ZIMBABWE EZEKIEL GUTI UNIVERSITY

FACULTY OF EDUCATION, GOVERNANCE, THEOLOGY AND LEADERSHIP

DEPARTMENT OF CURRICULUM AND EDUCATIONAL PHILOSOPHY

EXAMINATION PAPER

MODULE CODE	:	**EPD/EPR 124**
MODULE TITLE	:	**RESEARCH AND STATISTICS**
SPECIAL REQUIREMENTS	:	**STATISTICAL TABLES**
		FORMULAE SHEETS
		GRAPH PAPER
DURATION	:	**3 HOURS**
LEVEL	:	**1.2**
DATE		28 NOV 2025

INSTRUCTIONS TO CANDIDATES:

1. No cell phones are allowed in the examination venue.
2. Answer three (3) questions. Section A is research methods with three questions. Section B is statistics also with three questions. **You are expected to answer three questions, but not more than two questions from a section.**
3. Each question carries (25) marks.
4. The number of marks for each question or part question is shown in brackets [ ]
5. Use of non-programmable calculators is allowed.
6. Start each question on a new page.
7. Show all your workings in order to gain full marks.
8. Answer sheets are provided
9. **DO NOT OPEN THIS PAPER UNTIL THE INVIGILATOR INSTRUCTS YOU.**

SECTION A

QUESTION ONE

a. Critically evaluate the strengths and limitations of the three major philosophical approaches in educational research. **(15 marks)**

b. Which approach do you consider most appropriate for studying inclusive education, and why? **(10 marks)**

QUESTION TWO

a. Critically assess the strengths and limitations of quantitative, qualitative, and mixed methods research designs in educational research. **(15 marks)**

b. Which design would you recommend for studying the impact of digital learning tools in rural schools, and why? **(10 marks)**

QUESTION THREE

a. Identify and describe three common data collection methods used in quantitative educational research. For each method, explain the type of instrument used and how it ensures reliability and validity. **(15 marks)**

b. An educator has been assigned to select a representative sample of learners from a provincial population of 500 for participation in a study commissioned by the Provincial leadership. Describe an appropriate sampling method the educator could use to randomly select 30 learners, and provide a justification for the chosen method. **[10 marks]**

SECTION B

QUESTION ONE

Using the table below,

Student	**Score**
A	65
B	70

C	85
D	90
E	80
F	55
G	60
H	75
I	90
J	100

a. Calculate the Mean, Median, and Mode of the students' scores. **(6 marks)**

b. Using your answers in (a), comment on the skewness of the students' scores. **(3 marks)**

c. Calculate the Range, Variance, Standard Deviation and coefficient of variation. **(10 marks)**

d. Write a brief report commenting on the statistics computed above and provide strategic recommendations teacher. **(6 marks)**

QUESTION TWO

The table below shows the number of group study sessions attended by students and their final exam scores:

Student	Group Study Sessions (X)	Final Exam Score (Y)
A	1	55
B	2	60
C	3	65
D	4	70
E	5	75

a. Calculate the simple linear regression equation. **(8 marks)**

b. Interpret the slope and intercept in the context of this study. **(5 marks)**

c. Predict the exam score for a student who attends 6 group study sessions. **(2 marks)**

d. Calculate a correlation coefficient for these data and interpret its value. **(5 marks)**

e. Calculate a coefficient of determination for these data and interpret its value. **(5 marks)**

QUESTION THREE

a. Two schools implemented different reading programs and want to compare the reading level outcomes of their students. The results are as follows:

Reading Level	School A	School B
Below Average	10	15
Average	25	20
Above Average	15	15

Using a Chi-squared test of homogeneity, determine whether the distribution of reading levels differs between the two schools. Use a 5% level of significance. **(15 marks)**

b. The following table shows annual enrolment numbers for four schools in your district from 2020 to 2024:

School	2020	2021	2022	2023	2024
Matoranhembe	385	350	326	341	286
Madzorera	186	178	224	212	195
Mucheri	140	156	187	188	184
Kasanze	112	65	156	143	112

