



MIDTERM EXAMINATION
BUS102 – INTRODUCTION TO STATISTICS
FIRST SEMESTER (FALL 2018 – 2019)
MARKING GUIDE – VERSION A

PLEASE READ THE FOLLOWING INSTRUCTIONS

- Read the marking guide carefully before marking.
- Group marking procedure (**in case of more than one tutor**):
Before you start marking, randomly select two to three assessment papers (MTA and Final Exam). Make copies for one or two of the assessments you selected (depending on the number of markers). Tutors should mark their photocopies individually, after each question is marked a discussion will follow and tutors take turn justifying the marks they allocate for each question. Collaboratively the original paper will be marked and the tutors sign the original answer booklet. The other selected assessment papers to be marked collaboratively and discussions follow marking every single question/sub part. The aim of this practice is to re-standardize the marking procedure discussed previously when reading the marking guide. It is not unusual to find some discrepancy in the first/two of marked assessments. The discrepancy will gradually diminish on the second/third marked assessment and so on.
- It is fair to **follow a student's calculation mistake** and grant him/her the marks for the steps and parts that follow.
- Do not deduct marks for missing formula if it is embedded in the calculation steps, in particular when the output is correct.
- **Do not double penalize** students when repeating the same type of mistakes in a given exercise as long as the work flow is correct.
- It is fair to grant students marks for correct answers even though the steps to the answers are not mathematically well written as long as the students demonstrate knowledge of the concepts and knowing exactly what he/she is doing.
- It is **very important to include sufficient feedback** to students inside the script in all assessment.

Question 1: Answer by TRUE or FALSE each of the following: (10 points)

1. If a distribution is negatively skewed, the distribution is not symmetrical and the long tail is to the right.

True **False**

2. For any distribution, there are an equal number of values above and below the median.

True False

3. A sample is a portion or part of the population of interest.

True False

4. A frequency table groups quantitative data into classes showing the number of observations in each class.

True **False**

5. To convert a frequency distribution to a relative frequency distribution, divide each class frequency by the number of classes.

True **False**

Question 2: (14 points)

A Human Resources manager studied the overtime hours of employees. A sample of 10 employees showed the following number of overtime hours worked last month.

6 8 8 9 12 12 13 13 13 16

a) What is the Arithmetic Mean?

Mean = (6+.....+16)/10 = 11 (2 points)

b) What is the median?

Median = (12+12)/2=12 (2 points)

c) What is the Mode?

Mode = 13 (2 points)

d) Based on the values of the arithmetic mean, median, and mode, what is the most likely shape of the distribution?

Mean < Median < Mode, then the distribution is negatively skewed (2 points)

e) Find the sample variance. (Round your answer to the nearest hundredth)

X	6	8	8	9	12	12	13	13	13	16	Total
$X - \bar{X}$	-5	-3	-3	-2	1	1	2	2	2	5	0
$(X - \bar{X})^2$	25	9	9	4	1	1	4	4	4	25	86

$$s^2 = \frac{\sum (X - \bar{X})^2}{n - 1} = \frac{25 + .. + 25}{9} = \frac{86}{9} = 9.56$$

(3 points for the table, that is for the total 86)

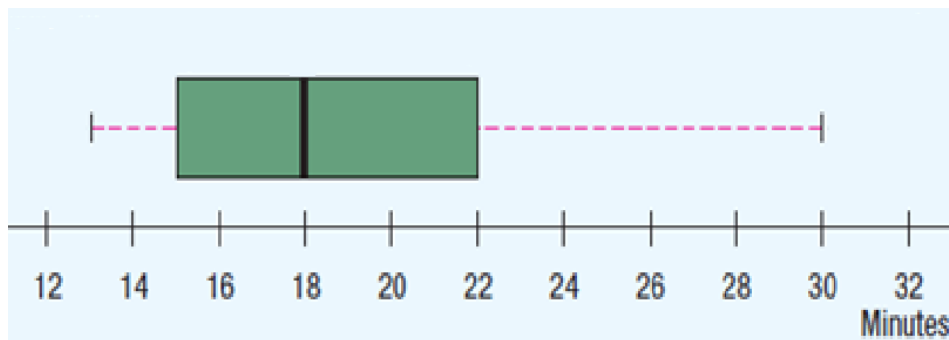
(1 point for the formula)

(2 points for the answer)

***Deduct 0.5 point for wrong rounding**

Question 3: (8 points)

Use the below boxplot to find the following:



- a) Median
Median = 18 minutes (2 points)
- b) Lower Quartile
Q₁ = 15 minutes (1.5 point)
- c) Upper Quartile
Q₃ = 22 minutes (1.5 point)
- d) Minimum and Maximum
Minimum = 13 minutes (1.5 point)
Maximum = 30 minutes (1.5 point)

Question 4: (8 points)

In a survey aiming to study the average number of cars per family, the following data was collected.

