Eastern University, Sri Lanka

Fourth Year First Semester Examination in Agriculture 2003/2004

AEC 4101 Social Research Methodology

Answer All Questions ***Time Allowed: Two Hours***

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1. a) Describe the importance of sampling (10 marks)

   b) Critically examine the merits of probability sampling and Non-probability sampling methods. (10 marks)

   c) What are the main steps involved in a sample survey? (05 marks)

2. a) Describe briefly the various methods of sampling techniques. (10 marks)

   b) In an animal farm there are 600 cows, A researcher wishes to estimate the cost of sampling of milking cows per day. The researcher wants to estimate the sampling error in the number of cows milking is no longer than +/- 10 with probability of 0.95. The previous studies indicated that the standard deviation is 85 cows. If the cost per estimate is Rs 30/= (this includes field work, supervision, editing, and tabulation of results, and report writing), calculate the total cost involved.

   Researcher is willing to sacrifice some accuracy in order to reduce cost, if he settles for an estimate with 0.90 probabilities, how much reduction in cost can be achieved? (15 marks)

3. a) What are the methods available for collecting information in a sample survey? (10marks)

   b) "The success of a sample survey requiring objective and subjective responses from individuals and organizations rests on the ***skill*** with which a **questionnaire** has been constructed". List the factors determining the ***skill***? (10matrks)

   c) Describe the Systematic sampling method. (05 marks)

4. a) A farm survey conducted for inventory control to reduce the inventory for a particular crop to an average of less than 3000 crops per month. A sampling of the inventory on hand at the end of each eight randomly selected months is shown in the following table. Do the data present sufficient evidence to indicate that mean monthly number of plant in inventory is less than 3000? Consider $\alpha = 0.05$

Number of plants	
2905	2895
2725	3005
2835	2835
3065	2605

The sample mean and standard deviation for the recorded data are,

$$\bar{X} = \sum X / N = 2858.75, \qquad S = \sqrt{\frac{\sum(X - \bar{X})^2}{(N-1)}} = 146.77$$

Test the Null Hypothesis H_o : $\mu = 3000$ against Alternative Hypothesis H_1 : $\mu < 3000$

(10marks)

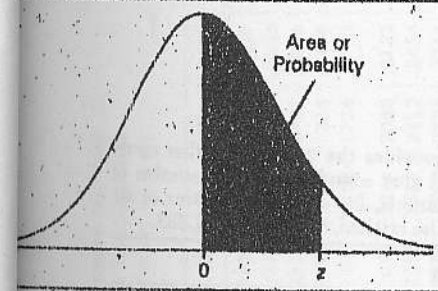
b) In a crop production experiment conducted to study the relationship between yield per acre of a crop (Y) and the dose of NPK fertilizer (X),

Sample Size $n = 20$, $\bar{X} = 12.8$, $\bar{Y} = 130.7$ $\sigma^2X = 70.6/20$ $\sigma^2Y = 98.5/20$
Cov (x,y) = 68.3/20 . Assuming linear relationship between Y and X, answer the following,

i. . Develop a least square regression line (04marks)
ii. Compute the standard error of estimates (03marks)
iii. Estimate the yield corresponding when X=12 (03marks)

c) In a group of 120 students, it was decided to constitute an academic committee with Six representatives. Use the systematic sampling method to select the committee. (05marks)

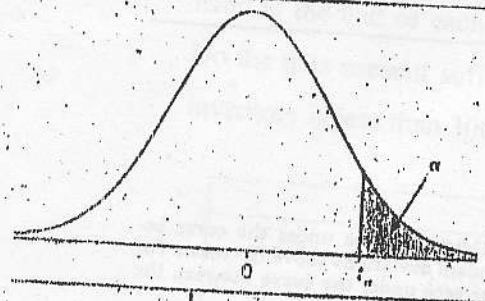
Standard Normal Curve Areas



Entries in this table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 2.25$, the area under the curve between the mean and z is .4878

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4986	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000									

Source: The National Bureau of Standards, *Tables of Normal Probability Functions*, Applied Mathematics Series, no. 23 (Washington, D.C.: U.S. Government Printing Office, 1953). The original contains probabilities for values of z from 0 to 8.285, mostly in increments of .0001, and for areas from $\mu - z$ to $\mu + z$.



The following table provides the values of t_α that correspond to a given upper-tail area α and a specified number of degrees of freedom. For example, for an upper-tail area of .05 and 9 degrees of freedom, the critical value of $t_\alpha = 1.833$.

