



**AMREF INTERNATIONAL UNIVERSITY  
SCHOOL OF MEDICAL SCIENCES  
DEPARTMENT OF REHABILITATION MEDICINE  
BACHELOR OF SCIENCE IN PHYSIOTHERAPY**

**END OF TRIMESTER EXAMINATIONS JANUARY TO APRIL 2026**

**UNIT CODE: PHT 315**

**UNIT NAME: Biostatistics Upgrading (Main exam)**

**DATE: 17 APRIL 2026**

**TIME: 6PM-8PM**

**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 8 including the cover.**
- 6. Read through the paper quickly before you start.**

## SECTION A: MULTIPLE CHOICE QUESTIONS (30 Marks)

1. A therapist records patient sex, age, pain score, and muscle strength. Which variable is measured on a ratio scale?
  - A. Sex
  - B. Pain category (mild/moderate/severe)
  - C. Muscle strength measured in kilograms
  - D. Injury classification
2. Patients are classified as low, moderate, or high disability. Which measurement scale does this represent?
  - A. Nominal
  - B. Ordinal
  - C. Interval
  - D. Ratio
3. A physiotherapist measures number of therapy sessions attended by patients. Which type of variable is represented?
  - A. Continuous
  - B. Discrete
  - C. Ordinal
  - D. Nominal
4. A physiotherapy department grouped range of motion values into class intervals before analysis. What statistical purpose does this serve?
  - A. Eliminating measurement error
  - B. Organizing data for summarization and visualization
  - C. Removing outliers
  - D. Increasing sample size
5. A therapist wants to present percentage distribution of treatment types used in the clinic. Which graphical method is most appropriate?
  - A. Histogram
  - B. Pie chart
  - C. Scatter plot
  - D. Frequency polygon
6. A dataset of rehabilitation time contains extreme long recovery values. Which measure of central tendency best represents the typical recovery time?
  - A. Mean
  - B. Median
  - C. Mode
  - D. Range
7. Two physiotherapy programs show similar mean improvement but different variability. Which statistic explains this difference?
  - A. Median
  - B. Standard deviation
  - C. Mode
  - D. Frequency
8. In a dataset of rehabilitation time, most patients recover quickly while a few require very long periods.

- What type of distribution is most likely?
- A. Symmetrical
  - B. Positively skewed
  - C. Negatively skewed
  - D. Uniform
9. A physiotherapist compares variability of outcomes between two clinics with different mean values.  
Which measure is most appropriate?
- A. Variance
  - B. Coefficient of variation
  - C. Range
  - D. Mean deviation
10. A physiotherapist constructs a histogram of shoulder flexibility measurements.  
Which characteristic distinguishes a histogram from a bar chart?
- A. Bars represent categories
  - B. Bars are separated by spaces
  - C. Bars are continuous without gaps
  - D. Frequencies cannot be shown
11. If the probability of successful rehabilitation is 0.7, what is the probability of failure?
- A. 0.2
  - B. 0.3
  - C. 0.7
  - D. 1.7
12. A physiotherapist studies the number of patients who improve after treatment in repeated trials.  
Which probability distribution is appropriate?
- A. Normal distribution
  - B. Binomial distribution
  - C. Uniform distribution
  - D. Chi-square distribution
13. In a normal distribution, approximately 68% of observations fall within:
- A.  $\pm 1$  SD
  - B.  $\pm 2$  SD
  - C.  $\pm 3$  SD
  - D.  $\pm 4$  SD
14. A researcher selects 50 patients from a large rehabilitation population to estimate the average recovery time.  
This process represents:
- A. Census
  - B. Sampling
  - C. Estimation error
  - D. Measurement bias
15. A physiotherapist hypothesizes that a new treatment improves balance more than the standard therapy.  
This statement represents:
- A. Null hypothesis

- B. Alternative hypothesis
  - C. Statistical assumption
  - D. Sampling hypothesis
16. A researcher rejects the null hypothesis when it is actually true. This is known as:
- A. Type I error
  - B. Type II error
  - C. Sampling bias
  - D. Measurement error
17. A physiotherapy trial reports  $p = 0.02$ . What decision should be made at  $\alpha = 0.05$ ?
- A. Accept the null hypothesis
  - B. Reject the null hypothesis
  - C. Increase sample size
  - D. Repeat experiment
18. A physiotherapist investigates whether treatment type is associated with gender. Which statistical test is most appropriate?
- A. t-test
  - B. Chi-square test
  - C. ANOVA
  - D. Correlation
19. A researcher compares mean recovery times across three therapy techniques. Which statistical test is appropriate?
- A. Chi-square
  - B. ANOVA
  - C. t-test
  - D. Correlation
20. A therapist studies the relationship between exercise duration and muscle strength gain. Which analysis should be used?
- A. Regression
  - B. Correlation
  - C. Chi-square
  - D. Frequency analysis
21. A physiotherapy researcher selects a random sample of 80 patients from a large hospital to estimate the average rehabilitation time for stroke patients. Which statistical concept allows the researcher to use the sample mean to estimate the population mean?
- A. Sampling distribution
  - B. Estimation theory
  - C. Probability density
  - D. Regression analysis
22. A physiotherapist evaluates the probability of improvement after therapy. Historical data show that 60% of patients improve after a particular treatment. If two patients are selected independently, what is the probability that both improve?
- A. 0.12
  - B. 0.36

