



Institute of Health Management Research, Jaipur

Postgraduate Programme in Hospital and Health Management

Batch XVIII (2013-15)

First Year

Biostatistics

Term Examination

November 18, 2013

Maximum Marks – 70

Duration: 3 hrs.

Note:

- a. Kindly attach the question paper with the answer sheet at the time of submission of answer sheet.
- b. All sections are compulsory. Attempt any 5 questions from section C.
- c. Marks are indicated against each question.

Section A

Kindly tick (✓) against the correct option. (4 x 1mark = 4 marks)

i. Most commonly used statistical average -

- a. Mean
- b. Median
- c. Mode
- d. None

ii. Mean value of weight of a group of 10 boys was found to be 18.2 kg. Later it was found that weight of one of the boys was wrongly recorded as 2 kg that should have been 20 kg. The true mean weight of the group is -

- a. 18.2 kg
- b. 20.2 kg
- c. 16.4 kg
- d. 20 kg

iii. Systolic BP of a group of persons follows normal distribution curve. The mean BP is 120. The values above 120 are -

- a. 25 per cent
- b. 75 per cent
- c. 50 per cent
- d. 100 per cent

- iv. In a 3 x 4 contingency table, the number of degrees of freedom equals to -
- a. 1
 - b. 5
 - c. 6
 - d. 12

Kindly fill in the blanks for the following (3 x 1mark = 3 marks)

- v. Correlation coefficient tends to lie between.....
- vi. If the grading of diabetes is classified as "mild", "moderate" and "severe" the scale of measurement used is.....
- vii. For large degrees of freedom, the distribution becomes almost adistribution

Kindly write True or False against the statement (3 x 1mark = 3 marks)

- viii. The best method to show the association between height and weight of children in a class is by Line diagram
- ix. With increasing degree of accuracy, the sample size increases
- x. Association between an employee's performance level and his job satisfaction could be tested by doing t-test

Section B

Define any four from the following (4 x 2.5 marks= 10 marks)

- a. Biostatistics
- b. Levels of measurement (Types of scale)
- c. Describe mean with its merits and demerits
- d. Two types of errors in hypothesis testing
- e. Normal distribution
- f. Steps followed in testing of hypothesis

Section C

1. The following are the ages of 30 patients seen in the emergency room of a hospital on a Friday night;

35	32	21	43	39	60
36	12	54	45	37	53
45	23	64	10	34	22
36	45	55	44	55	46
22	38	35	56	45	57

Summarize the major features of the above data set by calculating

- a. The mean (2.5 marks)
- b. The median (2.5 marks)
- c. The standard deviation (2.5 marks)
- d. The coefficient of variation (2.5 marks)

2. The Hb level in healthy women has mean 13.5 g/dl and standard deviation 1.5 g/dl, what is the probability for a woman selected randomly will have Hb level:

- a. Greater than 15 g/dl (3 marks)
- b. Less than 12 g/dl (3 marks)
- c. Between 11 g/dl and 14 g/dl (4 marks)

3. Skin cancer has an incidence in northern North America of 24 cases per 100000 individuals per year. In a community of 12200 individuals, how likely is it that:

- a. Only 1 case will occur? (2 marks)
- b. Fewer than three cases will occur? (4 marks)
- c. More than 4 cases will occur? (4 marks)

4. Suppose that blood pressure readings have been taken from 25 subjects and their diastolic blood pressure levels recorded. From the 25 individual results, it has been calculated that the mean value is 90 mm Hg, and the standard deviation is 14 mm Hg. Construct 90% and 99% confidence interval estimate for the population mean. (10 marks)

5. Systolic blood pressure of 9 normal individuals who had been recumbent for 5 minutes was taken. Then 2 ml of 0.5 per cent solution of hypotensive drug was given and blood pressure recorded again. Did the injection of drug lower the blood pressure? (10 marks)

Serial No.	BP before injection	BP after injection
1.	122	120
2.	121	118
3.	120	115
4.	115	110
5.	126	122
6.	130	130
7.	120	116
8.	125	124
9.	128	125

6. A study was conducted to test if use of herbal tea played any role in prevention of common cold. Data was collected on the number of people who developed cold and those who did not develop cold and data was tabulated in relation to whether they consumed herbal tea or not –

