



**EMBU UNIVERSITY COLLEGE**  
**(A Constituent College of the University of Nairobi)**

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**2015/2016 ACADEMIC YEAR**

**SECOND SEMESTER EXAMINATIONS**  
**SCHOOL-BASED**

**FIRST YEAR EXAMINATION FOR THE DEGREES OF MASTER OF EDUCATION AND**  
**MASTER OF SCIENCE**

**TAP 501: STATISTICS FOR EDUCATIONAL RESEARCH/ACS 600: BIOMETRICS FOR**  
**AGRICULTURAL SCIENCES**

**DATE: APRIL 11, 2016**

**TIME: 02:00-05:00**

**INSTRUCTIONS: Answer Question ONE and ANY Other TWO Questions. Standard normal and t-distribution tables are provided at the end of the question paper.**

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**QUESTION ONE**

a) Distinguish between the following terms as used in statistics:

- i) Descriptive and inferential statistics (2 marks)
- ii) Parameter and statistic (2 marks)
- iii) Continuous and discrete variable (2 marks)
- iv) Simple and stratified random sample (4 marks)
- v) Nominal and ordinal scale of measurement (4 marks)
- vi) Type I and Type II error (2 marks)

b) The weights (in kg) of a random sample of ten 20-year-old women are:

50, 55, 60, 61, 45, 52, 62, 54, 48, 53

Using these data, determine the following measures:

- i) Mean weight (2 marks)
  - ii) Range of the weights (1 mark)
  - iii) Median weight (2 marks)
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- iv) Inter-quartile range of the weights (3 marks)
- v) Modal weight (1 mark)
- vi) Variance of the weights (5 marks)

**QUESTION TWO**

a) The following data show the marks obtained by 10 students in mathematics and physics tests.

Student	A	B	C	D	E	F	G	H	I	J
Mathematics mark (out of 40)	30	33	18	39	24	21	21	30	27	27
Physics mark (out of 30)	20	25	11	23	23	16	12	21	23	26

- i) Plot a scatter diagram for the data (3 marks)
  - ii) Using the above data, calculate the Pearson's product-moment correlation coefficient and interpret the value obtained. (7 marks)
- b) Twenty snails of the same size were divided into two equal groups. One group was maintained at a temperature of  $20^{\circ}C$  while the other group was kept at  $23^{\circ}C$ . Both groups were given the same quantity of food, and the shell diameters were measured after three weeks. The table below shows the results of the shell measurements (in mm) for the two groups:

Group A ( $20^{\circ}C$ )	5.5	4.8	4.9	5.3	5.4	4.5	4.9	5.0	5.2	5.0
Group B ( $23^{\circ}C$ )	6.5	5.5	5.6	5.9	6.0	6.0	5.4	5.8	6.0	5.8

Is there a significant difference in the average sizes of the two groups of snails? (Use a two-tailed test with a 5% level of significance.) (10 marks)

**QUESTION THREE**

a) Obtain the least squares regression line of Y on X using the data below (6 marks)

X	10	11	12	15	16
Y	14	16	18	24	26

- b) Use the results in part (a) above to predict the value of Y when  $X=20$  (2 marks)
- c) A researcher is interested in estimating the prevalence of overweight children in a certain county. The prevalence is expected to be around 20%. If the researcher intends to use a 95%

confidence interval and a  $\pm 5\%$  margin of error, what is the minimum number of children needed for the study? (4 marks)

- d) The table below shows the means and standard deviations of the scores obtained by thirty nine (twenty boys and nineteen girls) Form 2 students in a mathematics examination:

	Mean	Standard deviation
Boys	26.7	3.63
Girls	27.1	2.57

Do these data indicate a significant difference between the boys and the girls (use a two-tailed test with a 5% level of significance) (8 marks)

#### **QUESTION FOUR**

- a) A social scientist claims that more than 40% of students in a certain university engage in unprotected sex. To determine the statistical validity of this claim, you conduct a study with a sample of 500 students from the university in question, out of whom 150 students report that they engage in unprotected sex. Assuming that all the students in the sample give honest responses, determine whether the social scientist's claim is statistically valid (use a 5% level of significance). (7 marks)
- b) The following grouped frequency distribution table represents the IQ scores of students admitted for the B.Ed. program at a certain private university

IQ	Number of students
95-99	2
100-104	5
105-109	13
110-114	6
115-119	5
120-124	19

Determine:

- i) The mean of the IQ scores (5 marks)

**STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.**

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
-3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
-3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
-3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
-3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
-3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
-2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
-2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
-2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
-2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
-2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
-2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
-2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
-2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
-2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
-2.0	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08691	.08534	.08379	.08226
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.0	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786
-0.9	.18406	.18141	.17879	.17619	.17361	.17106	.16853	.16602	.16354	.16109
-0.8	.21186	.20897	.20611	.20327	.20045	.19766	.19489	.19215	.18943	.18673
-0.7	.24196	.23885	.23576	.23270	.22965	.22663	.22363	.22065	.21770	.21476
-0.6	.27425	.27093	.26763	.26435	.26109	.25785	.25463	.25143	.24825	.24510
-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
-0.4	.34458	.34090	.33724	.33360	.32997	.32636	.32276	.31918	.31561	.31207
-0.3	.38209	.37828	.37448	.37070	.36693	.36317	.35942	.35569	.35197	.34827
-0.2	.42074	.41683	.41294	.40905	.40517	.40129	.39743	.39358	.38974	.38591
-0.1	.46017	.45620	.45224	.44828	.44433	.44038	.43644	.43251	.42858	.42465
-0.0	.50000	.49601	.49202	.48803	.48405	.48006	.47608	.47210	.46812	.46414

**STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.**

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997

### The t Distribution (Table E.6)

		Level of Significance for One Tailed Test								
		0.2500	0.2000	0.1500	0.1000	0.0500	0.0250	0.0100	0.0050	0.0005
		Level of Significance for a Two Tailed Test								
df		0.5000	0.4000	0.3000	0.2000	0.1000	0.0500	0.0200	0.0100	0.0010
1		1.0000	1.3764	1.9626	3.0777	6.3137	12.7062	31.8210	63.6559	636.5776
2		0.8165	1.0607	1.3862	1.8856	2.9200	4.3027	6.9645	9.9250	31.5998
3		0.7649	0.9785	1.2498	1.6377	2.3534	3.1824	4.5407	5.8408	12.9244
4		0.7407	0.9410	1.1896	1.5332	2.1318	2.7765	3.7469	4.6041	8.6101
5		0.7267	0.9195	1.1558	1.4759	2.0150	2.5706	3.3649	4.0321	6.8685
6		0.7176	0.9057	1.1342	1.4398	1.9432	2.4469	3.1427	3.7074	5.9587
7		0.7111	0.8960	1.1192	1.4149	1.8946	2.3646	2.9979	3.4995	5.4081
8		0.7064	0.8889	1.1081	1.3968	1.8595	2.3060	2.8965	3.3554	5.0414
9		0.7027	0.8834	1.0997	1.3830	1.8331	2.2622	2.8214	3.2498	4.7809
10		0.6998	0.8791	1.0931	1.3722	1.8125	2.2281	2.7638	3.1693	4.5868
11		0.6974	0.8755	1.0877	1.3634	1.7959	2.2010	2.7181	3.1058	4.4369
12		0.6955	0.8726	1.0832	1.3562	1.7823	2.1788	2.6810	3.0545	4.3178
13		0.6938	0.8702	1.0795	1.3502	1.7709	2.1604	2.6503	3.0123	4.2209
14		0.6924	0.8681	1.0763	1.3450	1.7613	2.1448	2.6245	2.9768	4.1403
15		0.6912	0.8662	1.0735	1.3406	1.7531	2.1315	2.6025	2.9467	4.0728
16		0.6901	0.8647	1.0711	1.3368	1.7459	2.1199	2.5835	2.9208	4.0149
17		0.6892	0.8633	1.0690	1.3334	1.7396	2.1098	2.5669	2.8982	3.9651
18		0.6884	0.8620	1.0672	1.3304	1.7341	2.1009	2.5524	2.8784	3.9217
19		0.6876	0.8610	1.0655	1.3277	1.7291	2.0930	2.5395	2.8609	3.8833
20		0.6870	0.8600	1.0640	1.3253	1.7247	2.0860	2.5280	2.8453	3.8496
22		0.6858	0.8583	1.0614	1.3212	1.7171	2.0739	2.5083	2.8188	3.7922
24		0.6848	0.8569	1.0593	1.3178	1.7109	2.0639	2.4922	2.7970	3.7454
26		0.6840	0.8557	1.0575	1.3150	1.7056	2.0555	2.4786	2.7787	3.7067
28		0.6834	0.8546	1.0560	1.3125	1.7011	2.0484	2.4671	2.7633	3.6739
30		0.6828	0.8538	1.0547	1.3104	1.6973	2.0423	2.4573	2.7500	3.6460
32		0.6822	0.8530	1.0535	1.3086	1.6939	2.0369	2.4487	2.7385	3.6218
34		0.6818	0.8523	1.0525	1.3070	1.6909	2.0322	2.4411	2.7284	3.6007
36		0.6814	0.8517	1.0516	1.3055	1.6883	2.0281	2.4345	2.7195	3.5821
38		0.6810	0.8512	1.0508	1.3042	1.6860	2.0244	2.4286	2.7116	3.5657
40		0.6807	0.8507	1.0500	1.3031	1.6839	2.0211	2.4233	2.7045	3.5510
42		0.6804	0.8503	1.0494	1.3020	1.6820	2.0181	2.4185	2.6981	3.5377
44		0.6801	0.8499	1.0488	1.3011	1.6802	2.0154	2.4141	2.6923	3.5258
46		0.6799	0.8495	1.0482	1.3002	1.6787	2.0129	2.4102	2.6870	3.5149
48		0.6796	0.8492	1.0478	1.2994	1.6772	2.0106	2.4066	2.6822	3.5050
50		0.6794	0.8489	1.0473	1.2987	1.6759	2.0086	2.4033	2.6778	3.4960
55		0.6790	0.8482	1.0463	1.2971	1.6730	2.0040	2.3961	2.6682	3.4765
60		0.6786	0.8477	1.0455	1.2958	1.6706	2.0003	2.3901	2.6603	3.4602
65		0.6783	0.8472	1.0448	1.2947	1.6686	1.9971	2.3851	2.6536	3.4466
70		0.6780	0.8468	1.0442	1.2938	1.6669	1.9944	2.3808	2.6479	3.4350
75		0.6778	0.8464	1.0436	1.2929	1.6654	1.9921	2.3771	2.6430	3.4249
80		0.6776	0.8461	1.0432	1.2922	1.6641	1.9901	2.3739	2.6387	3.4164
85		0.6774	0.8459	1.0428	1.2916	1.6630	1.9883	2.3710	2.6349	3.4086
90		0.6772	0.8456	1.0424	1.2910	1.6620	1.9867	2.3685	2.6316	3.4019
95		0.6771	0.8454	1.0421	1.2905	1.6611	1.9852	2.3662	2.6286	3.3958
100		0.6770	0.8452	1.0418	1.2901	1.6602	1.9840	2.3642	2.6259	3.3905
∞		0.6745	0.8416	1.0364	1.2815	1.6448	1.9600	2.3264	2.5758	3.2905