(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS
UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
MAIN EXAMS

THIRD YEAR FIRST TRIMESTER EXAMINATIONS

FOR THE DEGREE OF
BSC HUMAN NUTRITION AND DIETETICS

COURSE CODE: NUR 311

COURSE TITLE: MEDICAL BIOSTATISTICS

DATE: 6th December 2023   **TIME:** 12:00 - 2:00PM

INSTRUCTIONS TO CANDIDATES
There are three sections in the paper, answer questions in **ALL** the three sections.
1. **Section A** comprises of 10 multiple choice questions.
2. **Section B** comprises of 5 short answer questions.
3. **Section C** comprises of 3 statistical type questions. Answer **ONLY TWO**

TIME: 2 Hours

MCQ (10 Questions)
1. Which of the following refers to numbers that indicate the spread or scatter of observations in a data set?
    A. Measures of center.
    B. Measures of location.
    C. Measures of variability.
    D. Measures of shape.

2. Which is the following is correct?
    A. The probability of a type I error is β.
    B. The probability of a type II error is $(1 - \beta)$.
    C. The probability of a type II error is α.
    D. None of the above.

3. A Nutritionist is studying the weight loss in a new nutrition therapy program for obesity clients. In particular, the last 500 clients seen in a city had an average weight loss of 0.5 kilograms. What is the study population?
    A. The 500 clients seen.
    B. 0.5.
    C. All the obese clients in the city.
    D. None of the above.

4. A Food joint in a busy street printed a customer satisfaction survey and placed at its customer exit gate then asked all exiting customers to pick and fill it out then send it in once done. Over 1000 customers did so within two weeks. This type of sample is called?
    A. A cluster sample.
    B. A self-selected sample.
    C. A stratified sample.
    D. A simple random sample.

5. 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).

Answer the following questions by True or False. (Answer all in the Answer booklet)

6. While estimating a parameter if the mean of the sampling distribution statistic equals the corresponding population parameter, then the statistic is said to be an unbiased estimator of the parameter otherwise it is biased.	T F
7. In sampling we can increase the degree of error by decreasing the sample size.	T F
8. The binomial distribution tends to be more symmetric as the probability of success p approaches 0.5.	T F
9. In a hypothesis test, assuming the conventional critical value for evaluating p-values of 0.05, a p-value greater than 0.05 indicates statistical significance.	T F
10. The number of students attending a Biostatistics lecture on any given day is a discrete variable.	T F

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SHORT CALCULATION (5 Questions)

11. Using an example define the following terms as used in hypothesis testing. (6mks)
    a) Null Hypothesis.
    b) Critical value.
    c) Sample frame.

12. Briefly explain the difference between:
    a. Stratified sampling and cluster sampling. (4mks)
    b. Simple Random sampling and systematic random sampling. (4mks)

13. List the **THREE** characteristics of:
    a. Binomial distribution. (3mks)
    b. Normal distribution. (3mks)

14. The distribution of heights of American women aged 18 to 24 is approximately normally distributed with a mean of 65.5 inches and standard deviation of 2.5 inches. Calculate the z-score for a woman sixty nine inches tall. (10mks)

LONG CALCULATION AND STATISTICAL REASONING (3 Questions)

15. The weights of 100 young adult patients seen in a busy hospital on a given day were recorded to the nearest kg at the general out patient department. This was summarized on a frequency distribution as shown below:

Weight (kgs)	Number of patients
60.00 - 62.00	5
63.00 - 65.00	18
66.00 - 68.00	42
69.00 - 71.00	27
72.00 - 74.00	8

a) Calculate the mean patient weight (3mks)
b) Calculate the proportion of patients heavier than 67.96 kgs (2mks)
c) Calculate the standard deviation of the patient weights (5mks)
d) It is finally discovered that one weight was typographically wrongly recorded as 67 yet the correct value should have been 61kgs. What is the difference between correct mean and the mean in (question a) above? (5mks)

