注意事項：一.不得使用具特殊功能之計算機(器)。
二.計算部份應詳列計算之過程。
三.參考數值表參見第三頁。

一. The amount of time spent by North American adults watching television per day is normally distributed with a mean of 6 hours and a standard deviation of 1.5 hours.

(a) What proportion of the population watches television for more than 7 hours per day? (5%)

(b) What is the probability that the average number of hours spent watching television by a random sample of five adults is more than 7 hours? (5%)

(c) What is the probability that in a random sample of five adults all watch television for more than 7 hours per day? (5%)

二. An agronomist planted three test plots each with four variaties of wheat and obtained the following yields (in pounds per plot):

Variety A:	55,	55,	52
Variety B:	58,	58,	55
Variety C:	60,	61,	56
Variety D:	59,	52,	51

Use the 0.05 level of significance to test whether the differences among the four sample means can be attributed to chance. (12%)

三. 市場研究員為探討廠商投入之廣告費(X,萬元)對銷售額(Y,百萬元)之影響，乃建立迴歸模型 $Y=\beta_0+\beta_1 x+\varepsilon$，$\varepsilon$為誤差項
今隨機抽取五家廠商，得其廣告費與銷售額之關係表如右所示．並進而求得：

廣告費 X	12	16	8	12	12
銷售額 Y	8	12	4	6	5

$\Sigma x=60$，$\Sigma y=35$，$\Sigma xy=452$，$\Sigma x^2=752$，
$\Sigma y^2=285$，

(一) 試配合迴歸方程式 $\hat{y}=\hat{\beta}_0+\hat{\beta}_1 x$．(6%)

(二) 以 $\alpha=0.05$ 檢定迴歸模型是否與橫軸平行？(5%)

(三) 若廣告費為10萬元，試求銷售額之 $\mu_{Y|x}$ 的95%信賴區間．(4%)

四. 為美化成功大學校園，總務處擬於校園內種植鳳凰木，經請教生物系之教授甲、乙兩人，甲云有10%之鳳凰樹不能種活，乙則認為有20%不能種活，根據以往經驗知甲之推斷可靠程度為乙之2倍．且事實證明兩人中必有一人推斷正確。今種植一個月後，

(一) 隨機觀察4棵樹中已死去1棵，問甲、乙兩人判斷正確之機率分別為何？(6%)

(二) 若觀察4棵樹死去1棵，則必須再補充樹苗，若照甲之推測補充10%，照乙之推測補充20%。如果事實與判斷者相符，無損失可言；否則便造成損失，其數額如右表．今若欲使期望損失為最小，試問應補充樹苗10%或20%？(4%)

補充樹苗 \ 實際死去樹苗	10%	20%
10%	0	$20,000
20%	$4,000	0

(三) 若採購組承辦人員偷懶，未實地現場查看，故無4棵樹中有1棵死去之資訊。此時若仍欲遵該損失表及期望損失為最小之原則來下決策，試問應補充樹苗10%或20%？(4%)

(背面仍有題目，請繼續作答)

五、設兩生產線之產品的長度符合常態分配，今分別自該兩生產線抽取隨機樣本，得其長度(公分)如右表：

生產線A	138	138	140	144	132	136
生產線B	144	140	138	142	134	142

茲據MINITAB統計套裝軟體，得電腦列印如下表所示：

Two Sample T-Test and Confidence Interval

```
Two sample T for C1
C2          N      Mean     StDev   SE Mean
1           6    138.00      4.00       1.6
2           6    140.00      3.58       1.5

95% CI for mu (1) - mu (2): ( -6.9,  2.9)
T-Test mu (1) = mu (2) (vs not =): T= -0.91  P=0.38  DF=  10
Both use Pooled StDev = 3.79
```

(一)上表中之 Pooled StDev = 3.79 ，T = −0.91 ，P = 0.38 係如何求得？試分別列出其計算式。(6%)

(二)若兩母體之標準差相等($\sigma_1 = \sigma_2$)，試問在5%之顯著水準下，兩生產線產品之平均長度是否有差異？(3%)

(三)寫出兩生產線產品平均長度之差的95%信賴區間之計算式。(4%)

六、某期間內觀察一工業之96位機械師所發生的意外數，得其結果如右表所示：

意外數 x	機械師數 觀察人數 O	機械師數 理論人數 e
0	59	58.2
1	27	29.1
2	9	7.3
3	1	1.4

今據MINITAB統計套裝軟體得電腦列印如下：

N	MEAN	MEDIAN	TRMEAN	STDEV	SEMEAN
96	0.5000	0.0000	0.4302	0.7108	0.0725

MIN	MAX	Q1	Q3
0.0000	3.0000	0.0000	1.0000

(一)若你認為此分配符合Poisson，則你如何由上表之資料直接進行判斷？試述之。(2%)

(二)試以意外數1次為例，說明其理論人數係如何推算而得。(4%)

