

(一) 請精確的解釋下列各名詞：(25分)

1. Earned Income Tax Credit
2. Alternative Minimum Tax
3. Double Dividends
4. Earmarking
5. Fiscal Position
6. Hotelling Principle
7. Intergenerational Externality
8. pyramiding
9. Egalitarian criteria
10. Dividend-paid Credit

(二) 試以 general Equilibrium Analysis 的觀點討論並比較在 Neoclassical 與 Keynesian short-run model 下，租稅負擔的差異及原因。(25分)

(Tax Incidence)

50%

(三) 請選出最合適的一個答案，劃計在電腦卡上。

1. 台灣「人頭稅」實施之記載最早出現於何時？
(A) 荷據 (B) 鄭統 (C) 清領 (D) 日治。
2. 日治時代，1937年台灣的租稅改革，其目標是擬建立以何者為重心的制度？
(A) 直接稅 (B) 間接稅 (C) 專賣事業 (D) 地方稅。
3. 下列那一個台灣的公共建設不是完成於日治時代？
(A) 縱貫鐵路 (B) 蘇花公路 (C) 桃園、嘉南大圳 (D) 中沙大橋。
4. 1968年台灣的租稅改革，是誰擔任該委員會主任委員？
(A) 蔣碩傑 (B) 劉大中 (C) 王作榮 (D) 李國鼎。
5. 台灣的所得稅是在那一年創設的？
(A) 1910 (B) 1920 (C) 1930 (D) 1940。
6. 台灣在那一年實施加值型營業稅？
(A) 1968 (B) 1978 (C) 1986 (D) 1996。
7. 全含性所得 (comprehensive income) 的概念，是誰提出的？
(A) Simons-Haig (B) A. C. Harberger (C) Hicks-Kaldor (D) Peacock-Wiseman。
8. 下列那一項目不必計入全含性所得？
(A) 未實現利得 (B) 已實現利得 (C) 地下經濟 (D) 退休金提撥金額。
9. 何人主張課徵土地單一稅？
(A) D. Ricardo (B) H. George (C) A. C. Pigou (D) A. Marshall。
10. 若對供給固定的土地課從量稅，則
(A) 價格提高 (B) 產量減少 (C) 沒有超額負擔 (D) 超額負擔無窮大。
11. 誰主張「穀價提高造成地租的提高」？

- (A) D. Ricardo (B) H. George (C) A. C. Harberger (D) A. Marshall。
12. 不帶條件的補助款與帶條件的補助款對受補助者而言，前者與後者之效用比較
(A) 前者較大 (B) 後者較大 (C) 兩者相等 (D) 不一定。
13. 進口貨物在輸出或產製國家之製造、生產、外銷運輸過程中，直接或間接領受獎金或其他補貼，以致危害我國產業者，可以對其課
(A) 反傾銷稅 (B) 平衡稅 (C) 沖退稅 (D) 報復關稅。
14. 在台灣的《財政統計年報》中，將證券交易稅
(A) 列為直接稅 (B) 列為間接稅 (C) 同時列入直接稅、間接稅 (D) 都不列入直接稅、間接稅。
15. 內地稅是指
(A) 在中國大陸繳的稅 (B) 在香港、澳門繳的稅 (C) 在台灣繳的稅 (D) 台灣的貨物稅屬之。
16. 政府經常收入減經常支出之餘額，即為
(A) 預算剩餘 (B) 政府儲蓄 (C) 債務餘額 (D) 現金餘額。
17. 下列何者為國稅？
(A) 印花稅 (B) 土地增值稅 (C) 公賣利益 (D) 菸酒稅。
18. 下列三者之中，在2000年度何者的租稅減免造成台灣稅收損失最多？
(A) 外銷品沖退稅 (B) 促進產業升級 (C) 獎勵投資 (D) 沒有數據可以比較。
19. 2001年度台灣的直轄市及縣(市)稅之中，以下列何者收入最多？
(A) 房屋稅 (B) 土地增值稅 (C) 營業稅 (D) 菸酒稅。
20. Earmarked tax 的中文為
(A) 重估稅 (B) 暫繳稅 (C) 指定用途稅 (D) 實物移轉稅。
21. 期貨交易稅
(A) 目前台灣沒有期交稅 (B) 在台灣屬於直接稅 (C) 在台灣屬於間接稅 (D) 已在2002年第一次開徵。

