

1. Four secretaries employed by an office file 40, 10, 30 and 20% of the documents. The probabilities that errors will be made in the process are 0.01, 0.04, 0.06, and 0.10. If a document was misfiled,
  - (A) What are the respective probabilities that the document was filed by (i) the first secretary, (ii) the second secretary, (iii) the third secretary, and (iv) the fourth secretary? (12%)
  - (B) Whom would you guess to be the person that filed the misfiled document? and why? (8%)
2. Give the definition for each of the following well-known distributions:
  - (A) Bernoulli trial (4%) , (B) Binomial distribution (4%) , (C) Poisson distribution (4%) , (D) Normal (Gaussian) distribution (4%) ,and (E) Exponential distribution. (4%) .
3. Suppose there were 600 pieces of same toy, from which a random sample of 60 pieces were obtained without replacement. If 6 pieces among the sample are found to be faulty, find a 95% confidence interval for the faulty rate among all of the 600 pieces. (20%)
4. A shoe manufacturer wanted to test the strength of two kinds of material, A and B. The method was to randomly select 8 athletes and have each of the athlete wear a shoe of material A on one foot and a shoe of material B on the other foot, then measure the days until that each shoe was worn out. Assume that the following data were obtained

| Athlete No. | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Material A  | 126 | 117 | 115 | 118 | 118 | 128 | 125 | 120 |
| Material B  | 130 | 118 | 125 | 120 | 121 | 125 | 130 | 120 |

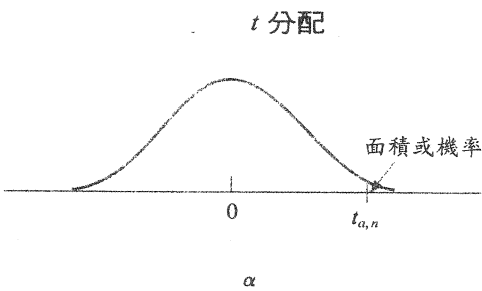
Assume that each of the material strength has a normal distribution, and the manufacturer would like to test if the two kinds of material A and B are of the same strength. Then for the hypothesis testing,

- (i) Give the null hypothesis and the alternative (5%)
  - (ii) Give the critical region (rejection region) (5%)
  - (iii) Execute the test and give your conclusion at level of significance  $\alpha=0.05$  (10%)
5. A beverage manufacturer wanted to know if in each of the stores there is a linear relationship between the number of autosale machines X and the number of

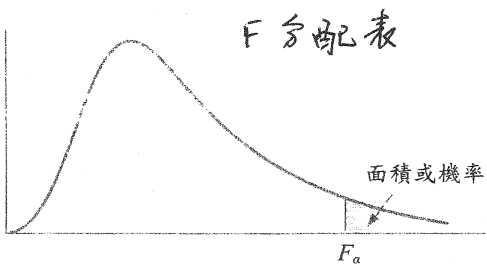
beverage cans Y sold. 8 stores were randomly selected and the data are obtained as the following:

|   |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|
| X | 1   | 1   | 1   | 2   | 4   | 4   | 5   | 6   |
| Y | 568 | 577 | 652 | 657 | 755 | 759 | 840 | 832 |

- (1) Find  $\hat{\alpha}$  and  $\hat{\beta}$  for the linear regression  $\hat{Y} = \hat{\alpha} + \hat{\beta}X$ , (10%)
- (2) At level of significance  $\alpha = 0.05$ , test if the linear regression model is of good fit. (10%)



