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統計學	92年5月11日	第1節	

選擇題 (每題 5 分, 共 100 分)

[For questions 1~2] There are a total of three treatments and each treatment has five data from different subjects. Please use the following table to answer questions.

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F value
Between treatments	227			
Error				
Total	518			

- The F value is (a) 2.68, (b) 2.86, (c) 4.68, (d) 4.86, (e) 15
- In order to test hypothesis at the 0.05 significant level, the computed F value should be compared with (a) $F_{0.025, 2, 12}$, (b) $F_{0.05, 3, 12}$, (c) $F_{0.025, 3, 14}$, (d) $F_{0.025, 2, 14}$, (e) $F_{0.05, 2, 12}$

[For questions 3~4] A random sample of employees is asked their opinions on a proposed job rotation program. The results are as follows. Test the hypothesis that opinion is independent of employees' department.

Department	Opinion	
	Favoring	Opposing
A	120	80
B	70	110
C	40	60

- What is the χ^2 value for this test? (a) 20.09, (b) 2.09, (c) 2.90, (d) 0.29, (e) 0.92
- Which test should be conducted? (a) χ^2 test of homogeneity, (b) goodness of fit test, (c) χ^2 test of fixed marginal totals, (d) multinominal population test, (e) χ^2 test of independence

[第 5~6 題] 某運輸公司調查行駛公里數(X)與行駛時間(Y)得到下列資料:

天數	1	2	3	4	5	6	7	8	9	10
公里數	100	90	95	95	80	85	120	115	110	110
時間	2.5	2	2.3	2.2	1.7	1.8	2.5	2.8	3.2	3

- 若假設迴歸模型為 $Y = \beta_0 + \beta_1 X_1 + e$, 請問 β_1 之估計值為若干? (a) 0.72, (b) 0.03, (c) 1.06, (d) 4.45, (e) 3.69
- 若某天預定行駛 200 公里則估計行駛時間約 (a) 0.5, (b) 2.5, (c) 5.2, (d) 6.7, (e) 8
- Suppose that random variables X and Y are independent, and their expectations and variances are known as $E(X)=5$, $E(Y)=10$, $\text{Var}(X)=1$, and $\text{Var}(Y)=2$. What is the value of the covariance $\text{Cov}(X+2Y, X-2Y+5)$? (a) -250 (b) -25 (c) -13 (d) -7 (e) -1
- 假設常態隨機變數 X 的平均值 $\mu=170$, 變異數 $\sigma^2=100$, 則下列那一個值最接近機率 $P(170 < X < 190)$? (a) 0.78 (b) 0.68 (c) 0.58 (d) 0.48 (e) 0.38
- 對母體平均數 μ 進行區間估計時, 估計誤差 E, 信賴係數 $1-\alpha$ 與樣本大小 n 三者的關係為: (a) E, $1-\alpha$ 與 n 三者沒有關係 (b) n 不變, $1-\alpha$ 愈大, 則 E 愈小 (c) n 不變, $1-\alpha$ 愈大, 則 E 愈大 (d) $1-\alpha$ 不變, n 愈小, 則 E 愈小 (e) 以上皆非。

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10. 有關型 I 誤差與型 II 誤差的敘述，下列何者正確？ (a) β 值愈小，表示檢定結果愈差 (b) 同一檢定中， α 增加，則 β 值將減小 (c) 同一檢定中，若樣本數增加，且其它條件不變下， α 減小， β 增加 (d) 其它條件不變下，樣本數增加將增加 α ，減小 β (e) 以上皆非。

		y	
	f(x, y)	0	1
x	0	0.10	0.15
	1	0.20	0.10
	2	0.30	0.15

Table I

11. Table I lists the joint probability function of random variables X and Y. Based on Table I, which one of the following statement or expressions is true? (a) X and Y are independent (b) $E(X)=1.5$ (c) $P(X=2|Y=1)=0.25$ (d) $P(Y=1|X=2)=0.15$ (e) $P(X=1|Y=1)=0.25$

12. Which one of the following functions is not a probability function?

- (a) $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}, -3 < x < 3$
 (b) $f(x) = \frac{1}{5}, 2 < x < 7$
 (c) $f(x) = (0.8)^{x-1} (0.2), x=1,2,3,\dots$
 (d) $f(x) = (0.8)^x (0.2)^{1-x}, x=0,1$
 (e) $f(x) = \binom{3}{x} (0.8)^x (0.2)^{3-x}, x=0,1,2,3$

13. Suppose that $\hat{\theta}_1, \hat{\theta}_2$ and $\hat{\theta}_3$ are estimators of the parameter θ . We know that $E(\hat{\theta}_1)=E(\hat{\theta}_2)=\theta, E(\hat{\theta}_3) \neq \theta, V(\hat{\theta}_1)=6, V(\hat{\theta}_2)=9,$ and $E(\hat{\theta}_3 - \theta)^2 = 5$. Which statement is correct? (a)

$MSE(\hat{\theta}_1)=9$ (b) $V(\hat{\theta}_3)=5$ (c) $\hat{\theta}_2$ is the best "unbiased" estimator (d) $\hat{\theta}_3$ is the most efficient estimator with bias (e) None of the above.

