| Room Number: | | Seat Number: | |
|---|---|---|---|
| Student ID: | | Student Name: | |

# FINAL EXAMINATION

| Unit: | TSTA602 (Non Award Unit Study) – Quantitative Methods for Accounting and Finance |
|---|---|
| Date: | 28/Feb/2023 |
| Time Allowed: | Three (3) hours |
| Total Number of Questions: | Part A: 15 Multiple Choice Questions<br>Part B: 5 Calculation Questions |
| Total Marks: | 100 marks |
| Instructions: | 1. Students are required to follow all instructions given by the Examination Supervisors.<br>2. All answers must be written in the separate answer booklet.<br>3. Write your name and student ID in the top section provided.<br>4. Pages are not to be separated and no part of the exam paper is to be removed from the examination room.<br>5. Hard copies of dictionaries and programmable calculators are not permitted.<br>6. Mobile phones and unauthorized personal electronic devices must be switched off and kept away from physical contact. |

This paper consists of nine pages.

**DO NOT START UNTIL INSTRUCTED TO DO SO**

**Part A: 15 Multiple Choice Questions (2 marks for each question, 30 marks).**

For each question, you should consider the correct answer by selecting ONE of the A, B, C, or D. Giving more than one answer will be counted as a wrong answer.

1. A bag of candy was opened, and the number of pieces was counted. The results are shown in the table below:

| Colour | Number |
|--------|--------|
| Red | 25 |
| Brown | 20 |
| Green | 20 |
| Blue | 15 |
| Yellow | 10 |
| Orange | 10 |

   Find the probability that a randomly chosen piece of candy is not green or orange.

   A) 0.4

   B) 0.3

   C) 0.85

   D) 0.7

2. The points scored by a basketball team for each game during its last season have been summarized in the table below. Which statement following the table must be correct?

| Score | Frequency |
|-------|-----------|
| 41-60 | 4 |
| 61-80 | 9 |
| 81-100 | 16 |
| 101-120 | 8 |

   A) The range is least 81 but at most 100

   B) The range is least 41 but at most 120

   C) The range is least 41 but at most 79

   D) None of these choices

3. The probability that a product is found to be defective is 0.10. If we examine 100 products, which of the following has the highest probability?

   A) 10 defective products are found

   B) 8 defective products are found

   C) 6 defective products are found

D) 9 defective products are found

4. The interquartile range is the difference between the:
   A) largest and smallest numbers in the data set.
   B) range of values between the first and third quartiles.
   C) median and the mean.
   D) None of these choices.

5. The temperature fluctuated between a low of 73°F and a high of 89°F. Which of the following could be calculated using just this information?
   A) Median
   B) Standard Deviation
   C) Range
   D) Variance

6. When a customer enters a store there are three outcomes that can occur: buy nothing, buy a small amount, or buy a large amount. In this situation, if a customer buys a large amount, he or she cannot also buy a small amount or buy nothing. Thus, the events are:
   A) dependent events
   B) mutually exclusive.
   C) independent.
   D) all inclusive.

7. The conditional probability of A given B is equal to the marginal probability of A, which is called the:
   A) marginal probability
   B) joint probability
   C) independent event
   D) conditional probability of A given B

8. A regression analysis between sales (Y) and advertising (X) (both in dollars) resulted in the following equation:
$$Y=100+4000X$$
   The above equation implies that an
   A) increase of $1 in advertising is correlated with an increase of $4 in sales.
   B) increase of $1 in advertising is correlated with an increase of $100 in sales.
   C) increase of $1 in advertising is correlated with an increase of $400 in sales.
   D) increase of $1 in advertising is correlated with an increase of $4000 in sales.

9. If sample points A, B, C, and D are the only possible outcomes of an experiment, find the probability of D using the table below.

| Sample point | A | B | C | D |
|---|---|---|---|---|
| Probability | $\frac{1}{9}$ | $\frac{2}{9}$ | $\frac{3}{9}$ | |

A) 1/9

B) 3/9

C) 4/9

D) 2/9

10. Following are the weather data collected on Christmas Day

| Event | Relative Frequency |
|---|---|
| Clear & dry | 0.3 |
| Cloudy & dry | 0.4 |
| Rain | 0.2 |
| Snow | 0.1 |

Based on the data, what is the probability that next Christmas will be snowy or clear and dry?

A) 0.4

B) 0.5

C) 0.6

D) 0.3

11. Two chips are drawn at random and without replacement from a bag containing four blue and three red chips. Find probability of drawing two red chips.

A) $\frac{1}{12}$

B) $\frac{6}{7}$

C) $\frac{1}{7}$

D) $\frac{9}{49}$

12. The speed at which a jet plane can fly is an example of _____.

A) neither discrete nor continuous random variable

B) both discrete and continuous random variable

C) a continuous random variable

D) a discrete random variable

13. Consider the following frequency distribution:

| Class Interval | Frequency |
|---|---|
| 100-under 200 | 15 |
| 200-under 300 | 25 |
| 300-under 400 | 20 |
| 400-under 500 | 40 |

What is the cumulative frequency of the third-class interval?

