

115年公務人員特種考試警察人員、一般警察人員、  
國家安全局國家安全情報人員及移民行政人員考試試題

代號：50620  
頁次：7-1

考試別：國家安全情報人員考試

等別：三等考試

類科組別：數理組（選試英文）

科目：機率統計

考試時間：2 小時

座號：\_\_\_\_\_

※注意：(一)可以使用電子計算器。

(二)不必抄題，作答時請將試題題號及答案依照順序寫在試卷上，於本試題上作答者，不予計分。

(三)本科目除專門名詞或數理公式外，應使用本國文字作答。

一、令隨機向量  $(X, Y)$  為一服從連續型均勻分配之隨機向量，其值域為  $0 < x < 1$ ， $0 < y < 1$ ， $x + y < 1$ ，請回答下列問題：

（每小題 5 分，共 20 分）

(一)  $(X, Y)$  之聯合密度函數為何？

(二)  $P(X + Y = 0.5) = ?$

(三)  $P(X + Y < 0.5) = ?$

(四) 在給定  $Y = y$ ， $0 < y < 1$  時， $X$  之條件期望值為何？

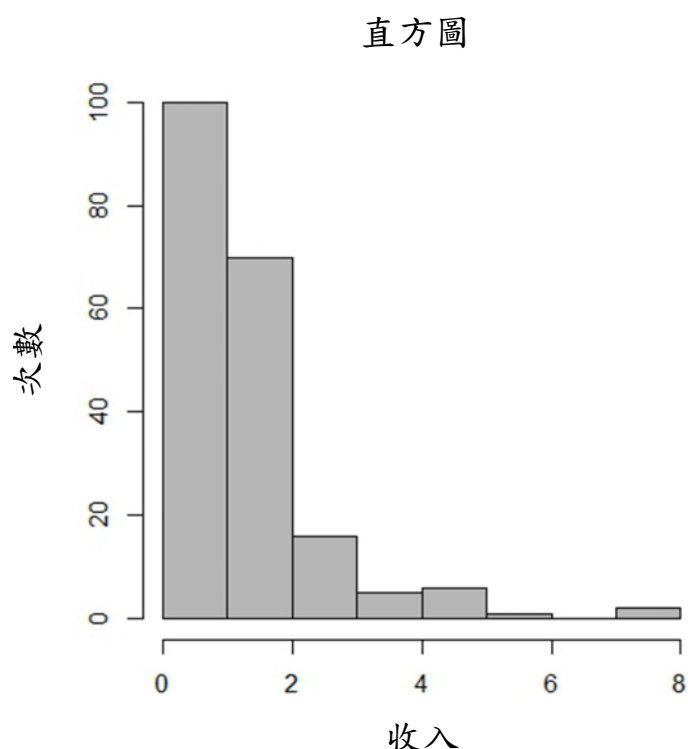
二、某集團為評估是否要於甲市中再設立一處大賣場，計劃先評估甲市內家戶之消費能力，若家戶平均每月可支配所得超過新臺幣 10 萬元，則可進一步考慮設立新的大賣場。為此該集團進行了一項調查，本調查以簡單隨機方式於甲市選擇了 500 份家戶樣本，詢問樣本家戶之每月可支配所得，所得樣本平均為 10.5 萬元，樣本變異數為 125 萬元平方。請回答下列問題：（每小題 10 分，共 30 分）

(一) 請以一組樣本之  $t$  檢定，在 95% 之信心水準下，判斷該集團是否需進一步評估在甲市設立另一處大賣場，請敘明適當之虛無及對立假設。

(二) 如果該市之家戶平均每月可支配所得確實已達新臺幣 10.5 萬元，請問(一)之檢定之型二誤差機率為何？如何解釋此一型二誤差？

(三) 某人進一步檢視這 500 筆資料，發現正如一般的所得資料常見之情形，樣本資料呈現右偏，但一組樣本之  $t$  檢定假設母體為常態，因此質疑在此使用本檢定是否合宜，但執行調查單位解釋，因為樣本數足夠大，所以還是可以使用一組樣本之  $t$  檢定，請解釋執行單位此一說明之理論依據。

三、為研析家庭收入狀況，某鎮公所蒐集了 200 筆家庭收入資料，繪製直方圖如下：



請回答下列問題：（每小題 5 分，共 10 分）

- (一)這 200 筆資料之樣本平均數及樣本中位數之大小關係為何？請說明理由。
- (二)樣本平均數及樣本中位數中何者在此一狀況下比較適合用以描述資料之位置或整體水準？