22. 目前台灣的汽車燃料使用費
 (A) 採隨車徵收 (B) 採隨油徵收 (C) 收入全歸 ~~國庫~~ (D) 採統收統支。
 財政部主管
23. 歲入：
 (A) 政府在一會計年度內之一切收入 (B) 債務之舉借屬之 (C) 以前年度歲計賸餘之移用屬之 (D) 不須全部編入預算。
24. 探討租稅歸宿時，何者為非？
 (A) 應同時考慮所得之來源與用途 (B) 歸宿視價格如何而定 (C) 歸宿視稅收如何配置而定 (D) 公司可作為稅負的單位。
25. 若供給線為水平，對機票課徵 10% 的稅率，其需求彈性為 1，每年之票價乘上張數為 790 億美元，則此稅：
 (A) 不致造成超額負擔 (B) 超額負擔為 $790 \times 10\%$ 億 (C) 超額負擔為 $\frac{1}{2} \times 790 \times (10\%)^2$ 億 (D) 超額負擔為無窮大。
26. 有關財產稅的歸宿分析，何者為非？
 (A) 將財產稅視為貨物稅 (B) 將財產稅視為資本稅 (C) 將財產稅視為薪資稅 (D) 將財產稅視為使用費。
27. 只有兩期，終生所得相同的兩個人，若在比例稅的所得稅制下，兩人的終生所得稅負
 (A) 一定相同 (B) 可能不同 (C) 第一期消費較多者，稅負較多 (D) 第二期消費較多者，稅負較少。
28. 只有二期，下標 0 為當期(第一期)，1 為下一期(第二期)，I 為所得，C 為消費，若有 A、B 兩人，其終生預算限制式分別為 $I_0 = C_0^A + \frac{C_1^A}{1+r}$ ；
 $I_0 = C_0^B + \frac{C_1^B}{1+r}$ ，則：
 (A) 兩人的終生所得不同 (B) 兩人之終生消費不同 (C) 兩人的終生所得相同 (D) 兩人之所得都來自第二期(下一期)。
29. 承上題，若課比例的消費稅，稅率 t_c ，則 A 君在第一期之稅負為
 (A) $t_c C_0^A$ (B) $t_c C_1^A$ (C) $t_c C_0^B$ (D) $t_c C_1^B$ 。

30. 承上題，A君在第二期之(當期值)稅負為

- (A) $t_c C_0^A$ (B) $t_c C_1^A$ (C) $t_c C_0^B$ (D) $t_c C_1^B$ 。

31. 承上題，若將前二題一起考慮，可知A君之終生稅負為

- (A) $t_c I_0$ (B) $t_c I_1$ (C) $t_c C_0^A$ (D) $t_c C_1^A$ 。

亦課

32. 承上題，若B君之消費稅比率的消費稅，則B君之終生稅負為

- (A) $t_c I_0$ (B) $t_c I_1$ (C) $t_c C_0^B$ (D) $t_c C_1^B$ 。

33. 承上題，從以上分析，結論是：

- (A) 比例消費稅下，終生所得相同者，其終生稅負相同
 (B) 比例消費稅下，終生所得相同者，其終生稅負不同
 (C) 比例所得稅下，終生所得相同者，其終生稅負相同
 (D) 比例所得稅下，其稅負等於比例的消費稅。

34. 若 q 為機器價格， i 為名目利率， r 為實質利率， π 為通膨率， δ 為折舊率，則資金的使用者成本 (user cost of capital) UC ，通常為

- (A) $UC = q(i + \delta)$ (B) $UC = q(r + \delta)$ (C) $UC = q(\pi + \delta)$ (D) $UC = q(i + \pi + \delta)$ 。

35. 若已知 $r = \beta i + (1 - \beta)\rho$ ，其中 r 為加權平均資金成本， β 為借款比率， ρ 為股權資金之報酬，若 M-M 定理成立，則 β 與 r

