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Instructions: **Write down your full name and username first**. For a multiple-choice question, select the only correct answer. For other types of questions, answer each question as what it asks in its respective following space in a sufficient yet succinct way. **The take-home final exam is one day long on Tuesday May 19.**

After completion, rename and save this file as **“Final\_BUSAD 040-02\_*your full name*” in either MS Word (.docx) or PDF (.pdf) format** then upload and submit it on Moodle by the due date. No other file formats will be accepted. Late submission will NOT be accepted.

**Total possible points: 100**

1. Multiple-choice questions (40 points in total, each worth 1 point)

Note: In each multiple-choice question, highlight the only correct answer in **bold font and yellow**, and type the correct answer’s option letter on the provided empty answer line.

1.1 The sample space refers to

a. any particular experimental outcome

b. the sample size minus one

c. the set of all possible experimental outcomes

d. an event

Answer \_\_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_

1.2 An experiment consists of four outcomes with P(E1) = 0.2, P(E2) = 0.3, and P(E3) = 0.4. The probability of outcome E4 is

a. 0.500

b. 0.024

c. 0.100

d. 0.900

Answer \_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_\_

1.3 A method of assigning probabilities which assumes that the experimental outcomes are equally likely is referred to as the

a. objective method

b. classical method

c. subjective method

d. experimental method

Answer \_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_\_

1.4 If A and B are independent events with P(A) = 0.38 and P(B) = 0.55, then P(A | B) =

a. 0.209

b. 0.000

c. 0.550

d. 0.38

Answer \_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_\_\_

1.5 If X and Y are mutually exclusive events with P(X) = 0.295, P(Y) = 0.32, then P(X | Y) =

a. 0.0944

b. 0.6150

c. 1.0000

d. 0.0000

Answer \_\_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_

1.6 If A and B are independent events with P(A) = 0.35 and P(B) = 0.20, then, P(A ⋃ B) =

a. 0.07

b. 0.62

c. 0.55

d. 0.48

Answer \_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_

1.7 If P(A) = 0.7, P(B) = 0.6, P(A ⋂ B) = 0, then events A and B are

a. not mutually exclusive

b. mutually exclusive

c. independent events

d. complements of each other

Answer \_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_

1.8 Assume your favorite soccer team has 3 games left to finish the season. The outcome of each game can be win, lose, or tie. How many possible outcomes exist?

a. 7

b. 27

c. 36

d. 64

Answer \_\_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_

1.9 The counting rule that is used for counting the number of experimental outcomes when n objects are selected from a set of N objects where **order of selection is important** is called

a. permutation

b. combination

c. multiple step experiment

d. None of these alternatives is correct.

Answer \_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_

1.10 From a group of six people, two individuals are to be selected at random. How many possible selections are possible?

a. 12

b. 36

c. 15

d. 8

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.11 When the results of experimentation or historical data are used to assign probability values, the method used to assign probabilities is referred to as the

a. relative frequency method

b. subjective method

c. classical method

d. posterior method

Answer \_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_

1.12 A sample point refers to the

a. numerical measure of the likelihood of the occurrence of an event

b. set of all possible experimental outcomes

c. individual outcome of an experiment

d. sample space

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.13 Two events are mutually exclusive

a. if their intersection is 1

b. if they have no sample points in common

c. if their intersection is 0.5

d. None of these alternatives is correct.

Answer \_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_

1.14 Two events with nonzero probabilities

a. can be both mutually exclusive and independent

b. cannot be both mutually exclusive and independent

c. are always mutually exclusive

d. are always independent

Answer \_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_

1.15 Events A and B are mutually exclusive if their joint probability is

a. larger than 1

b. less than zero

c. zero

d. infinity

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.16 If a six-sided dice is tossed twice and “3” shows up both times, the probability of “3” on the third trial is

a. much larger than any other outcome

b. much smaller than any other outcome

c. 1/6

d. 1/216

Answer \_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_

1.17 If P(A) = 0.4, P(B | A) = 0.35, P(A ⋃ B) = 0.69, then P(B) =

a. 0.14

b. 0.43

c. 0.75

d. 0.59

Answer \_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_

1.18 Given that event E has a probability of 0.31, the probability of the complement of event E is

a. cannot be determined with the above information

b. can have any value between zero and one

c. 0.69

d. 0.31

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.19 Each customer entering a department store will either buy or not buy some merchandise. An experiment consists of following 3 customers and determining whether or not they purchase any merchandise. The number of sample points in this experiment is

a. 2

b. 4

c. 6

d. 8

Answer \_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_\_

1.20 An experiment consists of three steps. There are 4 possible results on the first step, 3 possible results on the second step, and 2 possible results on the third step. The total number of experimental outcomes is

