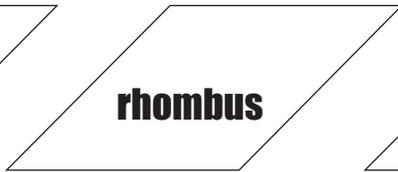
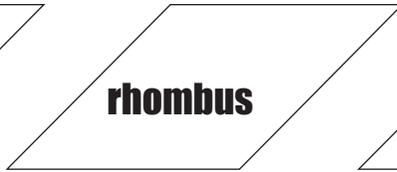
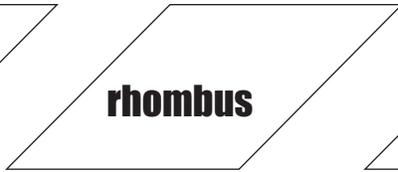
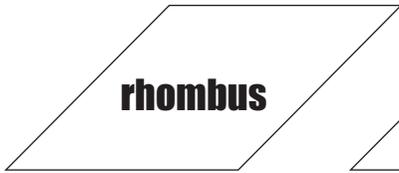
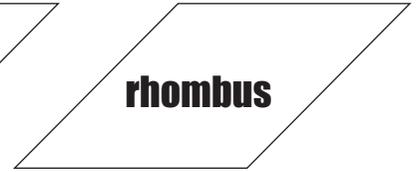
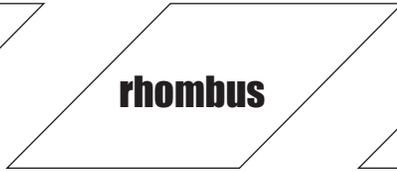
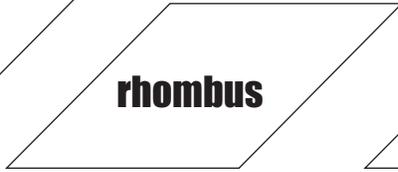
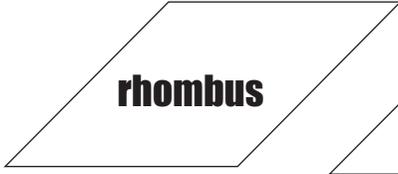
SHAPE SHEET -- RECTANGLES

rectangle

SHAPE SHEET -- TRIANGLES



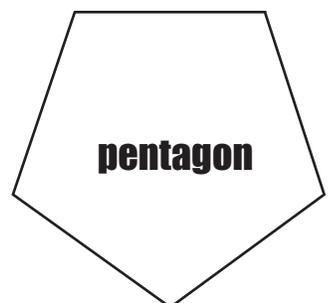
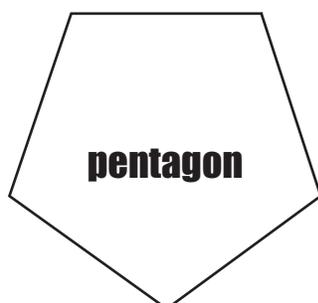
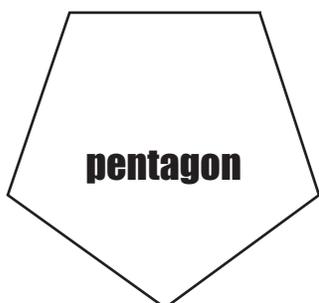
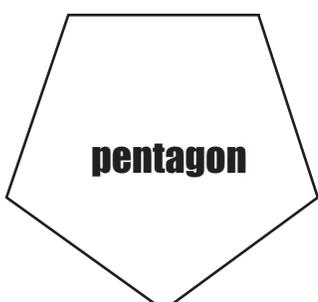
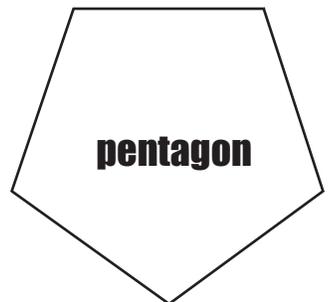
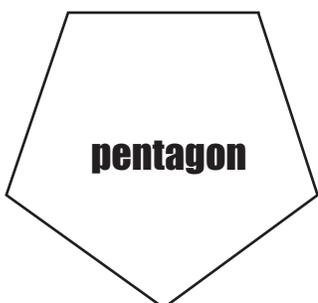
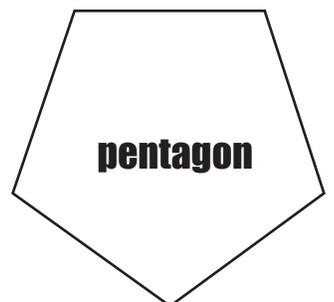
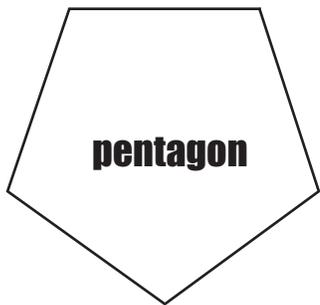
SHAPE SHEET -- RHOMBI