- (A) 不相干 (B) 成正向 (C) 成反向 (D) 成等比率變動。

36. 政府對公司課稅，則稅後調整的資金成本等於

- (A) $q(i + \delta)/(1 - t)$ (B) $q(r + \delta)/(1 - t)$ (C) $q(\pi + \delta)/(1 - t)$ (D) $q/(1 - t)$ 。

37. 承上題，則此時使用者資金成本最低即是

- (A) $t = -1$ (B) $t = 0$ (C) $t = 1/2$ (D) $t = 1$ 。

38. 計量實證發現：社區每獲得 100 元的補助所增加的公共支出與社區所得增加 100 元時所增加的公共支出比較，

- (A) 前者較大 (B) 後者較大 (C) 相等 (D) 不一定。

39. 承上題，此稱為
 (A) 李嘉圖等質定理 (B) M-M 定理 (C) 集遽效果 (D) 捕蠅紙效果。
40. 課徵何種租稅可能產生 double dividend?
 (A) income tax (B) green tax (C) business tax (D) poll tax。
41. 由整個社會的角度而言，負所得稅的勞動工作意願與國民所得，和負工資稅比較
 (A) 前者較低 (B) 前者較高 (C) 相等 (D) 不一定。
42. 電子商務交易種類有 28 種，其中歸屬 OECD 租稅協定範本
 (A) 第七條的營業利潤是否課稅，端視非居住者之國籍
 (B) 第七條的營業利潤是否課稅，端視非居住者之所得高低
 (C) 第十二條規定權利金來源國應給予免稅
 (D) 第十二條規定權利金來源國擁有絕對課稅權。
43. 下列那一個國家在 1976 1986 1992 三年的個人所得稅最高邊際稅率都是其中最低的？
 (A) 瑞典 (B) 英國 (C) 美國 (D) 日本。
44. 57%，50%，20% 是那一個國家分別在 1976 1986 1992 三年的個人所得稅最高邊際稅率？
 (A) 瑞典 (B) 英國 (C) 美國 (D) 日本。
45. 以全國公投方式贊成、反對核能電廠之興建，過半通過後並將最後興建於贊成比率最高的鄉鎮，且規定公投後不得遷徙，這符合
 (A) Arrow 的 impossibility theorem (B) Rawls 的 veil of ignorance (C) Ramsey 的 inverse demand elasticity (D) Tiebout 的 voting with feet。
46. "Goods which are complementary to leisure should be taxed more heavily than goods which are substitutes for leisure." 是為
 (A) M-M theorem (B) maximin rule (C) Corlett and Hague rule (D) compensation principle。

47. 對 X 財貨課稅的超額負擔為 $EB_X = \frac{1}{2} e_X P_X X t_X^2$,

對 Y 財貨課稅的超額負擔為 $EB_Y = \frac{1}{2} e_Y P_Y Y t_Y^2$;

若稅收 $R = P_X X t_X + P_Y Y t_Y$

且設 $L = \frac{1}{2} e_X P_X X t_X^2 + \frac{1}{2} e_Y P_Y Y t_Y^2 + \lambda (R - P_X X t_X - P_Y Y t_Y)$

則何者為非？ (A) L 為 Lagrange 函數 (B) L 為 Lindahl 函數 (C) L 可對 t_X 微分求一階條件 (D) L 可對 t_Y 微分求一階條件。

48. 承上題，此標的函數是在求其

(A) 極大值 (B) 極小值 (C) 中位數 (D) 標準差。

49. 承上題，從一階條件中，可以導出

(A) voting with feet (B) median voter theorem (C) Ramsey's rule (D) fly-paper effect。

50. 承上題，以上是假設 dX/dP_Y

(A) 等於 1 (B) 大於 0 (C) 等於 0 (D) 小於 0。

(不可使用計算機，若有小數點，計算至小數點後二位。)

1.

(1) (5 points) A consumer owns good 1 and good 2 and trades these two goods with other consumers in perfectly competitive markets. Denote his endowments of these two goods as ω_1 and ω_2 , and his consumption as x_1 and x_2 . The prices of good 1 and good 2 are p_1 and p_2 , respectively. Write down the Slutsky equation when p_1 changes.

