

本試題是否可以使用計算機： 可使用  不可使用 (請命題老師勾選)

考試日期：0302，節次：1

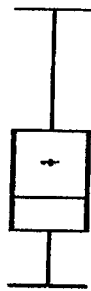
請根據下列敘述回答問題 1-8

(簡答與單、複選題 50%)

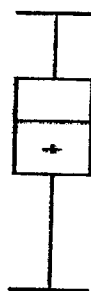
為探討咖啡攝取與疾病 A 之間的關係，假設研究者由一很大之母群體中隨機抽出一樣本 40 人來做研究，所收集之基本資料如表一，並可進一步整理成表二。由此 40 人的資料得到，罹患疾病 A 者每日飲用咖啡平均為 46.1 ml (變異數為 756.5)，而沒有疾病 A 者每日飲用咖啡平均為 52.5 ml (變異數為 979.3)。請問：

1. 此樣本中咖啡攝取量的平均數? (3 pts)
2. 由此樣本咖啡攝取之四分位(quantiles)分佈，得到中位數為 46.5，第一四分位為 23.5，第三四分位為 80.5。可知繪製出的箱型圖最可能為下列何者? (3 pts)

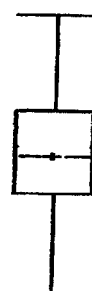
a.



b.



c.



3. 請問如何估計樣本之抽樣誤差? (4 pts)
4. 以 40 ml 為切點，咖啡攝取量高低兩組對於疾病 A 之得病危險差異(risk difference)為? (4 pts)
5. 探討咖啡攝取與疾病 A 之間的關係，依據以下資料至少有三種不同的檢定方法。假設你是此研究者，在顯著水準(alpha level)為 0.05 之下
  - a 顯著水準為 0.05 代表的意義為? (3 pts)
  - b 請舉出兩種檢定方法? 並依據檢定方法清楚寫出虛無和對立假設。 (8 pts)
  - c 依據提出的兩種檢定方法，選定其中一種，計算資料檢定值並描述顯著性結果。 (8 pts)
  - d 依據檢定的結果，請對咖啡攝取與疾病 A 之間的關係下一結論。 (3 pts)
6. 在得到上述之結論後，研究者估計第二型誤差( $\beta$ )為 0.67。對於咖啡攝取與疾病 A 之間的關係，下列描述何者為真? (4 pts)
  - a 此研究有足夠的檢力(power)下結論
  - b 依題 4 中疾病 A 之得病危險差異，其 95%信賴區間長度比上 99%信賴區間長度為 95:99
  - c 資料顯示有、無罹患疾病 A 者每日平均飲用咖啡量差異為 6.4 ml。若同時另有甲研究報告有、無罹患疾病 A 者，每日平均飲用咖啡差異為 5.2 ml，則另一研究相比於此研究有較低的檢力
  - d 為達到 0.8 的檢力，研究者應該增加樣本數

(背面仍有題目,請繼續作答)

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7. 此研究中研究者亦收集憂鬱症狀評量的分數資料，已知憂鬱症狀分數越高，預測疾病 A 發生的危險性越高。研究者進行咖啡攝取與憂鬱症狀分數間的相關探討，下列描述何者為真？ (5 pts)
- a 咖啡攝取與憂鬱症狀分數間的相關係數為 0.17
  - b 咖啡攝取與憂鬱症狀分數間的相關係數為 -0.17
  - c 咖啡攝取與憂鬱症狀分數間的相關性係數結果可用 T 檢定
  - d 咖啡攝取與憂鬱症狀分數間的相關性係數結果可用 Z 檢定
8. 題 6 中提到的甲研究，在台南市收集了 350 個樣本的憂鬱症狀評量分數，其中 200 為男性，150 名為女性，欲探討咖啡攝取與憂鬱症狀分數間的關係在男女性之間是否有差異。你會建議研究者使用何種方式來分析，並請簡單說明方法及原因？ (5 pts)

