



Problem of the Month **Piece It Together**



Level A:

You have 6 different pattern blocks of different colors. Organize the pattern blocks and draw the large face of each of them.

Determine the mathematical name of the large face of each of the blocks. List the attributes of the figures including length of sides and size of angles.

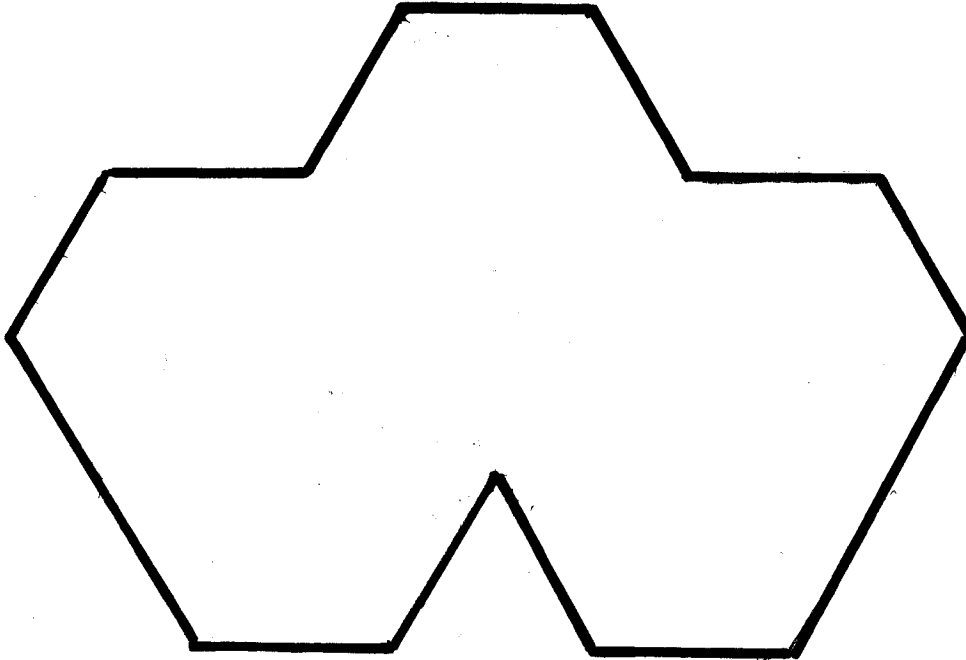
Compare the length and area of the figures. Make a systematic list indicating their relative sizes.

If the green triangle is one area unit in size, how does it compare with the trapezoid, the blue rhombus and the hexagon?

List the possible ways that a hexagon can be covered with the other pattern blocks.

Level B:

Consider the outline of the figure below. Investigate how to cover up that outline by arranging different blocks to fit into the space exactly.



If you were to only use one type of block, which block(s) can be used to cover the outline? Explain how you know for sure.

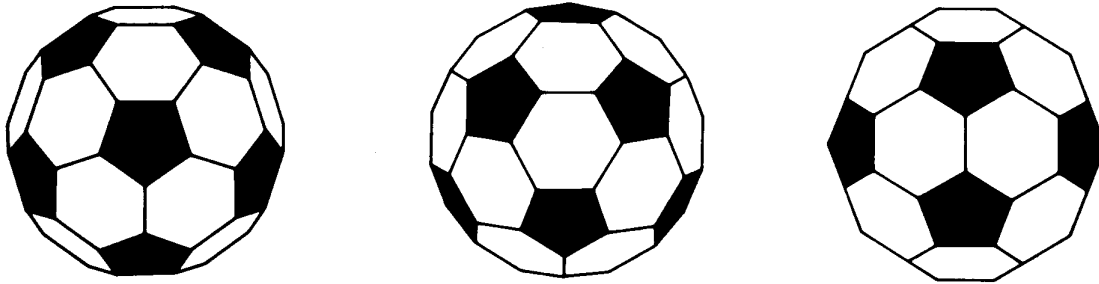
If you could use more than one type of block, which combination of blocks could be used to cover the outline? Explain or draw your solutions.

Which pattern block(s) can not be used at all? Explain why some patterns blocks work and others do not.

