

編號: 264 系所: 工業設計學系甲組

科目: 統計方法

說明: 1. 以下各題之作答, 請依序將題號如: 一(a)、一(b)、...、二(b)、...等標示於答案紙上, 並列出所有計算過程, 以利評閱, 未依規定者, 依情節輕重扣分。

2. 本考科滿分一百分, 允許使用未具程式化功能之計算機。

一、取一內含蛋白質食品樣本, 連續測 12 次, 測試結果為:

26.95 28.33 38.84 26.76 35.63 25.43
26.84 26.89 29.62 26.79 36.71 25.12

(a) 試建構一個箱形圖(Box Plot)。〈需列出所有演算步驟及式子始給分〉(10分)

(b) 試問在樣本平均數加減一個標準偏差($\bar{x} \pm s$)下, 指出所有不在此範圍內的量測值?(7分)

二、設一隨機變數 X 之機率函數為 $P_x(k) = c(0.5)^{k-1}$ $k = 1, 2, \dots, \infty$

(a) 決定 c 值, 使 P_x 為一機率函數? (7分)

(b) 求 F_x , 即 X 之 c.d.f.? (7分)

(C) 求 $P(\{X > 4\}) = ?$ (6分)

$$\text{三、} F(x) = \begin{cases} 0 & x \leq 150 \\ 0.1x - 15 & 150 < x \leq 160 \\ 1 & x > 160 \end{cases}$$

求若系統執行的合理範圍需介於 153 至 157 之間, 則系統超出範圍的機率為多少? (7分)

四、設某學校 500 名學生之身高為常態分配(Normal Distribution), 具平均身高 170.5 公分, 標準偏差 5.5 公分。試問身高介於 165.0 公分與 173.8 公分之間的學生人數有多少位?(8分)

五、某公司想決定選擇 A 品牌或 B 品牌的輪胎。今就兩種輪胎各 10 件進行測試輪胎壽命,

其結果為 品牌 A: $\bar{x}_1 = 36000$ 公里 $s_1 = 5000$ 公里

品牌 B: $\bar{x}_2 = 38500$ 公里 $s_2 = 6000$ 公里

假設該兩型輪胎壽命母體為近似常態分配, 其變異數相等。

(a) 試建構 95% 之 $\mu_1 - \mu_2$ 的信賴區間? (9分)

(b) 試在顯著水準 α 為 0.05 下, 檢定兩型輪胎平均壽命是否有顯著差異? (10分)

六、設某化學物質 y 其在不同溫度 $x^\circ\text{C}$ 下, 溶解於 100 公克水的量分別記錄如下:

$x^\circ\text{C}$	y (公克)		
15	12	10	14
30	25	21	24
45	31	33	28

(a) 試求 $x^\circ\text{C}$ 與 y (公克) 兩者之相關係數(Correlation Coefficient)? (9分)

(b) 試求迴歸方程式(Regression Equation) $\mu_{y|x} = a + \beta x$? (10分)

(背面仍有題目, 請繼續作答)

七、某項品牌喜好度調查, 經隨機抽樣 120 位成年人, 並依性別與品牌喜好進行分類, 其列聯表為

	性別	
	男性	女性
品牌 A	15	29
品牌 B	22	19
品牌 C	20	15

試檢定品牌與性別是否有關聯性? $\alpha = 0.05$ (10分)

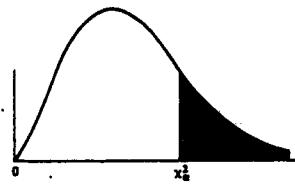
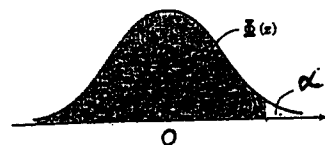


