Activity Set 1.1

1. a. Here are some of the many ways they differ:
   (1) The 7th figure has one more triangle than the 6th figure.
   (2) The 6th has the same number of triangles pointing up as pointing down.
   (3) The 6th figure forms a parallelogram, the 7th figure a trapezoid.
   (4) The length of the base in the 7th figure is longer than the base in the 6th figure.

   b. The 15th figure would contain 15 green triangles in a row. It would have the shape of a trapezoid with 8 triangles pointing up and 7 triangles pointing down.

2. a. New figures are created by adding a shape onto the right side of the previous figure so that the height of all the figures stays the same and there are no gaps. Odd numbered figures add a green triangle alternating between pointing up and pointing down. Even numbered figures add a blue rhombus alternating between slanting left and slanting right.

   b. The 10th figure will have a blue rhombus on the right end because all even numbered figures add a blue rhombus to the right end.

   c. 13 triangles and 12 rhombuses. Each even-numbered figure has the same number of triangles as rhombuses, and a rhombus on the right end. The 24th figure has 12 triangles and 12 rhombuses and a triangle attached to the right end produces the 25th figure.

   d. For n an odd number; n^{th} figure will have $(n+1) \div 2$ triangles and $(n-1) \div 2$ rhombuses.

3. a. New figures are created in this sequence by adding a shape onto the right side of the previous figure. The 1st figure and every 3rd figure after that adds a yellow hexagon. The 2nd figure and every 3rd figure after that adds a white rhombus. The 3rd figure and every 3rd figure after that adds an orange square.

   b. A rhombus. The pattern repeats after 3 steps so every 3rd figure (figures 3, 6, 9, etc.) has a square on the right. The 15th figure has a square on the right, the 16th a hexagon on the right, and the 17th a rhombus.

   c. There are 7 hexagons, 7 rhombuses, and 6 squares in the 20th figure. Multiples of 3 have the same number of each shape. The 18th figure has 6 of each shape. A hexagon and rhombus is added on for the 19th and 20th figures.

   d. 19 of each shape. Multiples of 3 have the same number of each shape.

4. a. The 10th figure has 4 hexagons and 6 triangles. The 15th figure has 5 hexagons and 10 triangles.
   b. If the figure number is 1 more than a multiple of 3 determine the number of hexagons and triangles for the previous figure (which is a multiple of 3) and then add another hexagon. If the figure number is 1 less than a multiple of 3 determine the number of hexagons and triangles for the following figure (which is a multiple of 3) and then subtract 1 triangle.
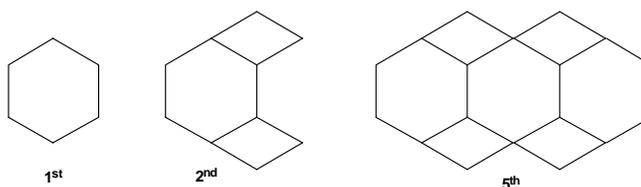
5.
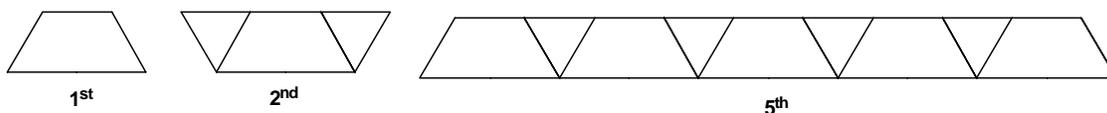
a. Here are some of the ways they differ
    (1) The odd numbered figures have a trapezoid at each end and the even numbered figures have triangles.
    (2) The bottom side is the longest side in the odd numbered figures.

b.

    Explanation: In any even numbered figure the number of hexagons is the figure number divided by 2. In any odd numbered figure the number of hexagons is the figure number plus 1 divided by 2.

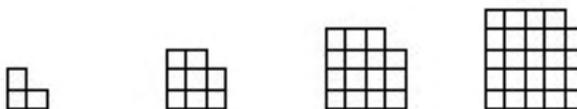6. Here are 3 ways. There are other possibilities.

    Sequence I

    Rule: Add one square to the top of each column in the previous figure.

    Sequence II

    Rule: Form 3 columns with 4 squares in each column and make the 4th column 1 square more than the preceding 4th column.

    Sequence III

    Rule: Form a square array whose dimensions are each one more than the figure number and remove 1 square from the upper right corner.