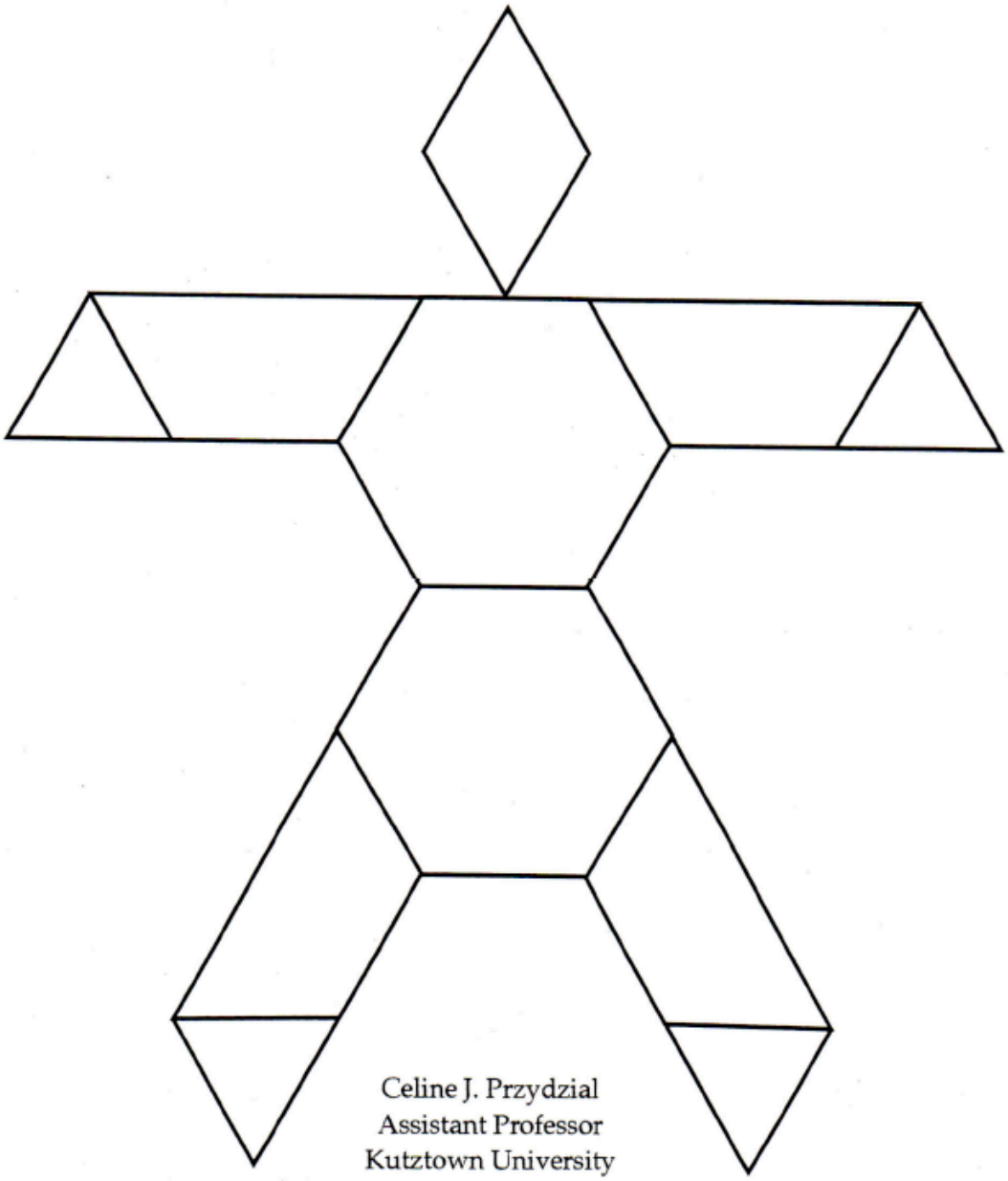
Learning Mathematics with Pattern Blocks



Celine J. Przydzial
Assistant Professor
Kutztown University
Kutztown, PA 19530
przydzia@kutztown.edu

Title: Cover-Up

Purpose: To develop problem-solving strategies.