- C. 0.60  
D. 0.72
23. A physiotherapy department conducted a study on recovery time using a small sample of 12 patients.  
Which limitation is most likely to affect the reliability of the results?
- A. Increased statistical power
  - B. Reduced sampling error
  - C. Greater sampling error
  - D. Elimination of bias
24. A physiotherapy study reports the mean improvement in walking speed as 0.8 m/s with a 95% confidence interval of 0.6–1.0 m/s.  
Which interpretation is most appropriate?
- A. 95% of patients improved by exactly 0.8 m/s
  - B. The true population mean improvement is likely between 0.6 and 1.0 m/s
  - C. The study result is incorrect 95% of the time
  - D. 95% of patients fall within this range
25. Two physiotherapy programs produce the following results:  
Program A: Mean improvement = 12 units, SD = 2  
Program B: Mean improvement = 12 units, SD = 6  
What can be concluded regarding the outcomes?
- A. Program B produces more consistent results
  - B. Program A produces more consistent outcomes
  - C. Both programs have identical variability
  - D. Program B has no variability
26. A therapist is analyzing the probability of treatment success. The probability of success is 0.7. Using the binomial model, what is the expected number of successes among 10 patients?
- A. 3
  - B. 5
  - C. 7
  - D. 10
27. A physiotherapist compares the mean pain reduction between two independent treatment groups.  
Which inferential statistical test is most appropriate?
- A. Chi-square test
  - B. Independent t-test
  - C. Pearson correlation
  - D. Frequency analysis
28. A rehabilitation researcher observes that increasing exercise duration is associated with increased muscle strength gains.  
Which statistical method is most appropriate to quantify the strength and direction of this relationship?
- A. Chi-square test
  - B. Pearson correlation
  - C. ANOVA
  - D. Z-test

29. A physiotherapy researcher increases the sample size from 20 patients to 100 patients when estimating the average recovery time. What effect does this have on the confidence interval?
- A. The interval becomes wider
  - B. The interval becomes narrower
  - C. The interval becomes skewed
  - D. The interval remains unchanged
30. A clinical trial comparing two physiotherapy interventions reports  $p = 0.08$  when testing the difference in mean recovery time. At  $\alpha = 0.05$ , which conclusion is most appropriate?
- A. Reject the null hypothesis
  - B. Fail to reject the null hypothesis
  - C. Accept the alternative hypothesis
  - D. Conclude the treatments are identical

### SECTION B: SHORT ANSWER QUESTIONS (20 Marks)

Answer ALL questions (5 marks each)

1. Pain scores recorded for 10 physiotherapy patients:  
6, 7, 8, 5, 7, 6, 9, 5, 8, 7
  - a) Compute the mean
  - b) Compute the standard deviation
  - c) Interpret the variability in relation to treatment response.
2. A physiotherapist recorded range of motion (degrees):  
110, 115, 120, 125, 110, 130, 135, 120
  - a) Construct a frequency distribution table using class intervals of 10.
  - b) Identify the modal class.
3. The following are Treatment preference among 60 patients:  
Manual therapy – 25  
Electrotherapy – 20  
Hydrotherapy – 15  
Use Chi-square test to determine whether preference distribution differs significantly assuming equal expected proportions.
4. Exercise duration and improvement scores:

Duration	Improvement
30	2
40	3
50	4
60	4

Duration	Improvement
70	5
80	6

Compute Pearson correlation coefficient ( $r$ ) and interpret.

### SECTION C: LONG ANSWER QUESTIONS (20 Marks)

Answer ONE question only

#### QUESTION 1

A physiotherapist evaluates grip strength (kg) in 10 elderly patients:

22, 24, 21, 23, 26, 25, 24, 22, 28, 23

- Compute mean, variance, and standard deviation (10 marks)
- Interpret variability among participants (5 marks)
- Another group has mean = 30 kg, SD = 3.

Use a Z-test to determine if the difference is significant at  $\alpha = 0.05$  (5 marks)

#### QUESTION 2

A physiotherapist evaluates inflammation size before and after ultrasound therapy:

Patient	Pre	Post
1	10	8
2	12	10
3	11	9
4	9	8
5	13	11
6	10	9
7	12	11
8	11	10

a) Compute mean difference and SD of differences (10 marks)

b) Conduct paired t-test (5 marks)

c) Interpret the clinical implication (5 marks)



Ztable.pdf



Chi-square-table.pdf

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