Table A. Critical Values of the Chi-Square Distribution

v	α									
	.995	.99	.98	.975	.95	.90	.80	.75	.70	.50
1	.00493	.0157	.0262	.0382	.0539	.0758	.1038	.1378	.1772	.2338
2	.0100	.0201	.0300	.0400	.0538	.0733	.0985	.1293	.1667	.2338
3	.0717	.115	.165	.216	.275	.344	.423	.512	.611	.784
4	.207	.297	.396	.494	.601	.717	.843	.979	.113	.148
5	.412	.554	.702	.851	.101	.125	.153	.184	.219	.270
6	.476	.622	.776	.931	.109	.134	.163	.195	.230	.282
7	.589	.743	.903	.107	.132	.161	.193	.227	.262	.314
8	1.344	1.646	2.032	2.480	2.733	3.179	3.592	4.000	4.413	4.963
9	1.735	2.088	2.532	2.970	3.325	3.790	4.223	4.655	5.096	5.638
10	2.156	2.558	3.059	3.547	3.940	4.438	4.911	5.379	5.852	6.431
11	2.603	3.053	3.609	4.166	4.575	5.073	5.556	6.034	6.517	7.106
12	3.074	3.571	4.178	4.784	5.226	5.724	6.207	6.685	7.168	7.767
13	3.565	4.107	4.765	5.409	5.892	6.400	6.883	7.361	7.844	8.443
14	4.075	4.660	5.368	6.059	6.571	7.090	7.573	8.051	8.534	9.133
15	4.601	5.229	5.985	6.726	7.261	7.790	8.273	8.751	9.234	9.833
16	5.142	5.812	6.614	7.408	7.962	8.500	8.983	9.461	9.944	10.543
17	5.697	6.408	7.255	8.104	8.672	9.210	9.693	10.171	10.654	11.253
18	6.265	7.015	7.906	8.801	9.390	9.938	10.421	10.903	11.386	11.985
19	6.844	7.633	8.567	9.511	10.117	10.675	11.158	11.639	12.122	12.721
20	7.434	8.260	9.237	10.216	10.851	11.419	11.900	12.381	12.864	13.463
21	8.034	8.897	9.915	10.883	11.591	12.169	12.650	13.131	13.614	14.213
22	8.643	9.542	10.600	11.682	12.338	12.926	13.407	13.888	14.371	14.920
23	9.260	10.196	11.293	12.401	13.091	13.689	14.170	14.651	15.132	15.731
24	9.886	10.856	11.992	13.001	13.848	14.450	14.931	15.412	15.893	16.490
25	10.520	11.524	12.697	13.560	14.611	15.200	15.681	16.162	16.643	17.242
26	11.160	12.198	13.409	14.170	15.379	15.960	16.441	16.922	17.403	17.983
27	11.808	12.879	14.125	14.731	16.151	16.741	17.222	17.703	18.184	18.764
28	12.461	13.565	14.847	15.308	16.928	17.520	18.000	18.481	18.962	19.542
29	13.121	14.256	15.574	16.047	17.708	18.300	18.781	19.262	19.743	20.321
30	13.787	14.953	16.306	16.791	18.493	19.000	19.562	20.043	20.524	21.103

Table 2 Cumulative Standard Normal Distribution (continued)