(2) (15 points) Suppose explicitly that this consumer's preferences are represented by the utility function $U(x_1, x_2) = \frac{1}{3} \ln x_1 + \frac{2}{3} \ln x_2$. His endowments are $\omega_1 = 10$ and $\omega_2 = 8$ and the original market prices are $p_1 = \$3$ and $p_2 = \$12$. Now p_1 increases to \$6. Please find:

- (a) The changes in consumption that are attributed to the substitution effect.
- (b) The changes in consumption that are attributed to the ordinary income effect.
- (c) The changes in consumption that are attributed to the endowment income effect.

2.

- (1) (8 points) Explain that English auctions can attain Pareto efficiency.
- (2) (7 points) If a consumer spends all of his income, then it is impossible that all of the goods that he consumes are inferior goods. Explain.

3.

Suppose that the market demand function of an oligopoly is $p(y_1 + y_2) = 120 - 4(y_1 + y_2)$, where y_1 and y_2 are the outputs of firm 1 and firm 2, respectively. Suppose also for simplicity that the costs of producing y_1 and y_2 are zero.

- (1) (7 points) Find the Cournot equilibrium.
- (2) (8 points) Suppose that firm 1 is a leader and firm 2 is a follower. Find the Stackelberg equilibrium.

1. (10 points) Explain under what conditions a group of countries with different capital-to-labor ratios and different levels of per worker output will “converge” in the basic Solow model. Does the empirical evidence support the convergence prediction? Explain.

2. (15 points) What is the difference between the traditional “Keynesian” consumption function and the permanent income hypothesis. What determines the level of current consumption in each model. What is the difference between “permanent” and “transitory” income, and how should households respond to them in each model?

3. (10 points) What are the macroeconomic effects when stock prices continue to fall? (Hint: start from wealth effect and Tobin’s q-theory)

4. (15 points) Briefly define and discuss the significance of the following concepts :
 - a) J curve
 - b) Ricardo-Barro Effect
 - c) the efficiency wage

作答方式: 為維護您的權益, 請依下列規定作答, 未依規定方式作答者, 不予計分。

一、選擇題請於答案卷第一頁一下列方式作答

1	2	3	4	5
6	7	8	9	10

二、問答題及計算題, 一律以橫式書寫方式作答, 並應清楚列示計算式

一、選擇題(40%), 每題 4 分

1. A company bought display racks for \$100,000 by issuing a noninterest-bearing, 3-year note payable. The note plus compounded interest at an annual rate of 8% is due in three years. (The present value of 1 due in three years at 8% is 0.7938.) The entry to record this transaction would include:

- A). A debit to Store Equipment for \$100,000.
- B). A debit to Discount on Notes Payable for \$20,620.
- C). A credit to Discount on Notes Payable for \$20,620.
- D). A credit to Notes Payable for \$79,380.
- E). A debit to Notes Payable for \$79,380.

2. Which of the following items is not likely to be an extraordinary item?

- A). Loss from an unexpected union strike.
- B). Condemnation of property by the city government.
- C). Loss of use of property due to a new and unexpected environmental regulation.
- D). Loss due to an earthquake in Florida.
- E). Expropriation of property by a foreign government.

3. Which of the following statements is true?

- A). Partners are employees of the partnership.
- B). Salaries to partners are expenses on the partnership income statement.
- C). Salary allowances usually reflect the relative value of services provided by partners.
- D). Salary allowances are expenses.
- E). Interest allowances are expenses.

4. Short-term investments in held-to-maturity debt securities are accounted for using the:

- A). Market value method with market adjustment to income.
- B). Market value method with market adjustment to equity.
- C). Cost method with amortization.
- D). Cost method without amortization.
- E). Equity method.

5. Uncertainties:

- A). Are not contingent liabilities because they are future events not arising out of past transactions or events.
- B). Are contingent liabilities because they are future events arising from past transactions or events.
- C). Should be disclosed because of their usefulness to financial statements.
- D). Are estimated liabilities because the amounts are uncertain.
- E). Arise out of transactions such as debt guarantees.

6. The deferred income tax liability:

- A). Represents income tax payments that are deferred until future years because of temporary differences between GAAP rules and tax accounting rules.
- B). Is a contingent liability.
- C). Can result in a deferred income tax asset.
- D). Is never recorded.
- E). Is recorded whether or not the difference between taxable income and financial accounting income is permanent or temporary.

