

Kuwait University
College of Science
Department of Statistics and Operations Research

Stat 101
Homework Booklet

Summer Term 2014/2015

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Homework 1

Problem 1

For each of the following cases, indicate whether the variable is qualitative or quantitative (specifying in the second case whether it is discrete or continuous).

- a. High school GPA of those who applied for admission to Kuwait University in Spring 2012
- b. Entry level salary of students who graduated from Kuwait University in Fall 2012
- c. Gender of students enrolled in all sections of Stat 101 during Spring 2012
- d. Educational institution where the teaching staff working currently within the Statistics and Operations Research department earned their PhD degrees
- e. Color of the cars driven by the 2012 players of the handball national team of Kuwait

Problem 2

Indicate whether each of the following constitutes a population or a sample.

- a. One hundred students admitted to Kuwait University in Spring 2012
- b. All non-technical support staff currently working for Kuwait University
- c. All female students graduating from Kuwait University in spring 2012
- d. One thousand applicants for jobs advertised by Microsoft in December 2012
- e. All students enrolled in all courses offered by the College of Science of Kuwait University in Fall 2012
- f. All students who were enrolled in Stat 101 during Fall 2012

Problem 3

Indicate for each of the following the population, the sample, the variable, and its type. Provide an example of a possible observation for each case.

- a. Income of 10 physicians practicing in Kuwait City in January 2010

- b. Number of accidents that occurred along the 4th ring road on 15 random days of summer 2013

- c. Blood type of 20 Kuwait University students enrolled in Stat 101 of Summer 2013

- d. Number of courses already completed by 10 male students newly enrolled in the Statistics and Operations Research Department in Spring 2012

- e. Weight of 15 male athletes from Al-Qadesyya sports club on the day of their medical test.

Problem 4

A study of the records of 300 students from the college of Social Sciences revealed that 60 persons of the sampled students were originally admitted to a different college. The University is interested in predicting the proportion of students that might transfer to the college of Social Sciences next academic year. Describe the

1. Population

2. Sample

3. Variable of interest and its type

4. Descriptive statistics

5. Inference of interest.

Problem 5

30 adults were asked which of the following conveniences they find essential for their lives: television (T), refrigerator (R), air conditioning (A), public transportation (P), or microwave (M). Their responses were

R	A	R	T	P	T	R	M	A	A
A	R	R	T	P	P	T	R	A	A
R	P	A	T	T	P	T	A	A	R

1. Prepare a frequency distribution. Also give the relative and percentages frequencies.
2. What percentage of these adults named refrigerator or air conditioning as the convenience that is essential for them?
3. Draw a bar graph for the relative frequency distribution.
4. Draw a pie chart for this data.

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Homework 2

The following data give the time (in minutes) that each of 20 students waited in line at their bookstore to pay for their textbooks in the beginning of Spring 2013.

11	8	23	25	5	17	31	24	36	6
5	10	14	17	16	25	33	3	22	19

1. Find the mean, median, and mode.
2. Compute the range and standard deviation.
3. Construct the Box Plot.
4. Comment on the shape of the distribution.

Problem 3

In a statistics class of 100 students, 45 have volunteered for community service in the past. One student is randomly selected from this class,

1. What is the probability that he or she
 - a. Has volunteered for community service in the past?

 - b. Has not volunteered for community service in the past?

2. Do these probabilities add to 1.0?

Problem 4

1. Given that A, B, and C are independent events with $P(A) = 0.40$, $P(B) = 0.50$ and $P(C) = 0.8$ then:
 - a. $P(A \text{ and } B) =$

 - b. $P(A \text{ and } B \text{ and } C) =$

2. If $P(A^c) = 0.40$, and $P(A \text{ and } B) = 0.25$, then $P(B|A) =$

3. If $P(A|B) = 0.6$, and $P(A \text{ and } B) = 0.5$, then $P(B) =$

4. If $P(A) = 0.5$, $P(B) = 0.6$, and $P(A \text{ and } B) = 0.4$, then $P(A \text{ or } B) =$

5. If A and B are mutually exclusive events with $P(A) = 0.5$, and $P(B) = 0.4$, then $P(A \text{ or } B) =$

Problem 5

The following two-way table gives the responses of a random sample of 100 adults.

	Have shopped on the internet	Have never shopped on the internet
Male	25	45
Female	5	25

1. If one adult is selected at random from these 100 adults, find the probability that this adult
 - a. has never shopped on the Internet
 - b. has never shopped on the Internet and is a male
 - c. has shopped on the Internet given that this adult is a female
 - d. is a male given that he has never shopped on the Internet
2. Are the events “male” and “female” mutually exclusive? Why or why not?
3. Are the events “have shopped” and “male” mutually exclusive? Why or why not?
4. Are the events “have shopped” and “female” independent? Why or why not?