四、為研析作物產量與化肥用量的關係，蒐集了 10 筆稻田資料，記錄其每公畝稻米產量及化肥用量資料如下：

|          |    |    |    |    |    |    |    |    |    |    |
|----------|----|----|----|----|----|----|----|----|----|----|
| 稻米產量（公斤） | 54 | 78 | 60 | 90 | 57 | 96 | 57 | 75 | 81 | 72 |
| 化肥用量（公斤） | 4  | 4  | 6  | 11 | 7  | 7  | 4  | 5  | 5  | 7  |

樣本統計量為：

|       |          |          |
|-------|----------|----------|
|       | 稻米產量（公斤） | 化肥用量（公斤） |
| 樣本平均  | 72       | 6        |
| 樣本變異數 | 216      | 4.67     |
| 相關係數  | 0.4935   |          |

若欲配置一簡單線性迴歸模型，以化肥用量為解釋變數，稻米產量為反應變數，請回答下列問題：

(一)寫出此一線性模型中之斜率及截距之最小平方法估計值，並解釋其含意。(10分)

(二)寫出此一線性模型之變異數分析表如下格式：(10分)

| 變異來源 | 平方和 (SS) | 自由度 (df) | 均方 (MS) | F |
|------|----------|----------|---------|---|
| 迴歸   |          |          |         |   |
| 殘差   |          |          |         |   |
| 總和   |          |          |         |   |

(三)請問在 95%信心水準下，化肥用量是否為稻米產量之顯著解釋變數。(5分)

五、一組獨立且分配一致之隨機變數  $X_1, X_2, \dots, X_n$ ， $X_i$  服從伽瑪分布， $X_i \sim \Gamma(a, b)$ ，其密度函數如下：

$$f(x_i) = \frac{x_i^{a-1} \exp(-x_i / b)}{b^a \Gamma(a)}, \quad x_i > 0$$

其中  $a > 0$ ， $b > 0$  為本分布之參數。已知  $X_i$  之期望值及變異數分別為  $E(X_i) = ab$  及  $\text{var}(X_i) = ab^2$ ，令  $X_1, X_2, \dots, X_n$  之樣本平均及樣本變異數

分別為  $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$  及  $S^2 = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$ ，請回答下列問題：

(一)請以動差估計法利用  $\bar{X}$  及  $S^2$  估計參數  $a$  及  $b$ 。(10分)

(二)請敘述動差估計法之優點。(5分)

表一

Critical Values for Student's  $t$ -Distribution.

