

Show all your work!!

Seat: \_\_\_\_\_

Partial credit is based on work shown!!

6pts

1. Fill in the next two numbers for each sequence:

a. 4, 16, 64, 256, 1024, \_\_\_\_\_, \_\_\_\_\_

b. 6, 18, 54, 162, 486, \_\_\_\_\_, \_\_\_\_\_

c. 4, 11, 18, 25, 32, \_\_\_\_\_, \_\_\_\_\_

8pts

2. For this sequence from problem 1c 4, 11, 18, 25, 32, ...

a. Describe the sequence **with words**.

b. Describe this sequence with a **formula** using  $n$  as the variable; that is, what is the formula that would generate the sequence if  $n = 1$ , then  $n = 2$ , etc.?

c. What is the 301st term of this sequence?

10pts

3. a. Pick any number and try the following "number magic".

1st try

2nd try

algebraic proof

Pick a number

Add 5

Multiply by 4

Subtract the original number

Subtract 2

Divide by 3

(Show your result)

b. What generalization can you make about how the result is related to each number picked?

c. Use algebra (in space **above**) to prove that your generalization is correct. \_\_\_\_\_

6pts

4. In chapter 1, we studied strategies for planning how to solve problems. List six of these strategies.

14pts

5. Solve each of the following problems, showing your reasoning and calculations, then list the problem solving strategy (see problem #4 above) that you used.

- a. A well is 30 feet deep. A worm climbs up 5 feet each day and then slides back 3 feet each night. How many days will it take the worm to crawl out of the well?

List the strategies you used:

- b. Together a baseball and a football weigh 1.25 pounds, the baseball and a soccer ball weigh 1.35 pounds, and the football and the soccer ball weigh 1.9 pounds. How much does each of the balls weigh?

List the strategies you used:

14pts

6. If  $A = \{a, e, i, o, u\}$  and  $B = \{a, b, c\}$  and the universal set,  $U = \{x \mid x \in \text{the English alphabet}\}$  then:

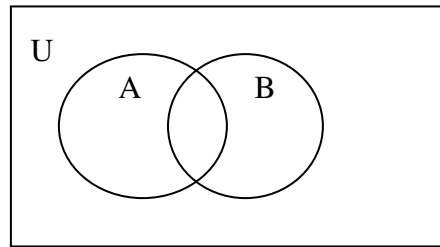
a.  $A \cup B =$  \_\_\_\_\_

b.  $B - A =$  \_\_\_\_\_

d. The Cartesian Product  $A \times B$  has **how many** elements? \_\_\_\_\_

e. List **all** the subsets of set B:

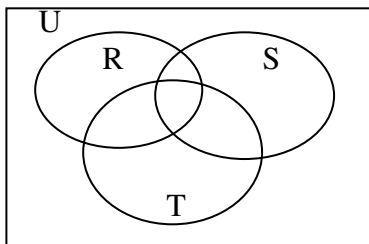
c. Draw a **Venn diagram**, listing the elements in each part of each set (for sets A, B & U.)



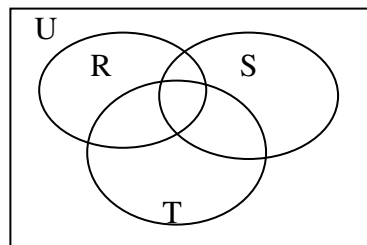
4pts

7. Shade each Venn diagram to represent the set.

a.  $(R \cap S)$



b.  $\bar{T}$



8pts

8. **True or False:** If false, tell why it is false or correct the statement.

a. \_\_\_\_\_  $(A \cap B) \subseteq (A \cup B)$

b. \_\_\_\_\_ If  $X \subset Y$ , then  $X \cap Y = X$ .

c. \_\_\_\_\_ If  $5 \in \{C \cap D\}$ , then 5 is in set C or in set D.

d. \_\_\_\_\_  $A \cup \{ \} = \{ \}$

6pts

9. Write the usual Hindu-Arabic numeral for each of the following numerals:

a. MCDLXXXIV

b.



6pts

10. Write 232 in each of the following number systems.

a. Babylonian

b. Mayan

4pts

11. If you are counting in base three, fill in the blanks to show what numbers would follow the given ones.

1, 2, 10, 11, 12, 20, 21, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

6pts

12. a.  $212_{four} = \text{_____}_{ten}$

b.  $187_{ten} = \text{_____}_{six}$

8pts

13. A particular function is the matching of a whole number with the cube of the number. This could be expressed with the formula  $y = n^3$ . If the domain of the function is  $n = \{1, 2, 3\}$ , what is the range of the function? \_\_\_\_\_ Express this function in each of the following ways:

a. As an arrow diagram.

b. As a set of ordered pairs

c. As a function machine

(matching numbers in two sets)