# 大同大學 100 學年度研究所碩士班入學考試試題

考試科目:統計學　　所別:資訊經營研究所　　

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1. (20%) 是非題 (若正確請標示TRUE，若錯誤請標示FALSE，並將題號標示清楚，每題2分)
   (1) The total sum of squares is the sum of the sum of squares for error and the sum of squares for treatments.
   (2) The degrees of freedom associated with the sum of squares treatments is n-1.
   (3) The appropriate distribution when testing for the difference in two population means, assuming equal variances and small sample sizes is the t distribution.
   (4) The degrees of freedom for the paired-observation t-test are n-2.
   (5) The two assumptions necessary to test for a difference in two population proportions are that the sample sizes are large and that the samples are independent random samples from the two populations.
   (6) The probability of success changes from trial to trial in Bernoulli trials experiments.
   (7) In regression analysis, every time that an insignificant and unimportant variable is added to the regression model, the $R^2$ decreases.
   (8) The uniform distribution has higher probabilities for small values than for higher ones.
   (9) The Central Limit Theorem states that as the sample size increases, the distribution of the sample mean approaches a normal distribution with mean equal to the population mean and standard deviation equal to the population standard deviation.
   (10) The standard error of the sample mean is equal to $\sigma$.

2. (20%) 選擇題 (請選取其中一個最適當的答案填入答案卷內，並將題號標示清楚，每題2分)
   (1) Suppose that you carry out a statistical test and find that the test statistic is $z = .20$ (Assume that the sample size is at least 30.) If the test is one-tailed, then the p-value is:
   A. -0.0124　B. 0.0062　C. .00228　D. 0.9876　E. 0.1212

   (2) If $\alpha = 0.01$ for a one-tailed test, how large is the area of rejection?
   A. 0.05　B. 0.025　C. 0.01　D. 0.005　E. None of the above

   (3) I would like to test the null hypothesis that the population mean is 50 versus the alternative that it is not 50. My sample size is 6 and the sample mean is 38 with sample standard deviation of 16. At $\alpha = 0.05$, I should:
   A. Strongly reject the null hypothesis
   B. Mildly reject the null hypothesis
   C. Fail to reject the null hypothesis
   D. Accept the alternative hypothesis
   E. There is insufficient information to determine

   (4) In a left-tailed hypothesis test involving a normally distributed population with a known standard deviation, the computed test statistic was $Z = -1.74$. If the null hypothesis is rejected based on this evidence, the risk of making a __________ error is approximately __________.
   A. Type I; 4.1 %
   B. Type II; 4.1%
   C. Type I; 95.9%
   D. Type II; 95.9%
   E. Both A and D are correct

   (5) A clothes store manager has sales data of trouser sizes for the last month's sales. Which measure of central tendency should the manager use, if the manager is interested in the most sellable size?
   A. Mean
   B. Median
   C. Mode
   D. Standard deviation
   E. Interquartile range

   (6) A market research company has collected data on the price of a particular brand of soap in several different locations. The prices are as follows: \$0.89, 0.95, 1.25, 1.36, 1.49, 1.65, 1.79, 1.89, 1.99. What are the upper and lower quartiles of soap prices for this brand?
   A. 1.72, 1.17
   B. 1.84, 1.17
   C. 1.72, 1.10
   D. 2.21, 0.74
   E. 1.84, 1.10

<背面繼續>

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<接前頁>

(7) A survey in which customers taste five different brands of ice cream and rank their favorites from 1 to 5, would be an example of which type of scale of measurement?
A. Nominal　B. Ordinal　C. Interval　D. Ratio　E. Mean

(8) The probability of stock A rising is 0.3 and of stock B is 0.4. If stocks A and B are not independent and the probability of both stocks rising is 0.09, what is the probability that neither stock rises?
A. 0.61　B. 0.39　C. 0.12　D. 0.91　E. 0.03

(9) The estimate for the true population slope, $b_l$, is the ratio of which two values?
A. $SS_X/SS_Y$
B. $SS_{XY}/SS_X$
C. $SS_X/SS_{XY}$
D. None of the above

(10) When testing $H_0$: $\beta_1 = 0$, against $H_1$: $\beta_1 \neq 0$, failing to reject the null hypothesis means what?
A. The slope of the regression line is not zero
B. There is evidence of a relationship between x and y, but it is not linear
C. The relationship between x and y is an inverse one
D. There is not a linear relationship between x and y
E. There is a linear relationship between x and y

3. (5%) According to the past experience of Tatung Department Store, 25% of the customers buy PDP TV, 30% of the customers buy LCD TV and 45% of them just “look around”. Suppose there are six customers in a given day, what is the probability that the owner of Sogo Department Store sells 2 PDP TV and 2 LCD TV on that day?

