

科目：統計學

系所組：企業管理學系管理學碩士班乙組

1. The Flying BA is a marathon (26.2 mile long) running race held every year in FJU, Xinzhuang. Suppose that the following data show the ages for a sample of 25 marathon runners.

49 33 40 37 56 44 46 57 55 32 50 52 43  
64 40 46 24 30 37 43 31 43 50 36 61

- (a) Using a class width of 10 (20~29, 30~39...), construct a frequency histogram for the ages of 25 marathon runners. (10%)
- (b) Develop a stem-and-leaf display for the ages of 25 marathon runners. (leaf unit=1) (5%)
2. FJUBA is an organization that tests outdoor gear used for climbing, camping, mountaineering, and backpacking. Suppose that the following data show the ratings of hardshell jackets based on the breathability, durability, versatility, features, mobility, and weight of each jacket. The ratings range from 0 (lowest) to 100 (highest).
- 42 66 67 71 78 62 61 76 71 67 61 64 61 54 62  
83 63 68 69 81 53 96 32 62 77 62 68 67 67 63
- (a) Compute the mean, median, and mode. (5%)
- (b) Compute and interpret the 80th percentile. (5%)
3. The 10.1" iPads will have faster processors and a cheaper price point in an effort to take market share away from Google Chromebooks in public school districts. Suppose that the following data represent the percentages of students currently using Apple iPads for a sample of 20 U.S. public school districts.
- 7 22 12 21 26 18 42 29 64 20  
16 23 18 24 27 24 26 19 34 29
- (a) Compute the first and third quartiles and I.Q.R. (9%)
- (b) Using "lower and upper limit" to determine the outliers if any. (6%)
4. According to *Franchise Business Review*, over 50% of all food franchises earn a profit of less than \$50,000 a year. In a sample of 187 casual dining restaurants, 96 earned a profit of less than \$50,000 last year.
- (a) Provide a 95% confidence interval for the proportion of casual dining restaurants that earned a profit of less than \$50,000 last year. (5%)
- (b) How large a sample is needed if the desired margin of error is 0.03? (5%)

※ 注意：1.考生須在「彌封答案卷」上作答。

2.本試題紙空白部份可當稿紙使用，試題須隨答案卷繳回。

3.考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。

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5. BCC and BAMedia provided a television channel targeted to individuals waiting in supermarket checkout lines. The channel showed news, short features, and advertisements. The length of the program was based on the assumption that the population mean time a shopper stands in a supermarket checkout line is 10 minutes. A sample of actual waiting times will be used to test this assumption and determine whether actual mean waiting time differs from this standard.

(a) Formulate the hypotheses for this application. (5%)

(b) A sample of 64 shoppers showed a sample mean waiting time of 9 minutes.

Assume a population standard deviation of  $\sigma = 3.2$  minutes.

What is the value of the test statistic. (5%)

(c) What is the p-value? At  $\alpha = 0.05$ , what is your conclusion? (5%)

6. Consider the following hypothesis test.

$$\begin{cases} H_0: \mu_1 - \mu_2 = 0 \\ H_1: \mu_1 - \mu_2 \neq 0 \end{cases}$$

The following data for two independent random samples taken from two normal populations.

|                 |    |   |    |   |   |   |
|-----------------|----|---|----|---|---|---|
| <b>Sample 1</b> | 10 | 7 | 13 | 7 | 9 | 8 |
| <b>Sample 2</b> | 8  | 7 | 8  | 4 | 6 | 9 |

(a) What is the value of the test statistic? (5%)

(b) What is the degrees of freedom for the distribution? (5%)

(c) What is the p-value? And what is your conclusion? (5%)

7. A personal fitness company produces both a deluxe and a standard model of a smoothie blender for home use. Selling prices obtained from a sample of retail outlets follow.