Activity: Use pattern blocks to build congruent shapes.

1. Lay out a trapezoid. Use other pattern blocks to build a trapezoid that is the same size.
2. Lay out a hexagon. Use other pattern blocks to find how many different ways can be used to cover the hexagon.
3. How many solutions use only blocks of the same color? Two different colors? Three different colors? More than three colors?
4. Are there any blocks that did not work? Which ones and why?

Title: Number Value and the Shapes

Purpose: To explore the relationship between pattern blocks and use this to develop number concepts.

Activity: Use pattern blocks to create figures with specific values.

1. If the green triangle has a value of 1, what is the value of the blue rhombus?
   What is the value of:
   - the trapezoid?
   - the hexagon?
   - two blue rhombuses?
   - a trapezoid and a triangle?
2. Make figures using three pattern blocks. How much are the figures worth if the green triangle has a value of 1.
3. Make figures worth 6, if the green triangle has a value of 1. Do all these figures use the same number of blocks?
4. The yellow hexagon has a value of 6. Make a model worth 11 using three different blocks and write the addition sentence for the model. Make other models worth 11 and write the addition sentence for the model.
5. Make models worth 7, without using a hexagon, if the green triangle has a value of 1.
6. The yellow hexagon has a value of 3. Name the values of the:
   - blue rhombus
   - triangle
   - trapezoid.

   Which three blocks are equal to one-half of 10? What is the value of 11 triangles? Make the same value with the smallest number of blocks.
7. The blue rhombus has a value of 1. Name the values of the:
   - hexagon
   - triangle
   - trapezoid.

Create figures which show the values of 3, 6 and 9.

8. A rhombus is to a hexagon as a triangle is to a ...?
   A triangle is to a hexagon as a trapezoid is to a ...?
   A triangle is to a trapezoid as a blue rhombus is to a ...?

Title: Pattern Block Fractions

Purpose: To develop an understanding of the symbolic representation of fractions and equivalent fractions.

Activity: Use pattern blocks to represent fractional parts of a whole and equivalent fractions.

1. Lay out a yellow hexagon. This is the unit whole. How many blue rhombuses will cover the hexagon? Are each of these blue rhombuses equal parts of the hexagon? Each blue rhombus is what fractional part of the hexagon? Two blue rhombuses are what fractional part of the hexagon?
2. How many red trapezoids will cover the hexagon? Are each of these red trapezoids equal parts of the hexagon? Each red trapezoid is what fractional part of the hexagon?
3. How many triangles will cover the hexagon? Are each of these triangles equal parts of the hexagon? Each triangle is what fractional part of the hexagon?
4. Lay out the red trapezoid. This is the unit whole. How many blue rhombuses will cover the trapezoid? Does this cover the whole unit? How many triangles cover the red trapezoid? How many triangles cover the blue rhombus? Each blue rhombus is what fractional part of the trapezoid?
5. Lay out 2 yellow hexagons. Cover one hexagon with 2 green triangles. The triangles are what fractional part of the hexagon? Cover the other hexagon with a blue rhombus. The blue rhombus is what fractional part of the hexagon? Do the 2 green triangles and blue rhombus cover the same amount on each hexagon? What are the two equivalent fractions that are represented?
6. Lay out 2 yellow hexagons. Cover one hexagon with 3 green triangles. The triangles are what fractional part of the hexagon? Cover the other hexagon with a red trapezoid. The red trapezoid is what fractional part of the hexagon? Do the 3 green triangles and the red trapezoid cover the same amount on each hexagon? What are the two equivalent fractions that are represented?
7. Make fraction flash cards for the following fractions:

$$\frac{1}{2} \quad \frac{1}{3} \quad \frac{2}{3} \quad \frac{1}{6} \quad \frac{2}{6} \quad \frac{3}{6} \quad \frac{4}{6} \quad \frac{5}{6} \quad \frac{2}{2} \quad \frac{3}{3} \quad \frac{6}{6}.$$

   Choose a flash card and show a representation of that fraction using pattern blocks.

