

## **Dear Family,**

The next unit in your child's mathematics class this year is ***Shapes and Designs: Two-Dimensional Geometry***. It is the first unit in the *Connected Mathematics* geometry strand. Students will recognize, analyze, measure, and reason about the shapes and visual patterns that are important features of our world. It builds on students' previous exposure to simple shapes by analyzing the properties that make certain shapes special and useful.

## **UNIT GOALS**

The goal of *Shapes and Designs* is to have students discover and analyze many of the key properties of polygonal shapes that make them useful and attractive. This unit focuses on polygons and develops these two themes:

- How do the measures of angles in a polygon determine its shapes and uses?
- How do the lengths of edges in a polygon determine its shapes and uses?

Each investigation focuses on some key properties of figures and the importance of those properties in applications. Students are periodically asked to identify differences among particular classifications of polygons. Students are also asked to find and describe places where they see different polygons and to think about why those shapes are used.

## **HELPING WITH HOMEWORK**

You can help with homework and encourage sound mathematical habits as your child studies this unit by asking questions such as:

- What kinds of shapes/polygons will cover a flat surface?
- What do these shapes have in common?
- How can angle measures be estimated?
- How can angles be measured with more accuracy?

In your child's notebook, you can find worked-out examples from problems done in class, notes on the unit's mathematics, and descriptions of the vocabulary words.

## **HAVING CONVERSATIONS ABOUT THE MATHEMATICS IN SHAPES AND DESIGNS**

You can help your child see how this aspect of geometry is important in everyday life in several ways:

- Whenever you notice an interesting shape in a newspaper or a magazine, discuss with your child whether it is one of the polygons mentioned in the unit, and suggest that it might be cut out and saved for the shapes project.
- Have your child share his or her mathematics notebook with you, showing you what has been recorded about the different shapes being studied. Ask your child to explain why these ideas are important, and try to share ways that shapes help you with work or hobbies.
- Look over your child's homework and make sure all questions are answered and that explanations are clear.

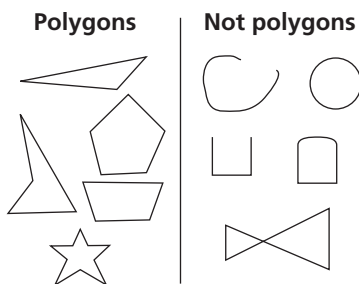
A few important mathematical ideas that your child will learn in *Shapes and Designs* are given on the back. As always, if you have any questions or concerns about this unit or your child's progress in class, please feel free to call.

Sincerely,

## Important Concepts and Examples

### Polygon

A shape formed by line segments so that each of the segments meets exactly two other segments, and all of the points where the segments meet are end points of the segments.



### Polygon Names

**Triangle** 3 sides and 3 angles  
**Quadrilateral** 4 sides and 4 angles  
**Pentagon** 5 sides and 5 angles  
**Hexagon** 6 sides and 6 angles  
**Heptagon** 7 sides and 7 angles  
**Octagon** 8 sides and 8 angles  
**Nonagon** 9 sides and 9 angles  
**Decagon** 10 sides and 10 angles  
**Dodecagon** 12 sides and 12 angles

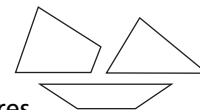
### Regular Polygons

Polygons whose side lengths are equal and interior angle measures are equal.



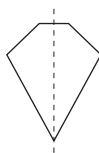
### Irregular Polygon

A polygon that has either at least two sides with different lengths or two angles with different measures



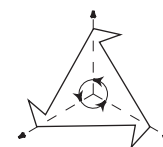
### Line (or Mirror) Symmetry

If the polygon is folded over the line of symmetry, the two halves of the shape will match exactly.



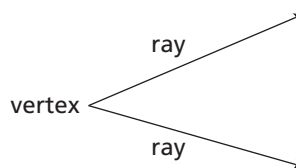
### Rotational (or Turn) Symmetry

A polygon with turn symmetry can be turned around its center point less than a full turn and still look exactly as it did before it was rotated.



### Angles

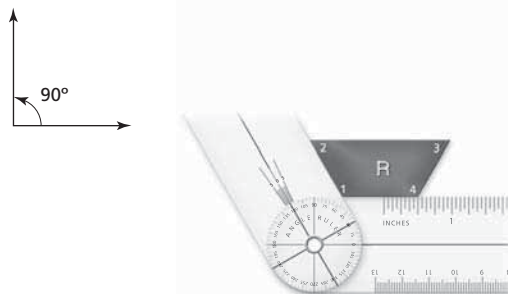
Angles are figures formed by two rays or line segments that have a common vertex. The **vertex** of an angle is the point where the two rays meet or intersect. Angles are measured in degrees.



### Angle Measures

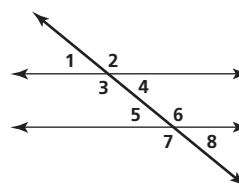
To develop estimation skills, students relate angles to right angles. Combinations and partitions of  $90^\circ$  are used as benchmarks to estimate angle size.

A **goniometer** (goh nee AHM uh tur), or **angle ruler**, is an instrument for making more precise measurements of angles. This tool is used in the medical field for measuring angle of motion or flexibility in body joints, such as knees.



### Angles and Parallel Lines

Parallel lines cut by a **transversal** make pairs of equal corresponding angles and pairs of equal alternate interior angles. Angles 1 and 5, angles 2 and 6, angles 3 and 7, and angles 4 and 8 are pairs of **corresponding angles**. Angles 4 and 5 and angles 3 and 6 are pairs of **alternate interior angles**.



### Polygons That Tile a Plane

For regular polygons to tile a plane (or cover a flat surface without gaps or overlaps), the angle measure of an interior angle must be a factor of  $360^\circ$ . The only regular polygons that can tile a plane are an equilateral triangle ( $60^\circ$  angles), a square ( $90^\circ$  angles), and a regular hexagon ( $120^\circ$  angles).

### Triangle Inequality Theorem

The sum of two side lengths of a triangle must be greater than the 3rd side length.

If the side lengths are  $a$ ,  $b$ , and  $c$ , then:  $a + b > c$ ,  
 $b + c > a$ ,  $c + a > b$