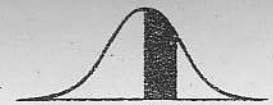
Degrees of Freedom	Critical Values for Upper-Tail Area, α									
	.4	.25	.1	.05	.025	.01	.005	.0025	.001	.0005
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	.289	.816	1.886	2.920	4.303	6.965	9.925	14.089	22.327	31.598
3	.277	.765	1.638	2.353	3.182	4.541	5.841	7.453	10.214	12.924
4	.271	.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	.265	.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	.263	.711	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	.262	.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	.261	.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	.260	.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	.259	.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	.259	.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	.258	.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	.258	.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	.257	.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	.257	.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	.257	.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	0.257	0.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	.257	.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	.256	.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	.256	.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	.256	.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	0.256	0.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	.256	.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	.256	.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	.256	.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	.256	.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	.255	.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	.254	.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	.254	.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	.253	.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291
Confidence Level for Two-Tailed Test	.20	.50	.80	.90	.95	.98	.99	.995	.998	.999

Source: E. S. Pearson and H. O. Hartley, *Biometrika Tables for Statisticians*, vol. I, (Cambridge: Cambridge University Press, 1966), p. 146.

RANDOM NUMBERS (*Continued*)

24418	23508	91507	76455	54941	72711	39406
57404	73678	08272	62941	02349	71389	45605
77644	98489	86268	73652	98210	44546	27174
68366	65614	01443	07607	11826	91326	29664
64472	72294	95432	53555	96810	17100	35066
88205	37913	98633	81009	81060	33449	68055
98455	78685	71250	10329	56135	80647	51404
48977	36794	56054	50243	57361	65304	93258
93077	72941	92779	23581	24548	56415	61927
84533	26564	91583	83411	66504	02036	02922
11338	12003	14514	27585	45068	05520	56321
23853	68500	92274	87026	90717	01542	72990
94096	74920	25822	98026	05394	61840	83089
83160	82362	09350	98536	38155	42661	02363
97425	47335	69709	01386	74319	04318	99387
83951	11954	24317	20345	18134	90062	10761
93085	35203	05740	03206	92012	42710	34650
33762	83193	58045	89880	78101	44392	53767
49665	85307	85137	30496	23469	42846	94810
37541	82627	80051	72521	36342	56119	97190
22145	85304	35348	82854	55846	18076	12415
27153	08662	61078	52433	22184	83998	87436
00301	49425	66682	25442	83668	66236	79655
43815	43272	73778	63469	50083	70696	13558
14689	86482	74157	46012	97765	27552	49617
16680	55936	82453	19532	49088	13176	94219
86038	60429	01137	86168	78257	86249	40134
33944	29219	73161	46061	30946	22210	79302
16045	67736	18608	18198	10408	76358	69203
37044	52523	25627	63107	30806	80857	84383
61471	45322	35340	35132	42163	60332	98851
47422	21296	16785	66393	39249	51463	95963
24133	39719	14484	58613	88717	29280	77360
67253	67064	10748	16006	16767	57345	42285
62382	76941	01635	35829	77516	98468	51686
98011	16503	09201	03523	87192	66483	55649
37366	24386	20654	85117	74078	64120	04643
73587	83993	54176	05221	94119	20108	78101
33583	68291	50547	96085	62180	27453	18567
02878	33223	39199	49536	56199	05993	71201
91498	41673	17195	83175	04904	00879	70337
91127	19815	30219	55591	21725	43827	78862
12997	55013	18662	81724	24305	37661	18056
96098	13651	15393	69995	14762	69734	89150
97627	17837	10472	18983	28387	99781	52977
40064	47981	31484	76603	54088	91005	00010
16239	68743	71374	55863	22672	91609	51514
58354	24913	20435	30965	17453	65623	93058
52567	65085	60220	84641	18278	49604	47418
06236	29052	91392	07551	83532	68130	56970

An entry in the table is the proportion under the entire curve which is between $z = 0$ and a positive value of z. Areas for negative values of z are obtained by symmetry.



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	1480	.1517
0.4	.1554	.1591	.1628	.1664	1700	1736	.1772	.1808	1844	1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Table 6: RANDOM NUMBERS