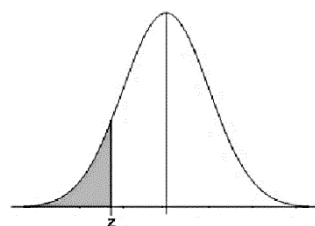


| Critical Values for Student's <i>t</i> Distribution |                                                   |       |       |       |        |        |        |        |        |         |
|-----------------------------------------------------|---------------------------------------------------|-------|-------|-------|--------|--------|--------|--------|--------|---------|
| df                                                  | Upper Tail Probability: Pr( <i>T</i> > <i>t</i> ) |       |       |       |        |        |        |        |        |         |
|                                                     | 0.2                                               | 0.1   | 0.05  | 0.04  | 0.03   | 0.025  | 0.02   | 0.01   | 0.005  | 0.0005  |
| 1                                                   | 1.376                                             | 3.078 | 6.314 | 7.916 | 10.579 | 12.706 | 15.895 | 31.821 | 63.657 | 636.619 |
| 2                                                   | 1.061                                             | 1.886 | 2.920 | 3.320 | 3.896  | 4.303  | 4.849  | 6.965  | 9.925  | 31.599  |
| 3                                                   | 0.978                                             | 1.638 | 2.353 | 2.605 | 2.951  | 3.182  | 3.482  | 4.541  | 5.841  | 12.924  |
| 4                                                   | 0.941                                             | 1.533 | 2.132 | 2.333 | 2.601  | 2.776  | 2.999  | 3.747  | 4.604  | 8.610   |
| 5                                                   | 0.920                                             | 1.476 | 2.015 | 2.191 | 2.422  | 2.571  | 2.757  | 3.365  | 4.032  | 6.869   |
| 6                                                   | 0.906                                             | 1.440 | 1.943 | 2.104 | 2.313  | 2.447  | 2.612  | 3.143  | 3.707  | 5.959   |
| 7                                                   | 0.896                                             | 1.415 | 1.895 | 2.046 | 2.241  | 2.365  | 2.517  | 2.998  | 3.499  | 5.408   |
| 8                                                   | 0.889                                             | 1.397 | 1.860 | 2.004 | 2.189  | 2.306  | 2.449  | 2.896  | 3.355  | 5.041   |
| 9                                                   | 0.883                                             | 1.383 | 1.833 | 1.973 | 2.150  | 2.262  | 2.398  | 2.821  | 3.250  | 4.781   |
| 10                                                  | 0.879                                             | 1.372 | 1.812 | 1.948 | 2.120  | 2.228  | 2.359  | 2.764  | 3.169  | 4.587   |
| 11                                                  | 0.876                                             | 1.363 | 1.796 | 1.928 | 2.096  | 2.201  | 2.328  | 2.718  | 3.106  | 4.437   |
| 12                                                  | 0.873                                             | 1.356 | 1.782 | 1.912 | 2.076  | 2.179  | 2.303  | 2.681  | 3.055  | 4.318   |
| 13                                                  | 0.870                                             | 1.350 | 1.771 | 1.899 | 2.060  | 2.160  | 2.282  | 2.650  | 3.012  | 4.221   |
| 14                                                  | 0.868                                             | 1.345 | 1.761 | 1.887 | 2.046  | 2.145  | 2.264  | 2.624  | 2.977  | 4.140   |
| 15                                                  | 0.866                                             | 1.341 | 1.753 | 1.878 | 2.034  | 2.131  | 2.249  | 2.602  | 2.947  | 4.073   |
| 16                                                  | 0.865                                             | 1.337 | 1.746 | 1.869 | 2.024  | 2.120  | 2.235  | 2.583  | 2.921  | 4.015   |
| 17                                                  | 0.863                                             | 1.333 | 1.740 | 1.862 | 2.015  | 2.110  | 2.224  | 2.567  | 2.898  | 3.965   |
| 18                                                  | 0.862                                             | 1.330 | 1.734 | 1.855 | 2.007  | 2.101  | 2.214  | 2.552  | 2.878  | 3.922   |
| 19                                                  | 0.861                                             | 1.328 | 1.729 | 1.850 | 2.000  | 2.093  | 2.205  | 2.539  | 2.861  | 3.883   |