a. 9

b. 14

c. 24

d. 36

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.21 If A and B are independent events with P(A) = 0.2 and P(B) = 0.6, then P(A ⋃ B) =

a. 0.62

b. 0.12

c. 0.60

d. 0.68

Answer \_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_

1.22 If A and B are mutually exclusive events with P(A) = 0.3 and P(B) = 0.5, then P(A ⋃ B) =

a. 0.00

b. 0.15

c. 0.8

d. 0.2

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.23 Events A and B are mutually exclusive with P(A) = 0.3 and P(B) = 0.2. Then, P() =

a. 0.00

b. 0.06

c. 0.7

d. 0.8

Answer \_\_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_

1.24 If a six-sided dice is tossed twice, the probability of obtaining two “4”s in a row is

a. 1/6

b. 1/36

c. 1/96

d. 1/216

Answer \_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_

1.25 If P(A) = 0.48, P(A ⋃ B) = 0.82, and P(B) = 0.54, then P(A ⋂ B) =

a. 0.3936

b. 0.3400

c. 0.2000

d. 1.0200

Answer \_\_\_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_

1.26 In a regression analysis, the error term Ꜫ is a random variable with a mean or expected value of

a. zero

b. one

c. any positive value

d. any value

Answer \_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_

1.27 For a **population dataset**, the mathematical equation relating the independent variable to the expected value of the dependent variable, that is, E(y) = β0 + β1x, is known as

a. regression equation

b. correlation equation

c. estimated regression equation

d. regression model

Answer \_\_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_

1.28 In regression analysis, which of the following is **NOT** a required assumption about the error term Ꜫ?

a. The expected value of the error term is one.

b. The variance of the error term is the same for all values of X.

c. The values of the error term are independent.

d. The error term is normally distributed.

Answer \_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_

1.29 In a regression and correlation analysis if , then

a. SSE = SST

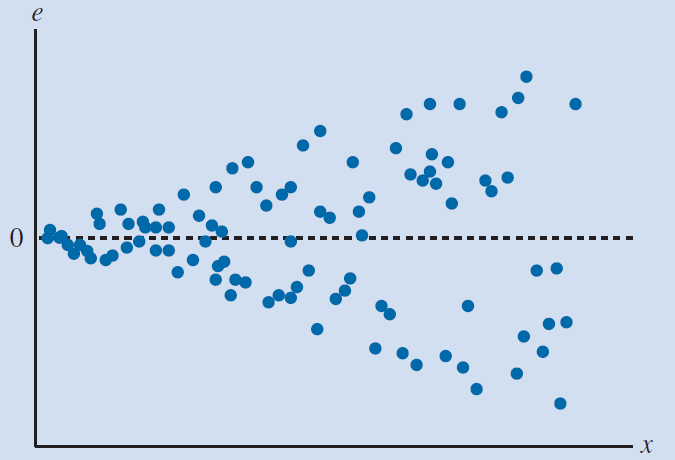
b. SSE = 1

c. SSR = SSE

d. SSR = SST

Answer \_\_\_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_

1.30 Which of the following inferences can be drawn from the **residual scatter plot** given below?

a. The residuals have a varying variance.

b. The model captures the relationship between the variables accurately.

c. The regression model follows the F probability distribution.

d. The residual distribution is consistently scattered about zero.

Answer \_\_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_

1.31 If the (coefficient of determination) is 0.9, the percentage of variation in the dependent variable explained by the variation in the independent variable is

a. 0.90%

b. 90%

c. 81%

d. 0.81%

Answer \_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_\_

1.32 In regression analysis, the variable that is **being predicted** is the

a. dependent variable

b. independent variable

c. intervening variable

d. is usually x

Answer \_\_\_\_\_\_\_\_A\_\_\_\_\_\_\_\_\_\_\_

1.33 In the following estimated regression equation

a. b1 is the slope

b. b1 is the intercept

c. b0 is the slope

d. None of these alternatives is correct.

Answer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1.34 The model developed from a **sample dataset** that has the form of is known as

a. regression equation

b. correlation equation

c. estimated regression equation

d. regression model

Answer \_\_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_

1.35 In regression analysis, the independent variable is

a. used to predict other independent variables

b. used to predict the dependent variable

c. called the intervening variable

d. the variable that is being predicted

Answer \_\_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_

1.36 In a regression analysis, the variable that **is used to predict** another variable

a. must have the same units as the other variable

b. is the independent variable

c. is the dependent variable

d. usually is denoted by y

Answer \_\_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_

1.37 A regression analysis between sales (**in $1000**) and price (**in dollars**) resulted in the estimated equation . This equation implies that an

a. increase of $1 in price is associated with a decrease of $8 in sales

b. increase of $8 in price is associated with a decrease of $52,000 in sales

c. increase of $1 in price is associated with a decrease of $52 in sales

d. increase of $1 in price is associated with a decrease of $8000 in sales

Answer \_\_\_\_\_\_\_\_C\_\_\_\_\_\_\_\_\_\_\_

1.38 If there is a very strong correlation between two variables then the (coefficient of determination) must be

a. much larger than 1, if the correlation is positive

b. much smaller than -1, if the correlation is negative

c. any value larger than 1

d. None of these alternatives is correct.

