AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF REHABILIATION MEDICINE

BACHELOR OF SCIENCE IN PHYSIOTHERAPY

END OF TRIMESTER EXAMINATIONS JANUARY TO APRIL 2026

UNIT CODE: PHT 315

UNIT NAME: Biostatistics Fresh entry (Main exam)

DATE: 10th April 2026

TIME: 9am-11am

INSTRUCTIONS

1. **All students will have two (2) hours to complete the examination**
2. **This is an online exam, Attempt all questions as per the instruction**
3. **It is the student's responsibility to report any page and number missing in this paper.**
4. **Check that the paper is complete**
5. **Total number of pages is 7 including the cover.**
6. **Read through the paper quickly before you start.**

SECTION A: MULTIPLE CHOICE QUESTIONS (30 Marks)

Each question is based on a physiotherapy or rehabilitation scenario.

1. A physiotherapist collects the following information from patients in a rehabilitation clinic:

   Blood group
   Level of disability (mild, moderate, severe)
   Age (years)
   Walking speed (m/s)

   Which variable is measured on a nominal scale?

   A. Age
   B. Walking speed
   C. Blood group
   D. Disability level

2. Patients undergoing physiotherapy are categorized into Stage I, Stage II, and Stage III recovery.

   Which measurement scale best describes this variable?

   A. Nominal
   B. Ordinal
   C. Ratio
   D. Interval

3. A physiotherapist records the number of falls experienced by elderly patients during rehabilitation.

   What type of variable is this?

   A. Continuous
   B. Discrete
   C. Ordinal
   D. Ratio

4. A physiotherapy department summarizes the number of patients treated for different conditions (stroke, fracture, arthritis).

   Which graphical method is most appropriate for presenting this information?

   A. Histogram
   B. Pie chart
   C. Scatter diagram
   D. Frequency polygon

5. A researcher wants to visualize the distribution of patients' ages attending physiotherapy sessions.
   Which graphical method is most suitable?
   A. Bar chart
   B. Histogram
   C. Pie chart
   D. Line graph
6. A physiotherapist analyzes recovery times from a dataset where most values are clustered around the center.
   Which measure best represents the average recovery time?
   A. Mean
   B. Range
   C. Variance
   D. Frequency
7. A dataset of rehabilitation outcomes contains extremely high values for a few patients due to complications.
   Which measure of central tendency is least affected by these outliers?
   A. Mean
   B. Median
   C. Mode.
   D. Standard deviation
8. Two physiotherapy clinics report the following recovery time statistics:
   Clinic A: Mean = 14 days, SD = 2
   Clinic B: Mean = 14 days, SD = 7
   Which conclusion is correct?
   A. Clinic B shows greater variability in recovery times
   B. Clinic A has greater variability
   C. Both clinics have identical distributions
   D. Variability cannot be determined
9. A physiotherapist finds that most patients recover quickly but a few take much longer.
   This distribution is likely:
   A. Symmetrical
   B. Positively skewed
   C. Negatively skewed
   D. Uniform
10. The coefficient of variation is most useful when:
    A. Comparing datasets with different measurement units
    B. Comparing variability relative to the mean
    C. Measuring probability distributions
    D. Testing hypotheses

11. The probability that a patient fully recovers after therapy is 0.65.
    What is the probability that a patient does not recover?
    A. 0.25
    B. 0.35
    C. 0.65
    D. 1.65
12. A physiotherapist studies the number of successful treatments among several patients, where each outcome is either success or failure.
    Which probability distribution is appropriate?
    A. Normal distribution
    B. Binomial distribution
    C. Poisson distribution
    D. Uniform distribution
13. A physiotherapist selects a sample of patients from a rehabilitation center to estimate the average length of stay.
    This is an example of:
    A. Descriptive statistics
    B. Inferential statistics
    C. Data coding
    D. Experimental bias
14. When the sample size increases, sampling error generally:
    A. Increases
    B. Decreases
    C. Remains constant
    D. Becomes negative
15. A physiotherapy study estimates the mean improvement in muscle strength as 15 kg with a 95% confidence interval of 12–18 kg.
    Which interpretation is correct?
    A. 95% of patients improved by 15 kg
    B. The true population mean improvement likely lies between 12 and 18 kg
    C. The sample mean is incorrect
    D. The improvement must equal 18 kg
16. A physiotherapist hypothesizes that aquatic therapy improves mobility more than standard therapy.
    This statement represents:
    A. Null hypothesis
    B. Alternative hypothesis
    C. Descriptive statistic
    D. Sampling distribution

