(108)輔仁大學轉學生招生考試試題	考試日期：108 年 7 月 8 日第二節
	本試題共： 二 頁(本頁為第 1 頁)

科目：**統計學**　　系組：**統計資訊學系**　　年級：**二**

1. (20%)試說明經驗法則(Empirical rule)和柴比雪夫法則(Chebyshev's rule)，並指出兩者間的差異?

2. (20%) 假設統計學考試的時間限定是1小時。為了評估試題的難易情形，教師以10位學生為樣本，在他們繳交試卷的時候記錄了他們考試所花的時間。記錄的時間(近似至最接近的分鐘) 是

   33　29　45　60　42　19　52　38　36　40

a. 計算平均數、中位數與眾數。

b. 從(a) 小題所得到的3 個統計量，你得到什麼訊息？

c. 請繪製箱型圖(Box-plot)。

d. 若有位同學10分鐘即繳交試卷，請計算判斷此同學是否為離群值?

3. (20%)為了檢視公司四次週年廣告促銷的成效，以寄問卷給詢問顧客去年因為促銷而訂購商品的次數。下列資料表列出的機率是從問卷得到的，其中隨機變數X 代表因促銷活動而促使訂購的次數。

x	0	1	2	3	4
$P(x)$	.10	.25	.40	.20	.05

a. 假設所有顧客次年的購買行為將會和前一年的相同，則下一年每位顧客會把握促銷優勢而訂購的期望次數為何？

b. 根據一份先前歷史紀錄的分析發現訂購促銷商品的平均價格是\$20，公司從每一份訂單中賺取20% 的利潤。計算明年獲利的期望值。

c. 若執行四次促銷的固定成本被估計是\$15,000，以及每位顧客的郵寄與處理的變動成本是\$3.00。公司需要多大的顧客群以抵補促銷的成本？

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科目：**統計學** 系組：**統計資訊學系** 年級：**二**

4. (20%) a. 某商店九點開始營業，每小時平均來3人，試求某日早上九點到九點半之間沒有客戶上門的機率？ b. 某商店平均20分鐘來1人。試求某日開門後等候30分鐘以上才有客戶來的機率。

5. (20%)調查員隨機抽樣10個觀測值， 發現$\bar{x}=103$與$s=17$。

($z_{0.1}=1.28$, $t_{0.1,9}=1.383$, $t_{0.1,10}=1.372$)

a. 在10%的顯著水準下是否有足夠的證據結論說母體平均數是小於110 的？

b. 假設你已知母體標準差為$\sigma=17$，重做(a) 小題。

c. 請解釋(a)小題與(b)小題所產生的結論，有何差異?

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(108)輔仁大學轉學生招生考試試題	考試日期：108 年 7 月 8 日第三節
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科目：**微積分**　　系組：**統計資訊學系**　　年級：**二**

1. **(10%)** Find the following limits:

   (3%) (a) $\lim_{x\to 1^-}\left(\frac{x^3-1}{x-1}\right)$

   (3%) (b) $\lim_{x\to 1^+}\left(\frac{x^3-1}{x-1}\right)$

   (4%) (c) $\lim_{x\to 1}\left(\frac{x^3-1}{x-1}\right)$

2. **(10%)** $f(x)=(x^2+3x+5)^{10}$, find $\frac{d^{20}}{dx^{20}}f(x)$

3. **(10%)** $\int_0^2(3x^2+x-5)dx$

4. **(10%)** $\int(x^2+2x-3)^3(x+1)dx$

5. **(10%)** $\int_1^2\frac{2\ln x}{x}dx$

6. **(10%)** Find the area under the curve between the given x-values:

   $f(x)=\frac{2x^2+12x}{\sqrt[3]{x^3+9x^2+17}}$, from x=1 to x=3。

7. **(10%)** The second derivative of $f(x)=(x^2-x+1)\cdot(x^3-1)$ can be written as $\frac{d^2}{dx^2}f(x)=Ax^3+Bx^2+Cx+D$. What is (A, B, C, D) ?

8. **(10%)** A company finds that its revenue from selling x units of a product is $R(x)=x^2+500x$ dollars. If sales are increasing at the rate of 50 per month, find the **rate of change** of revenue when 200 units have been sold.

9. **(10%) Find the equation for the tangent line to the curve** $y=x^2\ln x-x^2$ **at** $x=e$.

10. (10%) Given $f(x)=\begin{cases}\lambda e^{-\lambda x} & ,x\ge 0\\ 0 & ,x<0\end{cases}$ and $\lambda>0$ ，please derive the value of the improper integral $\int_{-\infty}^{\infty}xf(x)dx$.

