BINDURA UNIVERSITY OF SCIENCE EDUCATION

AUG 2024

FACULTY OF SCIENCE EDUCATION

DEPARTMENT: CURRICULUM AND EDUCATIONAL MANAGEMENT STUDIES

PROGRAMME: BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE
BACHELOR OF SCIENCE HONOURS DEGREE
POST GRADUATE DIPLOMA IN EDUCATION

COURSE CODE: PC102 (1) NARRATION: RESEARCH METHODS & STATISTICS
DURATION: 3 HOURS TOTAL MARKS: 300

INSTRUCTIONS TO CANDIDATES

Answer any **three** questions choosing **at least one question** from each section. Each question begins on a separate booklet. Each question carries 100 marks except the statistical questions which carry the indicated marks which will be converted into a mark out of 100. Relate your answer and examples to the Zimbabwean context. Statistical tables will be provided.

Section A: Research Methods

1. Justify the relevance of **any four** types of validity an educational researcher would use in carrying out research.
   (100 marks)

2. Use the 'paradigms debate' to argue for mixed methods research approach.
   (100 marks)

3. Analyse the role of triangulation in the conduct of research.
   (100 marks)

Section B: Statistics

4. Teachers encourage their students to study hard because there is a strong belief that the more hours students spend studying, the better the students' academic performance in tests. A randomly selected group of ten (10) students were asked the number of hours they spent studying in preparation for their statistics test. The mark they got in the test was then recorded.
   The following information was obtained.

Student	A	B	C	D	E	F	G	H	I	J
Study hours	18	18	20	12	22	10	24	20	26	8
Tests scores	66	70	72	58	74	62	78	74	82	54

(a) Calculate the Spearman rank order correlation coefficient and use the calculated value to determine whether it is true the more hours students spend studying for tests the better their academic performance [8 marks]

(b) State any two factors which could have influenced the performance of the students in the tests. [2 marks]

(c) If a distinction was pegged at 1.25 Standard Deviation (SD) below the mean, which students if any got a distinction in the test? [4 marks]

(d) If the pass mark was pegged at 1.6 Standard Deviation (SD) below the mean, which student if any failed the test [4 marks]

(e) Calculate the percentile rank of student H. [2 marks]

(f) Draw a normal distribution curve and on it mark the approximate position of student H. [5 marks]

5. The values below give the resting pulse rate of 20 students after a Physical Education exercise.

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pulse rate	56	60	65	70	64	66	72	80	64	64	60	58	69	71	68	78	64	65	66	70

(a) Find the (i) mean (ii) mode (iii) median (iv) range (v) inclusive range (5 marks)

(b) Using an appropriate class interval size, show values in a grouped frequency table showing the following columns:
- (i) Class interval (ci)
- (ii) Leaf
- (iii) Frequency (f)
- (iv) Cumulative frequency (cf)
- (v) Midpoint (mp), and
- (vi) fmp

(6 marks)

(c) Find the (i) mean (ii) mode (iii) median of the values and explain why these differ from those obtained in 4a above. (9 marks)

(d) Draw a histogram to show the distribution of the values (5 marks)

-END OF PAPER-

PC102

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DEPATMENT OF CURRICULUM STUDIES

KEY FORMULAE REQUIRED FOR TESTS AD EXAMINATIONS IN EDUCATIONAL STATISTICS

This is university property

Please do not make any marks on these papers

All answers should be to two (2) decimal places.

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1. **Mean of grouped data**

$\bar{x} = \frac{\Sigma fmp}{N}$ or $\frac{\Sigma fmp}{\Sigma f}$ where

$\bar{x}$	=	mean
f	=	frequency
mp	=	middle point of class interval
N	=	number of scores in the distribution

2. **Median of grouped data**

Median = $\lambda_m + [\frac{\frac{n}{2} - cfb}{fm}]i$ where

λ_m	=	the lower limit of the median class
n	=	number of pupils who wrote the test
cfb	=	cumulative frequency below the median class
i	=	class interval size
fm	=	median class frequency

3. **Mode of grouped data**

Mode = $\lambda + [\frac{fm-fl}{(fm-fl)(fm-fh)}]\ ci$ where

λ	=	the lower limit of the modal class
fm	=	frequency of modal class
fl	=	frequency of class below modal class
fh	=	frequency of class above modal class
ci	=	class interval size

4. **Percentile rank of ungrouped data**

Percentile Rank = $\frac{(n+1)-R}{n}$ x 100% where

n	=	number of scores
R	=	position of score whose percentile rank we want to calculate from the top of the class

5. **Percentile rank of grouped data**

Percentile Rank = $\lambda\% + [\frac{score-LRL}{h}]$ I% where

λ%	=	percentage of pupils scoring lower than the critical interval
score	=	raw score whose percentile rank we want to calculate
LRL	=	lower real limit of critical interval
h	=	class interval size
I%	=	percentage of pupils scoring within the critical interval

6. **Standard deviation**

Standard deviation = $\sqrt{\frac{\sum(x-\bar{x})2}{N}}$ or $\sqrt{\frac{\sum d2}{N}}$

x	=	scores
$\bar{x}$	=	mean of scores
N	=	number of scores
d	=	deviation of each score from the mean

7. Z Score

$$\text{Z Score} = \frac{x-\bar{x}}{Sd}$$

x = score

$\bar{x}$ = mean of scores

sd = Standard deviation of scores

8. **Spearman Rank Order Correlation Coefficient**

$$\rho = I - \frac{6\sum d^2}{N(N^2-1)} \text{ where}$$

I = one

ρ = correlation coefficient

d = differences between ranks of each pair of marks

N = number of scores in the distribution

9. **Pearson Product Moment Correlation Coefficient**

$$r = \frac{N\sum XY - \sum X \sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}} \text{ where}$$

N = number of marks in the distribution

X = scores in one set of marks

Y = scores in the other set of marks

10. **t test**

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{sd_1^2}{N_1} + \frac{sd_2^2}{N_2}}}$$

t = calculated t value

$\bar{x}_1$ = mean of the first set of scores

$\bar{x}_2$ = mean of second set of scores

sd_1 = standard deviation of the first set of marks

sd_2 = standard deviation of the second set of marks

N_1 = number of scores in the first distribution

N_2 = number of scores in the second distribution

11. Chi-Square

$X^2 = \sum \frac{(fo-fe)2}{fe}$ where

X^2 = calculated Chi-Square
fo = observed frequencies
fe = expected frequencies

12. Item difficulty

R/N × 100% where
R = number of pupils who got the item correct
N = number of pupils who attempted to answer the item

13. Item discriminating power index

(H – L) ÷ N/2 where
H = number of pupils in the top 25% of the class who got the item correct
L = number of pupils in the bottom 25% of the class who got the item correct
N = number of pupils who wrote the test