

國立政治大學 110 學年度第 2 學期 小考 (1) 考試命題紙

考試科目：統計學 (一)

開課班別：統計學整合開課

命題教授：吳漢銘

考試日期：3 月 17 日 (四) 16:10-17:30

※准帶項目打「O」，否則打「×」

1. 需加發計算紙或答案紙請在試題內封袋備註。
2. 為環保節能減碳，試題一律採雙面印刷，如有特殊印製需求，請註記：

本試題共 3 頁，印刷份數：56 份

計算機	課本	筆記	字典	手機平板筆電
O	×	×	×	×

備註：注意事項要看!! (範圍: §10~§11)

注意事項: (1) 答案卷請寫上姓名及學號。(2) 請按題號順序書寫。(3) 每一題號需置於答案卷最左邊。(4) 中英文作答皆可。(5) 可用鉛筆。(6) 需要計算過程。(7) 同時交回答案卷、題目卷、計算紙。(8) 總分共 120 分。

1. (10%) 試舉生活上一個應用「Hypothesis Testing for the Difference Between Two Population Means」的情境範例，同時說明，資料中的變數需滿足什麼條件才能合適地應用此統計方法。
2. (20%) Consider the following data for two independent random samples taken from two normal populations.

Sample 1: 10, 7, 13, 7, 9, 8

Sample 2: 8, 7, 8, 4, 6, 9

- (a) Compute the two sample means.
 - (b) Compute the two sample standard deviations.
 - (c) What is the point estimate of the difference between the two population means?
 - (d) What is the 90% confidence interval estimate of the difference between the two population means?
3. (20%) **Gender Differences in Raise or Promotion Expectations.** The Adecco Workplace Insights Survey sampled men and women workers and asked if they expected to get a raise or promotion this year. Suppose the survey sampled 200 men and 200 women. If 104 of the men replied Yes and 74 of the women replied Yes, are the results statistically significant in that you can conclude a greater proportion of men are expecting to get a raise or a promotion this year?
- (a) State the hypothesis test in terms of the population proportion of men and the population proportion of women.
 - (b) What is the sample proportion for men? For women?
 - (c) Use a .01 level of significance. What is the p -value and what is your conclusion?
4. (10%) A sample of 16 items provides a sample standard deviation of 9.5. Test the following hypotheses using $\alpha = 0.05$. What is your conclusion? Use both the p -value approach and the critical value approach.

$$H_0 : \sigma^2 \geq 50, \quad H_a : \sigma^2 < 50$$

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5. (20%) **Price Comparison of Smoothie Blenders.** 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.

Retail Outlet	Model Price (\$)						
	1	2	3	4	5	6	7
Standard	39	39	45	38	40	39	35
Deluxe	27	28	35	30	30	34	29

- (a) 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.
- (b) What is the 95% confidence interval for the difference between the mean prices of the two models?
6. (20%) **Smartphone Battery Life.** Battery life is an important issue for many smartphone owners. Public health studies have examined "low-battery anxiety" and acute anxiety called nomophobia that results when a smartphone user's phone battery charge runs low and then dies. Battery life between charges for the Samsung Galaxy S9 averages 31 hours when the primary use is talk time and 10 hours when the primary use is Internet applications. Because the mean hours for talk time usage is greater than the mean hours for Internet usage, the question was raised as to whether the variance in hours of usage is also greater when the primary use is talk time. Sample data showing battery life between charges for the two applications follows.

Primary Use: Talking: 35.8, 22.2, 24.0, 32.6, 18.5, 42.5, 28.0, 23.8, 30.0,
22.8, 20.3, 35.5

Primary Use: Internet: 14.0, 12.5, 16.4, 11.9, 9.9, 3.1, 5.4, 11.0, 15.2, 4.0, 4.7

- (a) Formulate hypotheses about the two population variances that can be used to determine if the population variance in battery life is greater for the talk time application.
- (b) What are the standard deviations of battery life for the two samples?
- (c) Conduct the hypothesis test and compute the p -value. Using a 0.05 level of significance, what is your conclusion?

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機率表

Upper tail probability.

i	p	z	t_6	t_9	t_{11}	χ_{15}^2	χ_{16}^2	$F_{11,10}$	$F_{10,11}$
1	0.200	0.8416	0.9057	0.8834	0.8755	19.3107	20.4651	1.7235	1.6940
2	0.100	1.2816	1.4398	1.3830	1.3634	22.3071	23.5418	2.3018	2.2482
3	0.050	1.6449	1.9432	1.8331	1.7959	24.9958	26.2962	2.9430	2.8536
4	0.025	1.9600	2.4469	2.2622	2.2010	27.4884	28.8454	3.6649	3.5257
5	0.010	2.3263	3.1427	2.8214	2.7181	30.5779	31.9999	4.7715	4.5393
6	0.005	2.5758	3.7074	3.2498	3.1058	32.8013	34.2672	5.7462	5.4183

公式

$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1-1} \left(\frac{s_1^2}{n_1}\right)^2 + \frac{1}{n_2-1} \left(\frac{s_2^2}{n_2}\right)^2}$$

注意：1、考試求公平及公正，請同學務必自律，維護學校與學生之榮譽。

2、考試時不得有交談、窺視、夾帶、抄襲、傳遞、代考或其它作弊等舞弊行為，考畢務必交卷，不得攜卷出場，違者依考場規則議處。