4. (15%) Suppose that $X$ has probability density function

$$f(x) = \begin{cases} kx(1-x) & ,0 \leq x \leq 1 \\ 0 & , otherwise \end{cases}$$

(a) Compute $k$.
(b) Compute $P(X \geq 0.2)$.
(c) Compute the expected value, $E(x)$.

5. (10%) A health club would like to show that one of its new programs helps members lose weight. A random sample of 5 participants in this program was asked to record their weight before and after this program. The results are shown below:

| Participant | Before (pound) | After (pound) |
|---|---|---|
| 1 | 125 | 115 |
| 2 | 170 | 165 |
| 3 | 121 | 121 |
| 4 | 172 | 175 |
| 5 | 202 | 195 |

At the 0.05 level of significance, is there a significant reduction in the average weight after participating in this program?

6. (15%) Men arrive at a service counter according to a Poisson at an average of 6 per hour, women arrive at a service counter according to a Poisson at an average of 12 per hour, and children arrive at service counter according to a Poisson at an average of 12 per hour.
(a) Please determine the probability that at least two customers (without regard to sex or age) arrive in a 5-minute period.
(b) If the counter is open at 9:00am, please determine the probability that the first customer (without regard to sex or age) arrives at the counter after 9:10am.

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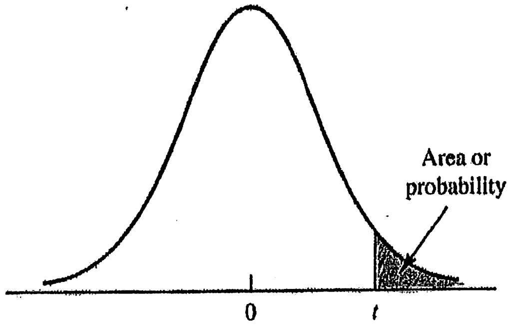
**TABLE 2** *t* DISTRIBUTION

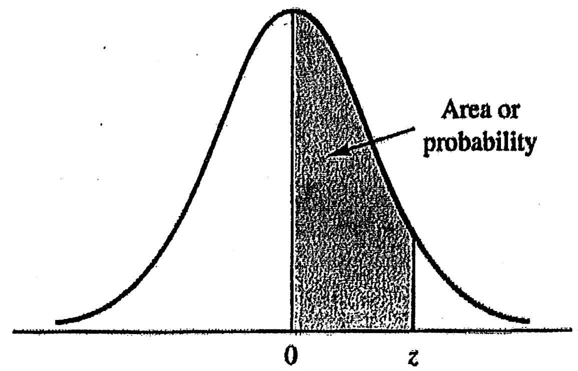



Entries in the table give *t* values for an area or probability in the upper tail of the *t* distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

| Degrees of Freedom | Area in Upper Tail .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 | 3.055 |
| 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 |
| 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 |
| 120 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 |
| ∞ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 |



STANDARD NORMAL DISTRIBUTION




Entries in the table give the area under the curve between the mean and *z* standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean and *z* is .3944.

| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|---|---|---|---|---|---|---|---|---|---|---|
| .0 | .0000 | .0040 | .0080 | .0120 | .0160 | .0199 | .0239 | .0279 | .0319 | .0359 |
| .1 | .0398 | .0438 | .0478 | .0517 | .0557 | .0596 | .0636 | .0675 | .0714 | .0753 |
| .2 | .0793 | .0832 | .0871 | .0910 | .0948 | .0987 | .1026 | .1064 | .1103 | .1141 |
| .3 | .1179 | .1217 | .1255 | .1293 | .1331 | .1368 | .1406 | .1443 | .1480 | .1517 |
| .4 | .1554 | .1591 | .1628 | .1664 | .1700 | .1736 | .1772 | .1808 | .1844 | .1879 |
| .5 | .1915 | .1950 | .1985 | .2019 | .2054 | .2088 | .2123 | .2157 | .2190 | .2224 |
| .6 | .2257 | .2291 | .2324 | .2357 | .2389 | .2422 | .2454 | .2486 | .2517 | .2549 |
| .7 | .2580 | .2611 | .2642 | .2673 | .2704 | .2734 | .2764 | .2794 | .2823 | .2852 |
| .8 | .2881 | .2910 | .2939 | .2967 | .2995 | .3023 | .3051 | .3078 | .3106 | .3133 |
| .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 |
| 2.7 | .4965 | .4966 | .4967 | .4968 | .4969 | .4970 | .4971 | .4972 | .4973 | .4974 |
| 2.8 | .4974 | .4975 | .4976 | .4977 | .4977 | .4978 | .4979 | .4979 | .4980 | .4981 |
| 2.9 | .4981 | .4982 | .4982 | .4983 | .4984 | .4984 | .4985 | .4985 | .4986 | .4986 |
| 3.0 | .4987 | .4987 | .4987 | .4988 | .4988 | .4989 | .4989 | .4989 | .4990 | .4990 |

