Name _____ Discrete II, 2/5/2016

Throughout this test, show all work and leave answers as meaningful expressions.

Use the following scenario for the next two problems. Suppose you have a bank account that earns 4% interest each year.

1) Write down the recurrence relation for the amount of money in the account after n years. (4 points)

2) Now suppose you start with $300 in the account. Find the value of the account after 2 years. (4 points)

3) Still supposing that you start with $300 in the account, find the value of the account after n years. (4 points)

4) A license plate will consist of four capital letters, followed by 4 digits. How many possible license plates are there? (4 points)

5) A license plate will consist of four capital letters and 4 digits. (Unlike the previous question they might be mixed up so that AB2C4G57 is valid). How many possible license plates are there? (4 points)

6) A license plate will consist of four capital letters and 4 digits. How many possible license plates are there that do not consist of 4 letters followed by 4 digits? (4 points)

Use the following scenario for the next **three** problems. A restaurant has 6 appetizers, 15 main dishes, and 8 desserts. You and a date are eating together. When sharing plates, you each take half without regard to who is served first.

7) How many ways can you order 3 appetizers? You're going to share. You don't mind if you have multiple of the same appetizer, because you just love all of them so much! (6 points)

8) How many ways can you order 2 main dishes? You're not going to share. (6 points)

9) How many ways can you order 2 different desserts? You're going to share. (6 points)

10) An ice cream parlor has 32 flavors of ice cream. Seven customers walk in and each want one scoop of ice cream. How many ways can this be done? (4 points)

11) You have three decks of cards and you draw one card from each deck. How many ways can you end up with 3 red cards? (4 points)

12) You draw 3 cards from a standard deck of cards. How many ways can you end up with a 3-of-a-kind? An example of a 3 of a kind is 3 jacks. (4 points)

13) You draw 4 cards from a standard deck of cards. How many ways can you end up with two different pairs? An example of two pairs is 2 jacks and 2 queens. (6 points)

Consider the recurrence relation below for the next **three** questions.
$$a_n = 8a_{n-1} - 16a_{n-2}$$
$$a_0 = 5; a_1 = 36$$

14) Find a solution to the recurrence relation. (6 points)

15) Find the general solution to the recurrence relation. (4 points)

16) Find the particular solution to the recurrence relation with the given initial conditions. (4 points)

17) How many numbers are there between 111 and 400, including both 111 and 400? (4 points)

18) How many numbers between 1 and 1200, including both, are divisible by either 5 or 10? (4 points)

19) How many nonnegative integer solutions are there to the equation below? (4 points)
$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 33$$

20) How many nonnegative integer solutions are there to the equation below, given the constraint that $x_2 \geq 8$? (4 points)
$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 33$$

21) How many nonnegative integer solutions are there to the equation below, given the constraint that $x_2 \leq 10$? (4 points)
$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 33$$

22) A Blockbuster movie rental store is having a clearance sale to liquidate their inventory before closing. They have 350 different DVDs to sell. How many ways can they sell the DVDs to 7 customers, such that each gets 50 DVDs? (4 points)

23) Calculate $\binom{7}{2}$. (Do the arithmetic until you get a single number as your answer) (4 points)