| 自由度 | 0.20   | 0.15   | 0.10   | 0.05   | 0.025  | 0.01   | 0.005  |
|-----|--------|--------|--------|--------|--------|--------|--------|
| 1   | 1.376  | 1.963  | 3.078  | 6.3138 | 12.706 | 31.821 | 63.657 |
| 2   | 1.061  | 1.386  | 1.886  | 2.9200 | 4.3027 | 6.965  | 9.9248 |
| 3   | 0.978  | 1.250  | 1.638  | 2.3534 | 3.1825 | 4.541  | 5.8409 |
| 4   | 0.941  | 1.190  | 1.533  | 2.1318 | 2.7764 | 3.747  | 4.6041 |
| 5   | 0.920  | 1.156  | 1.476  | 2.0150 | 2.5706 | 3.365  | 4.0321 |
| 6   | 0.906  | 1.134  | 1.440  | 1.9432 | 2.4469 | 3.143  | 3.7074 |
| 7   | 0.896  | 1.119  | 1.415  | 1.8946 | 2.3646 | 2.998  | 3.4995 |
| 8   | 0.889  | 1.108  | 1.397  | 1.8595 | 2.3060 | 2.896  | 3.3554 |
| 9   | 0.883  | 1.100  | 1.383  | 1.8331 | 2.2622 | 2.821  | 3.2498 |
| 10  | 0.879  | 1.093  | 1.372  | 1.8125 | 2.2281 | 2.764  | 3.1693 |
| 11  | 0.876  | 1.088  | 1.363  | 1.7959 | 2.2010 | 2.718  | 3.1058 |
| 12  | 0.873  | 1.083  | 1.356  | 1.7823 | 2.1788 | 2.681  | 3.0545 |
| 13  | 0.870  | 1.079  | 1.350  | 1.7709 | 2.1604 | 2.650  | 3.0123 |
| 14  | 0.868  | 1.076  | 1.345  | 1.7613 | 2.1448 | 2.624  | 2.9768 |
| 15  | 0.866  | 1.074  | 1.341  | 1.7530 | 2.1315 | 2.602  | 2.9467 |
| 16  | 0.865  | 1.071  | 1.337  | 1.7459 | 2.1199 | 2.583  | 2.9208 |
| 17  | 0.863  | 1.069  | 1.333  | 1.7396 | 2.1098 | 2.567  | 2.8982 |
| 18  | 0.862  | 1.067  | 1.330  | 1.7341 | 2.1009 | 2.552  | 2.8784 |
| 19  | 0.861  | 1.066  | 1.328  | 1.7291 | 2.0930 | 2.539  | 2.8609 |
| 20  | 0.860  | 1.064  | 1.325  | 1.7247 | 2.0860 | 2.528  | 2.8453 |
| 21  | 0.859  | 1.063  | 1.323  | 1.7207 | 2.0796 | 2.518  | 2.8314 |
| 22  | 0.858  | 1.061  | 1.321  | 1.7171 | 2.0739 | 2.508  | 2.8188 |
| 23  | 0.858  | 1.060  | 1.319  | 1.7139 | 2.0687 | 2.500  | 2.8073 |
| 24  | 0.857  | 1.059  | 1.318  | 1.7109 | 2.0639 | 2.492  | 2.7969 |
| 25  | 0.856  | 1.058  | 1.316  | 1.7081 | 2.0595 | 2.485  | 2.7874 |
| 26  | 0.856  | 1.058  | 1.315  | 1.7056 | 2.0555 | 2.479  | 2.7787 |
| 27  | 0.855  | 1.057  | 1.314  | 1.7033 | 2.0518 | 2.473  | 2.7707 |
| 28  | 0.855  | 1.056  | 1.313  | 1.7011 | 2.0484 | 2.467  | 2.7633 |
| 29  | 0.854  | 1.055  | 1.311  | 1.6991 | 2.0452 | 2.462  | 2.7564 |
| 30  | 0.854  | 1.055  | 1.310  | 1.6973 | 2.0423 | 2.457  | 2.7500 |
| 31  | 0.8535 | 1.0541 | 1.3095 | 1.6955 | 2.0395 | 2.453  | 2.7441 |
| 32  | 0.8531 | 1.0536 | 1.3086 | 1.6939 | 2.0370 | 2.449  | 2.7385 |
| 33  | 0.8527 | 1.0531 | 1.3078 | 1.6924 | 2.0345 | 2.445  | 2.7333 |
| 34  | 0.8524 | 1.0526 | 1.3070 | 1.6909 | 2.0323 | 2.441  | 2.7284 |

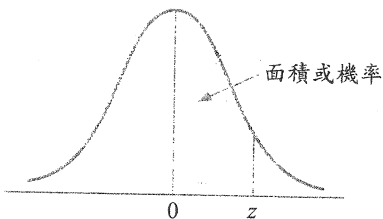


表中的數值是  $F_\alpha$ ，其中  $\alpha$  代表  $F$  分配右尾之面積或機率。例如，若分子自由度為 12、分母自由度為 15 且右尾面積為 0.05，則  $F_{0.05}=2.48$ 。

$F_{0.05}$  值之表

| 分母<br>自由度 | 分子自由度 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |          |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
|           | 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  | 5.66  | 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     |

