CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATION

RESIT/SUPPLEMENTARY / SPECIAL EXAMINATIONS EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN NURSING

NURS 393: BIOSTATISTICS

STREAMS: BSc. Nursing (Y3S1)   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 06/05/2021   **11.30 A.M - 1.30 P.M.**

INSTRUCTIONS:

- Answer **ALL** questions
- Do not write anything on the question paper
- This is a **closed book exam**, no reference materials are allowed in the examination room
- **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and **use your time wisely**

SECTION A: MULTIPLE CHOICE QUESTIONS [ONE MARK EACH] [20 MARKS]

1. If the mean is less than the mode, the distribution will be?

    A. Positively skewed

    B. Negatively skewed

    C. Symmetrical

    D. None of these

2. The number of children attending a clinic in a given hospital is an example of _____ variable

    A. Discrete

    B. Continuous

    C. Constant

    D. Qualitative

3. In biostatistics, the spread of dispersion is described by?

   A. Median

   B. Mode

   C. Standard deviation

   D. Mean

4. When we make a 99% confidence interval for the population mean using t or z test then the probability or chance of error will be?

   A. 0.05

   B. 1

   C. 0.01

   D. 5

5. The third quartile of a series of values is:?

   A. The value in the ordered series located at 15% of the number of values in the series

   B. The value in the ordered series located at 25% of the number of values in the series

   C. The value in the ordered series located at 75% of the number of values in the series

   D. The value in the ordered series located at 100% of the number of values in the series

6. The median of a series of numerical values is:

   A. A value for which half of the values are higher and half of the values are lower

   B. The value located exactly midway between the minimum and maximum of the series

   C. The most commonly encountered values among the series

   D. A measure of the eccentricity of the series

7. Which of the following is NOT a characteristic of a regression line?

   A. Is located as close as possible to all the points of a scatter chart

   B. Is defined by an equation having 2 parameters: the slope and the intercept

   C. Provides an approximate relationship between the values of two parameters

   D. Is parallel to one of the coordinate axes

8. Variance is obtained by the the square of:

    A. Standard deviation

    B. Mode

    C. Regression

    D. Standard error

9. Which of the following is not affected by extreme values?

    A. Mean

    B. Median

    C. Range

    D. Standard deviation

10. Pearson correlation coefficient, denoted by r, measures:

    A. The scattering strength of data for a statistical series

    B. The strength of the correlation between the mean and median

    C. The strength of the correlation between two numerical parameters

    D. The strength of the correlation between two non-numerical parameters parameters

11. The correlation coefficient computed for two parameters measured in 429 patients is r=0.829. This means that:

    A. The two parameters are directly correlated, and the link is weak - r is positive and close to 0

    B. The two parameters are inversely correlated, and the link is strong - r is negative and close to 1

    C. The two parameters are directly correlated, and the link is strong -r is positive and close to 1

    D. There are too few cases (under 30) and we do not trust this coefficient's value

12. Which of the following is NOT an attribute of a Gauss curve?

    A. Symmetrical to the mean

    B. Symmetrical to the vertical axis, which passes through 0

    C. Has a maximum where the average of the series of values is located

    D. Tends to 0 towards plus infinity and minus infinity (i.e. very low and very high values)

13. The Student's t test is:

    A. Parametric test

    B. A nonparametric test

    C. A test for comparing standard errors

    D. A test for comparing variances

14. If, after performing a Student test for comparison of means, we obtain $p = 0.0342$, then:

    A. We reject H0 and accept H1

    B. We accept H0

    C. We reject H1

    D. We cannot decide

15. The stages of a malignant disease (cancer) is recorded using the symbols 0, I, II, III, IV. We say that the scale used is:

    A. Alphanumeric

    B. Numerical

    C. Ordinal

    D. Nominal

16. The birth weights in a hospital are to be presented in a graph. This is best done by a:

    A. Bar diagram.

    B. Pie chart.

    C. Histogram

    D. Pictogram

17. The result of a statistical test, denoted p, shall be interpreted as follows:

    A. The null hypothesis H0 is rejected if $p < 0.05$

    B. The null hypothesis H0 is rejected if $p > 0.05$

    C. The alternate hypothesis H1 is rejected if $p > 0.05$

    D. The null hypothesis H0 is accepted if $p < 0.05$

18. Which one of the following variables is not categorical?

    A. Age of a person.

    B. Gender of a person: male or female.

    C. Choice on a test item: true or false.

    D. Marital status of a person (single, married, divorced, other)

19. The data that categories patients as males or females are known as?

    A. Random data

    B. Nominal data

    C. Ordinal data

    D. Interval data

20. The ANOVA procedure is a statistical approach for determining whether or not:

    A. The means of two samples are equal

    B. The means of two or more samples are equal

    C. The means of more than two samples are equal

    D. The means of two or more populations are equal

SECTION B:[20 MARKS]