Number of cars (X)	Number of Families (Frequency)	R.F
0	10	10/100 = 0.10
1	25	25/100 = 0.25
2	29	29/100 = 0.29
3	24	24/100 = 0.24
4	12	12/100 = 0.12
Total	100	

- a) Find the relative frequency for each category (group).
(0.5 point each)
- b) How many families owns more than two cars?
36 families (2.5 points)
- c) What is the percentage of families having less than two cars?
35/100 x 100% = 35% (3 points)
*Deduct 0.5 point for missing %

Question 5: (7 points)

In a departmental review of employee performance, 3 employees were scored a 4 (excellent performance), 5 employees were scored a 3 (average performance), and 2 employees were scored a 1 (below average performance). What is the weighted mean of the employees' scores?

$$\text{Weighted Mean} = \bar{X} = \frac{\sum wx}{\sum w} = \frac{w_1x_1 + w_2x_2 + w_3x_3}{w_1 + w_2 + w_3} \quad (1 \text{ point})$$

$$= (3 \times 4 + 5 \times 3 + 2 \times 1) / 10 \quad (3 \text{ points})$$

$$= 29 / 10 \quad (2 \text{ points})$$

$$= 2.9 \quad (1 \text{ point})$$

Question 6: (8 points)

The lengths of stay on the cancer floor of Community Hospital were organized into a frequency distribution. The mean length was 28 days, the median 25 days and the standard deviation was 4.2 days.

- a) What is the Pearson's coefficient of skewness? (Round your answer to the nearest hundredth)

$$sk = \frac{3(\bar{X} - \text{Median})}{S} = \frac{3(28 - 25)}{4.2} = \frac{9}{4.2} = 2.14$$

(1 point for the formula)

(4 points for the answer)

*Deduct 0.5 point for wrong rounding

- b) Describe the skewness of the distribution based on the computed coefficient.

The distribution is positively skewed. (3 points)

Question 7: (10 points)

The following set of numbers are the daily rate of 16 employees working for a small factory.

\$31	\$20	\$40	\$39	\$23	\$25	\$40	\$29
\$30	\$19	\$31	\$20	\$24	\$35	\$38	\$28

- a) What is the third quartile for the distribution of daily rates?

\$19	\$20	\$20	\$23	\$24	\$25	\$28	\$29
\$30	\$31	\$31	\$35	\$38	\$39	\$40	\$40

(1 point for arranging)

$$L_p = (n+1) \frac{P}{100} \quad (1 \text{ point})$$

$$L_{75} = (16+1) \frac{75}{100} = 12.75 \quad (2 \text{ points})$$

$$Q_3 = 35 + 0.75(38-35) = \$37.25 \quad (2 \text{ points})$$

b) What is the first quartile for the distribution of daily rates?

$$L_{25} = (16+1) \frac{25}{100} = 4.25 \quad (2 \text{ points})$$

$$Q_1 = 23 + 0.25(24-23) = \$23.25 \quad (2 \text{ points})$$

Question 8: (12 points)

Consider the weekly spending (\$) for a sample of 25 youngsters grouped in the following frequency distribution table:

Class	Frequency (f)	Class Midpoint (M)	f.M	M- \bar{X}	(M- \bar{X}) ²	f.(M- \bar{X}) ²
\$40 up to \$50	7	45	315	-16	256	1792
\$50 up to \$60	4	55	220	-6	36	144
\$60 up to \$70	8	65	520	4	16	128
\$70 up to \$80	4	75	300	14	196	784
\$80 up to \$90	2	85	170	24	576	1152
Total	25		1525			4000

a) Copy the above table to your answer booklet and fill in the table.

Done Above

(4 points: Deduct 1 point for each calculation mistake)

b) Find the sample mean of weekly spending.

$$\text{Mean} = \bar{X} = \frac{\sum f.M}{n} = \frac{1525}{25} = \$61$$

(4 points = 1 point for formula + 3 points for answer)

* Deduct 0.5 point for missing \$

c) Find the sample variance of weekly spending. (Round your answer to the nearest hundredth)

$$\text{Variance} = S^2 = \frac{\sum f.(M-\bar{X})^2}{n-1} = \frac{4000}{24} = 166.67$$

(4 points = 1 point for formula + 3 points for answer)

*Deduct 0.5 point for wrong rounding

Question 9: (15 points)

AOU has to decide on a new approach to teaching Statistics. Full-time and part-time tutors were surveyed and the results are summarized below.

	Prefer Lecture (Tutorial)	Prefer Computer (Online)	No Preference	Total
Full-time	12	28	20	60
Part-time	13	17	10	40
Total	25	45	30	100

- a) If a tutor is selected at random, what is the probability that he is a full-timer?
Probability = $60/100 = 3/5$ (3 points)
- b) If a tutor is selected at random, what is the probability that he prefers online teaching?
Probability = $45/100 = 9/20$ (3 points)
- c) If a tutor is selected at random, what is the probability that he is a full-timer **and** has no preferences?
Probability = $20/100=1/5$ (3 points)
- d) **Given** that the selected tutor prefers online teaching through computers, what is the probably that he is a full-timer?
Probability = $28/45$ (3 points)
- e) **Given** that the selected tutor is a part-timer, what is the probably that he has no preference?
Probability = $10/40 = 1/4$ (3 points)

Question 10: (8 points)

In a BUS102 class of 30 students, there are 10 students registered in the accounting track and 15 doing management and 5 students of other majors. If **a student is chosen** at random.

- a) What is the probability of being either an accounting student or a management?
Probability (A or M) = $Pr(A) + Pr(M)$ (2 points)
 $= 10/30 + 15/30 = 25/30 = 5/6$ (2 points)
- b) What is the probability of being neither an accounting student nor a management?
Probability = $1 - \text{Probability (A or M)} = 1 - 5/6 = 1/6$ (4 points)
Or
Probability = Prob (Other majors) = $5/30 = 1/6$ (4 points)

End of Questions