MTE 301

Test #1, FORM A

SCRATCH PAPER IS PROVIDED. DO NOT USE YOUR OWN PAPER!

Read the instructions carefully:

1. This exam is worth a total of 100 points.
2. No notes, formula sheets, or books may be used during this test.
3. You may use your own manipulatives.
4. Read all the questions carefully.
5. You must show your work and/or explain a process as appropriate for each problem to receive full credit.
6. Answers must be complete, organized, and exact unless directed otherwise.
7. When possible, place your answer on the line provided.

Honor Statement: By signing below I confirm that I have neither given nor received any unauthorized assistance on this exam. This includes any use of a graphing calculator beyond those uses specifically authorized by the Mathematics Department and my instructor. Furthermore, I agree not to discuss this exam with anyone until the exam-testing period is over. In addition, my calculator's memory and menus may be checked at any time and cleared by any testing center proctor or Mathematics Department instructor.

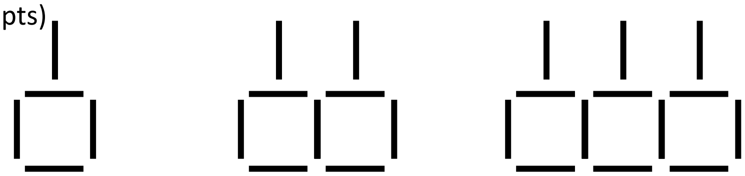
__________________________________ ________________

Signature Date

____

Printed Name

1. Look at the pattern of toothpicks below. **Explain** how to come up with the number of toothpicks needed for the 10th shape without drawing out the 10th shape or creating a recursive or an explicit rule. (5 pts)



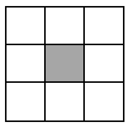
Shape 1 Shape 2 Shape 3

(5 pts) Does your thinking involve **deductive** or **inductive** thinking? Why?

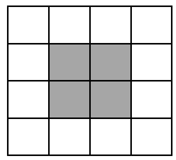
2. (5 pts) Write a **recursive** rule for the number of toothpicks needed per shape in number 1.

(5 pts) Write an **explicit** rule for the number of toothpicks needed per shape in number 1.

3. Patricia is building square patios with dark colored tiles, and surrounding them with borders of a single layer of light-colored tiles. The smallest is drawn below to the right. The next size is to its right. Draw the next patio following Patricia's pattern.



Patio 1



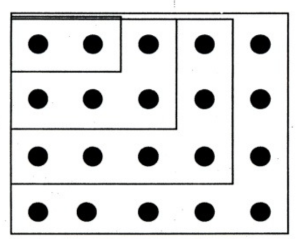
Patio 2

Patio 3

Complete the table below

Patio	Dark Tiles	Light tiles
1	(.25 pts)	(.25 pts)
2	(.25 pts)	(.25 pts)
3	(.25 pts)	(.25 pts)
4	(.25 pts)	(.25 pts)
…		
10	(1 pt)	(1 pt)
…		
n (explicit rule)	(3 pts)	(3 pts)

4. The drawing below represents a set of overlapping rectangles.



The first (top) rectangle contains 2 dots.

The second rectangle contains 6 dots.

The third rectangle contains 12 dots.

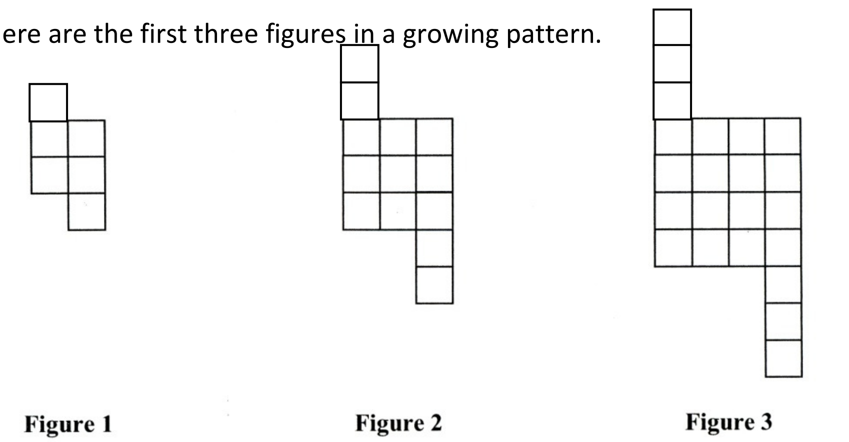
The fourth rectangle contains 20 dots.

(2 pts) How many dots will be in the fifth rectangle?

(3 pts) How many dots will be in the hundredth rectangle?

(5 pts) How many dots in the nth (explicit rule) rectangle?

5. Here are the first three figures in a growing pattern.



(3.3 pts) Write a **recursive** rule for finding the perimeter of the nth figure in the pattern.

(3.3 pts) Write an **explicit** rule for finding the perimeter of the nth figure in the pattern.

(3.4 pts) Write an **explicit** rule for finding the area of the nth figure in the pattern.

6. Write a **recursive** rule for each of the following pattern of numbers. **Also** indicate whether the sequence is arithmetic or geometric. (each worth 2.5 pts)

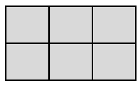
a. 7, 11, 15, 19…

b. 3, 12, 48, 192, …

c. 2, 4, 6, 8, 10, …

d. 2, 5, 8, 11, 14, …

7. The figure below shows a rectangle 2 squares wide and 3 squares long.



(2 pts) How many squares are needed to build a border one square thick all the way around the rectangle (including the corners)?

For each expression listed below, draw a figure to show how the squares are counted. Check to see whether or not the expressions are equivalent.

(4 pts) $2l + 2w + 4$

(4 pts) $2(l + 2) + 2(w + 2) - 4$

8. A display of 12-packs in a grocery store starts with 30 packs on the bottom row, than 29 on top of that, 28 on top of that, and so on until there is one 12-pack on the top. How many 12-packs of cans make up the display (5 pts)? What is the **explicit** formula that can be used to solve this problem (5 pts)?

9. The elementary school parking lot has spaces for cars and for bicycles. This morning 37 vehicles are parked there with a total of 116 wheels. How many of each vehicle (cars and bicycles) are parked there (answer 3 pts)? Show how you solved the problem **with equations** (4 pts). **Which** method of solving equations did you use (3 pts)?

10. A student creates the following pattern with color tiles: red, blue, green, blue, blue, red, blue, green, blue, blue.

(2pts) What is the pattern that repeats?

(3 pts) What color will the 20^{th} tile be in this pattern?

(5 pts) What color will the 523^{rd} tile be in this pattern? How do you know?