The Open University of Sri Lanka B.Sc/B.Ed. DEGREE, CONTINUING EDUCATION PROGRAMME No Book Test - 2023/2024 Level 05 - Applied Mathematics ADU5305-Statistical Inference

Duration: - One Hour.

DATE: - 26-01-2024

Time: -

Non programmable calculators are permitted. Statistical tables are provided.

Answer all questions.

1.

Briefly explain the following terms. (a)

> Point estimation and interval estimation (i)

Type I error and Type II error. (ii)

(b)

Suppose weight of a certain product X, produced by ABC Company, follows normal distribution. However, the mean weight and variance weight of randomly selected product is unknown.

Weights of 16 randomly selected products in grams are given below.

		····		
195.66	202.30	205.10	200.98	189.91
198.95	201.33	193.27	192.99	196.04
197.16	207.16	197.67	202.10	204.09
193.75				

- (i) Find 95% confidence interval for mean weight of a randomly selected product and interpret
- (ii) Find 90% Confidence interval for variance weight of a randomly selected product and interpret the results.

Suppose we want to know whether or not the mean weight between two different species (A and B) of turtles is equal. 16 turtles from each population were randomly selected. The mean and variance weight of the turtles are given below. From the past experience it is reasonable to assume that the weights of the turtles of both spices follow normal distribution with equal variance.

Specie of turtle	A	В
Sample size	16	16
Sample mean	25.4 kg	27.8 kg
Sample standard deviation	1.5 kg	1.3 kg

- (i) Using a suitable statistical test, test the validity of the claim that "weight of randomly select Spice B turtle is 29 kg". Use 5% level of significance.
- (ii) Using suitable statistical test, test the validity of the claim that "randomly select Spice B turtle is heavier than the randomly select Spice A turtle". Use 5% level of significance.

Note: When the df > 20, t-distribution is approximated to standard normal distribution. Table of Standard Normal Probabilities

Let $Z \sim N(0,1)$. This table contains the probabilities $Pr(Z \ge z)$ 0.09 0.07 80.0 0.04 0.05 0.06 0.01 0.02 0.03 0.00 0.0681 0.0778 0.0764 0.0749 0.0735 0.0721 0.0708 0.0694 0.0793 1.4 0.0808 0.0559 0.0594 0.0582 0.0571 0.0630 0.0606 0.0668 0.0655 0.0643 0.0618 1.5 0.0455 0.0475 0.0465 0.0495 0.0485 0.0526 0.0516 0.0505 1.6 0.0548 0.0537 0.0367 0.0401 0.0392 0.0384 0.0375 0.0418 0.0409 0.0436 0.0427 1.7 0.0446 0.0307 0.0301 0.0294 0.0322 0.0314 0.0344 0.0336 0.0329 0.0359 0.0351 1.8 0.0233 0.0250 0.0244 0.0239 0.0281 0.0274 0.0268 0.0262 0.0256 1.9 0.0287 0.0188 0.0192 0.0183 0.0202 0.0197 0.0222 0.0217 0.0212 0.0207 2 0.0228

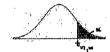


TABLE B: 1-DISTRIBUTION CRITICAL VALUES

				*	Tail probability p							
ď	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
11	.697	.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	.695	.873	1.083	1,356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	.694	870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3,372	3.852	4.221
14	.692	.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	691	.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	.690	.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252-	3,686	4.015
17	.689	.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
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Note: When the d.f \geq 20, t-distribution is approximated to standard normal distribution.

Table of $\chi^2_{\alpha,\nu}$ quantiles (χ^2 table)

df	The contract of the contract o									
v	0.99	0.975	0.95	0.90	0.1	0.05	0.025	0.01		
10	2.558	3.247	3.94	4.865	15.987	18.307	20.483	23.209		
11	3.053	3.816	4.575	5.578	17.275	19.675	21.92	24.725		
12	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217		
13	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688		
14	4.66	5,629	6.571	7.79	21.064	23.685	26.119	29,141		
15	5.229	6.262	7.261	8.547	22,307	24,996	27.488	30.578		
16	5.812	6.908	7.962	9.312	23,542	26.296	28.845	32		

Let $X \sim \chi^2_{\nu}$ and α be a probability. This table contains the upper α quantiles $\chi^2_{\alpha,\nu}$ of the χ^2_{ν} distributions such that $\Pr(X > \chi^2_{\alpha,\nu}) = \alpha$. For example, $\chi^2_{0.035,40} = 20.483$.