| 20                                                  | 0.860                                             | 1.325 | 1.725 | 1.844 | 1.994  | 2.086  | 2.197  | 2.528  | 2.845  | 3.850   |
| 21                                                  | 0.859                                             | 1.323 | 1.721 | 1.840 | 1.988  | 2.080  | 2.189  | 2.518  | 2.831  | 3.819   |
| 22                                                  | 0.858                                             | 1.321 | 1.717 | 1.835 | 1.983  | 2.074  | 2.183  | 2.508  | 2.819  | 3.792   |
| 23                                                  | 0.858                                             | 1.319 | 1.714 | 1.832 | 1.978  | 2.069  | 2.177  | 2.500  | 2.807  | 3.768   |
| 24                                                  | 0.857                                             | 1.318 | 1.711 | 1.828 | 1.974  | 2.064  | 2.172  | 2.492  | 2.797  | 3.745   |
| 25                                                  | 0.856                                             | 1.316 | 1.708 | 1.825 | 1.970  | 2.060  | 2.167  | 2.485  | 2.787  | 3.725   |
| 26                                                  | 0.856                                             | 1.315 | 1.706 | 1.822 | 1.967  | 2.056  | 2.162  | 2.479  | 2.779  | 3.707   |
| 27                                                  | 0.855                                             | 1.314 | 1.703 | 1.819 | 1.963  | 2.052  | 2.158  | 2.473  | 2.771  | 3.690   |
| 28                                                  | 0.855                                             | 1.313 | 1.701 | 1.817 | 1.960  | 2.048  | 2.154  | 2.467  | 2.763  | 3.674   |
| 29                                                  | 0.854                                             | 1.311 | 1.699 | 1.814 | 1.957  | 2.045  | 2.150  | 2.462  | 2.756  | 3.659   |
| 30                                                  | 0.854                                             | 1.310 | 1.697 | 1.812 | 1.955  | 2.042  | 2.147  | 2.457  | 2.750  | 3.646   |
| 31                                                  | 0.853                                             | 1.309 | 1.696 | 1.810 | 1.952  | 2.040  | 2.144  | 2.453  | 2.744  | 3.633   |
| 32                                                  | 0.853                                             | 1.309 | 1.694 | 1.808 | 1.950  | 2.037  | 2.141  | 2.449  | 2.738  | 3.622   |
| 33                                                  | 0.853                                             | 1.308 | 1.692 | 1.806 | 1.948  | 2.035  | 2.138  | 2.445  | 2.733  | 3.611   |
| 34                                                  | 0.852                                             | 1.307 | 1.691 | 1.805 | 1.946  | 2.032  | 2.136  | 2.441  | 2.728  | 3.601   |
| 35                                                  | 0.852                                             | 1.306 | 1.690 | 1.803 | 1.944  | 2.030  | 2.133  | 2.438  | 2.724  | 3.591   |
| 36                                                  | 0.852                                             | 1.306 | 1.688 | 1.802 | 1.942  | 2.028  | 2.131  | 2.434  | 2.719  | 3.582   |
| 37                                                  | 0.851                                             | 1.305 | 1.687 | 1.800 | 1.940  | 2.026  | 2.129  | 2.431  | 2.715  | 3.574   |
| 38                                                  | 0.851                                             | 1.304 | 1.686 | 1.799 | 1.939  | 2.024  | 2.127  | 2.429  | 2.712  | 3.566   |
| 39                                                  | 0.851                                             | 1.304 | 1.685 | 1.798 | 1.937  | 2.023  | 2.125  | 2.426  | 2.708  | 3.558   |
| 40                                                  | 0.851                                             | 1.303 | 1.684 | 1.796 | 1.936  | 2.021  | 2.123  | 2.423  | 2.704  | 3.551   |
| 41                                                  | 0.850                                             | 1.303 | 1.683 | 1.795 | 1.934  | 2.020  | 2.121  | 2.421  | 2.701  | 3.544   |