	Herbal tea	
	Consumed	Not consumed
Had cold	12	23
Did not have a cold	34	38

Whether use of herbal tea played any role in prevention of common cold? (10 marks)

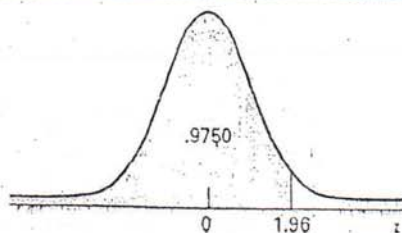
7. In a large city like Ahmedabad 20 per cent of random sample of 900 school children had defective eye sight. In other city like Bombay 15 per cent of random sample of 1600 school children had defective eye sight. Is this difference between two proportions significant at $\alpha = 5\%$? (10 marks)

8. The age and blood pressure of 10 women are:

Age	56	42	36	47	49	42	60	72	63	55
Blood Pressure	147	125	118	128	145	140	155	164	149	150

- Find the regression equation of blood pressure on age. (5 marks)
- Estimate the blood pressure of woman whose age is 45 years. (5 marks)

TABLE D Normal Curve Areas $P(z \leq z_0)$. Entries in the Body of the Table Are Areas Between $-\infty$ and z

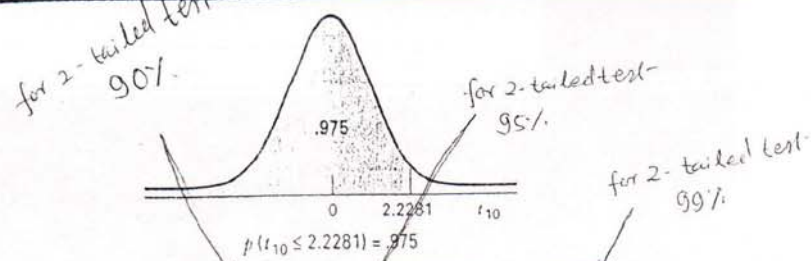


z	-0.09	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0.00	z
-3.80	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	-3.80
-3.70	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	-3.70
-3.60	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0002	.0002	-3.60
-3.50	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	-3.50
-3.40	.0002	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	-3.40
-3.30	.0003	.0004	.0004	.0004	.0004	.0004	.0004	.0005	.0005	.0005	-3.30
-3.20	.0005	.0005	.0005	.0006	.0006	.0006	.0006	.0006	.0007	.0007	-3.20
-3.10	.0007	.0007	.0008	.0008	.0008	.0008	.0009	.0009	.0009	.0010	-3.10
-3.00	.0010	.0010	.0011	.0011	.0011	.0012	.0012	.0013	.0013	.0013	-3.00
-2.90	.0014	.0014	.0015	.0015	.0016	.0016	.0017	.0018	.0018	.0019	-2.90
-2.80	.0019	.0020	.0021	.0021	.0022	.0023	.0023	.0024	.0025	.0026	-2.80
-2.70	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033	.0034	.0035	-2.70
-2.60	.0036	.0037	.0038	.0039	.0040	.0041	.0043	.0044	.0045	.0047	-2.60