14. A textile fiber manufacturer is investigating a new drapery yarn, which the company claims has a mean thread elongation of 12 kg with a standard deviation of 0.5 kg normal distribution. The company wishes to test the hypothesis $H_0: \mu=12$, against $H_1: \mu < 12$, using a random sample four specimens. Find β for the case where the true mean elongation is 11.25 kg if the critical region is defined as $\bar{X} < 11.5$ kg?

- (a) 0.3085 (b) 0.1586 (c) 0.0668 (d) 0.1151 (e) None of the above.

15. 下列關於相關的敘述，何者為真？(a) 相關係數最小為 0, (b) 正相關代表一變數隨著另一變數的遞增而遞減, (c) X 與 Y 之間有很強的線性關係代表 X 為造成 Y 之因, (d) 相關係數的值越接近 0 代表相關很弱, (e) 相關僅探討二個變數之關係

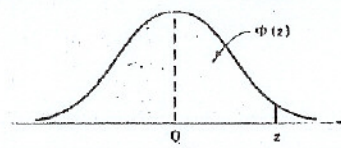
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- 16-17. A random sample of 500 adult residents of Taichung County found that 385 were in favor of increasing the highway speed limit to 75 mph, while another sample of 400 adult residents of Taipei County found that 267 were in favor of the increased speed limit. Do these data indicate that there is a difference in the support for increasing the speed limit between the residents of the two counties? Use $\alpha = 0.05$.
16. The test statistic and result are (a) 2.52, reject the null (b) 2.73, do not reject the null (c) 3.42, reject the null (d) 3.10, do not reject the null (e) 4.47, reject the null.
17. Calculate the P-value for the test. (a) $0.0001 < P\text{-value} < 0.00025$ (b) $0.00025 < P\text{-value} < 0.0005$ (c) $0.0005 < P\text{-value} < 0.00075$ (d) $0.00075 < P\text{-value} < 0.001$ (e) $0.001 < P\text{-value} < 0.00125$.
18. Suppose that events A and B are independent with probabilities $P(A) = 0.3$ and $P(B) = 0.4$, and A' is the complementary event of A, then $P(A' \cup B)$ equals
 (a) 0.12 (b) 0.28 (c) 0.58 (d) 0.82 (e) 1.1
19. 假設某影印機平均每印 100 頁中就有一次故障。現在某人想用這台影印機影印 500 頁的專題報告，則他在影印過程中此影印機沒有發生故障的機率約為
 (a) 0.0067 (b) 0.0165 (c) 0.0561 (d) 0.0651 (e) 0.0760
20. 假設 Z 為標準常態且 T 為自由度為 5 的 t 隨機變數，則下列各式何者不正確？
 (a) $E(Z) = 0$ (b) $E(T) = 0$ (c) $\text{Var}(Z) = 1$ (d) $\text{Var}(T) = 1$ (e) $E(Z^2) = 1$

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附表 Cumulative Standard Normal Distribution