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	本試題共：四頁(本頁為第 一 頁)

科目：經濟學　　系組：統計資訊學系　　年級：二

一、Multiple Choice (48%)(每題 2 分)

1. What you give up to obtain an item is called your
   a. explicit cost.
   b. monetary cost.
   c. opportunity cost.
   d. direct cost.

2. Which of the following changes would *not* shift the demand curve for a good or service?
   a. a change in income.
   b. a change in the price of the good or service.
   c. a change in expectations about the future price of the good or service.
   d. a change in the price of a related good or service.

3. If goods A and B are complements, then an increase in the price of good A will result in
   a. more of good B being sold.
   b. more of good A being sold.
   c. less of good B being sold.
   d. no difference in the quantity sold of either good.

4. A supply curve slopes upward because
   a. an increase in input prices increases supply.
   b. an increase in price gives producers an incentive to supply a larger quantity.
   c. the quantity supplied of most goods and services increases over time.
   d. as more is produced, total cost of production falls.

5. The smaller the price elasticity of demand, the
   a. steeper the demand curve will be through a given point.
   b. flatter the demand curve will be through a given point.
   c. more strongly buyers respond to a change in price between any two prices P_1 and P_2.
   d. smaller the decrease in equilibrium price when the supply curve shifts rightward from S_1 to S_2.

6. Suppose the price of potato chips decreases from \$1.45 to \$1.25 and, as a result, the quantity of potato chips demanded increases from 2,000 to 2,200. Using the midpoint method, the price elasticity of demand for potato chips in the given price range is
   a. 2.00.
   b. 1.55.
   c. 1.00.
   d. 0.64.

7. When a tax is imposed on a good for which the supply is relatively elastic and the demand is relatively inelastic,
   a. buyers of the good will bear most of the burden of the tax.
   b. sellers of the good will bear most of the burden of the tax.
   c. buyers and sellers will each bear 50 percent of the burden of the tax.
   d. both equilibrium price and quantity will increase.

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8. The minimum wage is an example of a
   a. price ceiling.
   b. price floor.
   c. wage subsidy.
   d. tax.

9. Total surplus is equal to
   a. value to buyers - profit to sellers.
   b. consumer surplus x producer surplus.
   c. (consumer surplus + producer surplus) x equilibrium quantity.
   d. value to buyers - cost to sellers.

10. Efficiency is attained when
   a. total surplus is maximized.
   b. producer surplus is maximized.
   c. all resources are being used.
   d. consumer surplus is maximized and producer surplus is minimized.

11. A difference between explicit and implicit costs is that
   a. explicit costs must be greater than implicit costs.
   b. explicit costs do not require a direct monetary outlay by the firm, whereas implicit costs do.
   c. implicit costs do not require a direct monetary outlay by the firm, whereas explicit costs do.
   d. implicit costs must be greater than explicit costs.

12. A negative externality will cause a private market to produce
   a. less than is socially desirable.
   b. more than is socially desirable.
   c. exactly the quantity that is socially desirable.
   d. less than the same market would produce in the presence of a positive externality.

13. The accountants hired by the Brookside Racquet Club have determined total fixed cost to be $75,000, total variable cost to be $130,000, and total revenue to be $145,000. Because of this information, in the short run, the Brookside Racquet Club should
   a. shut down.
   b. exit the industry.
   c. stay open because shutting down would be more expensive.
   d. stay open because the firm is making an economic profit.

14. Which of the following is a characteristic of a natural monopoly?
   a. Fixed costs are typically a small portion of total costs.
   b. Average total cost declines over large regions of output.
   c. The product sold is a natural resource such as diamonds or water.
   d. All of the above are correct.

15. A market structure with only a few sellers, each offering similar or identical products, is known as
   a. perfect competition.
   b. monopoly.
   c. monopolistic competition.
   d. oligopoly.

16. The prisoners' dilemma provides insights into the
    a. difficulty of maintaining cooperation.
    b. benefits of avoiding cooperation.
    c. benefits of government ownership of monopoly.
    d. ease with which oligopoly firms maintain high prices.

17. Gross domestic product measures
    a. income and expenditures.
    b. income but not expenditures.
    c. expenditures but not income.
    d. neither income nor expenditures.

18. Economists use the term inflation to describe a situation in which
    a. the economy's overall output of goods and services is rising faster than the economy's overall price level.
    b. some prices are rising faster than others.
    c. the economy's overall price level is rising.
    d. the economy's overall price level is high, but not necessarily rising.