| 42                                                  | 0.850                                             | 1.302 | 1.682 | 1.794 | 1.933  | 2.018  | 2.120  | 2.418  | 2.698  | 3.538   |
| 43                                                  | 0.850                                             | 1.302 | 1.681 | 1.793 | 1.932  | 2.017  | 2.118  | 2.416  | 2.695  | 3.532   |
| 44                                                  | 0.850                                             | 1.301 | 1.680 | 1.792 | 1.931  | 2.015  | 2.116  | 2.414  | 2.692  | 3.526   |
| 45                                                  | 0.850                                             | 1.301 | 1.679 | 1.791 | 1.929  | 2.014  | 2.115  | 2.412  | 2.690  | 3.520   |
| 46                                                  | 0.850                                             | 1.300 | 1.679 | 1.790 | 1.928  | 2.013  | 2.114  | 2.410  | 2.687  | 3.515   |
| 47                                                  | 0.849                                             | 1.300 | 1.678 | 1.789 | 1.927  | 2.012  | 2.112  | 2.408  | 2.685  | 3.510   |
| 48                                                  | 0.849                                             | 1.299 | 1.677 | 1.789 | 1.926  | 2.011  | 2.111  | 2.407  | 2.682  | 3.505   |
| 49                                                  | 0.849                                             | 1.299 | 1.677 | 1.788 | 1.925  | 2.010  | 2.110  | 2.405  | 2.680  | 3.500   |
| 50                                                  | 0.849                                             | 1.299 | 1.676 | 1.787 | 1.924  | 2.009  | 2.109  | 2.403  | 2.678  | 3.496   |
| 60                                                  | 0.848                                             | 1.296 | 1.671 | 1.781 | 1.917  | 2.000  | 2.099  | 2.390  | 2.660  | 3.460   |
| 70                                                  | 0.847                                             | 1.294 | 1.667 | 1.776 | 1.912  | 1.994  | 2.093  | 2.381  | 2.648  | 3.435   |
| 80                                                  | 0.846                                             | 1.292 | 1.664 | 1.773 | 1.908  | 1.990  | 2.088  | 2.374  | 2.639  | 3.416   |
| 90                                                  | 0.846                                             | 1.291 | 1.662 | 1.771 | 1.905  | 1.987  | 2.084  | 2.368  | 2.632  | 3.402   |
| 100                                                 | 0.845                                             | 1.290 | 1.660 | 1.769 | 1.902  | 1.984  | 2.081  | 2.364  | 2.626  | 3.390   |
| 120                                                 | 0.845                                             | 1.289 | 1.658 | 1.766 | 1.899  | 1.980  | 2.076  | 2.358  | 2.617  | 3.373   |
| 140                                                 | 0.844                                             | 1.288 | 1.656 | 1.763 | 1.896  | 1.977  | 2.073  | 2.353  | 2.611  | 3.361   |
| 180                                                 | 0.844                                             | 1.286 | 1.653 | 1.761 | 1.893  | 1.973  | 2.069  | 2.347  | 2.603  | 3.345   |
| 200                                                 | 0.843                                             | 1.286 | 1.653 | 1.760 | 1.892  | 1.972  | 2.067  | 2.345  | 2.601  | 3.340   |
| 500                                                 | 0.842                                             | 1.283 | 1.648 | 1.754 | 1.885  | 1.965  | 2.059  | 2.334  | 2.586  | 3.310   |
| 1000                                                | 0.842                                             | 1.282 | 1.646 | 1.752 | 1.883  | 1.962  | 2.056  | 2.330  | 2.581  | 3.300   |
| ∞                                                   | 0.842                                             | 1.282 | 1.645 | 1.751 | 1.881  | 1.960  | 2.054  | 2.326  | 2.576  | 3.291   |
|                                                     | 60%                                               | 80%   | 90%   | 92%   | 94%    | 95%    | 96%    | 98%    | 99%    | 99.9%   |
|                                                     | Confidence Level                                  |       |       |       |        |        |        |        |        |         |