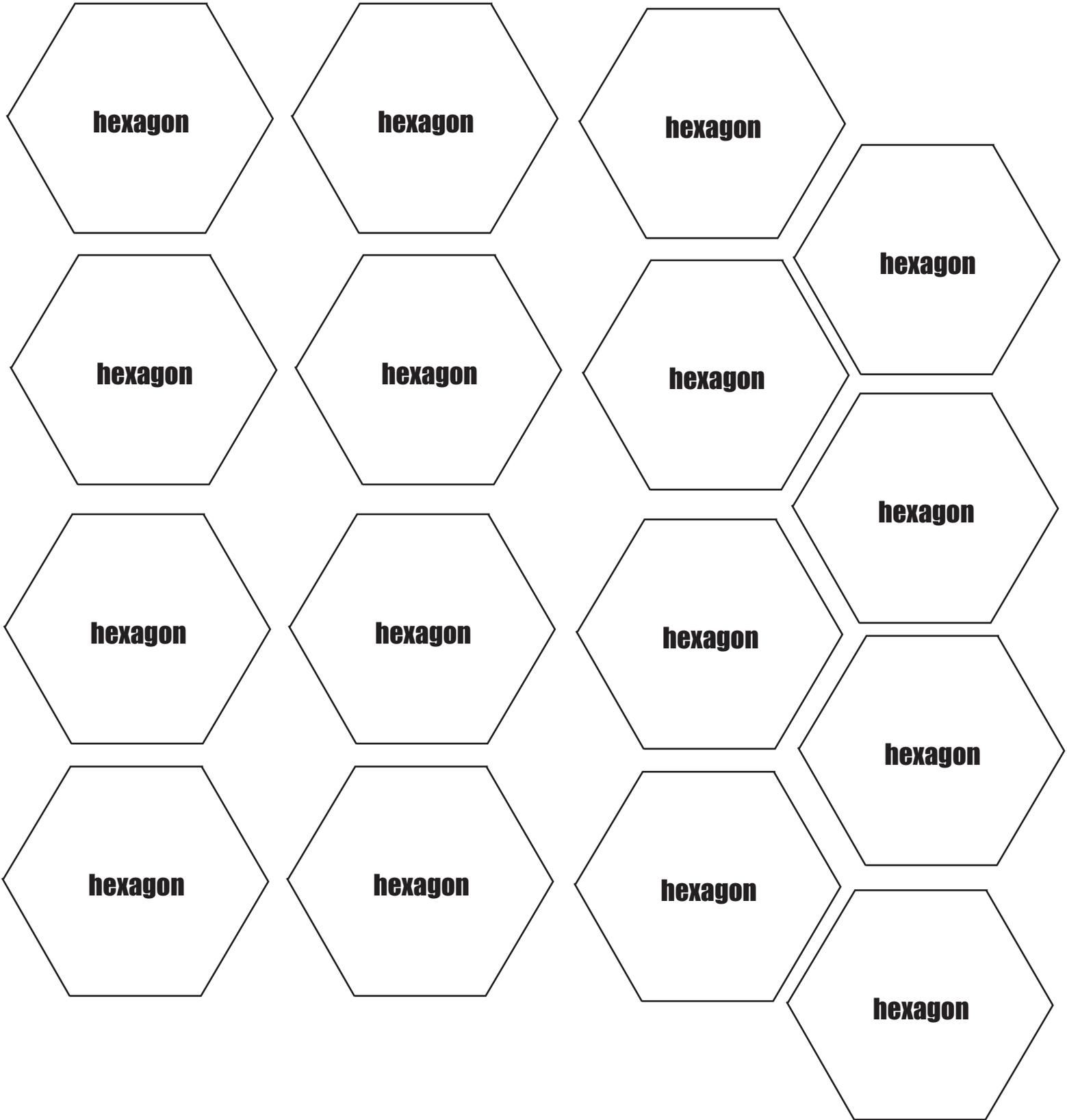
SHAPE SHEET -- Trapezoids



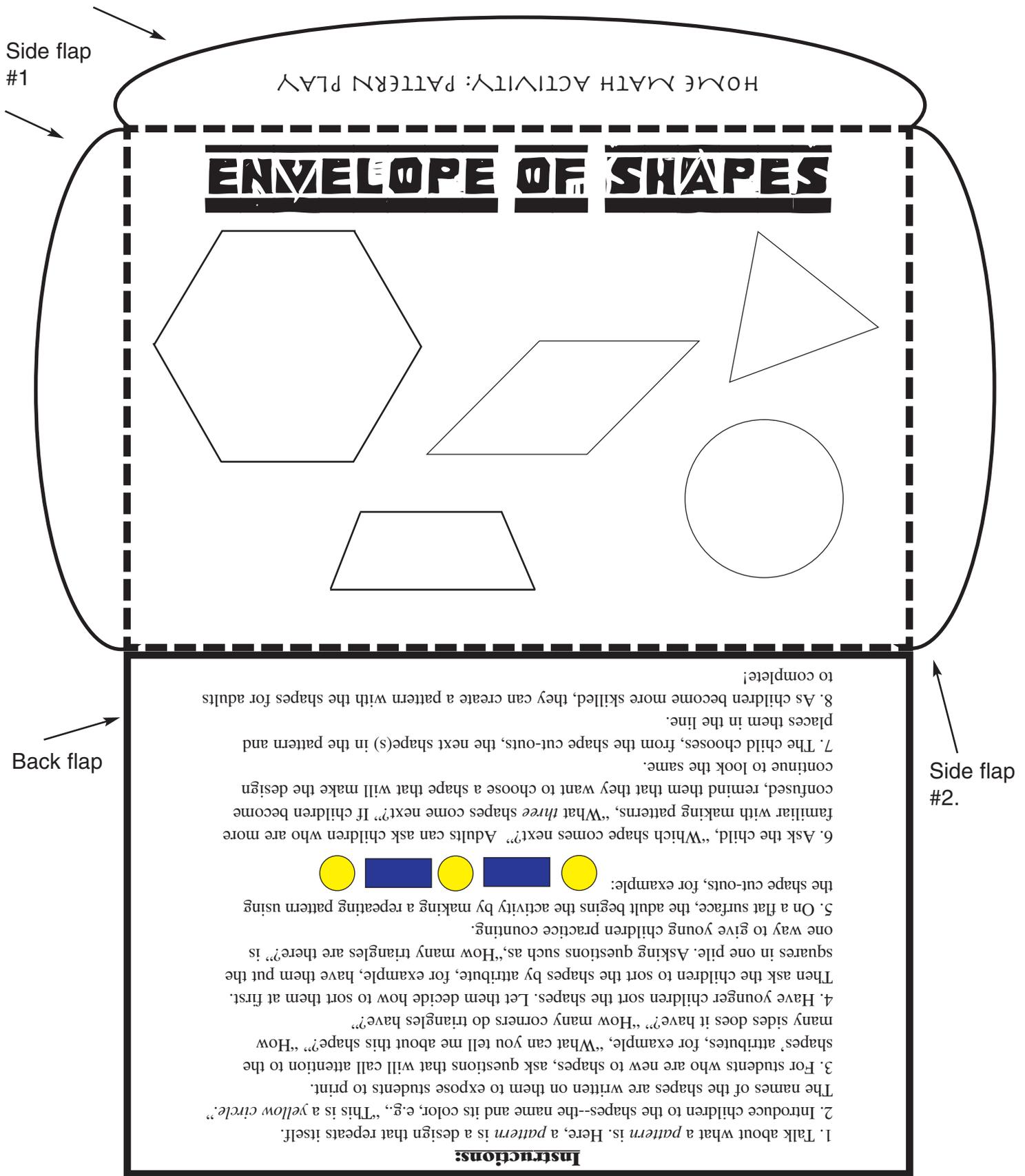
SHAPE SHEET -- Regular Pentagons



SHAPE SHEET -- Regular Hexagons



Use this top flap to close the envelop.



Cut along the solid lines only, then fold along the dotted lines. Fold so that you can still see the shapes on the front. After folding the back flap, fold and then glue or tape the two side flaps to the back flap. Put the shape cut-outs inside, then close the envelop using the top flap.

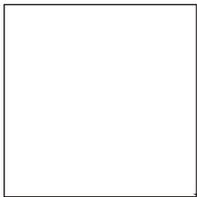
Teaching Tips: Basic Geometry

We know what a square is when we see one, but the true definition of a square is a bit more complex. Here is some background knowledge about basic plane geometry that adults may find helpful when answering students' questions.



When two lines are **PARALLEL**, they do not, and will not ever, intersect/cross each other. This is because all of the points on one line are the same distance from all of the points on the other line.

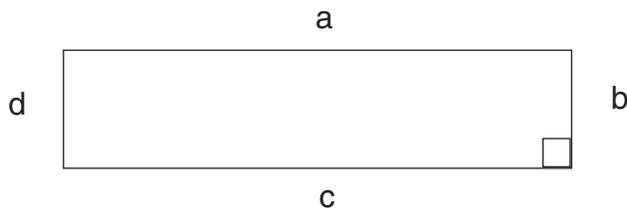
A **POLYGON** is “a closed plane figure with n sides...the word ‘polygon’ derives from the Greek *poly*, meaning ‘many’ and *gonia*, meaning ‘angle.’”¹



A SQUARE is a POLYGON that...

