Homework Assignment - 2

POM 500 Statistical Analysis

Note: Attempt all questions as per rubric. Weightage for each problem including case study is 10 marks. The maximum you can score is 50. Use Excel function wherever possible.

Problem-1

The following table provides a probability distribution for the random variable x.

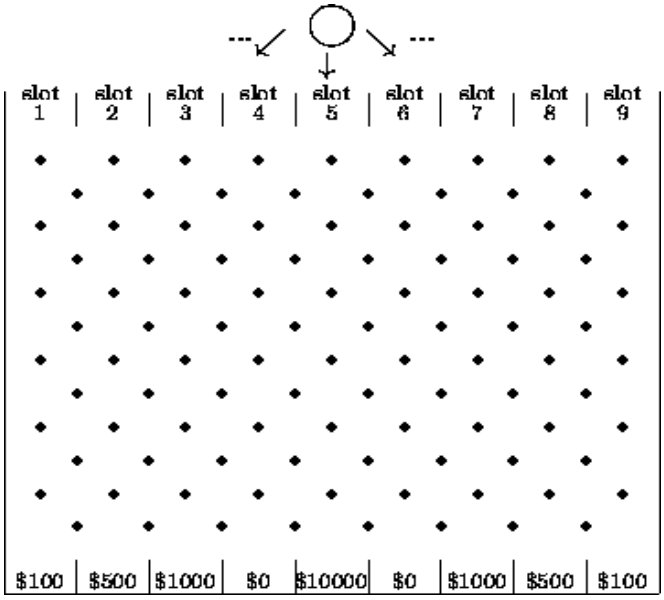
x	*f*(*x*)
2	0.20
4	0.30
7	0.40
8	0.10

a) Compute Expected value E(*x*).

b) Compute Variance (σ^2) and Standard Deviation (σ).

Problem-2

Game Description: Bob gives the contestant a free chip just for playing the game. The contestant climbs to the top of the Plinko board (see picture below) and drops the chips one at a time. The pegs send the chip bouncing all over the board until they land in slots representing money amounts at the bottom. The slots are, from left to right; $100, $500, $1000, $0, $10000, $0, $1000, $500, $100.



a) For each of the three middle slots at the top of the board (slots 4, 5, and 6), find the probability that a chip starting in each slot results in winning $10,000. (Write Excel function)

b) Compute the expected winnings for a chip dropped in slot 5 and the expected winnings for a chip dropped in slot 4 and 6.

Problem-3

During the period of time that a local university takes phone in registrations, calls come in at the rate of one every two minutes.

a) What is the expected number of calls in one hour?

b) What is the probability of three calls in ten minutes? (Write Excel function)

c) What is the probability of more than 3 calls in ten minutes? (Write Excel function)

Problem-4

Axline Computers manufactures personal computers at two plants, one in Texas and the other in Hawaii. The Texas plant has 40 employees; the Hawaii plant has 20. A random sample of 10 employees is to be asked to fill out a benefits questionnaire.

a) What is the probability that none of the employees in the sample work at the plant in Hawaii (to 4 decimals)? (Write Excel function)

b) What is the probability that two or fewer of the employees in the sample works at the plant in Hawaii (to 3 decimals)? (Write Excel function)

c) What is the probability that 3 or more of the employees in the sample work at the plant in Hawaii (to 3 decimals)? (Write Excel function)

d) What is the probability that 9 of the employees in the sample work at the plant in Texas (to 3 decimals)? (Write Excel function)

Case Study: Whole Foods Market Grows Through Mergers and Acquisitions

Over three decades ago, four businesspeople who had experience in retailing natural foods through food stores believed that there was a demand for a supermarket for natural foods. As a result, in 1980 in Austin, Texas, they founded the first Whole Foods Market store in a building that had around 10,000 square feet and a staff of 19. This store was quite large compared to health food stores at the time. By 1984, the company was successful enough to expand to Houston and Dallas. In 1988, they purchased the Whole Food Company in New Orleans and expanded there. The next year, they moved into the West Coast with a store in Palo Alto, California. Even though the company has built a few its own stores, much of the company growth has come through mergers and acquisitions, many of which came in the 1990s in such places as North Carolina, Massachusetts, Rhode Island, both Northern and Southern California, and Michigan. After the turn of the century, Whole Foods Market established a presence in Manhattan (NY), followed by a move into Canada and later into the United Kingdom.

Presently, Whole Foods Market has 297 stores in 38 U.S. states, the District of Columbia, Canada, and the United Kingdom, with 44 more in development. There are over 57,000 team members, 82% of whom are full-time employees. Existing stores now average 43,000 square feet in size, about four times as large as the original “supermarket.” Whole Foods Market is the ninth largest food and drug store in the United States with almost $2 billion in sales last year and is number 284 on the list of Fortune 500 companies.

Whole Food Markets is the largest retailer of natural and organic foods and prides itself in doing the research necessary to assure customers that offered products are free of artificial flavors, colors, sweeteners, preservatives, or hydrogenated fats. The company attempts to

customize each store by stocking it with products that are most in demand in any given community. Whole Foods Market management cares about their employees, and the company has been named by Fortune magazine as one of the "100 Best Companies to Work For" in the United States every year since the list was first compiled 13 years ago. The company attempts to be a good community citizen and it gives back at least 5% of after-tax profits to the communities in which they operate. In January 2008, Whole Foods Market was the first U.S. supermarket to commit to completely eliminating disposable plastic bags. The Core Values of the company are "Whole Foods, Whole People, and Whole Planet." The Whole Foods Market searches "for the highest quality, least processed, most flavorful and natural foods possible …" The Company attempts to "create a respectful workplace where people are treated fairly and are highly motivated to succeed." In addition, the company is committed to the world around us and protecting the planet.

Discussion:

1.Whole Foods Market has shown steady growth at a time when traditional supermarkets have been flat. This could be attributed to a growing awareness of and demand for more natural foods. According to a study by Mintel in 2006, 30% of consumers have a high level of concern about the safety of the food they eat. Write the name of the distribution and the related parameters. Suppose we want to test this figure to determine if consumers have changed since then.

a) What probability distribution could be used to study this problem? (1 point)

b) Assuming that the 30% figure still holds, what is the probability of randomly sampling 25 consumers and having 12 or more respond that they have a high level of concern about the safety of the food they eat? (1 point)

c) What would the expected number be? (1 point)

d) If a researcher actually got 12 or more out of 25 to respond that they have a high level of concern about the safety of the food they eat, what might this mean? (1 point)

2.Suppose that, on average, in a Whole Foods Market in Dallas, 3.4 customers want to check out every minute. Based on this figure, store management wants to staff checkout lines such that less than 1% of the time demand for checkout cannot be met.

a) In this case, store management would have to staff for what number of customers? (1.5 points)

b) Based on the 3.4 customer average per minute, what percentage of the time would the store have 12 or more customers who want to check out in any two-minute period? (1.5 points)

3. Suppose a survey is taken of 30 managers of Whole Foods Market stores and it is determined that 17 are at least 40 years old.

a) If another researcher randomly selects 10 of these 30 managers to interview, what is the probability that 3 or fewer are at least 40 years old? (1.5 points)

b) Suppose 9 of the 30 surveyed managers are female. What is the probability of randomly selecting 10 managers from the 30 and finding out that 7 of the 10 are female? (1.5 points)