   Match the flash cards and pattern block models for any equivalent fractions.

Title: Pattern Block Angles

Purpose: To determine the interior angle measures of each of the pattern blocks.

Activity: Use pattern blocks to categorize and measure each interior angle of the blocks.

1. Lay out a orange square. A square is a regular polygon. All the sides are equal length and all the angles have equal measure. All 4 angles are right angles. What is the measure of a right angle?
2. Lay out a tan rhombus. A rhombus is a parallelogram with all sides congruent in length. Opposite angles in a parallelogram are equal or the same measure. What types of angles are the interior angles of the tan rhombus? How many of the tan rhombuses, using the acute angles, will cover a right angle in the square? What is measure of each acute angle in the tan rhombus?
3. The sum of the angles in a quadrilateral is 360°. What is the measure of each obtuse angle in the tan rhombus? What are the measure of all the interior angles in the tan rhombus?
4. Lay out a blue rhombus. What types of angles are the interior angles of the blue rhombus? Using the acute angles of the tan rhombus and the blue rhombus cover a right angle in the square. What is the sum of the measure of these two angles? If the acute angle in the tan rhombus is 30°, what is the acute angle in the blue rhombus? What is the measure of each obtuse angle in the blue rhombus? What are the measures of all the interior angles in the blue rhombus?
5. Lay out a green triangle. This is an equilateral triangle, all the sides are equal lengths and all the angles are equal measure. Place one of the triangles on top of the acute angles of the blue rhombus. What is the measures of the interior angles of the green triangle? What is the measures of all the interior angles in the green triangle?
6. Knowing the measures of the interior angles of the green triangle, tan rhombus, and blue rhombus, discover the measures of all the interior angles of the red trapezoid and yellow hexagon.
7. What type of polygon is the yellow hexagon?

Title: Lines of Symmetry with Pattern Blocks

Purpose: To recognize symmetric shapes and locate lines of symmetry.

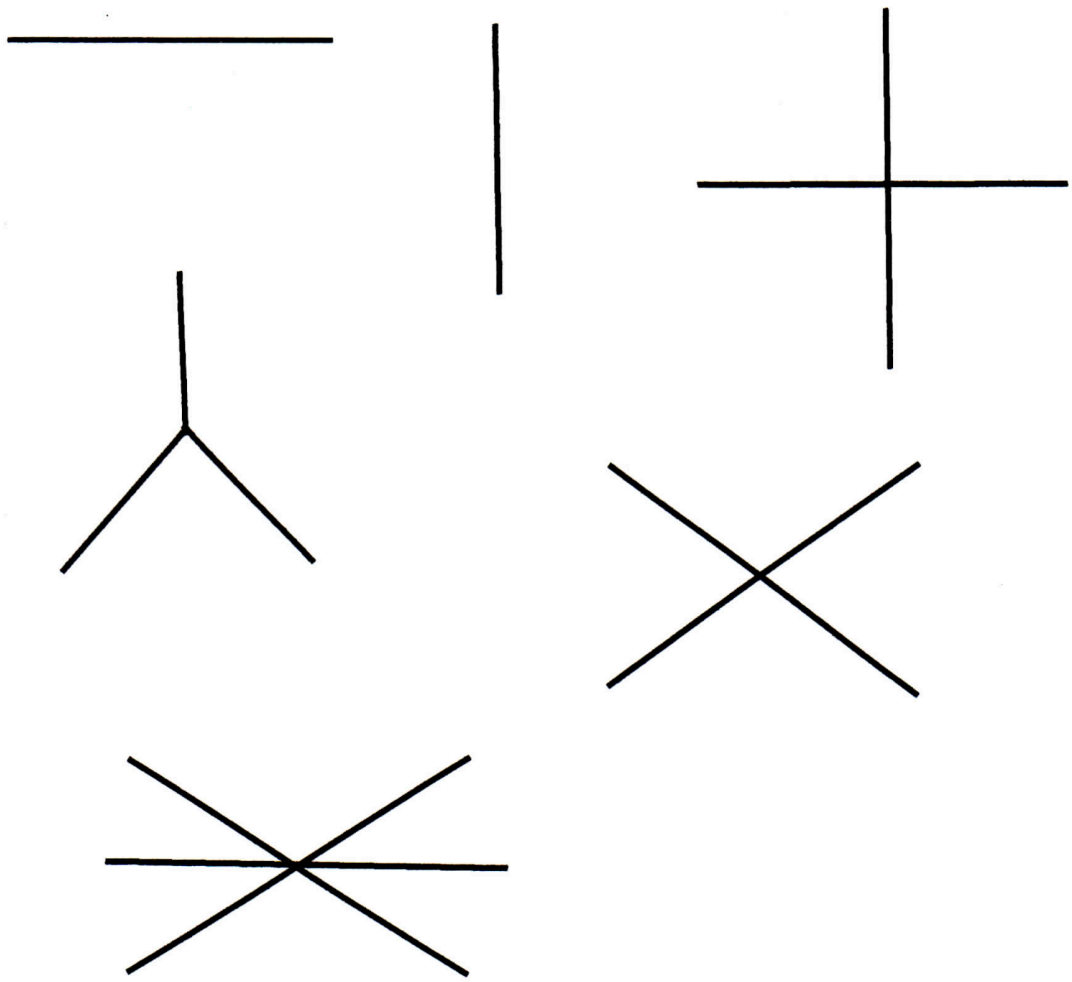
Activity: Determine which pattern block are symmetric and use pattern blocks to make shapes and designs that have lines of symmetry.

