# COMM215 Business Statistics

# Tutorial Problems for Mid-term Exam

# Question 1

One of the major measures of the quality of service provided by any organization is the speed with which it responds to customer complaints. A large carpet company was receiving complaints about the installation of carpets. The data below give the number of waiting days ($X_i$) between the receipt and resolution of a complaint for a random sample of customers with complaints.

72 60 51 36 35 34 32 31 30 29 29 29 28 27 27
26 26 25 23 22 20 14 13 12 9 5 4 3 1 1

$\Sigma x = 754$; $\Sigma x^2 = 26744$; $n = 30$

a. Construct a box plot for the data set and comment on the nature of the plot including identifying outliers, if any.

b. Compute the proportion of observations that are within one, two and three standard deviations of the mean. Does the empirical rule apply for this data set? Use *z* scores to identify outliers, if any.

c. To improve services, management wants to grant a special offer to customers whose complaints take unnecessarily longer periods to resolve. However, it is desirable that no more than 25% of the customers who lodge a complaint would receive the special offer. Approximately, what number of waiting days between the receipt and resolution of a complaint may be used for the cutoff?

## Question 2

Products are returned to stores for a variety reasons. A recent study showed that 60% are for operational reasons, 30% for cosmetic reasons, and the remaining for other reasons. The probability that an item returned for operational reasons will be under warranty is 0.7, while the probabilities that an item is returned for cosmetic or other reasons will be under warranty are 0.5 and 0.6, respectively.

a. If an item is returned, what is the probability that it is
   i. with warranty? ii. without warranty?

b. If an item with a warranty is returned, what is the probability that it is for cosmetic reason?

c. If at any time 50 items are returned to a store, how many are expected to be without warranties?

## Question 3

In a factory with a very large number of machines some machines break down almost daily. The factory management has determined daily machine breakdowns are independent. The number of machine breakdowns per day and their respective probabilities as shown below:

| Number of Breakdowns - $x$ | 0 | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|---|
| Probability - P ($x$) | 0.12 | 0.36 | 0.35 | 0.11 | 0.06 | 1 |

a. Find the mean and the standard deviation of the number of machine breakdowns per day.

b. If two days are selected randomly, what is the probability that there will be three breakdowns each day?

c. What is the probability that the number of breakdowns per day is more than the expected number of breakdowns per day?

## Question 4

The coming year is expected to be a good one for your company with probability 0.65. Given that it is a good year, you expect that a dividend will be declared with probability 0.80. However, if it is not a good year, then a dividend will occur with probability 0.15.

a. What is the probability that it is a good year and a dividend is issued?

b. What is the probability that a dividend is issued?

c. If dividend is issued, what is the probability that it is a good year?

## Question 5

About 40% of all customers of ZUBRAK Charge Card pay their bills in full before any interest charges are incurred.

a. In a random sample of 10 card holders, estimate the number of customers who are expected to pay their account balances after interest charges are incurred? What is the standard deviation?

b. In a random sample of 10 card holders, estimate the probability that at least half of the expected number of customers pay their account balances before interest charges are incurred?

## Question 6

Records of a department store show that 5% of its customers who make a purchase return the merchandise for refund. Of the remaining customers, 10% return the merchandise in order to exchange it.

a. In the next 20 purchases, what is the probability that at least three customers will return the merchandise for refund

b. In a sample of 25 customers, exactly five returned the merchandise for refund. What is the probability that the number of customers returning for merchandise exchange is in excess of the expected?

## Question 7

Air travel time between two cities is normally distributed with a mean of 2 hours and standard deviation of 10 minutes.

a. Find the percentage of all flights that take at least 125 minutes.

b. Find the percentage of all flights that take between 100 and 130 minutes.

c. If a scheduled flight time is 2 hours and 7 minutes, what percentage of flights are more than 5 minutes late?

d. How long is a flight if it takes longer than 80% of all other flights between two cities?