Note:  $t(\infty)_{\alpha/2} = Z_{\alpha/2}$  in our notation.

表二—1

# Standard Normal Cumulative Probability Table

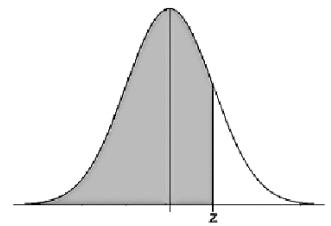


Cumulative probabilities for NEGATIVE z-values are shown in the following table:

| z    | 0.00   | 0.01   | 0.02   | 0.03   | 0.04   | 0.05   | 0.06   | 0.07   | 0.08   | 0.09   |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -3.4 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0002 |
| -3.3 | 0.0005 | 0.0005 | 0.0005 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0003 |
| -3.2 | 0.0007 | 0.0007 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0005 | 0.0005 | 0.0005 |
| -3.1 | 0.0010 | 0.0009 | 0.0009 | 0.0009 | 0.0008 | 0.0008 | 0.0008 | 0.0008 | 0.0007 | 0.0007 |
| -3.0 | 0.0013 | 0.0013 | 0.0013 | 0.0012 | 0.0012 | 0.0011 | 0.0011 | 0.0011 | 0.0010 | 0.0010 |
| -2.9 | 0.0019 | 0.0018 | 0.0018 | 0.0017 | 0.0016 | 0.0016 | 0.0015 | 0.0015 | 0.0014 | 0.0014 |
| -2.8 | 0.0026 | 0.0025 | 0.0024 | 0.0023 | 0.0023 | 0.0022 | 0.0021 | 0.0021 | 0.0020 | 0.0019 |
| -2.7 | 0.0035 | 0.0034 | 0.0033 | 0.0032 | 0.0031 | 0.0030 | 0.0029 | 0.0028 | 0.0027 | 0.0026 |
| -2.6 | 0.0047 | 0.0045 | 0.0044 | 0.0043 | 0.0041 | 0.0040 | 0.0039 | 0.0038 | 0.0037 | 0.0036 |
| -2.5 | 0.0062 | 0.0060 | 0.0059 | 0.0057 | 0.0055 | 0.0054 | 0.0052 | 0.0051 | 0.0049 | 0.0048 |
| -2.4 | 0.0082 | 0.0080 | 0.0078 | 0.0075 | 0.0073 | 0.0071 | 0.0069 | 0.0068 | 0.0066 | 0.0064 |
| -2.3 | 0.0107 | 0.0104 | 0.0102 | 0.0099 | 0.0096 | 0.0094 | 0.0091 | 0.0089 | 0.0087 | 0.0084 |
| -2.2 | 0.0139 | 0.0136 | 0.0132 | 0.0129 | 0.0125 | 0.0122 | 0.0119 | 0.0116 | 0.0113 | 0.0110 |
| -2.1 | 0.0179 | 0.0174 | 0.0170 | 0.0166 | 0.0162 | 0.0158 | 0.0154 | 0.0150 | 0.0146 | 0.0143 |
| -2.0 | 0.0228 | 0.0222 | 0.0217 | 0.0212 | 0.0207 | 0.0202 | 0.0197 | 0.0192 | 0.0188 | 0.0183 |
| -1.9 | 0.0287 | 0.0281 | 0.0274 | 0.0268 | 0.0262 | 0.0256 | 0.0250 | 0.0244 | 0.0239 | 0.0233 |
| -1.8 | 0.0359 | 0.0351 | 0.0344 | 0.0336 | 0.0329 | 0.0322 | 0.0314 | 0.0307 | 0.0301 | 0.0294 |
| -1.7 | 0.0446 | 0.0436 | 0.0427 | 0.0418 | 0.0409 | 0.0401 | 0.0392 | 0.0384 | 0.0375 | 0.0367 |
| -1.6 | 0.0548 | 0.0537 | 0.0526 | 0.0516 | 0.0505 | 0.0495 | 0.0485 | 0.0475 | 0.0465 | 0.0455 |
| -1.5 | 0.0668 | 0.0655 | 0.0643 | 0.0630 | 0.0618 | 0.0606 | 0.0594 | 0.0582 | 0.0571 | 0.0559 |
| -1.4 | 0.0808 | 0.0793 | 0.0778 | 0.0764 | 0.0749 | 0.0735 | 0.0721 | 0.0708 | 0.0694 | 0.0681 |
| -1.3 | 0.0968 | 0.0951 | 0.0934 | 0.0918 | 0.0901 | 0.0885 | 0.0869 | 0.0853 | 0.0838 | 0.0823 |
| -1.2 | 0.1151 | 0.1131 | 0.1112 | 0.1093 | 0.1075 | 0.1056 | 0.1038 | 0.1020 | 0.1003 | 0.0985 |
| -1.1 | 0.1357 | 0.1335 | 0.1314 | 0.1292 | 0.1271 | 0.1251 | 0.1230 | 0.1210 | 0.1190 | 0.1170 |
| -1.0 | 0.1587 | 0.1562 | 0.1539 | 0.1515 | 0.1492 | 0.1469 | 0.1446 | 0.1423 | 0.1401 | 0.1379 |
| -0.9 | 0.1841 | 0.1814 | 0.1788 | 0.1762 | 0.1736 | 0.1711 | 0.1685 | 0.1660 | 0.1635 | 0.1611 |
| -0.8 | 0.2119 | 0.2090 | 0.2061 | 0.2033 | 0.2005 | 0.1977 | 0.1949 | 0.1922 | 0.1894 | 0.1867 |
| -0.7 | 0.2420 | 0.2389 | 0.2358 | 0.2327 | 0.2296 | 0.2266 | 0.2236 | 0.2206 | 0.2177 | 0.2148 |
| -0.6 | 0.2743 | 0.2709 | 0.2676 | 0.2643 | 0.2611 | 0.2578 | 0.2546 | 0.2514 | 0.2483 | 0.2451 |
| -0.5 | 0.3085 | 0.3050 | 0.3015 | 0.2981 | 0.2946 | 0.2912 | 0.2877 | 0.2843 | 0.2810 | 0.2776 |
| -0.4 | 0.3446 | 0.3409 | 0.3372 | 0.3336 | 0.3300 | 0.3264 | 0.3228 | 0.3192 | 0.3156 | 0.3121 |
| -0.3 | 0.3821 | 0.3783 | 0.3745 | 0.3707 | 0.3669 | 0.3632 | 0.3594 | 0.3557 | 0.3520 | 0.3483 |
| -0.2 | 0.4207 | 0.4168 | 0.4129 | 0.4090 | 0.4052 | 0.4013 | 0.3974 | 0.3936 | 0.3897 | 0.3859 |
| -0.1 | 0.4602 | 0.4562 | 0.4522 | 0.4483 | 0.4443 | 0.4404 | 0.4364 | 0.4325 | 0.4286 | 0.4247 |
| 0.0  | 0.5000 | 0.4960 | 0.4920 | 0.4880 | 0.4840 | 0.4801 | 0.4761 | 0.4721 | 0.4681 | 0.4641 |