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Homework 4

Problem 1

Each of the following tables lists certain values of x and a function $P(x)$. Verify whether or not each table represents a valid probability distribution.

a.

x	$P(x)$
0	0.10
1	0.50
2	0.45
3	0.40

b.

x	$P(x)$
2	0.30
3	0.28
4	0.32
5	0.10

c.

x	$P(x)$
7	-0.25
8	0.85
9	0.40

d.

x	$P(x)$
7	0.25
8	0.60
9	0.15

Problem 2

A sporting shop sells exercise machines. On different days, it sells different numbers of these machines. The following table lists the probability distribution of the number of machines sold per day at this shop.

Machines sold	4	5	6	7	8	9	10
Probability	0.2	0.1	0.25	0.15	0.15	0.1	0.05

- Graph the probability distribution.
- Determine the probability that the number of machines sold by this shop on a given day is
 - Exactly 6
 - More than 8
 - 5 to 8 inclusive
 - 5 to 8 exclusive
- Calculate the mean and standard deviation for this probability distribution.

Problem 3

Assume that 30% of all adults feel stress in their daily lives. Let X represents the number who feel stress in a random sample of 15 adults, find

1. Compute the probability that X is:
 - a. exactly 12
 - b. at most 8
 - c. at least 5
 - d. 5 to 10 inclusive
 - e. 5 to 10 exclusive

2. Find the mean and the variance of X .

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Homework 5

Problem 1

1. Assume that Z has the standard normal distribution. Find

a. $P(-2.15 < Z < 1.65) =$

b. $P(-1.49 < Z < -1.14) =$

c. $P(Z < -1.35) =$

d. $P(Z > 1.35) =$

e. compare the result in c and d.

2. Assume Z has the standard normal distribution. Find the value of C in the following cases

a. $P(Z > C) = 0.1469$

b. $P(Z < C) = 0.2676$

c. $P(-C < Z < C) = 0.9$

3. For a normal distribution with mean μ and variance σ^2 , find the area between $\mu - \sigma$ and $\mu + \sigma$.

4. Assume X has the normal distribution with a mean of 4 and a standard deviation of 5.
- i. Compute the following probabilities:
 - a. $P(1.35 \leq X \leq 4.0) =$

 - b. $P(-3.25 < X < 11.7) =$

 - c. $P(X \geq 1.34) =$

 - ii. Find C in each of the following cases
 - a. $P(X > C) = 0.9147$.

 - b. $P(X < C) = 0.8438$.

 - c. $P(\mu < X < \mu + C) = 0.4207$ and $C > 0$.
5. Assume X has the binomial distribution with $n = 60$ and $p = 0.40$.
- a. Find the mean and standard deviation of X .

 - b. Approximate
 - i. $P(X \leq 22) =$

 - ii. $P(X = 24) =$

 - iii. $P(X > 24) =$

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Homework 6

Problem 1

Assume that the current daily hotel room rates have a normal distribution with mean 40 KD and standard deviation 10 KD. Let \bar{X} be the mean charge of a random sample of 64 rooms.

1. Find the mean and standard deviation of \bar{X} .
2. Compute $P(\bar{X} > 43)$

Problem 2

Assume that the daily earning of construction workers is normally distributed with mean 10 KD and standard deviation 2 KD. Find the probability that the mean daily earnings of a random sample of 16 construction workers is

1. between 8.5 KD and 12.4 KD
2. within 1 KD of the population mean

Problem 3

The data for a random sample of paired observations are shown in the following table

Pair	1	2	3	4	5	6
Pop 1	7	3	9	6	4	8
Pop 2	4	1	7	2	4	7

a. Find and interpret the 95% confidence interval for $\mu_d = (\mu_1 - \mu_2)$.

b. Conduct the test to check if μ_d is not zero.

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Homework 10

An auto manufacturing company wanted to investigate how the price of one of its car models depreciates with age. The research department at the company took a sample of eight cars of this model and collected the following information on the ages (in years) and prices (in hundreds of KD) of these cars.

Age	8	3	6	9	2	5	6	3
Price	20	80	50	20	120	40	36	100

1. Construct a scatter diagram for these data. Does the scatter diagram exhibit a linear relationship between ages and prices of cars?
2. Find the regression line to estimate the price on age.
3. Test the significance of the regression coefficient.
4. Give a brief interpretation of the values of the intercept and slope calculated in part 2.

5. Plot the regression line on the scatter diagram of part 1 and show the errors by drawing vertical lines between scatter points and the regression line.
6. Estimate the price of an 8-years old car of this model.
7. Compute the error of the above estimate.
8. Compute the coefficient of determination and give a brief interpretation of it.
9. Do you expect the ages and prices of cars to be positively or negatively related? Explain.
10. Compute the linear correlation coefficient.