表一

|                        |    |    |    |    |    |    |    |    |    |    |
|------------------------|----|----|----|----|----|----|----|----|----|----|
|                        | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| Coffee (ml/per day)    | 63 | 46 | 53 | 33 | 89 | 84 | 93 | 71 | 39 | 41 |
| Disease A (1/0 yes/no) | 1  | 1  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 0  |
|                        | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Coffee (ml/per day)    | 64 | 13 | 39 | 25 | 81 | 64 | 55 | 54 | 36 | 18 |
| Disease A (1/0 yes/no) | 1  | 0  | 1  | 1  | 0  | 0  | 1  | 0  | 1  | 1  |
|                        | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Coffee (ml/per day)    | 12 | 12 | 12 | 1  | 95 | 81 | 32 | 22 | 84 | 4  |
| Disease A (1/0 yes/no) | 1  | 0  | 0  | 1  | 0  | 1  | 1  | 0  | 1  | 1  |
|                        | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| Coffee (ml/per day)    | 10 | 34 | 91 | 80 | 93 | 89 | 18 | 41 | 47 | 53 |
| Disease A (1/0 yes/no) | 0  | 1  | 0  | 0  | 1  | 0  | 0  | 1  | 0  | 0  |

表二

|           |     | Coffee intake   |                 |
|-----------|-----|-----------------|-----------------|
|           |     | > 40 ml per day | ≤ 40 ml per day |
| Disease A | Yes | 10              | 10              |
|           | no  | 13              | 7               |

(顯著性檢定可參考附表)

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9. John and Tom are both 20 years of age. John's WAIS-R IQ ( $\mu=100, \sigma=15$ ) score is 130, and Tom's Stanford-Binet IQ ( $\mu=100, \sigma=16$ ) score is 130. In your opinion, who is smarter? Why? (15 points)
10. Please define content validity and construct validity. Compare and contrast them (25 points).
11. Please explain the following terms (10 points).
- A. convergent validity
  - B. discriminant validity

(背面仍有題目,請繼續作答)



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TABLE 5 Percentage points of the *t* distribution ( $t_{\alpha}$ )<sup>a</sup>