7. An insignificant stock dividend transaction requiring a transfer of an amount from retained earnings to common stock should

- A). Be reported in the statement of cash flows as an operating activity.
- B). Be reported in the statement of cash flows as an investing activity.
- C). Be reported in the statement of cash flows as a financing activity.
- D). Be reported as a footnote to the statement of cash flows.
- E). Not be reported in the statement of cash flows.

8. When treasury stock is purchased with cash, what is the impact on the balance sheet equation?

- A). No change: the reduction of the asset Cash is offset with the addition of the asset Treasury Stock.
- B). Assets decrease and Stockholders' Equity increase.
- C). Assets increase and Stockholders' Equity decrease.
- D). Assets decrease and Stockholders' Equity decrease.

9. After posting is completed, there may be an error if:

- A). The sum of the customer account balances does not equal the total in the sales journal.
- B). The sum of the accounts receivable ledger does not equal the balance in the Sales account.
- C). The sum of the customer account balances does not equal the Accounts Receivable controlling account balance.
- D). The balance in the sales journal does not equal the Accounts Receivable account balance.
- E). The sum of the accounts receivable ledger does not equal the balance in the sales journal.

10. To compute trend percents the analyst should:

- A). Select a base period, assign each item in the base period statement a weight of 100%, and then express financial numbers from other periods as a percent of the related base period number.
- B). Subtract the analysis period number from the base period number.
- C). Subtract the base period amount from the analysis period amount, divide the result by the analysis period amount, then multiply that amount by 100.
- D). Compare amounts across industries using Dun and Bradstreet.
- E). All of the above.

二、問答題及計算題(60%)，每題 10 分

1. (10%) A company plans to borrow about \$30,000 for 90 days at 12% interest. The bank offers 2 types of notes, a \$30,000 interest-bearing note and a \$30,000 noninterest-bearing note (with \$29,100 cash received at the note's issuance). Which type of note would be better for this company's? Justify your answer by showing calculations.

2. (10%) Prepare general journal entries to record the following investments-related transactions of a company for its first year of operations:

- a. On March 24, the company purchased 800 shares of ABC Company stock at 125 per share plus a \$1000 brokerage fee as a short-term investment in a security available for sale.
- b. On July 1, received a \$3.20 per share cash dividend on the ABC Company stock purchased in transaction (a).
- c. On October 28, sold 250 shares of ABC Company stock purchased in transaction (a) for \$130 per share, less a \$325 brokerage fee.
- d. The December 31 end-of-year market value of the company's short-term investments consisted solely, of the ABC Company stock, at 112 per share

3. (10%) A corporation plans to invest \$1,000,000 in oil exploration. The corporation is considering two plans to raise the money. Under Plan #1, bonds with a contract rate of interest of 8.3% would be issued. Under Plan #2, additional shares of common stock would be issued at \$20 per share. The corporation currently has 400,000 shares of stock outstanding, and it expects to earn \$650,000 per year before bond interest and income taxes (taxes rate is 35%).

Comment on the relative effects of each alternative, including the net income and return on investment for both plans and when one form of financing is preferred to another.

4. (10%) DEF Corporation's income statement showed the following: net income, \$248,000; depreciation expense, \$24,600; amortization expense, \$12,300; and gain on sale of plant assets, \$1,400. An examination of the company's current assets and current liabilities showed that the following changes occurred because of operating activities: accounts receivable decreased \$9,000; merchandise inventory increased \$23,000; prepaid expenses increased \$9,000; accounts payable increased \$8,000. Using the indirect method, calculate net cash provided (or used) by operating activities.

5. (10%) A company wants to estimate its inventory destroyed by a flood this period. Its average gross profit rate is 25%. The following information is available for the current period:

Beginning inventory: \$102,400

Purchases: \$687,500

Purchases returns and allowances: \$3,900

Transportation-in: \$4,500

Sales: \$975,000

Sales returns and allowances: \$4,700

Calculate the value of the destroyed ending inventory using the gross profit method.

