City Semester Name:_____
Problem Set #7
Show all work for full credit.

1. If you roll two dice, how many ways can the following events happen?
   (a) You roll an even number.

   (b) You roll a prime number.

   (c) You roll a multiple of 4.

   (d) You roll a multiple of 4 or a prime number.

   (e) You roll a number that is both a multiple of 4 and a prime number.

   (f) Your roll a number that is a multiple of 3 or a multiple of 4.

2. If you roll two dice how many outcomes will have two numbers that are not the same?

3. If you roll three dice how many outcomes will have three numbers, none of which are the same?

4. If you roll 4 dice, how many outcomes will have 4 numbers, none of which are the same?

5. If you roll 6 dice, how many outcomes will have 6 numbers, none of which are the same?

6. You have six plants, which you have creatively name one, two, three, ..., six.
   (a) In how many different ways can you order your six plants in a line along your window sill?

   (b) How is the previous question related to problem 5?

   (c) If you only want to put 2 plants out of the 6 you own on the window sill, how many arrangements are possible?

   (d) If you only want to put 3 plants out of the 6 plants you own on the window sill, how many arrangements are possible?

   (e) If you own n plants and you only want to put k of them on the window sill, how many arrangements (in terms of n and k) are possible?

7. You have ten songs you want to make into a playlist. How many unique playlists can you make? (Unique in the sense that the order of the songs differs.)

8. Explain in detail why for $\sum_{n=1}^{\infty} a_n r^{n-1} = \frac{a_1}{1-r}$ it is necessary that $|r| < 1$.

9. Evaluate the series $\sum_{n=10}^{\infty} 3\left(\frac{3}{4}\right)^{n-1}$

10. Assume that the following series converge. Explain why $\sum_{n=1}^{\infty} a_n = \sum_{n=0}^{\infty} a_{n+1} = \sum_{n=2}^{\infty} a_{n-1}$.

11. What is the probability of being dealt 5 cards from a well shuffled deck that contain two distinct pairs?