16. To test the hypothesis that eating fish makes one smarter, a random sample of 12 persons take a fish oil supplement for one year and then are given an IQ test. Here are the results:

116 111 101 120 99 94 106 115 107 101 110 92

Test using the following hypotheses:
   H0: $\mu = 100$
   Ha: $\mu > 100$

a) Write the hypothesis in words using the word "effects". (2mks)
b) Determine the mean and standard deviation. (3mks)
c) Calculate the test statistic. (3mks)
d) Using tables determine tabulated t value. (2mks)
e) Summarize your conclusion. (5mks)

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17. A total of 24 high blood pressure patients were seen at hospital A. Each of them was given the same medication and the hours to patient blood pressures drop to stability recorded to the nearest tenth of a minute.

7.4	8.2	6.1	9.3	7.4	8.5	7.2	6.8
6.4	7.7	9.6	8.8	8.9	7.2	7.3	7.0
5.9	8.9	7.6	9.3	7.4	7.9	9.1	5.7

Using the above data determine the values of (a-e) in the box plot below (15mks)

Shaded area = α
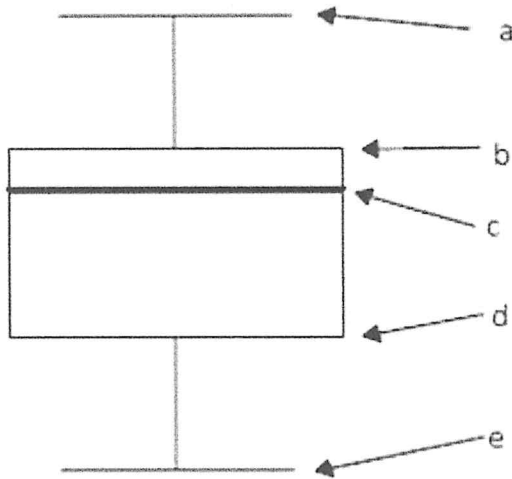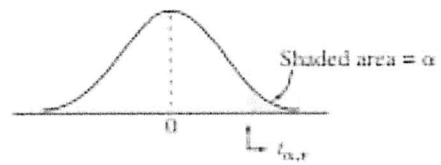
TABLE 2
Percentage points of Student's t distribution

df/α =	.40	.25	.10	.05	.025	.01	.005	.001	.0005
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	318.309	636.619
2	0.289	0.816	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.277	0.765	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.271	0.741	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.263	0.711	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.258	0.690	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.257	0.689	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.257	0.688	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.257	0.688	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.257	0.687	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.257	0.686	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.256	0.686	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.256	0.685	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.256	0.685	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.256	0.684	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.256	0.684	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.256	0.684	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.256	0.683	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.256	0.683	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.385	3.646
35	0.255	0.682	1.306	1.690	2.030	2.438	2.724	3.340	3.591
40	0.255	0.681	1.303	1.684	2.021	2.423	2.704	3.307	3.551
50	0.255	0.679	1.299	1.676	2.009	2.403	2.678	3.261	3.496
60	0.254	0.679	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	0.254	0.677	1.289	1.658	1.980	2.358	2.617	3.160	3.373
inf.	0.253	0.674	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Source: Computed by M. Longnecker using Splus.

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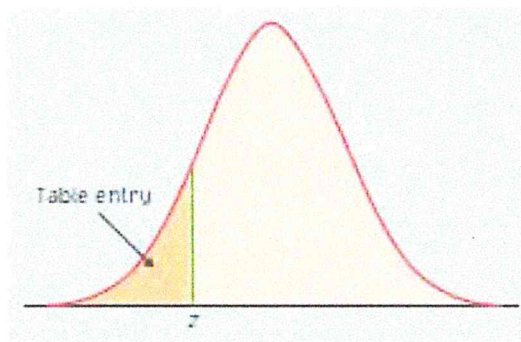Table entry for z is the area under the standard normal curve left of z.

TABLE A Standard normal probabilities

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

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