標準常態分配——半表



表中的數值代表介於平均數和平均數右邊 $z$ 個標準差之間的曲線下面積，例如，對 $z=1.25$ 而言，介於平均數和 $z$ 之間的曲線下面積為0.3944。

| $z$ | 0.00   | 0.01   | 0.02   | 0.03   | 0.04   | 0.05   | 0.06   | 0.07   | 0.08   | 0.09   |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | 0.0000 | 0.0040 | 0.0080 | 0.0120 | 0.0160 | 0.0199 | 0.0239 | 0.0279 | 0.0319 | 0.0359 |
| 0.1 | 0.0398 | 0.0438 | 0.0478 | 0.0517 | 0.0557 | 0.0596 | 0.0636 | 0.0675 | 0.0714 | 0.0753 |
| 0.2 | 0.0793 | 0.0832 | 0.0871 | 0.0910 | 0.0948 | 0.0987 | 0.1026 | 0.1064 | 0.1103 | 0.1141 |
| 0.3 | 0.1179 | 0.1217 | 0.1255 | 0.1293 | 0.1331 | 0.1368 | 0.1406 | 0.1443 | 0.1480 | 0.1517 |
| 0.4 | 0.1554 | 0.1591 | 0.1628 | 0.1664 | 0.1700 | 0.1736 | 0.1772 | 0.1808 | 0.1844 | 0.1879 |
| 0.5 | 0.1915 | 0.1950 | 0.1985 | 0.2019 | 0.2054 | 0.2088 | 0.2123 | 0.2157 | 0.2190 | 0.2224 |
| 0.6 | 0.2257 | 0.2291 | 0.2324 | 0.2357 | 0.2389 | 0.2422 | 0.2454 | 0.2486 | 0.2518 | 0.2549 |
| 0.7 | 0.2580 | 0.2612 | 0.2642 | 0.2673 | 0.2704 | 0.2734 | 0.2764 | 0.2794 | 0.2823 | 0.2852 |
| 0.8 | 0.2881 | 0.2910 | 0.2939 | 0.2967 | 0.2995 | 0.3023 | 0.3051 | 0.3078 | 0.3106 | 0.3133 |
| 0.9 | 0.3159 | 0.3186 | 0.3212 | 0.3238 | 0.3264 | 0.3289 | 0.3315 | 0.3340 | 0.3365 | 0.3389 |
| 1.0 | 0.3413 | 0.3438 | 0.3461 | 0.3485 | 0.3508 | 0.3531 | 0.3554 | 0.3577 | 0.3599 | 0.3621 |
| 1.1 | 0.3643 | 0.3665 | 0.3686 | 0.3708 | 0.3729 | 0.3749 | 0.3770 | 0.3790 | 0.3810 | 0.3830 |
| 1.2 | 0.3849 | 0.3869 | 0.3888 | 0.3907 | 0.3925 | 0.3944 | 0.3962 | 0.3980 | 0.3997 | 0.4015 |
| 1.3 | 0.4032 | 0.4049 | 0.4066 | 0.4082 | 0.4099 | 0.4115 | 0.4131 | 0.4147 | 0.4162 | 0.4177 |
| 1.4 | 0.4192 | 0.4207 | 0.4222 | 0.4236 | 0.4251 | 0.4265 | 0.4279 | 0.4292 | 0.4306 | 0.4319 |
| 1.5 | 0.4332 | 0.4345 | 0.4357 | 0.4370 | 0.4382 | 0.4394 | 0.4406 | 0.4418 | 0.4429 | 0.4441 |
| 1.6 | 0.4452 | 0.4463 | 0.4474 | 0.4484 | 0.4495 | 0.4505 | 0.4515 | 0.4525 | 0.4535 | 0.4545 |
| 1.7 | 0.4554 | 0.4564 | 0.4573 | 0.4582 | 0.4591 | 0.4599 | 0.4608 | 0.4616 | 0.4625 | 0.4633 |
| 1.8 | 0.4641 | 0.4649 | 0.4656 | 0.4664 | 0.4671 | 0.4678 | 0.4686 | 0.4693 | 0.4699 | 0.4706 |
| 1.9 | 0.4713 | 0.4719 | 0.4726 | 0.4732 | 0.4738 | 0.4744 | 0.4750 | 0.4756 | 0.4761 | 0.4767 |
| 2.0 | 0.4772 | 0.4778 | 0.4783 | 0.4788 | 0.4793 | 0.4798 | 0.4803 | 0.4808 | 0.4812 | 0.4817 |
| 2.1 | 0.4821 | 0.4826 | 0.4830 | 0.4834 | 0.4838 | 0.4842 | 0.4846 | 0.4850 | 0.4854 | 0.4857 |
| 2.2 | 0.4861 | 0.4864 | 0.4868 | 0.4871 | 0.4875 | 0.4878 | 0.4881 | 0.4884 | 0.4887 | 0.4890 |
| 2.3 | 0.4893 | 0.4896 | 0.4898 | 0.4901 | 0.4904 | 0.4906 | 0.4909 | 0.4911 | 0.4913 | 0.4916 |
| 2.4 | 0.4918 | 0.4920 | 0.4922 | 0.4925 | 0.4927 | 0.4929 | 0.4931 | 0.4932 | 0.4934 | 0.4936 |
| 2.5 | 0.4938 | 0.4940 | 0.4941 | 0.4943 | 0.4945 | 0.4946 | 0.4948 | 0.4949 | 0.4951 | 0.4952 |
| 2.6 | 0.4953 | 0.4955 | 0.4956 | 0.4957 | 0.4959 | 0.4960 | 0.4961 | 0.4962 | 0.4963 | 0.4964 |
| 2.7 | 0.4965 | 0.4966 | 0.4967 | 0.4968 | 0.4969 | 0.4970 | 0.4971 | 0.4972 | 0.4973 | 0.4974 |
| 2.8 | 0.4974 | 0.4975 | 0.4976 | 0.4977 | 0.4977 | 0.4978 | 0.4979 | 0.4979 | 0.4980 | 0.4981 |
| 2.9 | 0.4981 | 0.4982 | 0.4982 | 0.4983 | 0.4984 | 0.4984 | 0.4985 | 0.4985 | 0.4986 | 0.4986 |
| 3.0 | 0.4986 | 0.4987 | 0.4987 | 0.4988 | 0.4988 | 0.4989 | 0.4989 | 0.4989 | 0.4990 | 0.4990 |