1. Fold each pattern block in half as many ways as you can.
2. Unfold each piece and use a dotted line to draw on the fold line of each piece.

3. Identify the number of lines of symmetry for each piece:

yellow hexagon:	blue rhombus
orange square:	tan rhombus
red trapezoid:	green triangle:

4. Use toothpicks or straws to create a fold line or a line of symmetry. Working in pairs, one person, places a pattern block on one side of the line so that one edge of the block is on the line. The other person puts a block on the other side of the line to make a match or symmetric figure. Individuals take turns adding blocks to the existing one and matching them to preserve the symmetry of the growing figure.
5. Create reflection pictures that have more than one line of symmetry. Examples of ways to position the toothpicks or straws to create the line(s) of symmetry are:



Title: Measuring Perimeter and Area with Pattern Blocks

Purpose: To develop the concept of perimeter and area using pattern blocks.
To construct figures with specific areas areas and perimeters using pattern blocks.

Activity: Find the perimeter of the pattern blocks and the area and perimeter of polygons constructed with pattern blocks.

1. Using the orange square with a side of one unit of length, find the perimeter of each pattern block:

   yellow hexagon:
   red trapezoid:
   Blue rhombus:
   tan rhombus:
   green triangle:

2. Which pattern block has the greatest perimeter? Which block has the least perimeter? Which blocks have the same perimeter?
3. Using a blue rhombus, a tan rhombus, and orange square construct figures with different perimeters. What is the smallest perimeter found? What is the largest? Can you find other perimeters? Why do some figures with the same blocks have different perimeters?
4. Using the orange square with area equal to one square unit of area, find the perimeter and area of a rectangle that is a 4x3 array of pattern block squares.
5. Create other figures with area = 12 square units using only orange squares. Find the perimeter of these figures.
6. Arrange a 3x3 array of pattern block squares with perimeter = 12 units and area = 9 square units. Reduce the area by one square unit and maintain the perimeter of 12 units. Reduce to area to 7 square units while maintaining the perimeter of 12 units. Reduce the area to 6 square units while keeping the same perimeter. Reduce to 5 square units while keeping the same perimeter. Reduce to 4 square units while keeping the same perimeter. Reduce to 3 square units while keeping the same perimeter.