19. Other things equal, relatively poor countries tend to grow
    a. slower than relatively rich countries; this is called the poverty trap.
    b. slower than relatively rich countries; this is called the fall-behind effect.
    c. faster than relatively rich countries; this is called the catch-up effect.
    d. faster than relatively rich countries; this is called the constant-returns-to-scale effect.

20. Which of the following is not a function of money?
    a. a unit of account
    b. a store of value
    c. medium of exchange
    d. liquidity

21. The Fisher effect says that
    a. the growth rate of the money supply is negatively related to the velocity of money.
    b. real variables are heavily influenced by the monetary system.
    c. the nominal interest rate adjusts one for one with the inflation rate.
    d. All of the above are correct.

22. Which of the following correctly of explains the crowding-out effect?
    a. An increase in government expenditures decreases the interest rate and so increases investment spending.
    b. the reduction in aggregate demand that results when a fiscal expansion causes the interest rate to increase.
    c. the reduction in aggregate demand that results when a monetary expansion causes the interest rate to decrease.
    d. All of the above are correct.

23. Which of the following would cause stagflation?
    a. aggregate demand shifts left
    b. aggregate demand shifts right
    c. aggregate supply shifts right
    d. aggregate supply shifts left

24. According to liquidity preference theory, the money-supply curve is
    a. upward sloping.
    b. downward sloping.
    c. vertical.
    d. horizontal.

二 、問答與計算 (52%)
(須寫出推導或計算過程並說明理由，否則不予計分)

1. 蘋果市場僅有甲與乙二人，其需求函數分別為 Q＝10－P 和 Q＝14－2P，

   (1). 請問在何種情形下市場僅剩甲一人願意有需求，請說明理由。(5 分)

   (2). 若今天市場只有一位供給者，其供給函數為 Q＝5P，請問該市場的均衡數量與均衡價格為何? (10 分)

   (3). 兩個消費者在市場均衡價格下各自購買數量為何? (6 分)

   (4). 當市場價格為 2 時，市場成交量為何? 此時有超額供給或超額需求?其數量為何? (6 分)

2. 一簡單凱因斯開放模型，C：消費＝100+0.5(Y-T)、I：投資＝70、G：政府支出＝120、T：稅收＝90+0.2Y、EX：出口＝50、IM：進口＝10+0.15Y。試問：

   (1). 該經濟體系的均衡所得為多少?若充分就業 Yf=500，此時為膨脹缺口或緊縮缺口? (13 分)

   (2). 若要消除此缺口，缺府支出應如何變動? (6 分)

   (3). 若要消除此缺口，租稅應如何變動? (6 分)

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科目：**統計學** 系組：**統計資訊學系** 年級：**三**

1. (20%)統計學上有一重要性質為「不偏性」。假設隨機變數 Xi, i=1,2,...,n 為常態分佈，也就是 Xi～N(μ,σ^2), i.i.d.。假設 $\hat{\mu}$ 是 μ 的估計值，試問：
   a. 何謂不偏性？
   b. 請舉例出三個具不偏性的統計量，並決定使用其中的哪一個，解釋建議選用的原因？

2. (20%)快速檢驗(Rapid Test) 被用來判斷某人是否有HIV (造成AIDS 的病毒)。錯誤陽性與錯誤陰性發生的機率分別是.027 和.080。一位醫師剛收到一份快速檢驗報告，病患檢測的結果呈現陽性。在收到此報告之前，這位醫生將這位病患歸類在低危險群，其為HIV 帶原的機率只有0.5%。這位病患實際有HIV的機率為何？此外，敏感度(Sensitivity)、特異性(Specificity)、陽性預測值與陰性預測值為何？

3. (20%)為了確定一種新品的肥料比目前使用的種類更有效，研究人員用12 塊的田地，其分散在縣市各地。每一塊地被區分為兩個大小相等的次區塊，其中之一施加目前使用的肥料，另外一塊地則施加新品肥料。在這些地上種植小麥，並且對農作產量進行測量。($t_{0.05,11} = 1.796, t_{0.05,12} = 1.782$)