- ✓ has two pairs of parallel sides;
- ✓ has four sides that are the same length;
- ✓ has four equal angles (each angle is 90 degrees).

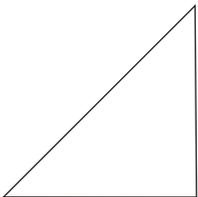
angle



A RECTANGLE is a POLYGON that...

- ✓ has four sides
- ✓ has two pairs of parallel sides; each side is the same length as its opposite side (side a = side c; side b = side d);
- ✓ has four, 90-degree angles.

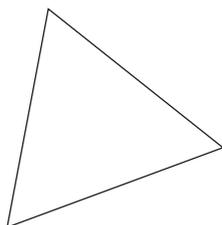
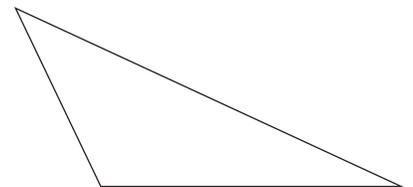
All **SQUARES** are **RECTANGLES**, but not all **RECTANGLES** are **SQUARES**!



A TRIANGLE is a POLYGON that...

- ✓ has three sides;
- ✓ has three angles.

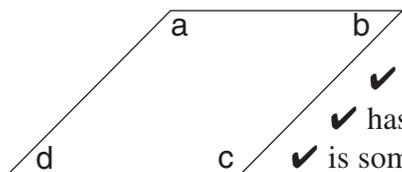
Some triangles have two or three sides and angles that are equal; others have no sides nor angles that are equal.



CONTINUED ON THE BACK PAGE...



Teaching Tips: Basic Geometry (Page 2)



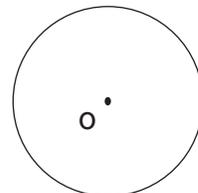
A **RHOMBUS** is a **POLYGON** that...

- ✓ has four sides that are equal in length;²
- ✓ has two pairs of parallel sides;³
- ✓ is sometimes referred to as a diamond;⁴
- ✓ has four angles; the opposite angles are equal (angle a = angle c; angle b = angle d.)

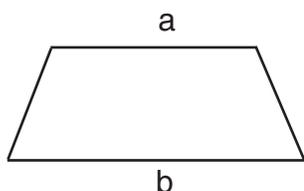
The plural of rhombus can be either rhombi, or rhombuses.⁵

All **SQUARES** are **RHOMBI**, but not all **RHOMBI** are **SQUARES**!

A **CIRCLE** is, “the set of points in a plane that are equidistant from a given point O.”⁶
Circles are not polygons.

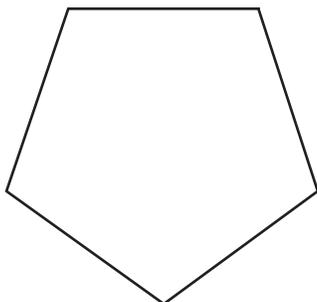


POLYGONS that have four sides are **QUADRILATERALS** (squares, rectangles, rhombi, and trapezoids, for example); **POLYGONS** that have five sides are **PENTAGONS**; that have six sides are **HEXAGONS**; and that have eight sides are **OCTAGONS**.⁷



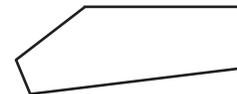
A **TRAPEZOID** has only one set of parallel lines.
(Lines a and b are parallel.)

A **REGULAR POLYGON**, “...is an n-sided polygon in which the sides are all the same length and are symmetrically placed about a common center.”⁸



So, for example, a **REGULAR PENTAGON** (see left) has five sides that are the same length.⁹ Since the sides are the same length and are placed around a common center, the regular pentagon has five equal angles (108 degrees each).

PENTAGONS that have five sides that vary in length are **IRREGULAR PENTAGONS** (see right).



Cited Sources (Retrieved from the World Wide Web on December 6, 2005):

- 1 & 7. Eric W. Weisstein. "Polygon." From MathWorld--A Wolfram Web Resource. <http://mathworld.wolfram.com/Polygon.html>.
- 2-5. Eric W. Weisstein. "Rhombus." From MathWorld--A Wolfram Web Resource. <http://mathworld.wolfram.com/Rhombus.html>
6. Eric W. Weisstein. "Circle." From MathWorld--A Wolfram Web Resource. <http://mathworld.wolfram.com/Circle.html>.
8. Eric W. Weisstein. "Regular Polygon." From MathWorld--A Wolfram Web Resource. <http://mathworld.wolfram.com/RegularPolygon.html>
9. Eric W. Weisstein. "Pentagon." From MathWorld--A Wolfram Web Resource. <http://mathworld.wolfram.com/Pentagon.html>