1. Explain thefollowing concepts as used in biostatistics   [3 marks]

    i.   Statistical data

    ii.   Variable

    iii.   Chi-square test

2. Explain three (3)characteristics of parametric statistics   [3 marks]

3. The mean haemoglobin levels among children under five in Kenya is 12.28 g/dl. A research was done for 12 children in Meru town. The mean was 13.21 ± 2.62 g/dl. Determine if there is a significant difference between the Kenyan mean and the research mean for the twelve children at 95% confidence level.   [4 marks]

4. In a health research was undertaken to establish whether the presence of a given disease was independent of their occupation. Using the table below, test whether the presence of the disease was independent of occupation.   [6 marks]

Occupation	Disease presence		
	Yes	No	Total
Business	22	44	66
Casual labour	38	50	88
Salaried employed	16	40	56
Total	76	134	210

5. The following are ages of six mothers involved in a clinical trial:29, 35, 22, 38, 28, 41. Determine if the largest value is an outlier at a 95% confidence level.[4 marks]

SECTION C: [30 MARKS]

1. Explain four (4) methods of diagrammatic representation of data that can in used when presenting health service data   [8 marks]

2. An experiment study was conducted to determine how the number of services in a given hospital relates to number of client visiting the hospital. The results are as shown below.

Number of services offered	Number of clients
10	37
6	46
7	30
5	35
7	30
6	36
5	38
8	42

a) Calculate the product-moment correlation coefficient (r)   [8 marks]

b) Describe the direction and magnitude of the relationship   [2 marks]

3. Find the mean, median, standard deviation and quartile deviation of the following grouped data   [12 marks]

Circulating albumin in gm (CI)	Frequency (f)
100-109	2
110-119	6
120-129	6
130-139	7
140-149	8
150-159	1
Total	

TABLE 1

t Distribution: Critical Values of *t*

Significance level

Degrees of freedom	Two-tailed test: One-tailed test:	10% 5%	5% 2.5%	2% 1%	1% 0.5%	0.2% 0.1%	0.1% 0.05%
1		6.314	12.706	31.821	63.657	318.309	636.619
2		2.920	4.303	6.965	9.925	22.327	31.599
3		2.353	3.182	4.541	5.841	10.215	12.924
4		2.132	2.776	3.747	4.604	7.173	8.610
5		2.015	2.571	3.365	4.032	5.893	6.869
6		1.943	2.447	3.143	3.707	5.208	5.959
7		1.894	2.365	2.998	3.499	4.785	5.408
8		1.860	2.306	2.896	3.355	4.501	5.041
9		1.833	2.262	2.821	3.250	4.297	4.781
10		1.812	2.228	2.764	3.169	4.144	4.587
11		1.796	2.201	2.718	3.106	4.025	4.437
12		1.782	2.179	2.681	3.055	3.930	4.318
13		1.771	2.160	2.650	3.012	3.852	4.221
14		1.761	2.145	2.624	2.977	3.787	4.140
15		1.753	2.131	2.602	2.947	3.733	4.073
16		1.746	2.120	2.583	2.921	3.686	4.015
17		1.740	2.110	2.567	2.898	3.646	3.965
18		1.734	2.101	2.552	2.878	3.610	3.922
19		1.729	2.093	2.539	2.861	3.579	3.883
20		1.725	2.086	2.528	2.845	3.552	3.850
21		1.721	2.080	2.518	2.831	3.527	3.819
22		1.717	2.074	2.508	2.819	3.505	3.792
23		1.714	2.069	2.500	2.807	3.485	3.768
24		1.711	2.064	2.492	2.797	3.467	3.745
25		1.708	2.060	2.485	2.787	3.450	3.725
26		1.706	2.056	2.479	2.779	3.435	3.707
27		1.703	2.052	2.473	2.771	3.421	3.690
28		1.701	2.048	2.467	2.763	3.408	3.674
29		1.699	2.045	2.462	2.756	3.396	3.659
30		1.697	2.042	2.457	2.750	3.385	3.646
32		1.694	2.037	2.449	2.738	3.365	3.622
34		1.691	2.032	2.441	2.728	3.348	3.601
36		1.688	2.028	2.434	2.719	3.333	3.582
38		1.686	2.024	2.429	2.712	3.319	3.566
40		1.684	2.021	2.423	2.704	3.307	3.551
42		1.682	2.018	2.418	2.698	3.296	3.538
44		1.680	2.015	2.414	2.692	3.286	3.526
46		1.679	2.013	2.410	2.687	3.277	3.515
48		1.677	2.011	2.407	2.682	3.269	3.505
50		1.676	2.009	2.403	2.678	3.261	3.496
60		1.671	2.000	2.390	2.660	3.232	3.460
70		1.667	1.994	2.381	2.648	3.211	3.435
80		1.664	1.990	2.374	2.639	3.195	3.416
90		1.662	1.987	2.368	2.632	3.183	3.402
100		1.660	1.984	2.364	2.626	3.174	3.390