-2.50	.0048	.0049	.0051	.0052	.0054	.0055	.0057	.0059	.0060	.0062	-2.50
-2.40	.0064	.0066	.0068	.0069	.0071	.0073	.0075	.0078	.0080	.0082	-2.40
-2.30	.0084	.0087	.0089	.0091	.0094	.0096	.0099	.0102	.0104	.0107	-2.30
-2.20	.0110	.0113	.0116	.0119	.0122	.0125	.0129	.0132	.0136	.0139	-2.20
-2.10	.0143	.0146	.0150	.0154	.0158	.0162	.0166	.0170	.0174	.0179	-2.10
-2.00	.0183	.0188	.0192	.0197	.0202	.0207	.0212	.0217	.0222	.0228	-2.00
-1.90	.0233	.0239	.0244	.0250	.0256	.0262	.0268	.0274	.0281	.0287	-1.90
-1.80	.0294	.0301	.0307	.0314	.0322	.0329	.0336	.0344	.0351	.0359	-1.80
-1.70	.0367	.0375	.0384	.0392	.0401	.0409	.0418	.0427	.0436	.0446	-1.70
-1.60	.0455	.0465	.0475	.0485	.0495	.0505	.0516	.0526	.0537	.0548	-1.60
-1.50	.0559	.0571	.0582	.0594	.0606	.0618	.0630	.0643	.0655	.0668	-1.50
-1.40	.0681	.0694	.0708	.0721	.0735	.0749	.0764	.0778	.0793	.0808	-1.40
-1.30	.0823	.0838	.0853	.0869	.0885	.0901	.0918	.0934	.0951	.0968	-1.30
-1.20	.0985	.1003	.1020	.1038	.1056	.1075	.1093	.1112	.1131	.1151	-1.20
-1.10	.1170	.1190	.1210	.1230	.1251	.1271	.1292	.1314	.1335	.1357	-1.10
-1.00	.1379	.1401	.1423	.1446	.1469	.1492	.1515	.1539	.1562	.1587	-1.00
-0.90	.1611	.1635	.1660	.1685	.1711	.1736	.1762	.1788	.1814	.1841	-0.90
-0.80	.1867	.1894	.1922	.1949	.1977	.2005	.2033	.2061	.2090	.2119	-0.80
-0.70	.2148	.2177	.2206	.2236	.2266	.2296	.2327	.2358	.2389	.2420	-0.70
-0.60	.2451	.2483	.2514	.2546	.2578	.2611	.2643	.2676	.2709	.2743	-0.60
-0.50	.2776	.2810	.2843	.2877	.2912	.2946	.2981	.3015	.3050	.3085	-0.50
-0.40	.3121	.3156	.3192	.3228	.3264	.3300	.3336	.3372	.3409	.3446	-0.40
-0.30	.3483	.3520	.3557	.3594	.3632	.3669	.3707	.3745	.3783	.3821	-0.30
-0.20	.3859	.3897	.3936	.3974	.4013	.4052	.4090	.4129	.4168	.4207	-0.20
-0.10	.4247	.4286	.4325	.4364	.4404	.4443	.4483	.4522	.4562	.4602	-0.10
0.00	.4641	.4681	.4721	.4761	.4801	.4840	.4880	.4920	.4960	.5000	0.00