| Degrees of freedom, <i>d</i> | <i>u</i> |       |       |       |       |        |        |        |         |
|------------------------------|----------|-------|-------|-------|-------|--------|--------|--------|---------|
|                              | .75      | .80   | .85   | .90   | .95   | .975   | .99    | .995   | .9995   |
| 1                            | 1.000    | 1.376 | 1.963 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 |
| 2                            | 0.816    | 1.061 | 1.386 | 1.886 | 2.920 | 4.303  | 6.965  | 9.925  | 31.598  |
| 3                            | 0.765    | 0.978 | 1.250 | 1.638 | 2.353 | 3.182  | 4.541  | 5.841  | 12.924  |
| 4                            | 0.741    | 0.941 | 1.190 | 1.533 | 2.132 | 2.776  | 3.747  | 4.604  | 8.610   |
| 5                            | 0.727    | 0.920 | 1.156 | 1.476 | 2.015 | 2.571  | 3.365  | 4.032  | 6.869   |
| 6                            | 0.718    | 0.906 | 1.134 | 1.440 | 1.943 | 2.447  | 3.143  | 3.707  | 5.959   |
| 7                            | 0.711    | 0.896 | 1.119 | 1.415 | 1.895 | 2.365  | 2.998  | 3.499  | 5.408   |
| 8                            | 0.706    | 0.889 | 1.108 | 1.397 | 1.860 | 2.306  | 2.896  | 3.355  | 5.041   |
| 9                            | 0.703    | 0.883 | 1.100 | 1.383 | 1.833 | 2.262  | 2.821  | 3.250  | 4.781   |
| 10                           | 0.700    | 0.879 | 1.093 | 1.372 | 1.812 | 2.228  | 2.764  | 3.169  | 4.587   |
| 11                           | 0.697    | 0.876 | 1.088 | 1.363 | 1.796 | 2.201  | 2.718  | 3.106  | 4.437   |
| 12                           | 0.695    | 0.873 | 1.083 | 1.356 | 1.782 | 2.179  | 2.681  | 3.055  | 4.318   |
| 13                           | 0.694    | 0.870 | 1.079 | 1.350 | 1.771 | 2.160  | 2.650  | 3.012  | 4.221   |
| 14                           | 0.692    | 0.868 | 1.076 | 1.345 | 1.761 | 2.145  | 2.624  | 2.977  | 4.140   |
| 15                           | 0.691    | 0.866 | 1.074 | 1.341 | 1.753 | 2.131  | 2.602  | 2.947  | 4.073   |
| 16                           | 0.690    | 0.865 | 1.071 | 1.337 | 1.746 | 2.120  | 2.583  | 2.921  | 4.015   |
| 17                           | 0.689    | 0.863 | 1.069 | 1.333 | 1.740 | 2.110  | 2.567  | 2.898  | 3.965   |
| 18                           | 0.688    | 0.862 | 1.067 | 1.330 | 1.734 | 2.101  | 2.552  | 2.878  | 3.922   |
| 19                           | 0.688    | 0.861 | 1.066 | 1.328 | 1.729 | 2.093  | 2.539  | 2.861  | 3.883   |
| 20                           | 0.687    | 0.860 | 1.064 | 1.325 | 1.725 | 2.086  | 2.528  | 2.845  | 3.850   |
| 21                           | 0.686    | 0.859 | 1.063 | 1.323 | 1.721 | 2.080  | 2.518  | 2.831  | 3.819   |
| 22                           | 0.686    | 0.858 | 1.061 | 1.321 | 1.717 | 2.074  | 2.508  | 2.819  | 3.792   |
| 23                           | 0.685    | 0.858 | 1.060 | 1.319 | 1.714 | 2.069  | 2.500  | 2.807  | 3.767   |
| 24                           | 0.685    | 0.857 | 1.059 | 1.318 | 1.711 | 2.064  | 2.492  | 2.797  | 3.745   |
| 25                           | 0.684    | 0.856 | 1.058 | 1.316 | 1.708 | 2.060  | 2.485  | 2.787  | 3.725   |
| 26                           | 0.684    | 0.856 | 1.058 | 1.315 | 1.706 | 2.056  | 2.479  | 2.779  | 3.707   |
| 27                           | 0.684    | 0.855 | 1.057 | 1.314 | 1.703 | 2.052  | 2.473  | 2.771  | 3.690   |
| 28                           | 0.683    | 0.855 | 1.056 | 1.313 | 1.701 | 2.048  | 2.467  | 2.763  | 3.674   |
| 29                           | 0.683    | 0.854 | 1.055 | 1.311 | 1.699 | 2.045  | 2.462  | 2.756  | 3.659   |
| 30                           | 0.683    | 0.854 | 1.055 | 1.310 | 1.697 | 2.042  | 2.457  | 2.750  | 3.646   |
| 40                           | 0.681    | 0.851 | 1.050 | 1.303 | 1.684 | 2.021  | 2.423  | 2.704  | 3.551   |
| 60                           | 0.679    | 0.848 | 1.046 | 1.296 | 1.671 | 2.000  | 2.390  | 2.660  | 3.460   |
| 120                          | 0.677    | 0.845 | 1.041 | 1.289 | 1.658 | 1.980  | 2.358  | 2.617  | 3.373   |
| ∞                            | 0.674    | 0.842 | 1.036 | 1.282 | 1.645 | 1.960  | 2.326  | 2.576  | 3.291   |

<sup>a</sup>The *u*th percentile of a *t* distribution with *d* degrees of freedom.  
 [Table 5 is taken from Table III of Fisher and Yates: "Statistical Tables for Biological, Agricultural and Medical Research," published by Longman Group Ltd., London (previously published by Oliver and Boyd Ltd., Edinburgh) and by permission of the authors and publishers.]

(背面仍有題目,請繼續作答)

TABLE 6 Percentage points of the chi-square distribution ( $\chi^2_{d,u}$ )<sup>a</sup>

