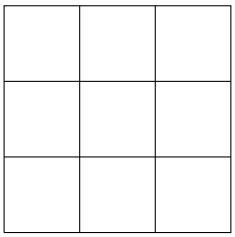
Math 221 - Problem Solving and Patterns Worksheet

Name: _____ Date: _____

Instructions: Solve the following problems. Write down the methods you used when trying to solve the problems.

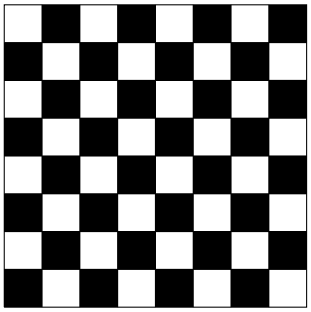
1. A farmer has a daughter who needs more practice in mathematics. One morning, the farmer looks out in the barnyard and sees a number of pigs and chickens. The farmer says to her daughter, "I count 24 heads and 80 feet. How many pigs and how many chickens are out there?"

2. Arrange the numbers 1 through 9 into a square subdivided into nine smaller squares (like the one shown below), so that the sum of every row, column, and main diagonal is the same.



3. Take any number and add 15 to the number. Now multiply that sum by 4. Next subtract 8 and divide the difference by 4. Now subtract 12 from the quotient and write down the answer. Your professor can tell you the original number. How did your professor find the original number so quickly?

4. (a) How many squares can be found in the 8×8 checkerboard figure below?



(b) If the number of rows and columns of the checkerboard is doubled (so you have a 16×16 board), is the number of squares doubled? Justify your answer.

5. (a) Notice that the circle with 2 points is cut into two regions. How many regions does the circle with 3 points have?

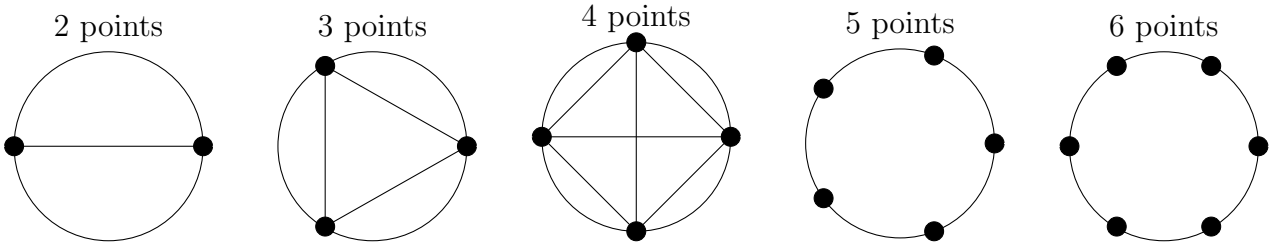
   (b) With 4?

   (c) Fill in all the lines for the circle with 5 points and count the number of regions. Do you see a pattern?

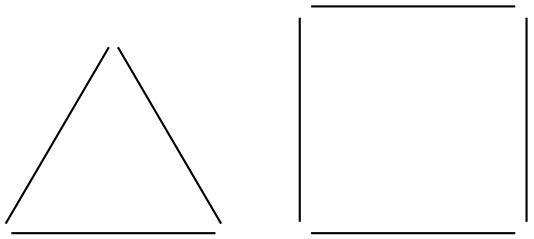
   (d) What would you expect the number of regions to be for the circle with 6 points?

   (e) Fill in all the lines for the circle with 6 points and count the number of regions. What happened?

   (f) What is the lesson here?



6. Using the given toothpicks, choose one of the following shapes:



(a) Starting from this shape, add toothpicks to create some sort of pattern. Draw the next 3 figures in your pattern.

Example: The following is one possible pattern of hexagons, but you will need 4 figures.

Figure 1 Figure 2 Figure 3

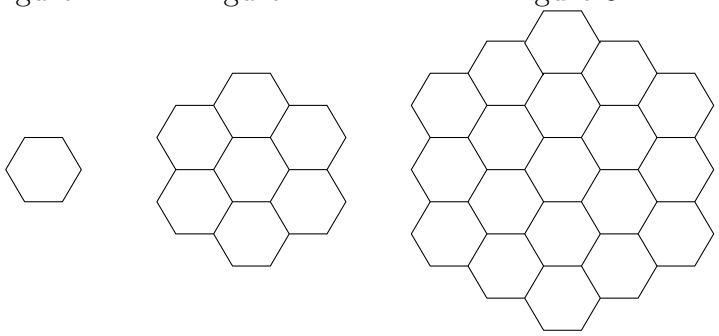


Figure 1 | Figure 2 | Figure 3 | Figure 4

(b) Count the number of toothpicks in your figures.

Figure	1	2	3	4
Number of Toothpicks				

(c) Is there a pattern? If so, what is it?