TABLE 2

F Distribution: Critical Values of F (5% significance level)

v_1	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
v_2															
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.36	246.46	247.32	248.01
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.42	19.43	19.44	19.45
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.71	8.69	8.67	8.66
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.87	5.84	5.82	5.80
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.64	4.60	4.58	4.56
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.96	3.92	3.90	3.87
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.53	3.49	3.47	3.44
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.24	3.20	3.17	3.15
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.03	2.99	2.96	2.94
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.86	2.83	2.80	2.77
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.74	2.70	2.67	2.65
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.64	2.60	2.57	2.54
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.55	2.51	2.48	2.46
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.48	2.44	2.41	2.39
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.42	2.38	2.35	2.33
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.37	2.33	2.30	2.28
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.33	2.29	2.26	2.23
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.29	2.25	2.22	2.19
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.26	2.21	2.18	2.16
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.22	2.18	2.15	2.12
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.20	2.16	2.12	2.10
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.17	2.13	2.10	2.07
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.15	2.11	2.08	2.05
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.13	2.09	2.05	2.03
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.11	2.07	2.04	2.01
26	4.22	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.09	2.05	2.02	1.99
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.08	2.04	2.00	1.97
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.06	2.02	1.99	1.96
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.05	2.01	1.97	1.94
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.04	1.99	1.96	1.93
35	4.12	3.27	2.87	2.64	2.49	2.37	2.29	2.22	2.16	2.11	2.04	1.99	1.94	1.91	1.88
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.95	1.90	1.87	1.84
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.03	1.95	1.89	1.85	1.81	1.78
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.86	1.82	1.78	1.75
70	3.98	3.13	2.74	2.50	2.35	2.23	2.14	2.07	2.02	1.97	1.89	1.84	1.79	1.75	1.72
80	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06	2.00	1.95	1.88	1.82	1.77	1.73	1.70
90	3.95	3.10	2.71	2.47	2.32	2.20	2.11	2.04	1.99	1.94	1.86	1.80	1.76	1.72	1.69
100	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.97	1.93	1.85	1.79	1.75	1.71	1.68

TABLE 3

χ^2 (Chi-Squared) Distribution: Critical Values of χ^2

Significance level

Degrees of freedom	5%	1%	0.1%
1	3.841	6.635	10.828
2	5.991	9.210	13.816
3	7.815	11.345	16.266
4	9.488	13.277	18.467
5	11.070	15.086	20.515
6	12.592	16.812	22.458
7	14.067	18.475	24.322
8	15.507	20.090	26.124
9	16.919	21.666	27.877
10	18.307	23.209	29.588

Table 4

Critical Values for the Q-Test of a Single Outlier (Q_{10})					
α⇒	0.1	0.05	0.04	0.02	0.01
n⇓					
3	0.941	0.970	0.976	0.988	0.994
4	0.765	0.829	0.846	0.889	0.926
5	0.642	0.710	0.729	0.780	0.821
6	0.560	0.625	0.644	0.698	0.740
7	0.507	0.568	0.586	0.637	0.680
8	0.468	0.526	0.543	0.590	0.634
9	0.437	0.493	0.510	0.555	0.598
10	0.412	0.466	0.483	0.527	0.568