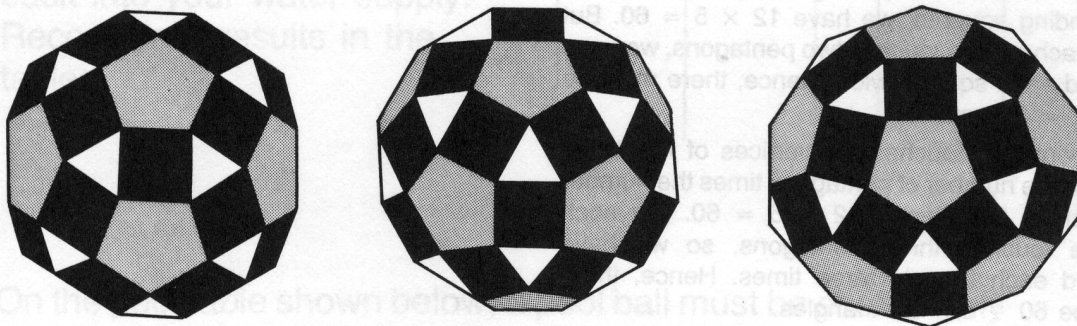
Level C:

You work for a sporting good manufacturer and you are finding that soccer is becoming more and more popular.

The top selling soccer ball is made by **Everkick**. The design pattern of this ball is comprised of pentagons and hexagons. Below are three views of the **Everkick** soccer ball. Analyze the design pattern and determine the number of pentagons and hexagons it takes to make a ball. Explain your conclusion using mathematical reasoning.



The **GoalScorer** ball is second on the list of best selling soccer balls. It has a different design pattern. The design pattern of this ball is comprised of pentagons, triangles and squares. Below are three views of the **GoalScorer** soccer ball. Analyze the design pattern and determine the number of pentagons, triangles and squares it takes to make a ball. Explain your conclusion using mathematical reasoning.



Level D:

Soccer balls are made in different sizes for age group soccer leagues. There are three standard balls, a size 5, a size 4 and a size 3 soccer ball. Major League Soccer and the World Cup use a size 5 soccer ball. According to the rule book, the circumference (around the equator of a sphere) of a size 5 soccer ball when fully inflated must be between 27 and 28 inches. Using your knowledge of the diameter (across the center of a sphere), volume and surface area of a sphere, determine those measures of the size 5 soccer ball.

Using geometry, determine the size (including the length of sides and area) of a pentagon and hexagon from a size 5 **Everkick** soccer ball. Explain the process you use to determine the dimensions and area.

Using geometry, determine the size (including the length of sides and area) of a pentagon, square and triangle from a size 5 **GoalScorer** ball. Explain the process you use to determine the dimensions and area.

Level E:

The executive board has assigned you the task of creating a new design pattern for the company's new soccer ball. Use various polygons to create a spherical shaped object. Build a design model using construction paper and tape. Draw a blueprint design of the ball showing at least three different views of the soccer ball. List the types of polygons used in the design. For each polygon state the quantity needed to construct a ball.

Prepare a design specification report for a size 5 soccer ball. State the volume, diameter, circumference and surface area. Also, list the dimensions of each polygon used in your design, including the length of the sides, the measure of interior angles, the perimeter and the area of the polygon.



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Primary Version Level A

Materials: A set of pattern blocks for each pair. Paper and pencil to write or draw. Color crayons, markers or pencils.

Discussion on the rug: (Students have sets of pattern blocks)
“Here are pattern blocks. What do you notice about them? What else do you notice about them?” (Teacher continues to ask children to notice that they are different colors, shapes, sizes and lengths. Teacher encourages the students to play with them and make different things.)

In small groups: (Each group has a set of pattern blocks)
(Teacher asks the following questions. Only go on to the next question if students have success)

1. “Which of these blocks do we know? What is its name? How many sides does it have? How many corners does it have?”
(Introduce the name of blocks, if the students demonstrate knowledge of its attributes).

2. “Which blocks fit on top of each other? How many green triangles fit on a blue rhombus? A red triangle? A yellow hexagon?”
(Have students write a number next to each block drawn).

3. “How many different ways can you cover the hexagon with other blocks?” (At the end of the investigation have students either draw a picture or dictate a response to represent their solution)

