

**Statistical Analysis I (STAT-1301)**  
**Practice Problems with Solutions**  
**Chapter 5**

**[Question 1]**

According to a survey, 35% of employees working at a very large company are happy with their jobs. Suppose that two employees are selected at random from this company. Let  $X$  denote the number of employees in this sample of two who are happy with their jobs.

- a) Construct the probability distribution table of  $X$ .
- b) Compute the mean and the variance of the number of employees who are happy with their job in this sample.

**[Question 2]**

The table shows the probability that a person chosen at random from a certain community will have the indicated number of children.

$x$	Probability
0	0.54
1	0.23
2	$3k$
3	$k$
4	0.03

- a) Determine the value of  $k$ .
- b) Determine the probability that a person chosen at random from this population will have at least one child.
- c) Determine the probability that a person chosen at random from this population will have at most 2 children.

**[Question 3]**

The following table lists the probability distribution of the number of patients entering the emergency room during a 1-hour period at Victorial Hospital.

$x$	$p(x)$	$P(X \leq x)$
0	0.45	?
1	0.375	?
2	$2a - 0.3$	?
3	0.025	?

- Find the value of  $a$ .
- Complete the column of cumulative probability by rewriting the table in your answer sheet.
- What is the probability of observing at least 2 patients during that 1-hour period?
- What are the mean, the variance and the standard deviation of  $X$ ?

**[Question 4]**

The following table lists the probability distribution of the number of refrigerators (denoted by  $X$ ) owned by all families in a city.

$x$	$p(x)$
0	0.01
1	0.69
2	0.22
3	?

- Find  $p(3)$ .
- What is the probability that a randomly selected family owns at most two refrigerators?
- What are  $E(X)$  (also denoted by  $\mu$ ) and  $V(X)$  (also denoted by  $Var(X)$  or  $\sigma^2$ )?

**[Question 5]**

According to a survey, 70% of households said that they have never purchased organic fruits or vegetables. Suppose that this result is true for the current population of households. Suppose a random sample of 10 households is selected.

- Find the probability that exactly 7 households will say that they have never purchased organic fruits or vegetables.

- b) Find the probability that none of the selected households will say that they have never purchased organic fruits or vegetables.
- c) Find the probability that at most 2 households will say that they have never purchased organic fruits or vegetables.
- d) Find the average number of households who will say that they have never purchased organic fruits or vegetables.
- e) Find the variance of this distribution.
- f) Find the average number of households who will say that they have purchased organic fruits or vegetables.

**[Question 6]**

Based on a study on a population of large size, about 2% of adults have at some point in their life been told that they have hypertension. A random sample of size 20 is selected from the population. Let  $X$  be the random variable that denotes the number of adults having hypertension.

- a) On average, how many adults having hypertension are found in a sample of 20 adults?
- b) Determine the variance and the standard deviation of  $X$ .
- c) Find the probability that a sample of 20 adults has at least 2 adults having hypertension.
- d) Assume that a new sample of size 10 is drawn from this population. What are the mean, the variance and the standard deviation of the number of adults who do NOT have hypertension in the sample of size 10.

**[Question 7]**

The Poisson distribution is used to model the number of patients referred to an oncologist per day. The researchers use a rate of 0.7 patients that are referred to the oncologist per day.

- a) Find the mean, the variance and the standard deviation of the number of patients that are referred to the oncologist per day.
- b) Find the probability that in a randomly selected day, the number of patients that are referred to the oncologist will be more than 1 and less than 4.

- c) Find the probability that in a randomly selected week, the number of patients that are referred to the oncologist will be at least 2.

**[Question 8]**

A university police department receives an average of 6 reports per week of lost student ID cards.

- a) Find the probability that at most one such report will be received during a given week by this police department.
- b) Find the probability that during a given week the number of such reports received by this police department is between 2 and 5, exclusively.
- c) Find the probability that during a given period of four days, none of such reports will be received by this police department.
- d) Find the average number of such reports received during a period of two weeks. Determine also the standard deviation of this distribution.

**[Question 9]**

The mean number of accidents to occur at a busy intersection during a 24-hour period is 2.10. Assume that the number of accidents to occur at this intersection during a 24-hour period follows a Poisson distribution.

- a) Find the mean and the standard deviation of the number of accidents to occur at this intersection during a 24-hour period.
- b) Find the probability that the number of accidents to occur at this intersection during a 24-hour period will be between 4 and 7, exclusive.
- c) Find the probability that no accidents will occur at this intersection during a 36-hour period.