(三)若欲藉 χ^2 檢定法進行配合適度之檢定(Test of goodness of fit)，則其有關之自由度為何？何故？(2%)

(四)以 $\alpha = 0.05$ 檢定機械師之意外數分配是否服從Poisson分配？(5%)

七、有八人在某餐館中聚餐，館中餐後備有甜點兩種，一為布丁，另一為冰淇淋。假定每一顧客餐後只能點選其中一種，且依以往之經驗，任何時段光臨之顧客點選此兩種甜點之人數幾無任何差別。今餐館製作布丁之材料稍有不足，若你為餐館之總經理，決定至多願冒0.05之布丁不足的風險，試問該指定廚師至少應準備布丁多少份，以應需求(冰淇淋除外)。(8%)

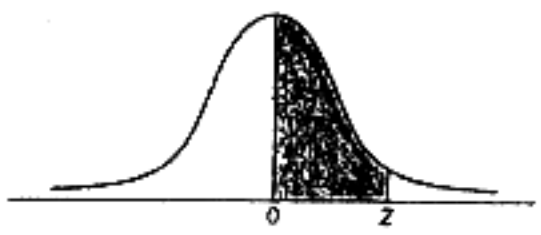
八、若隨機變數X服從如下之均等分配

$$f(x) = 1 \quad , \quad 0 \le x \le 1$$

試求其(一)平均數 μ ，(二)變異數 σ^2 ，(三)平均差(Mean deviation) M.D. ，(四)均互差(Mean difference) g. (3%, 3%, 2%, 2%)

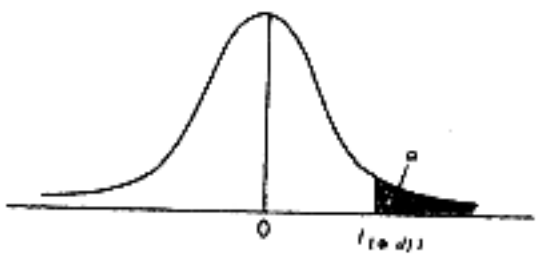
參考數值表

The standardized normal distribution



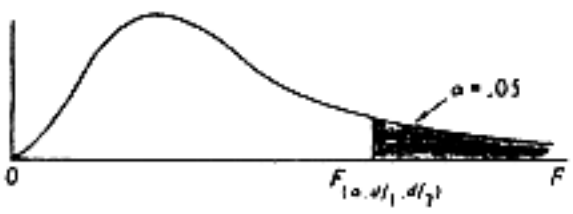
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.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
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.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
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.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

Critical values of t



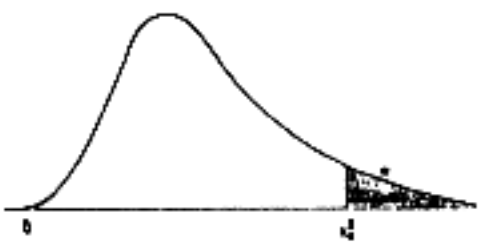
Degrees of Freedom	Upper Tail Areas					
	.25	.10	.05	.025	.01	.005
1	1.0000	3.0777	6.3138	12.7062	31.8207	63.6574
2	0.8165	1.8856	2.9200	4.3027	6.9646	9.9248
3	0.7649	1.6377	2.3534	3.1824	4.5407	5.8409
4	0.7407	1.5332	2.1318	2.7764	3.7469	4.6041
5	0.7267	1.4759	2.0150	2.5706	3.3649	4.0322
6	0.7176	1.4398	1.9432	2.4469	3.1427	3.7074
7	0.7111	1.4149	1.8946	2.3646	2.9980	3.4995
8	0.7064	1.3968	1.8595	2.3060	2.8965	3.3554
9	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498
10	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693

Critical values of F



Denominator df_2	Numerator df_1											
	1	2	3	4	5	6	7	8	9	10	12	15
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01

Critical Values of χ^2



d.f.	$\chi^2_{.995}$	$\chi^2_{.99}$	$\chi^2_{.975}$	$\chi^2_{.95}$	$\chi^2_{.90}$	$\chi^2_{.025}$	$\chi^2_{.01}$	$\chi^2_{.005}$
1	.0000393	.000157	.000982	.00393	3.841	5.024	6.635	7.879
2	.0100	.0201	.0506	.103	5.991	7.378	9.210	10.597
3	.0717	.115	.216	.352	7.815	9.348	11.345	12.838
4	.207	.297	.484	.711	9.488	11.143	13.277	14.860
5	.412	.554	.831	1.145	11.070	12.832	15.086	16.750
6	.676	.872	1.237	1.635	12.592	14.449	16.812	18.548
7	.989	1.239	1.690	2.167	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	13.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	18.307	20.483	23.209	26.188
11	2.603	3.053	3.816	4.575	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	22.362	24.736	27.688	29.819