TABLE D (continued)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	z
0.00	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359	0.00
0.10	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753	0.10
0.20	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141	0.20
0.30	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517	0.30
0.40	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879	0.40
0.50	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224	0.50
0.60	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549	0.60
0.70	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852	0.70
0.80	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133	0.80
0.90	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389	0.90
1.00	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621	1.00
1.10	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830	1.10
1.20	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015	1.20
1.30	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177	1.30
1.40	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319	1.40
1.50	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441	1.50
1.60	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545	1.60
1.70	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633	1.70
1.80	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706	1.80
1.90	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767	1.90
2.00	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817	2.00
2.10	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857	2.10
2.20	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890	2.20
2.30	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916	2.30
2.40	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936	2.40
2.50	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952	2.50
2.60	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964	2.60
2.70	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974	2.70
2.80	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981	2.80
2.90	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986	2.90
3.00	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990	3.00
3.10	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993	3.10
3.20	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995	3.20
3.30	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997	3.30
3.40	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998	3.40
3.50	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	3.50
3.60	.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	3.60
3.70	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	3.70
3.80	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	3.80

TABLE E Percentiles of the t Distribution



d.f.	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$
1	3.078	6.3138	12.706	31.821	63.657
2	1.886	2.9200	4.3027	6.965	9.9248
3	1.638	2.3534	3.1825	4.541	5.8409
4	1.533	2.1318	2.7764	3.747	4.6041
5	1.476	2.0150	2.5706	3.365	4.0321
6	1.440	1.9432	2.4469	3.143	3.7074
7	1.415	1.8946	2.3646	2.998	3.4995
8	1.397	1.8595	2.3060	2.896	3.3554
9	1.383	1.8331	2.2622	2.821	3.2498
10	1.372	1.8125	2.2281	2.764	3.1693
11	1.363	1.7959	2.2010	2.718	3.1058
12	1.356	1.7823	2.1788	2.681	3.0545
13	1.350	1.7709	2.1604	2.650	3.0123
14	1.345	1.7613	2.1448	2.624	2.9768
15	1.341	1.7530	2.1315	2.602	2.9467
16	1.337	1.7459	2.1199	2.583	2.9208
17	1.333	1.7396	2.1098	2.567	2.8982
18	1.330	1.7341	2.1009	2.552	2.8784
19	1.328	1.7291	2.0930	2.539	2.8609
20	1.325	1.7247	2.0860	2.528	2.8453
21	1.323	1.7207	2.0796	2.518	2.8314
22	1.321	1.7171	2.0739	2.508	2.8188
23	1.319	1.7139	2.0687	2.500	2.8073
24	1.318	1.7109	2.0639	2.492	2.7969
25	1.316	1.7081	2.0595	2.485	2.7874
26	1.315	1.7056	2.0555	2.479	2.7787
27	1.314	1.7033	2.0518	2.473	2.7707
28	1.313	1.7011	2.0484	2.467	2.7633
29	1.311	1.6991	2.0452	2.462	2.7564
30	1.310	1.6973	2.0423	2.457	2.7500
35	1.3062	1.6896	2.0301	2.438	2.7239
40	1.3031	1.6839	2.0211	2.423	2.7045
45	1.3007	1.6794	2.0141	2.412	2.6896
50	1.2987	1.6759	2.0086	2.403	2.6778
60	1.2959	1.6707	2.0003	2.390	2.6603
70	1.2938	1.6669	1.9945	2.381	2.6480
80	1.2922	1.6641	1.9901	2.374	2.6388
90	1.2910	1.6620	1.9867	2.368	2.6316
100	1.2901	1.6602	1.9840	2.364	2.6260
120	1.2887	1.6577	1.9799	2.358	2.6175
140	1.2876	1.6558	1.9771	2.353	2.6114
160	1.2869	1.6545	1.9749	2.350	2.6070
180	1.2863	1.6534	1.9733	2.347	2.6035
200	1.2858	1.6525	1.9719	2.345	2.6006
∞	1.282	1.645	1.96	2.326	2.576

TABLE F

Critical values for the chi- squared test	df	α					
		.10	.05	.025	.01	.005	.001
1	1	2.706	3.841	5.024	6.635	7.879	10.828
2	2	4.605	5.992	7.378	9.210	10.597	13.816
3	3	6.251	7.815	9.348	11.345	12.838	16.266
4	4	7.779	9.489	11.143	13.277	14.860	18.467
5	5	9.236	11.071	12.833	15.086	16.750	20.515
6	6	10.645	12.592	14.449	16.812	18.548	22.457
7	7	12.017	14.067	16.013	18.475	20.278	24.321
8	8	13.362	15.507	17.535	20.090	21.955	26.124
9	9	14.684	16.919	19.023	21.666	23.589	27.877
10	10	15.987	18.307	20.483	23.209	25.188	29.588
11	11	17.275	19.675	21.920	24.725	26.757	31.264
12	12	18.549	21.026	23.336	26.217	28.299	32.909
13	13	19.812	22.362	24.736	27.688	29.819	34.528
14	14	21.064	23.685	26.120	29.141	31.319	36.123
15	15	22.307	24.996	27.488	30.578	32.801	37.697
16	16	23.542	26.296	28.845	32.000	34.267	39.252
17	17	24.769	27.587	30.191	33.409	35.718	40.790
18	18	25.989	28.869	31.526	34.805	37.156	42.312
19	19	27.204	30.144	32.852	36.191	38.582	43.820
20	20	28.412	31.410	34.170	37.566	39.997	45.314
21	21	29.615	32.671	35.479	38.932	41.401	46.797
22	22	30.813	33.924	36.781	40.289	42.796	48.268
23	23	32.007	35.172	38.076	41.638	44.181	49.728
24	24	33.196	36.415	39.365	42.980	45.558	51.178
25	25	34.382	37.652	40.647	44.314	46.928	52.620
26	26	35.563	38.885	41.924	45.642	48.290	54.052
27	27	36.741	40.113	43.195	46.963	49.645	55.476
28	28	37.916	41.337	44.461	48.278	50.993	56.892
29	29	39.087	42.557	45.723	49.588	52.336	58.301
30	30	40.256	43.773	46.980	50.892	53.672	59.703