17. If a researcher fails to reject a false null hypothesis, the error committed is:
    A. Type I error
    B. Type II error
    C. Sampling bias
    D. Measurement error
18. A physiotherapy study reports $p = 0.03$ when comparing two rehabilitation methods. At $\alpha = 0.05$, what should the researcher conclude?
    A. Reject the null hypothesis
    B. Accept the null hypothesis
    C. Increase sample size
    D. Reduce variability
19. A physiotherapist investigates whether gender influences treatment preference. Which statistical test is appropriate?
    A. Independent t-test
    B. Chi-square test
    C. Correlation analysis
    D. Regression analysis
20. A researcher compares mean flexibility improvement among three physiotherapy programs.
    Which statistical test should be used?
    A. Chi-square test
    B. Independent t-test
    C. ANOVA
    D. Correlation
21. A physiotherapist calculates a Z-score for a patient's performance after therapy. What does the Z-score represent?
    A. The probability of improvement
    B. The distance from the mean in standard deviation units
    C. The average value of the dataset
    D. The range of scores
22. In a normal distribution, approximately 95% of observations fall within:
    A. ±1 SD
    B. ±2 SD
    C. ±3 SD
    D. ±4 S

23. A physiotherapist evaluates the relationship between exercise duration and weight loss. Which statistical method is most appropriate?
    A. Correlation analysis
    B. Chi-square test
    C. ANOVA
    D. Frequency analysis
24. A dataset has variance equal to zero.
    What does this indicate?
    A. Data are highly skewed
    B. All observations are identical
    C. Mean equals zero
    D. Data are normally distributed
25. A physiotherapist compares pain reduction between two treatment groups.
    Which statistical test is most appropriate?
    A. Independent t-test
    B. Chi-square test
    C. ANOVA
    D. Regression analysis
26. If the probability of treatment success is 0.8, what is the expected number of successes in 5 patients?
    A. 2
    B. 3
    C. 4
    D. 5
27. A physiotherapist increases the confidence level from 95% to 99%.
    What happens to the confidence interval?
    A. It becomes narrower
    B. It becomes wider
    C. It remains unchanged
    D. It becomes negative
28. Which measure best describes spread of data around the mean?
    A. Median
    B. Standard deviation
    C. Mode
    D. Frequency
29. In hypothesis testing, the significance level (α) represents:
    A. Probability of Type I error
    B. Probability of Type II error
    C. Standard deviation of sample
    D. Sample size

30. A researcher obtains p = 0.15 when testing a hypothesis.
    At α = 0.05, the correct conclusion is:
    A. Reject the null hypothesis
    B. Fail to reject the null hypothesis
    C. Accept the alternative hypothesis
    D. The study is invalid

SECTION B: SHORT ANSWER QUESTIONS (20 Marks)

Answer ALL questions. Each question carries 5 marks. Show all calculations.

1. A physiotherapy clinic records pain scores for 25 patients.
   Mean = 6.5
   Standard deviation = 1.8
   a) Calculate the 95% confidence interval for the mean pain score.
   b) Interpret the result in the context of physiotherapy treatment outcomes.
2. Two physiotherapy programs report the following recovery times:

Group	Mean	SD	n
Program A	10 days	2	12
Program B	13 days	3	12

   Conduct an independent t-test to determine whether the difference is significant at α = 0.05.
3. A dataset of patient improvement scores has:
   Mean = 50
   Standard deviation = 8
   A patient records a score of 66.
   a) Calculate the Z-score.
   b) Interpret the result clinically.
4. The following data represent range of motion (degrees) in 12 patients after therapy:
   60, 65, 70, 75, 70, 80, 85, 90, 75, 70, 65, 80
   a) Construct a frequency distribution table using class intervals of 5.
   b) Draw and describe the shape of the histogram that would represent this data.

SECTION C: LONG ANSWER QUESTIONS (20 Marks)

Answer ONE question only

QUESTION 1

A physiotherapy researcher evaluates three rehabilitation techniques for improving balance scores.

Technique	Scores
A	45, 48, 50, 47, 49
B	52, 55, 54, 56, 53
C	60, 58, 59, 61, 62

a) Conduct a one-way ANOVA to determine whether there is a significant difference among the three techniques. (12 marks)

b) Interpret the results in relation to physiotherapy practice and clinical decision-making. (8 marks)

QUESTION 2

A physiotherapist observes that the probability of successful rehabilitation after a specific treatment is 0.7.

Five patients receive the treatment.

a) Using the binomial probability formula, calculate the probability that exactly four patients will successfully recover. (10 marks)

b) Calculate the probability that at least three patients recover. (5 marks)

c) Interpret the results in terms of clinical expectations for treatment outcomes. (5 marks)

Chi-square-table.pdf

Ztable.pdf