田地	1	2	3	4	5	6	7	8	9	10	11	12
目前肥料	56	45	68	72	61	69	57	55	60	72	75	66
新品肥料	60	49	66	73	59	67	61	60	58	75	72	68

   a. 以5% 的顯著水準，能否結論說新品肥料的效果比目前使用的肥料更好？
   b. 以 90% 的信心水準，估計兩種肥料之間農作物產量的差異。

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4. (20%)某特定品種的蕃茄種子有90% 的機率會發芽。一位農夫在後院種了10粒種子。

   a. 恰好9 粒種子發芽的機率為何？

   b. 9 粒或更多種子發芽的機率為何？

   c. 9粒或更少種子發芽的機率為何？

   d. 種子發芽的期望粒數為何？

5. (20%)迴歸分析對於成本估計是重要的應用之一。假設考慮採集六組的樣本中，生產作業之產量(X)與成本(Y)有線性關係，且樣本資料結果如下：

$\overline{X}=575,\ \ \overline{Y}=5616.67;\ \ \sum_{i=1}^{6}(X_i-\overline{X})^2=93750,\ \ \sum_{i=1}^{6}(Y_i-\overline{Y})^2=5648333,$

$\sum_{i=1}^{6}(X_i-\overline{X})(Y_i-\overline{Y})=712500$

請問：利用樣本資料結果得到最小平方法之迴歸線為何？在隨機誤差的變異數假設均相等下，若 $\sum_{i=1}^{6}(Y_i-\hat{Y})^2=233333$，試建立出 ANOVA 表，並計算判定係數為多少？解釋判定係數在此題上意義？

$n=10$

二項分配機率值表

k	p														
	0.01	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.70	0.75	0.80	0.90	0.95	0.99
0	0.904	0.599	0.349	0.107	0.056	0.028	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1	0.996	0.914	0.736	0.376	0.244	0.149	0.046	0.011	0.002	0.000	0.000	0.000	0.000	0.000	0.000
2	1.000	0.988	0.930	0.678	0.526	0.383	0.167	0.055	0.012	0.002	0.000	0.000	0.000	0.000	0.000
3	1.000	0.999	0.987	0.879	0.776	0.650	0.382	0.172	0.055	0.011	0.004	0.001	0.000	0.000	0.000
4	1.000	1.000	0.998	0.967	0.922	0.850	0.633	0.377	0.166	0.047	0.020	0.006	0.000	0.000	0.000
5	1.000	1.000	1.000	0.994	0.980	0.953	0.834	0.623	0.367	0.150	0.078	0.033	0.002	0.000	0.000
6	1.000	1.000	1.000	0.999	0.996	0.989	0.945	0.828	0.618	0.350	0.224	0.121	0.013	0.001	0.000
7	1.000	1.000	1.000	1.000	1.000	0.998	0.988	0.945	0.833	0.617	0.474	0.322	0.070	0.012	0.000
8	1.000	1.000	1.000	1.000	1.000	1.000	0.998	0.989	0.954	0.851	0.756	0.624	0.264	0.086	0.004
9	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.999	0.994	0.972	0.944	0.893	0.651	0.401	0.096

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1. **(10%)** $\int_2^3 \frac{1}{(x-1)^2}\,dx$

2. **(10%)** $\int_{-1}^4 \sqrt{5+x}\,dx$

3. **(10%)** $\frac{d}{dx}\left(\frac{1-6x^2}{x^4-8x^2+7}\right)$

4. **(10%)** $\frac{d}{dz}\left[z^2+(z^2-1)^3\right]^5$

5. **(10%)** $\lim_{x\to -1}\left(\frac{3x^3-3x^2-6x}{x^2+x}\right)$

6. **(10%)** Given $\frac{d}{d\theta}\sin\theta=\cos\theta$, $\frac{d}{d\theta}\cos\theta=-\sin\theta$, and $\frac{d}{d\theta}\alpha\sin\theta=\alpha\cos\theta$,

   please find $\frac{dy}{dx}$ for $x\cos y=\sin(x+y)$.

7. **(10%)** Given $f(x)=\begin{cases}\lambda e^{-\lambda x} & ,x\ge 0\\ 0 & ,x<0\end{cases}$ and $\lambda>0$ ，please derive the value of

   the improper integral $\int_{-\infty}^{\infty} x^2 f(x)dx$.

8. **(10%)** Find the area under the curve between the given *x*-values:

   $f(x)=\frac{2x^2+12x}{\sqrt[3]{x^3+9x^2+17}}$, from *x*=1 to *x*=3。

9. **(10%)** The demand function for a product is $p=250+14x-x^2$, and the supply function for it is $p=154+18x+x^2$, where *p* is the number of dollars and *x* is the number of units. If the equilibrium price is $298, what is the producer's surplus at the equilibrium price? Round to the nearest cent.

10. **(10%)** $\int e^x\cos x\,dx$

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