(let  $\mu_{DX}$ : mean price of **Deluxe**,  $\mu_{STD}$ : mean price of **Standard**)

| <b>Retail Outlet</b> | 1  | 2  | 3  | 4  | 5  | 6  | 7  |
|----------------------|----|----|----|----|----|----|----|
| <b>Deluxe</b>        | 40 | 48 | 44 | 46 | 43 | 46 | 42 |
| <b>Standard</b>      | 31 | 28 | 31 | 29 | 29 | 34 | 29 |

The manufacturer's suggested retail prices for the two models show a \$10 price differential.

Use a 0.05 level of significance and test that the mean difference between the prices of the two models is \$10.

(a) Formulate the null and alternative hypotheses for this question. (5%)

(b) What is the value of the test statistic. (7%)

(c) What is the rejection rule using the critical value? and your conclusion? (8%)

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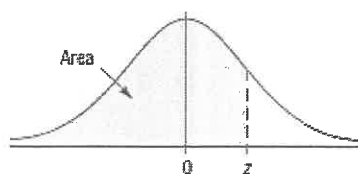
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Table E (continued)

## Cumulative Standard Normal Distribution

| z   | .00   | .01   | .02   | .03   | .04   | .05   | .06   | .07   | .08   | .09   |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.0 | .5000 | .5040 | .5080 | .5120 | .5160 | .5199 | .5239 | .5279 | .5319 | .5359 |
| 0.1 | .5398 | .5438 | .5478 | .5517 | .5557 | .5596 | .5636 | .5675 | .5714 | .5753 |
| 0.2 | .5793 | .5832 | .5871 | .5910 | .5948 | .5987 | .6026 | .6064 | .6103 | .6141 |
| 0.3 | .6179 | .6217 | .6255 | .6293 | .6331 | .6368 | .6406 | .6443 | .6480 | .6517 |
| 0.4 | .6554 | .6591 | .6628 | .6664 | .6700 | .6736 | .6772 | .6808 | .6844 | .6879 |
| 0.5 | .6915 | .6950 | .6985 | .7019 | .7054 | .7088 | .7123 | .7157 | .7190 | .7224 |
| 0.6 | .7257 | .7291 | .7324 | .7357 | .7389 | .7422 | .7454 | .7486 | .7517 | .7549 |
| 0.7 | .7580 | .7611 | .7642 | .7673 | .7704 | .7734 | .7764 | .7794 | .7823 | .7852 |
| 0.8 | .7881 | .7910 | .7939 | .7967 | .7995 | .8023 | .8051 | .8078 | .8106 | .8133 |
| 0.9 | .8159 | .8186 | .8212 | .8238 | .8264 | .8289 | .8315 | .8340 | .8365 | .8389 |
| 1.0 | .8413 | .8438 | .8461 | .8485 | .8508 | .8531 | .8554 | .8577 | .8599 | .8621 |
