Question Paper

Exam Date & Time: 03-May-2024 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal College of Pharmaceutical Sciences
Fourth year PharmD/First year PharmD (PB)
University Examination: April/May-2024

Biostatistics and Research Methodology [PPR 4.4T-S2]

Marks: 70 **Duration: 180 mins.**

A: Long Answer Questions

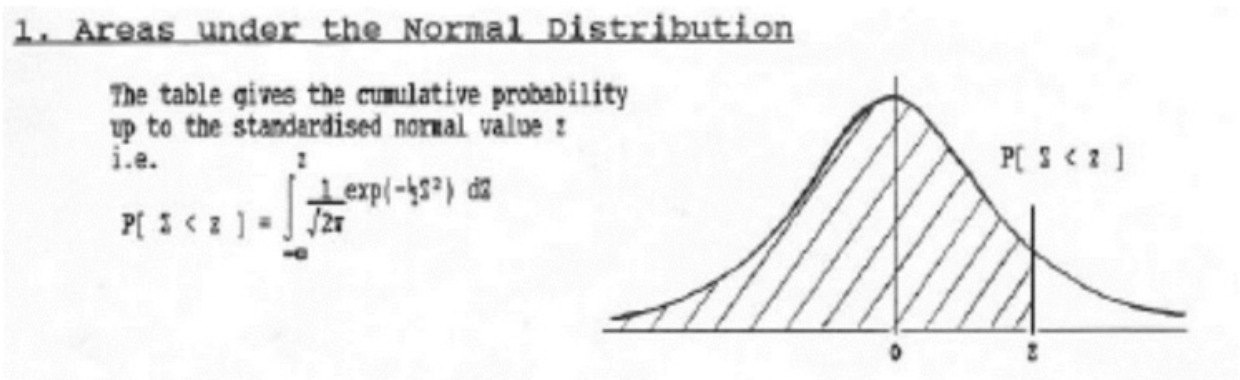
Answer all the questions.

Draw diagrams wherever necessary

1) Define standard normal distribution and explain its properties. (5)

a)

b) If spine bone density is normally distributed among young women with a mean of 1.0 g/cm^2 and standard deviation of 0.10 g/cm^2, then how many young women out of 100 would you expect to have bone densities less than 0.80 g/cm^2 and more than 1.15 g/cm^2? (5)



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5159	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7854
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8804	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9773	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9865	0.9868	0.9871	0.9874	0.9878	0.9881	0.9884	0.9887	0.9890

2) Classify ANOVA group of tests with suitable examples and write the general steps involved in the calculation of one-way ANOVA. (10)

3) Classify different types and phases of randomized controlled trial (RCT) and explain the methodology of RCT. (10)

B: Short Answer Questions

Answer all the questions.

Draw diagrams wherever necessary

4) Explain general rules for constructing graphs and explain construction and application of scatter plot. (5)

5) In a clinical trial to test the efficacy of an antidepressant drug, two groups of patients randomly assigned to receive placebo or new drug and their depression score was evaluated after 2-weeks of treatment. Data is given in the table. Using a suitable non-parametric test check, whether the new drug is effective in reducing depression? (5)

Patient ID	Hamilton depression score	
	Placebo	New drug
1	17	15
2	17	12
3	15	15
4	16	14
5	13	10
6	14	8

Table E Mann–Whitney test on unpaired samples: 5% and 1% levels of P

5% critical points of rank sums

n_2 ↓ / n_1 →	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4			10											
5		6	11	17										
6		7	12	18	26									

7		7	13	20	27	36							
8	3	8	14	21	29	38	49						
9	3	8	15	22	31	40	51	63					
10	3	9	15	23	32	42	53	65	78				
11	4	9	16	24	34	44	55	68	81	96			
12	4	10	17	26	35	46	58	71	85	99	115		
13	4	10	18	27	37	48	60	73	88	103	119	137	
14	4	11	19	28	38	50	63	76	91	106	123	141	160
15	4	11	20	29	40	52	65	79	94	110	127	145	164	185
16	4	12	21	31	42	54	67	82	97	114	131	150	169	
17	5	12	21	32	43	56	70	84	100	117	135	154		
18	5	13	22	33	45	58	72	87	103	121	139			
19	5	13	23	34	46	60	74	90	107	124				
20	5	14	24	35	48	62	77	93	110					
21	6	14	25	37	50	64	79	95						
22	6	15	26	38	51	66	82							
23	6	15	27	39	53	68								
24	6	16	28	40	55									
25	6	16	28	42										
26	7	17	29											
27	7	17												
28	7													