表二—2

## Standard Normal Cumulative Probability Table



**Cumulative probabilities for POSITIVE z-values are shown in the following table:**

| z   | 0.00   | 0.01   | 0.02   | 0.03   | 0.04   | 0.05   | 0.06   | 0.07   | 0.08   | 0.09   |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7852 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8810 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9772 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9864 | 0.9868 | 0.9871 | 0.9875 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9925 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9979 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| 3.0 | 0.9987 | 0.9987 | 0.9987 | 0.9988 | 0.9988 | 0.9989 | 0.9989 | 0.9989 | 0.9990 | 0.9990 |
| 3.1 | 0.9990 | 0.9991 | 0.9991 | 0.9991 | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9993 | 0.9993 |
| 3.2 | 0.9993 | 0.9993 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9995 | 0.9995 | 0.9995 |
| 3.3 | 0.9995 | 0.9995 | 0.9995 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9997 |
| 3.4 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9998 |

表三

| Critical Values of the $F$ -Distribution: $\alpha = 0.05$ |                              |         |         |         |         |         |         |         |         |         |
|-----------------------------------------------------------|------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Denom.                                                    | Numerator Degrees of Freedom |         |         |         |         |         |         |         |         |         |
| d.f.                                                      | 1                            | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10      |
| 1                                                         | 161.448                      | 199.500 | 215.707 | 224.583 | 230.162 | 233.986 | 236.768 | 238.883 | 240.543 | 241.882 |
| 2                                                         | 18.513                       | 19.000  | 19.164  | 19.247  | 19.296  | 19.330  | 19.353  | 19.371  | 19.385  | 19.396  |
| 3                                                         | 10.128                       | 9.552   | 9.277   | 9.117   | 9.013   | 8.941   | 8.887   | 8.845   | 8.812   | 8.786   |
| 4                                                         | 7.709                        | 6.944   | 6.591   | 6.388   | 6.256   | 6.163   | 6.094   | 6.041   | 5.999   | 5.964   |
| 5                                                         | 6.608                        | 5.786   | 5.409   | 5.192   | 5.050   | 4.950   | 4.876   | 4.818   | 4.772   | 4.735   |
| 6                                                         | 5.987                        | 5.143   | 4.757   | 4.534   | 4.387   | 4.284   | 4.207   | 4.147   | 4.099   | 4.060   |
| 7                                                         | 5.591                        | 4.737   | 4.347   | 4.120   | 3.972   | 3.866   | 3.787   | 3.726   | 3.677   | 3.637   |
| 8                                                         | 5.318                        | 4.459   | 4.066   | 3.838   | 3.687   | 3.581   | 3.500   | 3.438   | 3.388   | 3.347   |
| 9                                                         | 5.117                        | 4.256   | 3.863   | 3.633   | 3.482   | 3.374   | 3.293   | 3.230   | 3.179   | 3.137   |
| 10                                                        | 4.965                        | 4.103   | 3.708   | 3.478   | 3.326   | 3.217   | 3.135   | 3.072   | 3.020   | 2.978   |
| 11                                                        | 4.844                        | 3.982   | 3.587   | 3.357   | 3.204   | 3.095   | 3.012   | 2.948   | 2.896   | 2.854   |
| 12                                                        | 4.747                        | 3.885   | 3.490   | 3.259   | 3.106   | 2.996   | 2.913   | 2.849   | 2.796   | 2.753   |
| 13                                                        | 4.667                        | 3.806   | 3.411   | 3.179   | 3.025   | 2.915   | 2.832   | 2.767   | 2.714   | 2.671   |
| 14                                                        | 4.600                        | 3.739   | 3.344   | 3.112   | 2.958   | 2.848   | 2.764   | 2.699   | 2.646   | 2.602   |
| 15                                                        | 4.543                        | 3.682   | 3.287   | 3.056   | 2.901   | 2.790   | 2.707   | 2.641   | 2.588   | 2.544   |
| 16                                                        | 4.494                        | 3.634   | 3.239   | 3.007   | 2.852   | 2.741   | 2.657   | 2.591   | 2.538   | 2.494   |
| 17                                                        | 4.451                        | 3.592   | 3.197   | 2.965   | 2.810   | 2.699   | 2.614   | 2.548   | 2.494   | 2.450   |
| 18                                                        | 4.414                        | 3.555   | 3.160   | 2.928   | 2.773   | 2.661   | 2.577   | 2.510   | 2.456   | 2.412   |
| 19                                                        | 4.381                        | 3.522   | 3.127   | 2.895   | 2.740   | 2.628   | 2.544   | 2.477   | 2.423   | 2.378   |
| 20                                                        | 4.351                        | 3.493   | 3.098   | 2.866   | 2.711   | 2.599   | 2.514   | 2.447   | 2.393   | 2.348   |
| 21                                                        | 4.325                        | 3.467   | 3.072   | 2.840   | 2.685   | 2.573   | 2.488   | 2.420   | 2.366   | 2.321   |
| 22                                                        | 4.301                        | 3.443   | 3.049   | 2.817   | 2.661   | 2.549   | 2.464   | 2.397   | 2.342   | 2.297   |
| 23                                                        | 4.279                        | 3.422   | 3.028   | 2.796   | 2.640   | 2.528   | 2.442   | 2.375   | 2.320   | 2.275   |
| 24                                                        | 4.260                        | 3.403   | 3.009   | 2.776   | 2.621   | 2.508   | 2.423   | 2.355   | 2.300   | 2.255   |
| 25                                                        | 4.242                        | 3.385   | 2.991   | 2.759   | 2.603   | 2.490   | 2.405   | 2.337   | 2.282   | 2.236   |
