※ 考生請注意：本試題不可使用計算機　　請勿在本試題紙上作答，否則不予計分

I.　　True or False (20 points, 2 pts each)

Notes:

　　(1) Answer questions using "T" or "F".

　　(2) Write down your answers along with associated questions.

　　(3) Label questions in numerical order.

1.　The geometric mean is an appropriate estimator for the expected mean return or growth rate in the future.

2.　The percentage of the area to the right of the median is 50% no matter what skewness a distribution might have.

3.　The correlation between two independent variables should be zero while the covariance between them might not be zero.

4.　If there is a nonlinear relationship between random variables, then the correlation coefficient between them should not be zero.

5.　The distance between ends of a box in a box-and-whisker plot is the interquartile range.

6.　According to Chebyshev's theorem, the proportion of data within 1.5 standard deviations of the mean is at least 56%.

7.　If we want to enlarge the standard deviation of weekly returns to an annual frequency, it can be done by multiplying the weekly standard deviation by 52 assuming there are 52 weeks in a year.

8.　The adjusted R-squared of a regression might decrease if one more uncorrelated explanatory variable is included in the regression.

9.　An investigator has constructed a confidence interval of [-2.345, +2.345] at a confidence level of 95%. Therefore, the confidence interval at a 90% confidence level could be [-2.245, +2.245].

10.　The probability that it is sunny tomorrow is 0.4 and the probability that a person does not carry an umbrella with him/her during a rainy day is 0.25. Therefore, the probability that a person does not carry an umbrella given that it rains tomorrow is 0.625.

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II.　Choose the BEST answer (45 points, 3 pts each)

Notes:

(1) Answer questions using "A", "B", "C", or "D".

(2) Write down your answers along with associated questions.

(3) Label questions in numerical order.

1. A shopping mall holds a sweepstake in which a winner is able to take an iphone 5 home. Each participant has two chances and is required to draw one ticket each time from one of two boxes in which one box has 4 "thank you" tickets and the other box has one iphone 5 winning ticket and 3 "thank you" tickets. You are chosen to participate in this sweepstake. Your first draw is a "thank you" ticket. What is the probability that you are able to take an iphone 5 home?

   (A)　　0.33

   (B)　　0.14

   (C)　　0.19

   (D)　　None of above

2. A distribution has the mean of 3.45, the median of 1.35, and the sample standard deviation of 4.56. What is the Pearson's coefficient of skewness?

   (A) 1.6245
   (B) 1.5137
   (C) 1.4375
   (D) 1.3816

3. An experiment was conducted to examine whether women like sweets more than men. The following frequency table (unit: number of people) was obtained:

Chosen Food	Men	Women	Total
Sweets	3	7	10
Non-sweets	6	4	10
Total	9	11	20

   According to the Fisher's exact test, do women significantly like sweets more than men at 0.05 significance level?

   (A) Insignificant

   (B) Significant

   (C) Indeterminate

   (D) Not enough information

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Use the following information to answer **Questions 4 to 7**.

An investigator used the following time trend equation to fit the sales (in million dollars) data, starting from 1998 ($t=1$), of a beverage company.

$$\ln Sales_t = a + b \times t + \epsilon_t,$$

where t is time period, ϵ_t are residuals, a and b are parameters.

4. The predicted sales for years 2002 and 2005 are 427.82 and 924.36, respectively. What is the value of b?

   (A) 0.1467

   (B) 0.2568

   (C) 0.3654

   (D) 0.4147

5. What is the predicted value of year 2009?

   (A) 1545.2

   (B) 1997.6

   (C) 2581.9

   (D) 5579.8

6. What is the average predicted sales from years 2006 to 2008?

   (A) 1287
   (B) 1327
   (C) 1458
   (D) 1579

7. The standard error for the estimate of b is 0.0133. What is the value of F test statistic for testing the null hypothesis of $b = 0$?

   (A) 372.81
   (B) 423.17
   (C) 561.39
   (D) 672.15

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Use the following information to answer **Questions 8 to 11**.

