Question Paper

Exam Date & Time: 22-Nov-2018 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

END SEMESTER EXAMINATION - NOVEMBER/DECEMBER 2018

BIOSTATISTICS [IHS 231]

Marks: 100

Duration: 180 mins.

(15)

Α

Answer	5 out of 8 questions.	
1)	Taking an example of a sample research problem	ovelsie

A)	the following terms concerning statistical inference	(15)
,	(i) Unit	
	(ii) Experiment	
	(iii) Survey	
	(iv) ParameterStatistic	
B)	In a study on patients, the following data were obtained.	(5)
	Find the arithmetic mean.	
	Ago (in 10 20 20 40 50 60 70 90	

Age (in	10 -	20 -	30 -	40 -	50 -	60 -	70 -	80 -
years)	19	29	39	49	59	69	79	89
Number of Cases	1	0	1	10	17	38	9	3

²⁾ Consider the following natality statistics for the U.S. (16) population in 1992. According to these data, the probabilities that a randomly selected woman who gave birth in 1992 was in each of the following age groups are as follows:

Probability
0.003
0.124
0.263
0.290
0.220
0.085
0.014
0.001
1.000

(i) What is the probability that a woman who gave birth in 1992 was 24 years of age or younger? (ii) What is the probability that she was 40 or older? (iii) Given that the mother of a particular child was under 30 years of age, what is the probability that she was not yet 20? (iv) Given that the mother was 35 years of age or older, what is the probability that she was under 40? B) Suppose that you are interested in monitoring air pollution ⁽⁴⁾ in Los Angeles, California, over a one-week period. Let X be a random variable that represents the number of days out of the seven on which the concentration of carbon monoxide surpasses a specified level. Do you believe that X has a binomial distribution? Explain. (10)According to the Behavioral Risk Factor Surveillance System, 58% of all Americans adhere to a sedentary A) lifestyle. (i) If you selected repeated samples of size twelve from the U.S. population, what would be the mean number of individuals per sample who do not exercise regularly? What would be the standard deviation? (ii) Suppose that you select a sample of twelve individuals and find that ten of them do not exercise regularly. Assuming that the Surveillance System is correct, what is the probability that you would have obtained results as bad as or worse than those you observed? B) (10)Explain Poisson distribution and its applications in **Biostatistics**. Write down the probability distribution for a binomial (20) random variable with n=6 and p=0.15. That is, Calculate the probabilities from P(X=0) to P(X=6). (15)Consider the standard normal distribution with mean = 0and standard deviation = 1. Use the table provided at the A) end to answer the following. (i) What is the probability that an outcome z is greater than 2.60? (ii) What is the probability that z is less than 1.35? (iii) What is the probability that z is between -1.70 and 3.10? (iv) What value of z cuts off the upper 15% of the standard

3)

4)

5)

normal distribution?What value of z marks off the lower 20% of the distribution? (Standard Normal Distribution table may be used)

Areas of a standard normal distribution										
Ζ	.0	0.01	.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	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2903	.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
1.0	.3413	.3438	.3461	.3485	3508	3531	3554	3577	.3599	.3621
1.1	.3643	.3665	3686	.3708	3729	3749	3770	.3790	.3810	.3830
12	.3849	.3869	3888	.3907	3925	3944	3962	.3980	.3997	.4015
13	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
15	.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
22	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
23	.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

- ^{B)} Assuming that the height of adult males has a normal (5) distribution, what proportion of males will be more than two standard deviations above the mean height?
- 6) (10)What is the need of having a working hypothesis? A) B) (10)Explain the types of errors in hypothesis testing and provide examples. 7) (15)In a school, a health awareness program was conducted among high school students. A researcher wants to study if A) the awareness of the students has increased after the program (using a cutoff value of 500). The awareness levels of 12 students randomly selected were scored as 550, 570, 490, 615, 505, 580, 570, 460, 600, 580, 530 and 526. Can the researcher conclude at a 5 percent significance level that the awareness levels have increased due to training? Write the hypothesis and test it using an

appropriate parametric test.	(t-distribution	table	is
provided below)			

df	0.20	0.10	0.05	0.02	0.01	df
	0.10	0.05	0.025	0.01	0.005	
1	3.078	6314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	б
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3,355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2977	14
15	1.341	1.753	2.731	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1316	1.708	2.060	2.485	2.787	25
26	1315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1313	1.701	2.048	2.467	2.763	28
29	1311	1.699	2.045	2.462	2.756	29
Infinity	1.282	1.645	1.960	2.326	2.576	Infinity

- ^{B)} The probability of patients A, B, C responding to a drug are ⁽⁵⁾ 1/3, 2/7, 3/8 respectively. If all three are simultaneously administered the drug, find the probability that exactly one of them will respond to it.
- Explain any three non-probability sampling techniques (10)
 explaining their advantages and disadvantages. Provide suitable examples.
 - ^{B)} In a particular country, the average number of suicides ⁽¹⁰⁾ reported each month is 2.75. Assume that the number of suicides follows a Poisson distribution.

(i) What is the probability that no suicides, will be reported during a given month?

(ii) What is the probability that at most four suicides will be reported?

(iii) What is the probability that six or more suicides will be reported?

-----End-----