

- The complete linear regression model  $y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + \varepsilon$  was fit to  $n=20$  data points with  $R\text{-sq}=0.96$ . The reduced model  $y = b_0 + b_1x_1 + b_2x_2 + \gamma$  was also fit with  $R\text{-sq}=0.60$ . At 5% significance level, test whether the complete model contributes more information for the prediction of  $y$  than the reduced model. (15%)
- Let  $w$  = wear life,  $s$  = stress and  $l$  = loads, the nonlinear function is given as  $w = a/(s^b l^c)$ . Propose a regression model to estimate the unknown parameter  $a$ ,  $b$  and  $c$  for this nonlinear function. (15%)
- Consider the summary data of three treatments as following table:

Treatment	$n_i$	$\bar{x}_i$	$s_i$
1	10	2	0.1
2	10	6	0.2
3	10	4	0.1

- At 5% significance level, conduct an ANOVA table to test the treatment effect. (10%)
- Compute a 95% confidence interval for  $\frac{1}{2}(\mu_3 + \mu_2) - \mu_1$  (10%)
- A new computer software package has been developed. To evaluate the benefits of the new software package, 12 systems analysts are randomly selected. 6 of them are instructed to produce an information system by using the current technology. The other 6 analysts are trained in the use of the new software package and then instructed to use it to produce the information system. The completion time data (in hours) for the 12 analysts are shown below. The researcher-in-charge of the new software evaluation project wants to determine whether there is a significant difference between the mean project completion times of the current technology and the new software package. Assume that the project completion times of the two methods are independently normally distributed and have equal variances.

Current Technology: 30 28 35 38 37 36  
 New Software: 26 22 31 33 20 30

- What is the point estimate of the difference between the mean project completion times of the current technology and the new software package? (3%)
  - State the appropriate null and alternative hypotheses for the researcher-in-charge. (3%)
  - Compute the value of the test statistic. What can you say about the  $p$ -value? (8%)
  - Construct a 90% confidence interval for the difference between the mean project completion times of the current technology and the new software package. (3%)
  - Use your answer in part (d) to make a conclusion for the hypothesis test. (3%)
- A movie was rated by the viewers who had watched it. The scores range from a low of 1 (very uninteresting) to a high of 5 (very fascinating). A sample of 16 viewers was chosen and their ratings are listed below:

3 5 4 3 4 5 5 4 3 2 5 4 3 2 3 5

Suppose the ratings of the movie can be assumed to be normally distributed.

Hint:  $\sum_{i=1}^{16} x_i = 60$ ,  $\sum_{i=1}^{16} x_i^2 = 242$

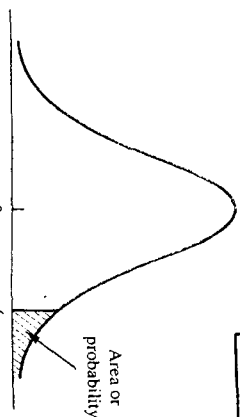
- The movie production company claimed that the mean rating score is at least 4. An independent movie review company wants to test this claim. Answer questions (a) through (c):
  - State the appropriate null and alternative hypotheses for the movie review company. (3%)
  - Compute the value of the test-statistic. (6%)
  - Using  $\alpha=0.05$ , would the movie review company conclude that the mean rating score of the movie is at least 4? Explain. (6%)
- If the score was rated 4 or 5, the movie was considered Grade "A" for that viewer. The movie production company also made the claim that at least 60% of the total viewers would grade the movie as "A". This claim is again tested by the movie review company. Use the sample in this problem to conduct the test. Answer questions (d) through (f):
  - State the appropriate null and alternative hypotheses for the movie review company. (3%)
  - Compute the value of the test-statistic. (6%)
  - Using  $\alpha=0.05$ , would the movie review company conclude that at least 60% of the total viewers would grade

參考用

注意：背面有試題

\*請在試卷答案卷(卡)內作答

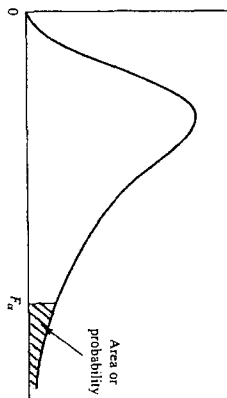
參考用



Entries in the table give  $t$  values for an area or probability in the upper tail of the  $t$  distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail,  $t_{.05} = 1.812$ .

Degrees of Freedom	.10	.05	.025	.01	.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	3.052
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
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
80	1.289	1.658	1.980	2.358	2.617
120	1.282	1.645	1.960	2.326	2.576
$\infty$					

F TABLE - I



Entries in the table give  $F_{\alpha}$  values, where  $\alpha$  is the area or probability in the upper tail of the  $F$  distribution. For example, with 12 numerator degrees of freedom, 15 denominator degrees of freedom, and a .05 area in the upper tail,  $F_{.05} = 2.48$ .

Table of  $F_{\alpha}$  Values

Denominator Degrees of Freedom	Numerator Degrees of Freedom																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
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	248.0	249.1	250.1	251.1	252.2	253.3	254.3
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	19.45	19.45	19.46	19.47	19.48	19.49	19.50
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	8.66	8.64	8.62	8.59	8.57	8.55	8.53
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	5.80	5.77	5.75	5.72	5.69	5.65	5.63
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	4.56	4.53	4.50	4.46	4.43	4.40	4.36
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	3.87	3.84	3.81	3.77	3.74	3.70	3.67
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	3.44	3.41	3.38	3.34	3.30	3.27	3.23
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	3.15	3.12	3.08	3.04	3.01	2.97	2.93
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	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.05	1.97	1.93	1.88	1.83	1.79	1.73	1.67
28	4.20	3.34	2.95	2.72	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.22	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.09	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
80	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
120	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00
$\infty$																			

注意：背面有試題