**A.P. Statistics**
**Assignment 4.3**

**Remember to show your thinking through your work.**

1) In a few sentences, define the following terms:
   a) Sample space

   b) Disjoint events

2) In order to ensure the safety of school classrooms the local Fire Marshall does an inspection at Thomas Jefferson High School every month, looking for faulty wiring, overloaded circuits, etc. At TJHS the new Academic Wing has 5 math rooms, 10 science rooms, and 10 English rooms. The science rooms are divided into 8 biology and 2 chemistry rooms. Each month, the Fire Marshall randomly picks one of the rooms in the new wing to inspect each month. Define the following events:

   S = the event the selected room is a science room
   B = the event the selected room is a biology room
   M = the event the selected room is a math room
   E = the event the selected room is an English room
   C= the event the selected room is a chemistry room

   Calculate the probabilities of the events described below:
   a) P(S)

   b) P(M or E )

   c) P(E or B)

   d) P(S and not C)

3) A random sample of 325 new Crest toothbrushes showed that 14 were defective.

a) What is your estimate of the probability that a new Crest toothbrush is defective?

b) What is your estimate of the probability that a new Crest toothbrush is not defective?

c) Either a toothbrush is defective or not. What is the sample space in this problem?

d) Do the probabilities assigned to the sample space add up to one?

4) M&M candies are great for probability. The following tables are the color distributions for the candies. Fill in each table with the missing probability and answer the questions that follow.

| ***Plain*** | Brown | Blue | Green | Orange | Red | Yellow |
|---|---|---|---|---|---|---|
| Probability | 0.3 | 0.1 | 0.1 | 0.1 | .02 | ??? |

| ***Peanut*** | Brown | Blue | Green | Orange | Red | Yellow |
|---|---|---|---|---|---|---|
| Probability | 0.2 | 0.3 | 0.1 | 0.1 | .01 | ??? |

a) What is the probability that a plain M&M is red or blue?

b) What is the probability that a peanut M&M is red or blue?

c) What is the probability that a peanut M&M is not brown?

5) Research shows that the probability of dying from heart disease is 0.45 and the probability of dying from cancer is 0.22.

a) What is the probability that a death was due to either heart disease or cancer?

b) What is the probability that a death was due to some other cause?

6) Find each of the following probabilities using Benford's Law, which follows the distribution below:

| First Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Probability | 0.301 | 0.176 | 0.125 | 0.097 | 0.079 | 0.067 | 0.058 | 0.051 | 0.046 |

a) P(A) = P(first digit is 1)

b) P(B) = P(first digit is 6 or greater)

c) P(C) = P(first digit is odd)

d) P(D) = P(first digit is less than 4)

e) $P(B \cup D)$ Remember this is the union of B and D.

f) $P(C \cap D)$ Remember this is the intersection of C and D.

g) $P(D^c)$ Remember this is the complement of D.