NCKU Micro automatic company purchases three replacement parts for machines used in manufacturing process. Information regarding the price and quantity of those parts is as follows:

Part	2010 (base period)		2012 (current period)	
	Price	Quantity	Price	Quantity
NK-p1	$30	4,000	$32	4,500
NK-p2	$15	1,800	$12	2,000
NK-p3	$20	2,500	$25	3,200

8. What is the simple aggregate index of year 2012?

   (A) 103.22
   (B) 104.32
   (C) 105.24
   (D) 106.15

9. What is the value index of year 2012?

   (A) 125.89
   (B) 126.75
   (C) 127.42
   (D) 128.35

10. NCKU Micro automatic company decides to make equal dollar amount purchase of three products. What is the equally-weighted index of year 2012 for this equal dollar amount purchase scheme?

    (A) 101.32
    (B) 102.45
    (C) 103.89
    (D) 104.74

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11. If the base period is shifted to year 2011, what is the value index of year 2010?

2011 (new base period)

Part	Price	Quantity
NK-p1	$31	4,100
NK-p2	$11	2,100
NK-p3	$22	2,800

(A) 92.07

(B) 93.01

(C) 94.31

(D) 95.23

Use the following information to answer **Questions 12 to 15**

A preliminary diet experiment was conducted to see if a new high-fiber cereal product is able to make any differences on calorie consumption in humans. Two groups (first group n_1 are consumers of the new cereal product; second group n_2 are nonconsumers of the new cereal product) which had $n_1 = 40$ and $n_2 = 108$ people, respectively, were randomly selected. The investigators constructed a confidence interval of consumed calorie difference between two groups at a $(1 - \alpha)$ level of [LCL, UCL]=[-47.6131, -0.5469] (LCL: lower confidence limit; UCL: upper confidence limit)

12. What is the difference between these two group averages?

(A) -23.14
(B) -24.08
(C) -25.32
(D) Not enough information

13. Assuming the variances are not equal between two groups, the sample variance of the first group is 4032 and the sample variance of the second group is 10845. What is the degree of freedom (rounded) for the t test statistic adopted in the mean difference test?

(A) 108
(B) 110
(C) 112
(D) 114

14. What is the value of α? (The followings are some t values (v represents the degree of freedom): $t_{0.05,v} = 1.659$, $t_{0.025,v} = 1.982$, and $t_{0.01,v} = 2.361$)

(A) 2%
(B) 5%
(C) 10%
(D) Not enough information

（背面仍有題目，請繼續作答）

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15. Is it significant that the consumers who took the new cereal consumed fewer calories than nonconsumers at significance level in question 14?

   (A) Insignificant

   (B) Significant

   (C) Indeterminate

   (D) Not enough information

III. Partial Credit Questions and Fill in the Blanks (35 points, 5 pts each)

Notes:

   (1) Write down your answers and solution steps along with associated blanks.

   (2) Label blanks in alphabetical order.

1. Below is a frequency table (unit: number of people) showing that opinions of financial analysts regarding relationship between the market sentiment and market conditions:

   Unit: number of people

Market Sentiment	Market Conditions			Total
	Up	Down	Flat	
Good	25	11	14	50
Bad	5	35	10	50
Total	30	46	24	100

   (1) What are the Pearson's Chi-square test statistics and the degree of freedom regarding the relationship between market sentiment and market conditions? __(a)__ and __(b)__

   (2) What is the likelihood ratio test statistic regarding the relationship between market sentiment and market conditions? __(c)__

   (3) What is the Cramer's v regarding the correlation between market sentiment and market conditions? __(d)__

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2. The following tables show standard deviations of and the correlations among the heating cost (HC), the outside temperature (OT), and the house insulation degree (HI).

Correlations

	Heating Cost	Outside Temperature	House Insulation Degree
Heating Cost	1		
Outside Temperature	-0.852	1	
House Insulation Degree	-0.256	-0.038	1

Standard Deviations

Heating Cost	Outside Temperature	House Insulation Degree
121.7372	19.3408	3.4198

(1) If we run a regression with an intercept between the heating cost and the house insulation degree, what is the slope of this regression line?　(e)

(2) If we run a regression with an intercept between the outside temperature and the house insulation degree, what is the slope of this regression line?　(f)

(3) The correlation between residuals from the regression lines of (1) and (2) above is -0.893, the standard deviation of residuals of the regression line between the heating cost and the house insulation degree $s_{HC,HI} = 117.6663$, and the standard deviation of residuals of the regression line between the outside temperature and the house insulation degree $s_{OT,HI} = 19.3269$. What is the regression coefficient associated with the outside temperature if we run a multiple regression line among the heating cost, the outside temperature and the house insulation degree?　(g)