Construct a suitable bar chart to visually represent the enrolment trends across the schools over the five-year period. **(10 marks)**

THE END

STATISTICAL FORMULAS

MEASURES OF CENTRAL TENDENCY

Ungrouped data

Population mean, $\mu = \frac{\sum x}{N}$

Sample mean, $\bar{x} = \frac{\sum x}{n}$

Median, $M_e = \frac{n+1}{2}$

Grouped data

Population mean, $\mu = \frac{\sum fx}{N}$

Sample mean, $\bar{x} = \frac{\sum fx}{n}$

Median, Me = $L_m + \frac{(\frac{n}{2} - F)C}{fm}$

Mode, Mo = $L_m + \frac{(d_1)\,c}{d_1 + d_2}$

MEASURES OF DISPERSION

Ungrouped data

Population average deviation, AD= $\frac{\sum |x - \mu|}{N}$

Sample average deviation, AD = $\frac{\sum |x - \bar{x}|}{n}$

Population variance $= \sigma^2 = \frac{1}{N}(\sum x_2 - \frac{1}{N}(\sum x)^2)$

Sample variance = $s^2 = \frac{1}{n-1}(\sum x_2 - \frac{1}{n}(\sum x)^2)$

Population standard deviation, $\sigma = \sqrt{\frac{1}{N}(\sum x_2 - \frac{1}{N}(\sum x)_2)}$

Sample standard deviation, $s = \sqrt{\frac{1}{n-1}(\sum x_2 - \frac{1}{n}(\sum x)_2)}$

Grouped data

Range = maximum value – minimum value

Percentile, $P_k = L_p + \frac{(\frac{kn}{100} - F)C}{fp}$

Decile, $D_x = L_d + \frac{(\frac{xn}{10} - F)C}{fd}$

Lower quartile, $Q_1 = L_q + \frac{(\frac{n}{4} - F)C}{fq}$

Upper quartile $Q_3 = L_q + \frac{(\frac{3n}{4} - F)C}{fq}$

Interquartile range = $Q_3 - Q_1$

Quartile deviation = $\frac{Q_3 - Q_1}{2}$

Population average deviation, AD= $\frac{\sum f|x-\mu|}{N}$

Sample average deviation, AD = $\frac{\sum f|x-\bar{x}|}{n}$

Population variance, $\sigma^2 = \frac{1}{N}(\sum fx_2 - \frac{1}{N}(\sum fx)^2)$

Sample variance= $s^2 = \frac{1}{n-1}(\sum fx_2 - \frac{1}{n}(\sum fx)^2)$

Population standard deviation, $\sigma = \sqrt{\frac{1}{N}(\sum fx_2 - \frac{1}{N}(\sum fx)_2)}$

Sample standard deviation, $s = \sqrt{\frac{1}{n-1}(\sum fx_2 - \frac{1}{n}(\sum fx)_2)}$

Population coefficient of variation, CV= $\frac{\sigma}{\mu}$ x 100%

Sample coefficient of variation, CV = $\frac{s}{\bar{x}}$ x 100%

SHAPE OF FREQUENCY DISTRIBUTIONS

Population skewness, Sk = $\frac{3(\mu - \text{median})}{\sigma}$ or $\frac{(\mu - \text{mode})}{\sigma}$

Sample skewness, Sk = $\frac{3(\bar{x} - \text{median})}{s}$ or $\frac{(\bar{x} - \text{mode})}{s}$

Population kurtosis = $\frac{\sum f(X-\mu)_4}{\sigma_4}$

Sample kurtosis = = $\frac{\sum f(X-\bar{x})^4}{s^4}$

TESTING OF HYPOTHESIS (ONE SAMPLE CASE)

Tests on the mean of a single population

i. If when σ^2 is unknown and sample size is small (n<30), then the t Statistic is such that,

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

ii. If when σ^2 is known and sample size is large, then the z statistic is such that:

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

iii. If when σ^2 is unknown and sample size is large, then the t statistic is approximately a standard normal random variable such that: $z = \frac{\bar{x} - \mu_x}{\frac{s}{\sqrt{n}}}$

Hypothesis to be tested	Distribution	Reject H_0 if
$H_0: \mu = \mu_0$ $H_1: \mu \neq \mu_0$	Z -distribution	$Z > Z_{\alpha/2}$ $Z < -Z_{\alpha/2}$
	T – distribution	$T > T_{\alpha/2}(n-1)$ $T < -t_{\alpha/2}(n-1)$
$H_0: \mu \leq \mu_0$ $H_1: \mu > \mu_0$	Z-distribution T-distribution	$Z > Z_\alpha$ $T > t_\alpha (n-1)$
$H_0: \mu \geq \mu_0$ $H_1: \mu < \mu_0$	Z-distribution T-distribution	$Z < -Z_\alpha$ $T < -t_\alpha (n-1)$

TESTING OF HYPOTHESIS (TWO SAMPLE CASE)

Comparing Two Population Means when samples are from independent populations

Use if sample sizes > 30 or if σ_1 and σ_2 are known: $z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma^2_1}{n_1} + \frac{\sigma^2_2}{n_2}}}$

Use if sample sizes > 30 or if σ_1 and σ_2 are unknown: $z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s^2_1}{n_1} + \frac{s^2_2}{n_2}}}$

Comparing Population Means with Unknown Population Standard Deviations (the Pooled *t*-test)

Small sample test of means (n<30)

The required assumptions are: (1) Both populations must follow the normal distribution. (2) The populations must have equal standard deviations and (3) The samples are from independent populations.

$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{S_{2p}(\frac{1}{n_1}+\frac{1}{n_2})}}$ where $S^2_p =$ $S^2_p = \frac{(n_1-1)S_{21} + (n_2-1)S_{22}}{n_1+n_2-2}$

Degrees of freedom (df) : n_1+n_2-2

Two-Sample Tests of Hypothesis: Dependent Samples

Use the following test when the samples are dependent:

$t = \frac{\bar{d}}{s_d/\sqrt{n}}$

Degrees of freedom (df): n-1

CHI-SQUARE TEST

$X^2_{calc} = \sum \frac{(fo-fe)_2}{f_e}$

Degrees of freedom (df) = (number of rows−1)×(number of columns−1)

SIMPLE REGRESSION AND CORRELATION

Fitted Trend Line: Y= a + bX

b $= \frac{n\sum XY - \sum X \sum Y}{n\sum X_2 - (\sum X)_2}$

a = $\bar{Y}$ - b $\bar{X}$

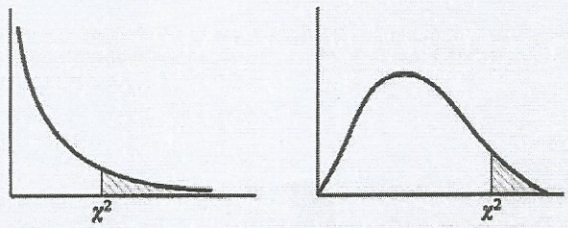
Correlation coefficient, r = $\sqrt{R_2}$ $= \frac{n\sum XY - \sum X \sum Y}{\sqrt{[n\sum X_2 - (\sum X)_2][n\sum Y_2 - (\sum Y)_2]}}$

Coefficient of determination, $R^2 = (\frac{n\sum XY - \sum X \sum Y}{\sqrt{[n\sum X_2 - (\sum X)_2][n\sum Y_2 - (\sum Y)_2]}}$