$$\Phi(z) = P(Z \leq z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{u^2}{2}} du$$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	z
0.0	0.500000	0.503989	0.507978	0.511967	0.515953	0.519939	0.523922	0.527903	0.531881	0.535856	0.0
0.1	0.539828	0.543795	0.547758	0.551717	0.555676	0.559635	0.563591	0.567545	0.571494	0.575445	0.1
0.2	0.579260	0.583166	0.587064	0.590954	0.594835	0.598706	0.602568	0.606420	0.610261	0.614092	0.2
0.3	0.617911	0.621719	0.625516	0.629300	0.633072	0.636831	0.640576	0.644309	0.648027	0.651732	0.3
0.4	0.655422	0.659097	0.662757	0.666402	0.670031	0.673645	0.677242	0.680822	0.684386	0.687933	0.4
0.5	0.691462	0.694974	0.698468	0.701944	0.705401	0.708840	0.712260	0.715661	0.719043	0.722405	0.5
0.6	0.725747	0.729069	0.732371	0.735653	0.738914	0.742154	0.745373	0.748571	0.751748	0.754903	0.6
0.7	0.758036	0.761148	0.764238	0.767305	0.770350	0.773373	0.776373	0.779350	0.782305	0.785236	0.7
0.8	0.788145	0.791030	0.793892	0.796731	0.799546	0.802338	0.805106	0.807850	0.810570	0.813267	0.8
0.9	0.815940	0.818589	0.821214	0.823815	0.826391	0.828944	0.831472	0.833977	0.836457	0.838913	0.9
1.0	0.841345	0.843752	0.846136	0.848495	0.850830	0.853141	0.855428	0.857690	0.859929	0.862143	1.0
1.1	0.864334	0.866500	0.868643	0.870762	0.872857	0.874928	0.876976	0.878999	0.881000	0.882977	1.1
1.2	0.884930	0.886860	0.888767	0.890651	0.892512	0.894350	0.896165	0.897958	0.899727	0.901475	1.2
1.3	0.903199	0.904902	0.906582	0.908241	0.909877	0.911492	0.913085	0.914657	0.916207	0.917736	1.3
1.4	0.919243	0.920730	0.922196	0.923641	0.925066	0.926471	0.927855	0.929219	0.930563	0.931888	1.4
1.5	0.933193	0.934478	0.935744	0.936992	0.938220	0.939429	0.940620	0.941792	0.942947	0.944083	1.5
1.6	0.945201	0.946301	0.947384	0.948449	0.949497	0.950529	0.951543	0.952540	0.953521	0.954486	1.6
1.7	0.955435	0.956367	0.957284	0.958185	0.959071	0.959941	0.960796	0.961636	0.962462	0.963273	1.7
1.8	0.964070	0.964852	0.965621	0.966375	0.967116	0.967843	0.968557	0.969258	0.969946	0.970621	1.8
1.9	0.971283	0.971933	0.972571	0.973197	0.973810	0.974412	0.975002	0.975581	0.976148	0.976705	1.9
2.0	0.977250	0.977784	0.978308	0.978822	0.979325	0.979818	0.980301	0.980774	0.981237	0.981691	2.0
2.1	0.982136	0.982571	0.982997	0.983414	0.983823	0.984222	0.984611	0.984997	0.985371	0.985738	2.1
2.2	0.986097	0.986447	0.986791	0.987126	0.987455	0.987776	0.988089	0.988396	0.988696	0.988989	2.2
2.3	0.989276	0.989556	0.989830	0.990097	0.990358	0.990613	0.990863	0.991106	0.991344	0.991576	2.3
2.4	0.991802	0.992024	0.992240	0.992451	0.992656	0.992857	0.993053	0.993244	0.993431	0.993613	2.4
2.5	0.993790	0.993963	0.994132	0.994297	0.994457	0.994614	0.994766	0.994915	0.995060	0.995201	2.5
2.6	0.995339	0.995477	0.995604	0.995731	0.995855	0.995975	0.996093	0.996207	0.996319	0.996427	2.6
2.7	0.996533	0.996636	0.996736	0.996833	0.996928	0.997020	0.997110	0.997197	0.997282	0.997365	2.7
2.8	0.997445	0.997523	0.997599	0.997673	0.997744	0.997814	0.997882	0.997948	0.998012	0.998074	2.8
2.9	0.998134	0.998192	0.998250	0.998305	0.998359	0.998411	0.998462	0.998511	0.998559	0.998605	2.9
3.0	0.998650	0.998694	0.998736	0.998777	0.998817	0.998856	0.998893	0.998930	0.998965	0.998999	3.0
3.1	0.999032	0.999065	0.999096	0.999126	0.999155	0.999184	0.999211	0.999238	0.999264	0.999289	3.1
3.2	0.999313	0.999336	0.999359	0.999381	0.999402	0.999423	0.999443	0.999462	0.999481	0.999499	3.2
3.3	0.999517	0.999533	0.999550	0.999566	0.999581	0.999596	0.999610	0.999624	0.999638	0.999650	3.3
3.4	0.999663	0.999675	0.999687	0.999698	0.999709	0.999720	0.999730	0.999740	0.999749	0.999758	3.4
3.5	0.999767	0.999776	0.999784	0.999792	0.999800	0.999807	0.999815	0.999821	0.999828	0.999835	3.5
3.6	0.999841	0.999847	0.999853	0.999858	0.999864	0.999869	0.999874	0.999879	0.999883	0.999888	3.6
3.7	0.999892	0.999896	0.999900	0.999904	0.999908	0.999912	0.999915	0.999918	0.999922	0.999925	3.7
3.8	0.999928	0.999931	0.999933	0.999936	0.999938	0.999941	0.999943	0.999946	0.999948	0.999950	3.8
3.9	0.999952	0.999954	0.999956	0.999958	0.999959	0.999961	0.999963	0.999964	0.999966	0.999967	3.9