

第一部分：複選題(每題請選出 2 個錯誤的敘述)，共 4 題，每題 5 分，共 20 分，請於試卷上「選擇題作答區：第 1 題到第 4 題」內依序作答。

1. (5%) About describing data:
 - (a) A relative frequency is the number of observations belonging to a category.
 - (b) Put the labels of the categories in order in a bar chart when showing the frequencies of an ordinal variable.
 - (c) The boxplot shows the mean plus or minus one standard deviation of the data.
 - (d) If data are right skewed, the mean is larger than the median.
 - (e) The histogram balanced on the mean.

2. (5%) About association between variables:
 - (a) The percentages of cases in the first column within each row of a contingency table are the same if the variables are not associated.
 - (b) If the categorical variable that identifies the supervising manager is associated with the categorical variable that indicates a problem with processing orders, then the manager is causing the problem.
 - (c) The correlation between sales and advertising when both are measured in millions of dollars is 0.65. The correlation remains the same if we convert these variables into thousands of dollars.
 - (d) A report gives the covariance between the number of employees at an assembly factory and the total number of items produced daily. The covariance would be larger if these data were aggregated to monthly totals.
 - (e) A gasoline station collected data on its monthly sales over the past three years along with the average selling price of gasoline. A scatterplot of sales on price of gasoline showed positive association, suggesting that higher prices attract more customers.

3. (5%) A market research assistant watches the next five shoppers as they leave the supermarket. He records whether the shopper is carrying a store bag that indicates the shopper made a purchase. He writes down a yes or a no for each observation. Define the events.
 $A = \{\text{first two shoppers have a bag}\}$
 $B = \{\text{last two shoppers have a bag}\}$
 $C = \{\text{last three shoppers have a bag}\}$
 - (a) The sample space S for this observation has 32 elements.
 - (b) The assumption of independence means that each shopper has the same probability for carrying a bag.
 - (c) The probability that a randomly selected shopper purchases with a credit card or spends more than \$500 is the same as or larger than the probability that the shopper purchases with a credit card and spends more than \$500.
 - (d) The probability that both events B and C occur, $P(B \& C)$, is equal to $P(B)$.
 - (e) If each shopper has the same chance of making a purchase and shoppers behave independently, then $P(A \& C) = P(A) * P(C)$.

見背面

4. (5%) The number of packages handles by a freight carrier daily is normally distributed. On average, 8,000 packages are shipped each day, with standard deviation 600. Assume the package counts are independent from one day to the next.
- The difference between the numbers of packages shipped on any two consecutive days is normally distributed.
 - If each shipped package earns the carrier \$25, then the amount earned per day is still normally distributed.
 - To verify the user of a normal model, the freight carrier can use the normal quantile plot of the amount shipped on a series of days.
 - The probability that more packages are handles tomorrow than today is unable to determine.
 - The difference between the numbers of packages shipped today and the number shipped tomorrow is zero.

第二部分：計算與簡答題，共 3 題，每題 10 分，共 30 分，請於答案卷上依序作答，並註明題號。

5. (10%) Customers at a fast-food restaurant buy both sandwiches and drinks. The following joint distribution summarizes the numbers of sandwiches (X) and drinks (Y) purchased by customers.

		X	
		1 sandwich	2 sandwiches
Y	1 drink	0.40	0.20
	2 drinks	0.10	0.25
	3 drinks	0	0.05

- Find the expected values and variances of the number of sandwiches and the number of drinks.
 - Find the covariance and correlation between X and Y .
 - If the profit earned from selling a sandwich is \$1.50 and from a drink is \$1.00, what is the expected value and standard deviation of the profit made from each customer?
 - Find the expected value of the ratio of drinks to sandwiches.
6. (10%) A shipment of assembly parts from a vendor offering inexpensive parts is used in a manufacturing plant. The box of 12 parts contains 5 that are defective and will not fit during assembly. A worker picks parts one at a time and attempts to install them. Find the probability of each outcome.
- The first two chosen are both good.
 - At least one of the first three is good.
 - The first four picked are all good.
 - The worker has to pick five parts to find on that is good.

接次頁

7. (10%) To boost interest in its big sale, a retailer offers special scratch-off coupons. When the shopper makes a purchase, the clerk scratches off the covering to reveal the amount of the discount. The discount is 10%, 20%, 30%, 40%, or 50% of the initial amount. Half of the coupons give the shopper 10% off, $1/8$ give 20% off, $1/8$ give 30% off, $3/32$ give 40% off, and $1/32$ give 50% off.
- (a) What are your chances of getting more than 30% off of your purchase?
- (b) A clerk was surprised and suspicious when three shoppers in a row appeared with coupons that gave them half off. Should he have been suspicious?
- (c) Half of the customers at a register purchase a sweater that retails for \$50 and the other half purchase a suit that retails for \$200. What is the probability that a customer saves more than \$20 by using one coupon? Be clear about any assumptions you make.