| 1.1 | .8643 | .8665 | .8686 | .8708 | .8729 | .8749 | .8770 | .8790 | .8810 | .8830 |
| 1.2 | .8849 | .8869 | .8888 | .8907 | .8925 | .8944 | .8962 | .8980 | .8997 | .9015 |
| 1.3 | .9032 | .9049 | .9066 | .9082 | .9099 | .9115 | .9131 | .9147 | .9162 | .9177 |
| 1.4 | .9192 | .9207 | .9222 | .9236 | .9251 | .9265 | .9279 | .9292 | .9306 | .9319 |
| 1.5 | .9332 | .9345 | .9357 | .9370 | .9382 | .9394 | .9406 | .9418 | .9429 | .9441 |
| 1.6 | .9452 | .9463 | .9474 | .9484 | .9495 | .9505 | .9515 | .9525 | .9535 | .9545 |
| 1.7 | .9554 | .9564 | .9573 | .9582 | .9591 | .9599 | .9608 | .9616 | .9625 | .9633 |
| 1.8 | .9641 | .9649 | .9656 | .9664 | .9671 | .9678 | .9686 | .9693 | .9699 | .9706 |
| 1.9 | .9713 | .9719 | .9726 | .9732 | .9738 | .9744 | .9750 | .9756 | .9761 | .9767 |
| 2.0 | .9772 | .9778 | .9783 | .9788 | .9793 | .9798 | .9803 | .9808 | .9812 | .9817 |
| 2.1 | .9821 | .9826 | .9830 | .9834 | .9838 | .9842 | .9846 | .9850 | .9854 | .9857 |
| 2.2 | .9861 | .9864 | .9868 | .9871 | .9875 | .9878 | .9881 | .9884 | .9887 | .9890 |
| 2.3 | .9893 | .9896 | .9898 | .9901 | .9904 | .9906 | .9909 | .9911 | .9913 | .9916 |
| 2.4 | .9918 | .9920 | .9922 | .9925 | .9927 | .9929 | .9931 | .9932 | .9934 | .9936 |
| 2.5 | .9938 | .9940 | .9941 | .9943 | .9945 | .9946 | .9948 | .9949 | .9951 | .9952 |
| 2.6 | .9953 | .9955 | .9956 | .9957 | .9959 | .9960 | .9961 | .9962 | .9963 | .9964 |
| 2.7 | .9965 | .9966 | .9967 | .9968 | .9969 | .9970 | .9971 | .9972 | .9973 | .9974 |
| 2.8 | .9974 | .9975 | .9976 | .9977 | .9977 | .9978 | .9979 | .9979 | .9980 | .9981 |
| 2.9 | .9981 | .9982 | .9982 | .9983 | .9984 | .9984 | .9985 | .9985 | .9986 | .9986 |
| 3.0 | .9987 | .9987 | .9987 | .9988 | .9988 | .9989 | .9989 | .9989 | .9990 | .9990 |
| 3.1 | .9990 | .9991 | .9991 | .9991 | .9992 | .9992 | .9992 | .9992 | .9993 | .9993 |
| 3.2 | .9993 | .9993 | .9994 | .9994 | .9994 | .9994 | .9994 | .9995 | .9995 | .9995 |
| 3.3 | .9995 | .9995 | .9995 | .9996 | .9996 | .9996 | .9996 | .9996 | .9996 | .9997 |
| 3.4 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9998 |