| d   | u                                 |                                   |                                   |         |       |       |       |        |        |        |        |        |        |        |
|-----|-----------------------------------|-----------------------------------|-----------------------------------|---------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
|     | .005                              | .01                               | .025                              | .05     | .10   | .25   | .50   | .75    | .90    | .95    | .975   | .99    | .995   | .999   |
| 1   | 0.0 <sup>a</sup> 393 <sup>b</sup> | 0.0 <sup>b</sup> 157 <sup>c</sup> | 0.0 <sup>d</sup> 982 <sup>d</sup> | 0.00393 | 0.02  | 0.10  | 0.45  | 1.32   | 2.71   | 3.84   | 5.02   | 6.63   | 7.88   | 10.83  |
| 2   | 0.0100                            | 0.0201                            | 0.0506                            | 0.103   | 0.21  | 0.58  | 1.39  | 2.77   | 4.61   | 5.99   | 7.38   | 9.21   | 10.60  | 13.81  |
| 3   | 0.0717                            | 0.115                             | 0.216                             | 0.352   | 0.58  | 1.21  | 2.37  | 4.11   | 6.25   | 7.81   | 9.35   | 11.34  | 12.84  | 16.27  |
| 4   | 0.207                             | 0.297                             | 0.484                             | 0.711   | 1.06  | 1.92  | 3.36  | 5.39   | 7.78   | 9.49   | 11.14  | 13.28  | 14.86  | 18.47  |
| 5   | 0.412                             | 0.554                             | 0.831                             | 1.15    | 1.61  | 2.67  | 4.35  | 6.63   | 9.24   | 11.07  | 12.83  | 15.09  | 16.75  | 20.52  |
| 6   | 0.676                             | 0.872                             | 1.24                              | 1.64    | 2.20  | 3.45  | 5.35  | 7.84   | 10.64  | 12.59  | 14.45  | 16.81  | 18.55  | 22.46  |
| 7   | 0.989                             | 1.24                              | 1.69                              | 2.17    | 2.83  | 4.25  | 6.35  | 9.04   | 12.02  | 14.07  | 16.01  | 18.48  | 20.28  | 24.32  |
| 8   | 1.34                              | 1.65                              | 2.18                              | 2.73    | 3.49  | 5.07  | 7.34  | 10.22  | 13.36  | 15.51  | 17.53  | 20.09  | 21.95  | 26.12  |
| 9   | 1.73                              | 2.09                              | 2.70                              | 3.33    | 4.17  | 5.90  | 8.34  | 11.39  | 14.68  | 16.92  | 19.02  | 21.67  | 23.59  | 27.88  |
| 10  | 2.16                              | 2.56                              | 3.25                              | 3.94    | 4.87  | 6.74  | 9.34  | 12.55  | 15.99  | 18.31  | 20.48  | 23.21  | 25.19  | 29.59  |
| 11  | 2.60                              | 3.05                              | 3.82                              | 4.57    | 5.58  | 7.58  | 10.34 | 13.70  | 17.28  | 19.68  | 21.92  | 24.72  | 26.76  | 31.26  |
| 12  | 3.07                              | 3.57                              | 4.40                              | 5.23    | 6.30  | 8.44  | 11.34 | 14.85  | 18.55  | 21.03  | 23.34  | 26.22  | 28.30  | 32.91  |
| 13  | 3.57                              | 4.11                              | 5.01                              | 5.89    | 7.04  | 9.30  | 12.34 | 15.98  | 19.81  | 22.36  | 24.74  | 27.69  | 29.82  | 34.53  |
| 14  | 4.07                              | 4.66                              | 5.63                              | 6.57    | 7.79  | 10.17 | 13.34 | 17.12  | 21.06  | 23.68  | 26.12  | 29.14  | 31.32  | 36.12  |
| 15  | 4.60                              | 5.23                              | 6.27                              | 7.26    | 8.55  | 11.04 | 14.34 | 18.25  | 22.31  | 25.00  | 27.49  | 30.58  | 32.80  | 37.70  |
| 16  | 5.14                              | 5.81                              | 6.91                              | 7.96    | 9.31  | 11.91 | 15.34 | 19.37  | 23.54  | 26.30  | 28.85  | 32.00  | 34.27  | 39.25  |
| 17  | 5.70                              | 6.41                              | 7.56                              | 8.67    | 10.09 | 12.79 | 16.34 | 20.49  | 24.77  | 27.59  | 30.19  | 33.41  | 35.72  | 40.79  |
| 18  | 6.26                              | 7.01                              | 8.23                              | 9.39    | 10.86 | 13.68 | 17.34 | 21.60  | 25.99  | 28.87  | 31.53  | 34.81  | 37.16  | 42.31  |