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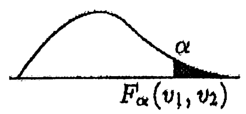


$\alpha = 0.05$

| $v_2$ \ $v_1$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 161.45 | 199.50 | 215.71 | 224.58 | 230.16 | 233.99 | 236.77 | 238.88 | 240.54 |
| 2 | 18.513 | 19.000 | 19.164 | 19.247 | 19.296 | 19.330 | 19.353 | 19.371 | 19.385 |
| 3 | 10.128 | 9.5521 | 9.2766 | 9.1172 | 9.0135 | 8.9406 | 8.8868 | 8.8452 | 8.8123 |
| 4 | 7.7086 | 6.9443 | 6.5914 | 6.3883 | 6.2560 | 6.1631 | 6.0942 | 6.0410 | 5.9988 |
| 5 | 6.6079 | 5.7861 | 5.4095 | 5.1922 | 5.0503 | 4.9503 | 4.8759 | 4.8183 | 4.7725 |
| 6 | 5.9874 | 5.1433 | 4.7571 | 4.5337 | 4.3874 | 4.2839 | 4.2066 | 4.1468 | 4.0990 |
| 7 | 5.5914 | 4.7374 | 4.3468 | 4.1203 | 3.9715 | 3.8660 | 3.7870 | 3.7257 | 3.6767 |
| 8 | 5.3177 | 4.4590 | 4.0662 | 3.8378 | 3.6875 | 3.5806 | 3.5005 | 3.4381 | 3.3881 |
| 9 | 5.1174 | 4.2565 | 3.8626 | 3.6331 | 3.4817 | 3.3738 | 3.2927 | 3.2296 | 3.1789 |
| 10 | 4.9646 | 4.1028 | 3.7083 | 3.4780 | 3.3258 | 3.2172 | 3.1355 | 3.0717 | 3.0204 |
| 11 | 4.8443 | 3.9823 | 3.5874 | 3.3567 | 3.2039 | 3.0946 | 3.0123 | 2.9480 | 2.8962 |
| 12 | 4.7472 | 3.8853 | 3.4903 | 3.2592 | 3.1059 | 2.9961 | 2.9134 | 2.8486 | 2.7964 |
| 13 | 4.6672 | 3.8056 | 3.4105 | 3.1791 | 3.0254 | 2.9153 | 2.8321 | 2.7669 | 2.7144 |
| 14 | 4.6001 | 3.7389 | 3.3439 | 3.1122 | 2.9582 | 2.8477 | 2.7642 | 2.6987 | 2.6458 |
| 15 | 4.5431 | 3.6823 | 3.2874 | 3.0556 | 2.9013 | 2.7905 | 2.7066 | 2.6408 | 2.5876 |
| 16 | 4.4940 | 3.6337 | 3.2389 | 3.0069 | 2.8524 | 2.7413 | 2.6572 | 2.5911 | 2.5377 |
| 17 | 4.4513 | 3.5915 | 3.1968 | 2.9647 | 2.8100 | 2.6987 | 2.6143 | 2.5480 | 2.4943 |
| 18 | 4.4139 | 3.5546 | 3.1599 | 2.9277 | 2.7729 | 2.6613 | 2.5767 | 2.5102 | 2.4563 |
| 19 | 4.3808 | 3.5219 | 3.1274 | 2.8951 | 2.7401 | 2.6283 | 2.5435 | 2.4768 | 2.4227 |
| 20 | 4.3513 | 3.4928 | 3.0984 | 2.8661 | 2.7109 | 2.5990 | 2.5140 | 2.4471 | 2.3928 |
| 21 | 4.3248 | 3.4668 | 3.0725 | 2.8401 | 2.6848 | 2.5727 | 2.4876 | 2.4205 | 2.3661 |
| 22 | 4.3009 | 3.4434 | 3.0491 | 2.8167 | 2.6613 | 2.5491 | 2.4638 | 2.3965 | 2.3419 |
| 23 | 4.2793 | 3.4221 | 3.0280 | 2.7955 | 2.6400 | 2.5277 | 2.4422 | 2.3748 | 2.3201 |
| 24 | 4.2597 | 3.4028 | 3.0088 | 2.7763 | 2.6207 | 2.5082 | 2.4226 | 2.3551 | 2.3002 |
| 25 | 4.2417 | 3.3852 | 2.9912 | 2.7587 | 2.6030 | 2.4904 | 2.4047 | 2.3371 | 2.2821 |
| 26 | 4.2252 | 3.3690 | 2.9751 | 2.7426 | 2.5868 | 2.4741 | 2.3883 | 2.3205 | 2.2655 |
| 27 | 4.2100 | 3.3541 | 2.9604 | 2.7278 | 2.5719 | 2.4591 | 2.3732 | 2.3053 | 2.2501 |
| 28 | 4.1960 | 3.3404 | 2.9467 | 2.7141 | 2.5581 | 2.4453 | 2.3593 | 2.2913 | 2.2360 |
| 29 | 4.1830 | 3.3277 | 2.9340 | 2.7014 | 2.5454 | 2.4324 | 2.3463 | 2.2782 | 2.2229 |
| 30 | 4.1709 | 3.3158 | 2.9223 | 2.6896 | 2.5336 | 2.4205 | 2.3343 | 2.2662 | 2.2107 |
| 40 | 4.0848 | 3.2317 | 2.8387 | 2.6060 | 2.4495 | 2.3359 | 2.2490 | 2.1802 | 2.1240 |
| 60 | 4.0012 | 3.1504 | 2.7581 | 2.5252 | 2.3683 | 2.2540 | 2.1665 | 2.0970 | 2.0401 |
| 120 | 3.9201 | 3.0718 | 2.6802 | 2.4472 | 2.2900 | 2.1750 | 2.0867 | 2.0164 | 1.9588 |
| ∞ | 3.8415 | 2.9957 | 2.6049 | 2.3719 | 2.2141 | 2.0986 | 2.0096 | 1.9384 | 1.8000 |