6. (10%) A company adopted the LIFO cost flow assumption for valuing the majority of remaining inventories. The company believes that the use of the LIFO method better matches current costs with current revenues. The cumulative effect of this change on retained earnings at the beginning of the year is neither determinable, nor are the existing effects of retroactive application of LIFO to prior years. The effect of this change on the current year was to decrease net income by \$20.0 million, or \$0.3 per share. Assume a 35% tax rate. If you are an analyst, what is the tax effect by adoption of the LIFO? How would you react to the \$0.3 per share decrease in income?

1. Find the values of a and b , if the limit $\lim_{x \rightarrow 0} \frac{\sqrt{1+x+x^2} - (1+ax)}{x^2} = b$ exists. (5 points)

2. Let $F(x, y) = y - x^y = 0$. Find $\frac{dy}{dx}$. (5 points)

3. Sketch the graph of $y = \frac{x}{x^2 + 1}$. Label the intercepts, relative extrema, points of inflection, and asymptotes. Then state the domain of the function. (10 points)

4. Evaluate the definite integral $\int_{-1}^e \ln |x| dx$. (5 points)

5. After test-marketing a new menu item, a fast-food restaurant predicts that sales of a new item will grow according to the model $\frac{dS}{dt} = \frac{2t}{(t+4)^2}$, where t is the time in weeks and S is the sales in thousands of dollars. Find the sales of the menu item at 10 weeks. [Hints: $\ln 2 = 0.6931$, $\ln 3 = 1.0986$, $\ln 5 = 1.6094$, $\ln 7 = 1.9459$, $\ln 11 = 2.3978$.] (10 points)

6. Examine the function $f(x, y) = -\frac{4x}{x^2 + y^2 + 1}$ for the relative extrema and saddle points. (10 points)

7. An investor is considering three different stocks in which to invest \$20,000. The average annual dividends for the stocks are

General Motors (G) 3.0%

Eastman Kodak (E) 2.3%

Kelly Services, Inc. (K) 2.5%

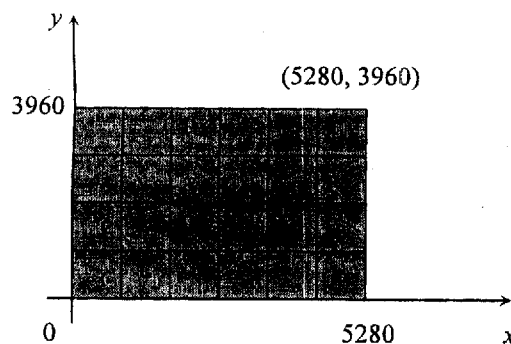
The amount invested in Eastman Kodak must follow the equation

$$2000K - 2000G + E^2 = 0$$

How much should be invested in each stock to yield a maximum of dividends? (10 points)

8. Find the value of a and b such the linear model $f(x) = a + bx$ has a minimum sum of the squared errors for the points $(-3, 0)$, $(-1, 1)$, $(0, 2)$, $(2, 3)$. (10 points)

9. The average value of real estate (in dollars per square foot) for a rectangular section of a city is given by $f(x, y) = 2.5x^{3/2}y^{3/4}$ (see figure). Find the average value of real estate for this section. (5 points)



10. The ordering and transportation cost C of the components used in manufacturing a product is

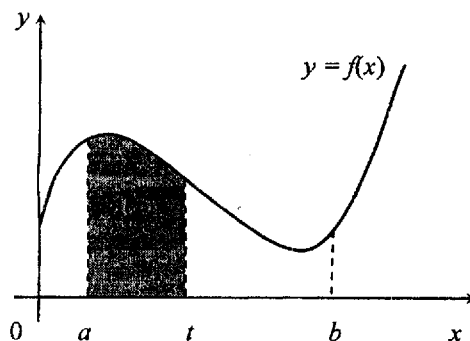
$$c = 100 \left(\frac{200}{x^2} + \frac{x}{x+30} \right), x \geq 1$$

where C is measured in thousands of dollars and x is the order size in hundreds. Find the order size that minimizes the cost. [Hint: Use Newton's Method.] (10 points)

11. Use a sixth-degree Taylor polynomial centered at zero to approximate the definite integral $\int_0^{1/2} e^{-x^2} dx$. (5 points)

