

**A.P. Statistics**  
**Assignment 5-4**

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

1. Is the following situation a binomial setting? Explain how it does or does not meet the conditions of a binomial setting. A manufacturer produces a large number of microwaves. From past experience, the manufacturer knows that approximately 1.5% of all their microwaves are defective. Consumer Reports randomly selects 20 of these microwaves for testing. We want to determine the probability that no more than 1 of these microwaves is defective?

a. What is the probability that exactly one of the toasters is defective?

b. What is the probability that at most two of the toasters are defective?

c. Find the mean and standard deviation.

2. In the workplace, racial discrimination is a very serious issue. Consider a company in which 20% of the employees are African-American. At the end of the year, promotions are awarded to a group of employees. Out of the 40 promotions awarded, 5 are African-American. Given that the awarding follows the binomial distribution,  $B(40, .2)$ .

a. How many African-Americans would you expect to get promotions?

b. What is the probability that 5 African-Americans receive promotions?

c. What is the probability that 5 or fewer African-Americans receive promotions?

d. Do you think the company is suspect of racial discrimination? Explain your thinking.

3. Consider testing a batch of 20 light bulbs from a certain, unnamed company. Let  $X$  be the number of properly functioning light bulbs.

a. What is the standard deviation of  $X$  if the light bulbs function properly 80% of the time.

b. What is the standard deviation of  $X$  if the light bulbs function properly 90% of the time.

c. What is the standard deviation of  $X$  if the light bulbs function properly 95% of the time.

d. What is the standard deviation of  $X$  if the light bulbs function properly 99% of the time.

e. What does your work show about the behavior of the standard deviation of a binomial distribution as the probability of success approaches 1?

4. The random walk theory of stocks in the stock market assumes there is a 0.67 chance that an index of stocks will increase in value in any given year. Furthermore, the index in any given year is not influenced by its previous year's performance. Let  $X$  be the number of years in which the index increased among the next 10 years time.

a. Verify that this can be modeled by a binomial distribution and write the notation.

b. What are the possible values of  $X$ ?

c. Construct a probability distribution table.

d. What are the mean and standard deviation of  $X$ ?