6) In order to check whether or not a certain training program is able to increase the maximum vertical jumps of college basketball players, a study was conducted on random sample of six college basketball players by measuring each of their maximum vertical jumps. Then, each player was given the training program for one month and then measured their max vertical jump again at the end of the month. Data is given in the table. Using a suitable parametric test check, whether training program is effective in increasing vertical jumps? (5)

Player ID	Max vertical jumps before training (inches)	Max vertical jumps after training (inches)
1	22	24
2	20	22
3	19	20
4	24	22
5	25	28
6	25	26

Table of Distribution of t

	Probability Type-I error (alpha)					
DF	*0.5*	*0.1*	*0.05*	*0.02*	*0.01*	*0.001*
1	1.000	6.314	12.706	31.821	63.657	636.619
2	0.816	2.920	4.303	6.965	9.925	31.598
3	0.765	2.353	3.182	4.541	5.841	12.941
4	0.741	2.132	2.776	3.747	4.604	8.610
5	0.727	2.015	2.571	3.365	4.032	6.859
6	0.718	1.943	2.447	3.143	3.707	5.959
7	0.711	1.895	2.365	2.998	3.499	5.405
8	0.706	1.860	2.306	2.896	3.355	5.041
9	0.703	1.833	2.262	2.821	3.250	4.781
10	0.700	1.812	2.228	2.764	3.169	4.587
11	0.697	1.796	2.201	2.718	3.106	4.437
12	0.695	1.782	2.179	2.681	3.055	4.318
13	0.694	1.771	2.160	2.650	3.012	4.221
14	0.692	1.761	2.145	2.624	2.977	4.140
15	0.691	1.753	2.131	2.602	2.947	4.073
16	0.690	1.746	2.120	2.583	2.921	4.015
17	0.689	1.740	2.110	2.567	2.898	3.965
18	0.688	1.734	2.101	2.552	2.878	3.922
19	0.688	1.729	2.093	2.539	2.861	3.883
20	0.687	1.725	2.086	2.528	2.845	3.850
21	0.686	1.721	2.080	2.518	2.831	3.819
22	0.686	1.717	2.074	2.508	2.819	3.792
23	0.685	1.714	2.069	2.500	2.807	3.767
24	0.685	1.711	2.064	2.492	2.797	3.745

25	0.684	1.708	2.060	2.485	2.787	3.725
26	0.684	1.706	2.056	2.479	2.779	3.707
27	0.684	1.703	2.052	2.473	2.771	3.690
28	0.683	1.701	2.048	2.467	2.763	3.674
29	0.683	1.699	2.045	2.462	2.756	3.659
30	0.683	1.697	2.042	2.457	2.750	3.646
40	0.681	1.684	2.021	2.423	2.704	3.551
60	0.679	1.671	2.000	2.390	2.660	3.460
120	0.677	1.658	1.980	2.358	2.617	3.373
α	0.674	1.645	1.960	2.326	2.576	3.291

7) Explain the aims of epidemiology according to International epidemiological association. (5)

8) With suitable example explain incidence and prevalence rate. (5)

9) Explain the application of computers in inventory of pharmacy. (5)

C. Give Reasons for the Following

Answer all the questions.

10) In the formula for calculation of sample standard deviation in denominator 'n-1' is used instead of n. (2)

11) Changing from 95% CI to 99% CI increases the width of confidence interval. (2)

12) Box plots are useful for presentation of skewed data. (2)

13) Case control studies are always retrospective. (2)

14) Computers play important role in dispensing of medicines. (2)

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