## TABLE 6 VALUES OF $e^{-\mu}$

| $\mu$ | $e^{-\mu}$ | $\mu$ | $e^{-\mu}$ | $\mu$ | $e^{-\mu}$ |
|---|---|---|---|---|---|
| .00 | 1.0000 | | | | |
| .05 | .9512 | 2.05 | .1287 | 4.05 | .0174 |
| .10 | .9048 | 2.10 | .1225 | 4.10 | .0166 |
| .15 | .8607 | 2.15 | .1165 | 4.15 | .0158 |
| .20 | .8187 | 2.20 | .1108 | 4.20 | .0150 |
| .25 | .7788 | 2.25 | .1054 | 4.25 | .0143 |
| .30 | .7408 | 2.30 | .1003 | 4.30 | .0136 |
| .35 | .7047 | 2.35 | .0954 | 4.35 | .0129 |
| .40 | .6703 | 2.40 | .0907 | 4.40 | .0123 |
| .45 | .6376 | 2.45 | .0863 | 4.45 | .0117 |
| .50 | .6065 | 2.50 | .0821 | 4.50 | .0111 |
| .55 | .5769 | 2.55 | .0781 | 4.55 | .0106 |
| .60 | .5488 | 2.60 | .0743 | 4.60 | .0101 |
| .65 | .5220 | 2.65 | .0707 | 4.65 | .0096 |
| .70 | .4966 | 2.70 | .0672 | 4.70 | .0091 |
| .75 | .4724 | 2.75 | .0639 | 4.75 | .0087 |
| .80 | .4493 | 2.80 | .0608 | 4.80 | .0082 |
| .85 | .4274 | 2.85 | .0578 | 4.85 | .0078 |
| .90 | .4066 | 2.90 | .0550 | 4.90 | .0074 |
| .95 | .3867 | 2.95 | .0523 | 4.95 | .0071 |
| 1.00 | .3679 | 3.00 | .0498 | 5.00 | .0067 |
| 1.05 | .3499 | 3.05 | .0474 | 6.00 | .0025 |
| 1.10 | .3329 | 3.10 | .0450 | 7.00 | .0009 |
| 1.15 | .3166 | 3.15 | .0429 | 8.00 | .000335 |
| 1.20 | .3012 | 3.20 | .0408 | 9.00 | .000123 |
| | | | | 10.00 | .000045 |
| 1.25 | .2865 | 3.25 | .0388 | | |
| 1.30 | .2725 | 3.30 | .0369 | | |
| 1.35 | .2592 | 3.35 | .0351 | | |
| 1.40 | .2466 | 3.40 | .0334 | | |
| 1.45 | .2346 | 3.45 | .0317 | | |
| 1.50 | .2231 | 3.50 | .0302 | | |
| 1.55 | .2122 | 3.55 | .0287 | | |
| 1.60 | .2019 | 3.60 | .0273 | | |
| 1.65 | .1920 | 3.65 | .0260 | | |
| 1.70 | .1827 | 3.70 | .0247 | | |
| 1.75 | .1738 | 3.75 | .0235 | | |
| 1.80 | .1653 | 3.80 | .0224 | | |
| 1.85 | .1572 | 3.85 | .0213 | | |
| 1.90 | .1496 | 3.90 | .0202 | | |
| 1.95 | .1423 | 3.95 | .0193 | | |
| 2.00 | .1353 | 4.00 | .0183 | | |