For z values greater than 3.49, use 0.9999.



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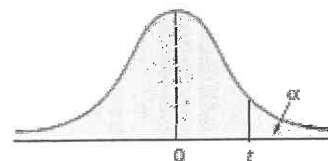
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TABLE E.3  
Critical Values of t

For a particular number of degrees of freedom, entry represents the critical value of t corresponding to the cumulative probability  $(1 - \alpha)$  and a specified upper-tail area ( $\alpha$ ).



| Degrees of Freedom | Cumulative Probabilities |        |        |         |         |         |
|--------------------|--------------------------|--------|--------|---------|---------|---------|
|                    | 0.75                     | 0.90   | 0.95   | 0.975   | 0.99    | 0.995   |
|                    | Upper-Tail Areas         |        |        |         |         |         |
|                    | 0.25                     | 0.10   | 0.05   | 0.025   | 0.01    | 0.005   |
| 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  |
| 11                 | 0.6974                   | 1.3634 | 1.7959 | 2.2010  | 2.7181  | 3.1058  |
| 12                 | 0.6955                   | 1.3562 | 1.7823 | 2.1788  | 2.6810  | 3.0545  |
| 13                 | 0.6938                   | 1.3502 | 1.7709 | 2.1604  | 2.6503  | 3.0123  |
| 14                 | 0.6924                   | 1.3450 | 1.7613 | 2.1448  | 2.6245  | 2.9768  |
| 15                 | 0.6912                   | 1.3406 | 1.7531 | 2.1315  | 2.6025  | 2.9467  |
| 16                 | 0.6901                   | 1.3368 | 1.7459 | 2.1199  | 2.5835  | 2.9208  |
| 17                 | 0.6892                   | 1.3334 | 1.7396 | 2.1098  | 2.5669  | 2.8982  |
| 18                 | 0.6884                   | 1.3304 | 1.7341 | 2.1009  | 2.5524  | 2.8784  |
| 19                 | 0.6876                   | 1.3277 | 1.7291 | 2.0930  | 2.5395  | 2.8609  |
| 20                 | 0.6870                   | 1.3253 | 1.7247 | 2.0860  | 2.5280  | 2.8453  |
| 21                 | 0.6864                   | 1.3232 | 1.7207 | 2.0796  | 2.5177  | 2.8314  |
| 22                 | 0.6858                   | 1.3212 | 1.7171 | 2.0739  | 2.5083  | 2.8188  |
| 23                 | 0.6853                   | 1.3195 | 1.7139 | 2.0687  | 2.4999  | 2.8073  |
| 24                 | 0.6848                   | 1.3178 | 1.7109 | 2.0639  | 2.4922  | 2.7969  |
| 25                 | 0.6844                   | 1.3163 | 1.7081 | 2.0595  | 2.4851  | 2.7874  |
| 26                 | 0.6840                   | 1.3150 | 1.7056 | 2.0555  | 2.4786  | 2.7787  |
| 27                 | 0.6837                   | 1.3137 | 1.7033 | 2.0518  | 2.4727  | 2.7707  |
| 28                 | 0.6834                   | 1.3125 | 1.7011 | 2.0484  | 2.4671  | 2.7633  |
| 29                 | 0.6830                   | 1.3114 | 1.6991 | 2.0452  | 2.4620  | 2.7564  |
| 30                 | 0.6828                   | 1.3104 | 1.6973 | 2.0423  | 2.4573  | 2.7500  |
| 31                 | 0.6825                   | 1.3095 | 1.6955 | 2.0395  | 2.4528  | 2.7440  |
| 32                 | 0.6822                   | 1.3086 | 1.6939 | 2.0369  | 2.4487  | 2.7385  |
| 33                 | 0.6820                   | 1.3077 | 1.6924 | 2.0345  | 2.4448  | 2.7333  |
| 34                 | 0.6818                   | 1.3070 | 1.6909 | 2.0322  | 2.4411  | 2.7284  |
| 35                 | 0.6816                   | 1.3062 | 1.6896 | 2.0301  | 2.4377  | 2.7238  |
| 36                 | 0.6814                   | 1.3055 | 1.6883 | 2.0281  | 2.4345  | 2.7195  |
| 37                 | 0.6812                   | 1.3049 | 1.6871 | 2.0262  | 2.4314  | 2.7154  |
| 38                 | 0.6810                   | 1.3042 | 1.6860 | 2.0244  | 2.4286  | 2.7116  |
| 39                 | 0.6808                   | 1.3036 | 1.6849 | 2.0227  | 2.4258  | 2.7079  |
| 40                 | 0.6807                   | 1.3031 | 1.6839 | 2.0211  | 2.4233  | 2.7045  |
| 41                 | 0.6805                   | 1.3025 | 1.6829 | 2.0195  | 2.4208  | 2.7012  |
| 42                 | 0.6804                   | 1.3020 | 1.6820 | 2.0181  | 2.4185  | 2.6981  |
| 43                 | 0.6802                   | 1.3016 | 1.6811 | 2.0167  | 2.4163  | 2.6951  |
| 44                 | 0.6801                   | 1.3011 | 1.6802 | 2.0154  | 2.4141  | 2.6923  |
| 45                 | 0.6800                   | 1.3006 | 1.6794 | 2.0141  | 2.4121  | 2.6896  |
| 46                 | 0.6799                   | 1.3002 | 1.6787 | 2.0129  | 2.4102  | 2.6870  |
| 47                 | 0.6797                   | 1.2998 | 1.6779 | 2.0117  | 2.4083  | 2.6846  |
| 48                 | 0.6796                   | 1.2994 | 1.6772 | 2.0106  | 2.4066  | 2.6822  |

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