第三部分：單選題(每題請選出1個正確的答案)，共25題，每題2分，共50分，請於試卷上「選擇題作答區：第8題到第32題」內依序作答。

It was the morning of early November, 2010, and David Bettman, senior marketing director of CreaTech Corp., just walked out of a conference room heading toward his harbor-view office across the hallway at the 57th floor of Columbia Center, Seattle. What bothered Bettman most in the morning meeting was not the availability of Zhu Zhu Hamsters (the Christmas gift for his three years old daughter), but the commercialization of CreaTech's first ever new tablet PC, CreaSlate, which targeted on business women and was scheduled to debut in the second quarter of 2011. CreaTech, a startup founded in 2008 and headquartered in Seattle, developed and sold a variety of handheld electronic devices.

Bettman believed that to ensure a solid and profitable standing in the tablet PC market, CreaSlate's daily sales had to reach as many as 600 units in the early introduction stage; however, he knew very well that it was almost impossible to accurately forecast the market needs or sales of a new product, especially when the market competition was extremely intensive and the tablet PC market was still not stable yet. In the morning meeting, derived from the data collected in an online survey, the market research team suggested an initial daily sales prediction of 635 units in US market. The data were collected from CreaTech's Facebook website. Viewers browsing this website were invited to fill in the survey regarding purchase intention of CreaSlate. Even though the forecast report on CreaSlate's initial sales seemed promising, the investment in manufacturing and marketing CreaSlate was extremely large. That is, if the evidence concluded that CreaSlate would not be launched profitably, the introduction of CreaSlate should be halted or the target and positioning of CreaSlate should be redefined. After returning to his office, Bettman glimpsed the current issue of Business Week on his desktop and his attention was immediately caught by the headline saying that the global tablet PC market would reach 50 million units by 2012. The enclosed article also cited the prediction of Ballmer (CEO of Microsoft) that tablet PC would eventually occupied $1/3$ of overall PC market. If the industrial overview on tablet PC was exceptionally positive, Bettman would totally regret not being able to enter the market if CreaSlate could turn out to be profitable.

8. Bettman's concern on the unavailability of true market needs/sales of CreaSlate in the process of hypothesis testing on CreaSlate's daily sales can be best characterized by ____.
- “夫言非吹也，言者有言，其所言者特未定也。”莊子，齊物論
 - “夫知有所待而後當，其所待者特未定也。”莊子，大宗師
 - “反者道之動，弱者道之用。”老子，第四十章
 - “天下皆知美之為美，斯惡已。皆知善之為善，斯不善已。”老子，第二章
9. 635 units of daily sales predicted by the market research team ____
- reduced the uncertainty of Bettman on whether CreaSlate might be profitable.
 - represented a sampling result from the true population in US market.
 - was irrelevant to the demand forecast of CreaSlate's target market.
 - might serve as a benchmark against which the true performance of CreaSlate's sales in US market could be compared.
10. If Bettman concerned much more about the tremendous investment of unprofitable launch of CreaSlate, what would be the alternative hypothesis to examine the launch decision based on daily sales forecast?
- $H_a: u > 600$
 - $H_a: u < 600$
 - $H_a: u = 600$
 - $H_a: u \neq 600$
11. If Bettman concerned much more about the potential loss of not being able to launch profitable CreaSlate, what would be the alternative hypothesis to examine the launch decision based on daily sales forecast?
- $H_a: u > 600$
 - $H_a: u < 600$
 - $H_a: u = 600$
 - $H_a: u \neq 600$
12. What would be the null hypothesis when Bettman concerned much more about the extreme investment of unprofitable launch of CreaSlate?
- $H_o: u > 600$
 - $H_o: u < 600$
 - $H_o: u = 600$
 - $H_o: u \neq 600$
13. When Bettman concerned much more about the potential loss of not being able to launch profitable CreaSlate, another credible report that the demand of tablet PC would reach 80 million units by 2012 would make the significance level ____.
- unchanged
 - increased or reduced
 - increased
 - reduced

14. Which of the followings could enhance the power of the test when Bettman concerned much more about the tremendous investment of unprofitable launch of CreaSlate?
- A. The sample size was increased by collecting more responses on Facebook.
 - B. The cost of manufacturing process was increased.
 - C. More business women were recruited to examine the hypothesis.
 - D. A credible report suggested that the demand of table PC would only reach 5 million units by 2012.