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



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	0.555660	0.559618	0.563559	0.567495	0.571424	0.575345	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	0.866300	0.868243	0.870162	0.872057	0.873928	0.875776	0.877601	0.879404	0.881185	1.1
1.2	0.882950	0.884680	0.886387	0.888071	0.889731	0.891368	0.892982	0.894573	0.896141	0.897687	1.2
1.3	0.900319	0.901802	0.903261	0.904696	0.906107	0.907494	0.908857	0.910197	0.911514	0.912807	1.3
1.4	0.914183	0.915443	0.916674	0.917876	0.919049	0.920194	0.921311	0.922401	0.923464	0.924501	1.4
1.5	0.925513	0.926536	0.927531	0.928500	0.929444	0.930363	0.931258	0.932129	0.932976	0.933800	1.5
1.6	0.934603	0.935378	0.936128	0.936854	0.937556	0.938234	0.938888	0.939519	0.940127	0.940713	1.6
1.7	0.941287	0.941828	0.942344	0.942835	0.943302	0.943745	0.944164	0.944560	0.944933	0.945284	1.7
1.8	0.945622	0.945951	0.946258	0.946543	0.946806	0.947047	0.947267	0.947465	0.947641	0.947795	1.8
1.9	0.947928	0.948083	0.948218	0.948334	0.948431	0.948509	0.948569	0.948611	0.948645	0.948671	1.9
2.0	0.948689	0.948700	0.948695	0.948675	0.948641	0.948593	0.948532	0.948458	0.948371	0.948272	2.0
2.1	0.948161	0.948048	0.947922	0.947783	0.947631	0.947466	0.947289	0.947100	0.946900	0.946688	2.1
2.2	0.946464	0.946239	0.945999	0.945746	0.945479	0.945198	0.944903	0.944595	0.944274	0.943941	2.2
2.3	0.943596	0.943253	0.942896	0.942525	0.942141	0.941744	0.941334	0.940911	0.940475	0.940026	2.3
2.4	0.939574	0.939127	0.938671	0.938206	0.937731	0.937247	0.936754	0.936252	0.935741	0.935211	2.4
2.5	0.934682	0.934153	0.933615	0.933068	0.932512	0.931947	0.931373	0.930790	0.930198	0.929597	2.5
2.6	0.928987	0.928378	0.927759	0.927131	0.926494	0.925848	0.925193	0.924529	0.923856	0.923174	2.6
2.7	0.922483	0.921790	0.921087	0.920374	0.919651	0.918918	0.918175	0.917422	0.916659	0.915886	2.7
2.8	0.915103	0.914320	0.913527	0.912724	0.911911	0.911088	0.910255	0.909412	0.908559	0.907696	2.8
2.9	0.906823	0.905950	0.905067	0.904174	0.903271	0.902358	0.901435	0.900502	0.899559	0.898606	2.9
3.0	0.897643	0.896690	0.895727	0.894754	0.893771	0.892778	0.891775	0.890762	0.889739	0.888696	3.0
3.1	0.887643	0.886570	0.885487	0.884394	0.883291	0.882178	0.881055	0.879922	0.878779	0.877626	3.1
3.2	0.876463	0.875260	0.874043	0.872811	0.871564	0.870302	0.869025	0.867733	0.866426	0.865104	3.2
3.3	0.863767	0.862446	0.861111	0.859761	0.858397	0.857019	0.855627	0.854221	0.852791	0.851337	3.3
3.4	0.850000	0.848543	0.847073	0.845590	0.844094	0.842584	0.841060	0.839522	0.837970	0.836404	3.4
3.5	0.834823	0.833243	0.831649	0.830041	0.828419	0.826783	0.825133	0.823470	0.821793	0.820102	3.5
3.6	0.818407	0.816716	0.815011	0.813291	0.811556	0.809806	0.808041	0.806261	0.804466	0.802656	3.6
3.7	0.800831	0.799011	0.797176	0.795326	0.793461	0.791581	0.789686	0.787776	0.785851	0.783911	3.7
3.8	0.781956	0.780006	0.778041	0.776061	0.774066	0.772056	0.770031	0.768001	0.765956	0.763896	3.8
3.9	0.761821	0.759766	0.757691	0.755596	0.753481	0.751346	0.749191	0.747016	0.744821	0.742606	3.9

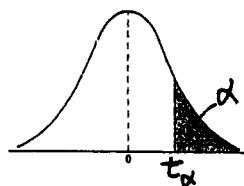


Table 3 Critical Values of the t Distribution

v	alpha				
	0.10	0.05	0.025	0.01	0.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
inf.	1.282	1.645	1.960	2.326	2.576