04433	80674	24520	18222	10610	05794	37515
60298	47829	72648	37414	75755	04717	29899
67884	59651	67533	68123	17730	95862	08034
89512	32155	51906	61662	64130	16688	37275
32653	01895	12506	88535	36553	23757	34209
95913	15405	13772	76638	48423	25018	99041
55864	21694	13122	44115	01601	50541	00147
35334	49810	91601	40617	72876	33967	73830
57729	32196	76487	11622	96297	24160	09903
86648	13697	63677	70119	94739	25875	38829
30574	47609	07967	32422	76791	39725	53711
81307	43694	83580	79974	45929	85113	72268
02410	54905	79007	54939	21410	86980	91772
18969	75274	52233	62319	08598	09066	95288
87863	82384	66860	62297	80196	19347	73234
68397	71708	15438	62311	72844	60203	46412
28529	54447	58729	10854	99058	18260	38765
44285	06372	15867	70418	57012	72122	36634
86299	83430	33571	23309	57040	29285	67870
84842	68668	90894	61658	15001	94055	36308
56970	83609	52098	04184	54967	72938	56834
83125	71257	60490	44369	66130	72936	69848
55503	52423	02464	26141	68779	66388	75242
47019	76273	33203	29608	54553	25971	69573
84828	32592	79526	29554	84580	37859	28504
68921	08141	79227	05748	51276	57143	31926
36458	96045	30424	98420	72925	40729	22337
95752	59445	36847	87729	81679	59126	59457
26768	47323	58454	56958	20575	76746	49878
42613	37056	43636	58085	06766	60227	96424
95457	30566	65482	25596	02678	54592	63607
95276	17894	63564	95958	39750	64379	46059
66954	52324	64776	52345	95110	59448	77249
17457	18481	14113	62462	02798	54977	48349
03704	36872	83214	59337	01695	60666	97410
21538	86497	33210	60337	27976	70661	08250
57178	67619	98310	70348	11317	71623	55510
31048	97558	94953	55866	96283	46620	52087
69799	55380	16498	80733	96422	58078	99643
90595	61867	59231	17772	67831	33317	00520
33570	04981	98939	78784	09977	29398	93896
15340	93460	57477	13898	48431	72936	78160
64079	42483	36512	56186	99098	48850	72527
63491	05546	67118	62063	74958	20946	28147
94003	63868	41034	28260	79708	00770	88643
52360	46658	66511	04172	73085	11795	52594
74622	12142	68355	65635	21828	39539	18988
04157	50079	61343	64315	70836	82857	35335
86003	60070	66241	32836	27573	11479	94114
41268	80187	20351	09636	84668	42486	71303

48611	62866	33963	14045	79451	04934	45576
78812	03509	78673	73181	29973	18664	04553
19472	63971	37271	31445	49019	49405	46925
51266	11569	68697	91120	64155	40365	74297
56808	96275	26130	47949	14877	69594	83041
77527	81360	18180	97421	55541	90275	18213
77680	58788	33016	61173	93049	04694	43534
15404	96554	88265	34557	38526	67924	40474
14045	22917	60718	66487	46346	30949	03173
68376	43918	77653	04127	69930	43283	35766
93385	13421	67957	20384	58731	53396	59723
09858	52104	32014	53115	03727	98624	84616
93307	34196	49516	42143	57740	31198	70335
04794	01534	92058	03157	91758	80611	45357
86265	49096	97621	92582	61422	75890	86442
65943	79232	45702	67055	39024	57383	44424
90038	94209	04055	27393	61517	23002	96560
97283	95943	78363	36498	40662	94188	18202
21813	72958	75637	99936	58715	07943	23748
41161	37341	81838	19389	80336	46348	91895
23777	98392	31417	98547	92058	02277	50315
59973	08144	61070	73094	27059	69181	55623
82690	74099	77885	23813	10954	11900	44363
83834	24715	48866	65745	31131	47636	45137
61980	34997	41825	11623	07320	15003	56774
99915	45821	97702	87125	44488	77613	56823
48293	86847	43186	42951	37804	85129	28093
33225	31280	41232	34750	91097	60752	69783
06846	32828	24425	30249	78801	26977	92074
32671	45587	79620	84831	38156	74211	82762
82098	21913	75544	55228	89798	05694	91552
51666	10433	10945	55306	78582	89630	41230
54044	67942	24145	42294	27427	84875	37022
66738	60184	75579	38120	17640	36242	99357
55064	17427	89180	74618	44865	53197	74810
69599	60264	84549	78007	83450	06488	72274
64756	87759	92354	78094	63639	89039	98644
80817	74553	68407	55862	32476	19326	05558
39847	96884	84657	33697	39578	90197	80532
90401	41700	95510	61165	33757	23279	85629
78227	90110	81378	96659	37008	04050	04223
87240	52718	87697	79433	16336	52862	69149
08486	10951	23832	39763	02486	71688	90936
39333	32169	03713	93510	61244	73774	01245
21188	01850	69689	49426	49128	14660	14143
13287	82531	04383	64893	11934	35031	68576
53609	04001	19648	14053	48823	10840	31918
87200	36194	31567	53606	34304	39010	78630
81641	00406	30058	75869	46620	70024	88755
10512	50277	71508	20118	79630	00769	74172