Bettman was aware that a lot of factors might influence the sales of a new product. One of factors came to his mind was number of sales representative (NSR). In order to identify the potential contribution of NSR on sales, Bettman asked the market research team to retrieve sales information, from CreaTech's database of sales on E-reader, of 10 cities from the east America and another 10 cities from the west America. The 10 pairs of cities were selected such that the sales within each pair were identical, and it was not necessary that sales across pairs were exactly the same. NSR from the east America for pair 1 to pair 10 was 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 respectively, and the counterpart from the west America was 10, 9, 8, 7, 6, 5, 4, 3, 2, and 1 respectively.

15. In the regression of sales on NSR for the east America, let the estimated coefficient of NSR be b . What would be the estimated coefficient of NSR on the same regression for the west America?
- A. b
 - B. $-b$
 - C. $10 - b$
 - D. Need more information to make the estimation, such as sales of 10 cities.
16. If the coefficient of correlation between NSR and sales in 10 cities of the west America was r , what would be R-square in the regression of sales on NSR for the east America?
- A. r^2
 - B. $(10 - r)^2$
 - C. $100 - r^2$
 - D. Need more information, such as sales of 10 cities.
17. In the regression of sales on NSR for the east America, let the estimated coefficient of NSR be b , and the lower limit of b 's confidence interval be L and upper limit be U . What would be the lower limit of confidence interval for the estimated coefficient of NSR on the same regression for the west America?
- A. $-L$
 - B. $10 - L$
 - C. $-U$
 - D. Need more information, such as sales of 10 cities.

見背面

18. In the regression of sales on NSR for the east America, let the estimated coefficient of NSR be b . If the data from the west America is merged with the data from the east America, 20 observations would be included in the new dataset. In the same regression of sales on NSR for the merged data, what would be the estimated coefficient of NSR?
- b
 - $-b$
 - 0
 - Need more information, such as sales of 10 cities.
19. Even though some factors might not predict sales perfectly well, Bettman noticed that sales units (U) and sales dollars (D) showed a functional relationship. That is, D would always be equivalent to U multiplied by the constant unit price (P), i.e., $D = f(U)$ or $D = U \cdot P$. In the other words, U was a perfect predictor of D . Which of the following is correct?
- The market research team could run a regression of D on U , and the estimated coefficient of U would be P .
 - If the significance level was set extremely low, the lower limit of confidence interval of the estimated coefficient of U would be reduced.
 - If the significance level was set relatively high, the upper limit of confidence interval of the estimated coefficient of U would be reduced.
 - The covariance between D and U was positive.

The market research team then suggested two more factors, i.e., package and channel, could explain sales, and retrieved from the same database relevant information as follows.

Package	Channel	
	National	Local
Large	48	48
	44	42
Medium	64	70
	70	74
Small	44	46
	42	50

Then the market research team prepared the following ANOVA table. Please fill in the missing values.

ANOVA Output (Dependent Variable: Sales)

Source	df	SS	MS	F
Package	"A"	"F"	"J"	"M"
Channel	"B"	"G"	"K"	
Interaction	"C"	"H"	"L"	
Error	"D"	"I"	10.33	
Total	"E"	---		

20. "A" is equal to ____.

- A. 1
- B. 2
- C. 3
- D. 4

21. "B" is equal to ____.

- A. 1
- B. 2
- C. 3
- D. 4

22. "C" is equal to ____.

- A. 1
- B. 2
- C. 3
- D. 4

23. "D" is equal to ____.

- A. 2
- B. 4
- C. 6
- D. 8

24. "E" is equal to ____.

- A. 10
- B. 11
- C. 9
- D. 8

25. "F" is equal to ____.

- A. 1390
- B. 1634
- C. 1428
- D. 1536

見背面

26. "G" is equal to ____.

- A. 23
- B. 27
- C. 29
- D. 25

27. "H" is equal to ____.

- A. 24
- B. 30
- C. 28
- D. 26

28. "I" is equal to ____.

- A. 54
- B. 50
- C. 58
- D. 62

29. "J" is equal to ____.

- A. 1428
- B. 714
- C. 376
- D. 768

30. "K" is equal to ____.

- A. 29
- B. 14.5
- C. 27
- D. 9.67

31. "L" is equal to ____.

- A. 12
- B. 14
- C. 28
- D. 26

32. "M" is equal to ____.

- A. 69.12
- B. 74.32
- C. 82.69
- D. 148.69

試題隨卷繳回