12. A large corporation starts at time $t = 0$ to invest part of its receipts at a rate of P dollars per year in a fund for future corporate expansion. Assume that the fund earns r percent interest per year compounded continuously. So, the rate of growth of the amount A in the fund is given by $\frac{dA}{dt} = rA + P$, where $A = 0$ when $t = 0$. Solve this differential equation for A as a function of t . (5 points)

13. Let $A(t)$, known as the area function, denote the area of the region R under the graph of a nonnegative function $y = f(x)$ from $x = a$ to $x = t$, where $a \leq t \leq b$ (see figure). Use the concept of area function to demonstrate the plausibility of the fundamental theorem of calculus for the case where f is nonnegative on an interval $[a, b]$. (10 points)



1. (10%) Two sections of a senior probability course are being taught. From what she has heard about the two instructors listed. Lisa estimates that her chances of passing the course are 0.85 if she gets professor X and 0.60 if she gets professor Y. The section into which she is put is determined by the registrar. Suppose that her chances of being assigned to professor X are 4 out of 10. Fifteen weeks later we learn that Lisa did, indeed, pass the course. What is the probability she was enrolled in professor X's section?

2. (10%) In a sample of 25, $\bar{x} = 1.63$ and $s = 0.51$.

Construct a 95 percent confidence interval for μ . Assuming that the sample of 25 is

from a normal distribution, $\text{Prob}\left(-2.064 \leq \frac{5(\bar{x} - \mu)}{s} \leq 2.064\right) = 0.95$,

where 2.064 is the critical value from a t distribution with 24 degrees of freedom.

3. (15%) Let X be a random variable of the continuous type with the probability density function $f(x)$, which is positive provided $0 < x < b < \infty$, and is equal to zero elsewhere. Show that $E(X) = \int_0^b [1 - F(x)] dx$, where $F(x)$ is the distribution function of X .

4. (15%) Prove that if x_1, \dots, x_n are a random sample from a population with mean μ and variance σ^2 , then \bar{x} is a random variable with mean μ and variance σ^2/n .

5. (15%) Let Y_1, Y_2 and Y_3 be a random sample from a normal distribution where both μ and σ^2 are unknown. Which is a more efficient estimator for μ ,

$$\hat{\mu}_1 = \frac{1}{4}Y_1 + \frac{1}{2}Y_2 + \frac{1}{4}Y_3$$

or

$$\hat{\mu}_2 = \frac{1}{3}Y_1 + \frac{1}{2}Y_2 + \frac{1}{6}Y_3$$

6. (15%) Among the problems faced by job seekers wanting to reenter the work force, eroded skills and outdated backgrounds are two of the most difficult to overcome. Knowing that, employers are often wary of hiring individuals who have spent lengthy periods of time away from the job. The following table shows the percentages of hospitals willing to rehire medical technicians who have been away from that career for x years. It can be argued that the fitted line should necessarily have a y -intercept of 100 because no employer would refuse to hire someone (due to outdated skills) whose career had not been interrupted at all--that is, applicants for whom $x = 0$. Under that assumption, estimate β_1 by fitting these data with the model $y = 100 + \beta_1 x$.

Years of Inactivity, x	Percent of Hospitals Willing to Hire, y
0.5	100
1.5	90
4	75
8	44
13	28
18	17

7. (20%) A useful measure of a stock's profitability is its yield, defined to be its dividends for the previous 12 months times 100, divided by its current market value. The following table gives the yields of the New York Stock Exchange Common Stock Index for each quarter of the years 1981 through 1985. Are yields affected by the quarter of the year? Is the variability in the yield from year to year statistically significant? Construct the ANOVA table and state your conclusions using the $\alpha = 0.05$ level of significance.

Year	Quarter			
	First	Second	Third	Fourth
1981	5.7	6.0	7.1	6.7
1982	7.2	7.0	6.1	5.2
1983	4.9	4.1	4.2	4.4
1984	4.5	4.9	4.5	4.5
1985	4.4	4.2	4.2	3.6

($F_{0.05, 3, 12} = 3.4903$, $F_{0.05, 4, 12} = 3.25916$, $F_{0.05, 5, 12} = 3.105875$,
 $F_{0.05, 3, 20} = 3.098393$, $F_{0.05, 4, 20} = 2.866081$, $F_{0.05, 5, 20} = 2.710891$)