APPENDIX 6

Chi-Square Distribution

Areas reported below: *



For $df = 1,2$ For $df \geq 3$

Proportions of Area for the χ^2 Distributions

df	Proportion of Area										
	0.995	0.990	0.975	0.950	0.900	0.500	0.100	0.050	0.025	0.010	0.005
1	0.00004	0.00016	0.00098	0.00393	0.0158	0.455	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	1.386	4.61	5.99	7.38	9.21	10.60
3	0.072	0.115	0.216	0.352	0.584	2.366	6.25	7.81	9.35	11.34	12.84
4	0.207	0.297	0.484	0.711	1.064	3.357	7.78	9.49	11.14	13.28	14.86
5	0.412	0.554	0.831	1.145	1.61	4.251	9.24	11.07	12.83	15.09	16.75
6	0.676	0.872	1.24	1.64	2.20	5.35	10.64	12.59	14.45	16.81	18.55
7	0.989	1.24	1.69	2.17	2.83	6.35	12.02	14.07	16.01	18.48	20.28
8	1.34	1.65	2.18	2.73	3.49	7.34	13.36	15.51	17.53	20.09	21.96
9	1.73	2.09	2.70	3.33	4.17	8.34	14.68	16.92	19.02	21.67	23.59
10	2.16	2.56	3.25	3.94	4.87	9.34	15.99	18.31	20.48	23.21	25.19
11	2.60	3.05	3.82	4.57	5.58	10.34	17.28	19.68	21.92	24.73	26.76
12	3.07	3.57	4.40	5.23	6.30	11.34	18.55	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	7.04	12.34	19.81	22.36	24.74	27.69	29.82
14	4.07	4.66	5.63	6.57	7.79	13.34	21.06	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	8.55	14.34	22.31	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	9.31	15.34	23.54	26.30	28.85	32.00	34.27
17	5.70	6.41	7.56	8.67	10.09	16.34	24.77	27.59	30.19	33.41	35.72
18	6.26	7.01	8.23	9.39	10.86	17.34	25.99	28.87	31.53	34.81	37.16
19	6.84	7.63	8.91	10.12	11.65	18.34	27.20	30.14	32.85	36.19	38.58
20	7.43	8.26	9.59	10.85	12.44	19.34	28.41	31.41	34.17	37.57	40.00

df	Proportion of Area										
	0.995	0.990	0.975	0.950	0.900	0.500	0.100	0.050	0.025	0.010	0.005
21	8.03	8.90	10.28	11.59	13.24	20.34	29.62	32.67	35.48	38.93	41.40
22	8.64	9.54	10.98	12.34	14.04	21.34	30.81	33.92	36.78	40.29	42.80
23	9.26	10.20	11.69	13.09	14.85	22.34	32.01	35.17	38.08	41.64	44.18
24	9.89	10.86	12.40	13.85	15.66	23.34	33.20	36.42	39.36	42.98	45.56
25	10.52	11.52	13.12	14.61	16.47	24.34	34.38	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	17.29	25.34	35.56	38.89	41.92	45.64	48.29
27	11.81	12.83	14.57	16.15	18.11	26.34	36.74	40.11	43.19	46.96	49.64
28	12.46	13.56	15.31	16.93	18.94	27.34	37.92	41.34	44.46	48.28	50.99
29	13.12	14.26	16.05	17.71	19.77	28.34	39.09	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	20.60	29.34	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	29.05	39.34	51.81	55.76	59.34	63.69	66.77
50	27.99	29.71	32.36	34.76	37.69	49.33	63.17	67.50	71.42	76.15	79.49
60	35.53	37.43	40.48	43.19	46.46	59.33	74.40	79.08	83.30	88.38	91.95
70	43.28	45.44	48.76	51.74	55.33	69.33	85.53	90.53	95.02	100.4	104.2
80	51.17	53.54	51.17	60.39	64.28	79.33	98.58	101.9	106.6	112.3	116.3
90	59.20	61.75	65.65	69.13	73.29	89.33	107.6	113.1	118.1	124.1	128.3
100	67.33	70.06	74.22	77.93	82.36	99.33	118.5	124.3	129.6	135.8	140.2

*Example: For the shaded area to represent 0.05 of the total area of 1.0 under the density function, the value of x^2 is 18.31 when df = 10.

Source: From Table IV of Fisher and Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, 6th ed., 1974, published by Longman Group Ltd., London (previously published by Oliver & Boyd, Edinburgh), by permission of the authors and publishers.

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