A) 20

B) 60

C) 40

D) 25

14. Jessica Salas, president of Salas Products, is reviewing the warranty policy for her company's new model of automobile batteries. Life tests performed on a sample of 100 batteries indicated: (1) an average life of 80 months, (2) a standard deviation of 15 months, and (3) a bell-shaped battery life distribution. Approximately 68% of the batteries will last between _____.

A) 75 and 85 months

B) 70 and 95 months

C) 65 and 95 months

D) 65 and 85 months

15. The normal distribution is an example of _____.

A) a discrete distribution

B) a continuous distribution

C) a bimodal distribution

D) an exponential distribution

**Part B: 8 Calculation Questions (70 marks)**

Show all necessary steps in your answers. No marks will be awarded if there are no written solutions.

**Question 1: [15 marks]**

The Public Utility Commission in a southern state is interested in describing the relationship between household monthly utility bills and the size of the house. A recent study of 30 randomly selected household resulted in the following regression results:

| Regression Statistics | | | | |
|---|---|---|---|---|
| Multiple R | 0.115878667 | | | |
| R Square | 0.013427866 | | | |
| Adjusted R Square | -0.038496984 | | | |
| Standard Error | 2.540377328 | | | |
| Observations | 30 | | | |
| | | | | |
| ANOVA | | | | |
| | df | SS | MS | F |
| Regression | 1 | 1.668891856 | 1.668891856 | 0.258601916 |
| Residual | 19 | 122.6168224 | 6.45351697 | |
| Total | 20 | 124.2857143 | | |
| | | | | |
| | Coefficients | Standard Error | t Stat | P-value |
| Intercept | 5.940809969 | 0.875967166 | 6.782000737 | 1.78E-06 |
| Square Feet | 0.07788162 | 0.153150743 | 0.50852917 | 0.61693623 |

Use the above output for answering the following questions:

**Part a)** (8 marks)

    i)      Interpret the slope of the regression line.

    ii)     Write down the estimated linear regression line.

    iii)    What is the value of coefficient of determination? Interpret this value

    iv)    What is the value of the coefficient of correlation? Interpret this value.

**Part b)** (7 marks)

Based on the information provided, indicate what, if any, conclusions can be reached about the relationship between utility bill and the size of the house in square feet.

**Type your answer here:**

**Question 2: [15 marks]**

**Part a)** (7 marks)

A sample of $n = 25$ observations is drawn from a normal population with $\mu = 100$ and $\sigma = 20$. Find the following.

i) $P(\bar{X} < 90)$
ii) $P(90 < \bar{X} < 105)$

**Part b)** (8 marks)
The amount of time the university professors devote to their jobs per week is normally distributed with a mean of 50 hours and a standard deviation of 10 hours.

i)    What is the probability that a professor works for more than 80 hours per week?

ii)   Find the probability that the mean amount of work per week for two randomly selected professors is more than 60 hours?

**Type your answer here:**

## Question 3: [14 marks]
**Part a)** (6 marks)
Calculate the value of the test statistic, set up the rejection region, undertaking hypothesis test and interpret the result.

$$H_0: \mu = 19$$
$$H_1: \mu \neq 19$$

Given that $\sigma = 5$, $n = 25$, $\bar{X} = 19.5$, $\alpha = 0.05$.

**Part b)** (8 marks)
A statistics practitioner is in the process of testing to determine whether is enough evidence to infer that the population mean is different from 190. She calculated the mean and standard deviation of a sample of 200 observations as $\bar{X} = 180$ and $s = 20$.

i)    Calculate the value of the test statistic of the test required to determine whether there is enough evidence to infer at the 5% significance level that the population means is different from 190.

ii)   Repeat the part i) with the population standard deviation to be 20.

**Type your answer here:**

## Question 4: [14 marks]
**Part a)** (6 marks)

Find the following probabilities by checking the z table

i) $P(-2.5 < Z < 0.8)$
ii) $P(1.30 < Z < 2.15)$

**Part b)** (8 marks)

Battery manufacturers compete on the basis of the amount of time their products last in cameras and toys. A manufacturer of alkaline batteries has observed that its batteries last for an average 26 hours when used in a toy racing car. The amount of time is normally distributed with a standard division of 2.5 hours.
i) What is the probability that the battery lasts between 24 and 30 hours?
ii) What is the probability that the battery lasts longer than 30 hours
iii) What is the probability that the battery lasts less than 24 hours.

**Type your answer here:**

## Question 5: [12 marks]
**Part a)** (6 marks)
The mean of a sample of 25 was calculated as mean of 250. The sample was randomly drawn from a population whose standard deviation is 20.
   i)      Estimate the population means with 99% confidence.
   ii)     Repeat part a changing the population standard deviation to 50

**Part b)** (6 marks)
A random sample of 4 observations was drawn from a normal population. The sample same and standard deviation are $\bar{X} = 200$ and $s = 40$.
   i)      Estimate the population mean with 90% confidence.
   ii)     Repeat part i) assuming the population standard deviation $\sigma = 30$.

**Type your answer here:**

**Formulas:**

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$Z = \frac{X - \mu}{\sigma}$$

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$\bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$t = \frac{b_1 - \beta_1}{s_{b_1}}$$

**END OF THE EXAMINATION**