| 19  | 6.84                              | 7.63                              | 8.91                              | 10.12   | 11.65 | 14.56 | 18.34 | 22.72  | 27.20  | 30.14  | 32.85  | 36.19  | 38.58  | 43.82  |
| 20  | 7.43                              | 8.26                              | 9.59                              | 10.85   | 12.44 | 15.45 | 19.34 | 23.83  | 28.41  | 31.41  | 34.17  | 37.57  | 40.00  | 45.32  |
| 21  | 8.03                              | 8.90                              | 10.28                             | 11.59   | 13.24 | 16.34 | 20.34 | 24.93  | 29.62  | 32.67  | 35.48  | 38.93  | 41.40  | 46.80  |
| 22  | 8.64                              | 9.54                              | 10.98                             | 12.34   | 14.04 | 17.24 | 21.34 | 26.04  | 30.81  | 33.92  | 36.78  | 40.29  | 42.80  | 48.27  |
| 23  | 9.26                              | 10.20                             | 11.69                             | 13.09   | 14.85 | 18.14 | 22.34 | 27.14  | 32.01  | 35.17  | 38.08  | 41.64  | 44.18  | 49.73  |
| 24  | 9.89                              | 10.86                             | 12.40                             | 13.85   | 15.66 | 19.04 | 23.34 | 28.24  | 33.20  | 36.42  | 39.36  | 42.98  | 45.56  | 51.18  |
| 25  | 10.52                             | 11.52                             | 13.12                             | 14.61   | 16.47 | 19.94 | 24.34 | 29.34  | 34.38  | 37.65  | 40.65  | 44.31  | 46.93  | 52.62  |
| 26  | 11.16                             | 12.20                             | 13.84                             | 15.38   | 17.29 | 20.84 | 25.34 | 30.43  | 35.56  | 38.89  | 41.92  | 45.64  | 48.29  | 54.05  |
| 27  | 11.81                             | 12.88                             | 14.57                             | 16.15   | 18.11 | 21.75 | 26.34 | 31.53  | 36.74  | 40.11  | 43.19  | 46.96  | 49.64  | 55.48  |
| 28  | 12.46                             | 13.56                             | 15.31                             | 16.93   | 18.94 | 22.66 | 27.34 | 32.62  | 37.92  | 41.34  | 44.46  | 48.28  | 50.99  | 56.89  |
| 29  | 13.12                             | 14.26                             | 16.05                             | 17.71   | 19.77 | 23.57 | 28.34 | 33.71  | 39.09  | 42.56  | 45.72  | 49.59  | 52.34  | 58.30  |
| 30  | 13.79                             | 14.95                             | 16.79                             | 18.49   | 20.60 | 24.48 | 29.34 | 34.80  | 40.26  | 43.77  | 46.98  | 50.89  | 53.67  | 59.70  |
| 40  | 20.71                             | 22.16                             | 24.43                             | 26.51   | 29.05 | 33.66 | 39.34 | 45.62  | 51.81  | 55.76  | 59.34  | 63.69  | 66.77  | 73.40  |
| 50  | 27.99                             | 29.71                             | 32.36                             | 34.76   | 37.69 | 42.94 | 49.33 | 56.33  | 63.17  | 67.50  | 71.42  | 76.15  | 79.49  | 86.66  |
| 60  | 35.53                             | 37.48                             | 40.48                             | 43.19   | 46.46 | 52.29 | 59.33 | 66.98  | 74.40  | 79.08  | 83.30  | 88.38  | 91.95  | 99.61  |
| 70  | 43.28                             | 45.44                             | 48.76                             | 51.74   | 55.33 | 61.70 | 69.33 | 77.58  | 85.53  | 90.59  | 95.02  | 100.42 | 104.22 | 112.32 |
| 80  | 51.17                             | 53.54                             | 57.15                             | 60.39   | 64.28 | 71.14 | 79.33 | 88.13  | 96.58  | 101.88 | 106.63 | 112.33 | 116.32 | 124.84 |
| 90  | 59.20                             | 61.75                             | 65.65                             | 69.13   | 73.29 | 80.62 | 89.33 | 98.64  | 107.56 | 113.14 | 118.14 | 124.12 | 128.30 | 137.21 |
| 100 | 67.33                             | 70.06                             | 74.22                             | 77.93   | 82.36 | 90.13 | 99.33 | 109.14 | 118.50 | 124.34 | 129.56 | 135.81 | 140.17 | 149.45 |

<sup>a</sup> $\chi^2_{d,u}$  = *u*th percentile of a  $\chi^2$  distribution with *d* degrees of freedom.

<sup>b</sup> = 0.0000393

<sup>c</sup> = 0.000157

<sup>d</sup> = 0.000982

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