| 26                                                        | 4.225                        | 3.369   | 2.975   | 2.743   | 2.587   | 2.474   | 2.388   | 2.321   | 2.265   | 2.220   |
| 27                                                        | 4.210                        | 3.354   | 2.960   | 2.728   | 2.572   | 2.459   | 2.373   | 2.305   | 2.250   | 2.204   |
| 28                                                        | 4.196                        | 3.340   | 2.947   | 2.714   | 2.558   | 2.445   | 2.359   | 2.291   | 2.236   | 2.190   |
| 29                                                        | 4.183                        | 3.328   | 2.934   | 2.701   | 2.545   | 2.432   | 2.346   | 2.278   | 2.223   | 2.177   |
| 30                                                        | 4.171                        | 3.316   | 2.922   | 2.690   | 2.534   | 2.421   | 2.334   | 2.266   | 2.211   | 2.165   |
| 31                                                        | 4.160                        | 3.305   | 2.911   | 2.679   | 2.523   | 2.409   | 2.323   | 2.255   | 2.199   | 2.153   |
| 32                                                        | 4.149                        | 3.295   | 2.901   | 2.668   | 2.512   | 2.399   | 2.313   | 2.244   | 2.189   | 2.142   |
| 33                                                        | 4.139                        | 3.285   | 2.892   | 2.659   | 2.503   | 2.389   | 2.303   | 2.235   | 2.179   | 2.133   |
| 34                                                        | 4.130                        | 3.276   | 2.883   | 2.650   | 2.494   | 2.380   | 2.294   | 2.225   | 2.170   | 2.123   |
| 35                                                        | 4.121                        | 3.267   | 2.874   | 2.641   | 2.485   | 2.372   | 2.285   | 2.217   | 2.161   | 2.114   |
| 36                                                        | 4.113                        | 3.259   | 2.866   | 2.634   | 2.477   | 2.364   | 2.277   | 2.209   | 2.153   | 2.106   |
| 37                                                        | 4.105                        | 3.252   | 2.859   | 2.626   | 2.470   | 2.356   | 2.270   | 2.201   | 2.145   | 2.098   |
| 38                                                        | 4.098                        | 3.245   | 2.852   | 2.619   | 2.463   | 2.349   | 2.262   | 2.194   | 2.138   | 2.091   |
| 39                                                        | 4.091                        | 3.238   | 2.845   | 2.612   | 2.456   | 2.342   | 2.255   | 2.187   | 2.131   | 2.084   |
| 40                                                        | 4.085                        | 3.232   | 2.839   | 2.606   | 2.449   | 2.336   | 2.249   | 2.180   | 2.124   | 2.077   |
| 41                                                        | 4.079                        | 3.226   | 2.833   | 2.600   | 2.443   | 2.330   | 2.243   | 2.174   | 2.118   | 2.071   |
| 42                                                        | 4.073                        | 3.220   | 2.827   | 2.594   | 2.438   | 2.324   | 2.237   | 2.168   | 2.112   | 2.065   |
| 43                                                        | 4.067                        | 3.214   | 2.822   | 2.589   | 2.432   | 2.318   | 2.232   | 2.163   | 2.106   | 2.059   |
| 44                                                        | 4.062                        | 3.209   | 2.816   | 2.584   | 2.427   | 2.313   | 2.226   | 2.157   | 2.101   | 2.054   |
| 45                                                        | 4.057                        | 3.204   | 2.812   | 2.579   | 2.422   | 2.308   | 2.221   | 2.152   | 2.096   | 2.049   |
| 46                                                        | 4.052                        | 3.200   | 2.807   | 2.574   | 2.417   | 2.304   | 2.216   | 2.147   | 2.091   | 2.044   |
| 47                                                        | 4.047                        | 3.195   | 2.802   | 2.570   | 2.413   | 2.299   | 2.212   | 2.143   | 2.086   | 2.039   |
| 48                                                        | 4.043                        | 3.191   | 2.798   | 2.565   | 2.409   | 2.295   | 2.207   | 2.138   | 2.082   | 2.035   |
| 49                                                        | 4.038                        | 3.187   | 2.794   | 2.561   | 2.404   | 2.290   | 2.203   | 2.134   | 2.077   | 2.030   |
| 50                                                        | 4.034                        | 3.183   | 2.790   | 2.557   | 2.400   | 2.286   | 2.199   | 2.130   | 2.073   | 2.026   |
| 60                                                        | 4.001                        | 3.150   | 2.758   | 2.525   | 2.368   | 2.254   | 2.167   | 2.097   | 2.040   | 1.993   |
| 70                                                        | 3.978                        | 3.128   | 2.736   | 2.503   | 2.346   | 2.231   | 2.143   | 2.074   | 2.017   | 1.969   |
| 80                                                        | 3.960                        | 3.111   | 2.719   | 2.486   | 2.329   | 2.214   | 2.126   | 2.056   | 1.999   | 1.951   |
| 90                                                        | 3.947                        | 3.098   | 2.706   | 2.473   | 2.316   | 2.201   | 2.113   | 2.043   | 1.986   | 1.938   |
| 100                                                       | 3.936                        | 3.087   | 2.696   | 2.463   | 2.305   | 2.191   | 2.103   | 2.032   | 1.975   | 1.927   |
| 120                                                       | 3.920                        | 3.072   | 2.680   | 2.447   | 2.290   | 2.175   | 2.087   | 2.016   | 1.959   | 1.910   |
| 140                                                       | 3.909                        | 3.061   | 2.669   | 2.436   | 2.279   | 2.164   | 2.076   | 2.005   | 1.947   | 1.899   |
| 180                                                       | 3.894                        | 3.046   | 2.655   | 2.422   | 2.264   | 2.149   | 2.061   | 1.990   | 1.932   | 1.884   |
| 200                                                       | 3.888                        | 3.041   | 2.650   | 2.417   | 2.259   | 2.144   | 2.056   | 1.985   | 1.927   | 1.878   |
| $\infty$                                                  | 3.841                        | 2.996   | 2.605   | 2.372   | 2.214   | 2.099   | 2.010   | 1.938   | 1.880   | 1.831   |