Answer \_\_\_\_\_\_\_D\_\_\_\_\_\_\_\_\_\_\_\_

1.39 In a regression analysis if SST = 4500 and SSE = 1575, then the (coefficient of determination) is

a. 0.35

b. 0.65

c. 2.85

d. 0.45

Answer \_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_

1.40 The sample correlation coefficient ()

a. is the square of the coefficient of determination

b. is the square root of the coefficient of determination

c. is the same as the coefficient of determination

d. can never be negative

Answer \_\_\_\_\_\_\_\_B\_\_\_\_\_\_\_\_\_\_\_

1. You are given the following information on Events A, B, C, and D.

P(A) = 0.4 P(A ⋃ D) = 0.6

P(B) = 0.2 P(A | B) = 0.3

P(C) = 0.1 P(A ⋂ C) = 0.04

P(A ⋂ D) = 0.03

Answer the following 8 questions (2.1-2.8) using the information provided above and show a little bit the process how you get your final answer for each question in its respective space. (20 points in total)

* 1. Compute P(D). (2 points)

P(A ⋃ D) = P(A) + P(D) - P(A ⋂ D)

0.6 = 0.4 + P(D) – 0.03

0.2 = P(D) – 0.03

0.23 = P(D)

2.2 Compute P(A ⋂ B). (3 points)

P(A | B) = P(A ⋂ B) / P(B)

0.3 = P(A ⋂ B) / 0.2

0.06 = P(A ⋂ B)

2.3 Compute P(A | C). (3 points)

P(A | C) = P(A ⋂ C) / P(C)

P(A | C) = 0.04 / 0.1

P(A | C) = 0.4

2.4 Compute the probability of the complement of C. (2 points)

P(Cc) = 1.0 - P(C)

P(Cc) = 1.0 – 0.1

P(Cc) = 0.9

2.5 Are A and B mutually exclusive? Explain your answer. (2 points)

No because P(A ⋂ B) is not equal to 0.

2.6 Are A and B independent? Explain your answer. (3 points)

No because neither P(A | B) = P(A) or P(B | A) = P(B)

2.7 Are A and C mutually exclusive? Explain your answer. (2 points)

No because P(A ⋂ C) is not equal to 0

2.8 Are A and C independent? Explain your answer. (3 points)

Yes because P(A ⋂ C) = P(A)P(C) which = 0.04

1. Jason believes that the sales of coffee at his coffee shop depend upon the weather. He has taken a sample dataset of 6 days which is shown as follows. (40 points in total)

|  |  |
| --- | --- |
| **Cups of Coffee Sold** | **Temperature (F)** |
| 350 | 50 |
| 200 | 60 |
| 210 | 70 |
| 100 | 80 |
| 60 | 90 |
| 40 | 100 |

He did a simple linear regression analysis in Excel based on the above sample dataset and got the following regression report:

3.1 Between the two variables “Cups of Coffee Sold” and “Temperature”, which variable is the dependent variable (y) in the linear regression analysis? And which variable is the independent variable (x)? (2 points)

Cups of Coffee Sold is the dependent variable and the temperature is the independent variable

3.2 According to the regression report, write the mathematical **estimated simple linear regression equation** expressed in and . Interpret the meaning of the estimated coefficient of x (i.e., Temperature) in terms of its effect on the change of y when increasing x by one unit. (10 points)

= 605.714 + (-5.9428)(x)

If the temperature goes up by one degree, the sales of coffee will go down by 5.942.

3.3 According to the regression report, how much is the SSR, SSE and SST respectively? (3 points)

SST= 68200

SSR=61805.71429

SSE=6394.285714

3.4 According to the regression report, how much is the (coefficient of determination)? Explain the meaning of this . With the , do you think the estimated regression equation did a good job at capturing the linear relationship between y and x in the sample dataset? Why or why not? (10 points)

R^2 = 0.906242145

It means that the %90.62 change can be attributed to the linear relationship between temperature of the weather and coffee cup sales.

Yes it did because it takes into account all of the variable changes including the outlying increase at temperature of 70 degree.

3.5 According to the regression report, do you think the overall linear relationship between y and x is statistically significant at the 5% significance level? Why or why not? Which number in the regression report you reference to get this conclusion? (5 points)

Yes because the P value is less the 0.05.

P-Value Intercept

3.6 According to the regression report, do you think the individual estimated coefficient of **Intercept** is statistically significant at the 5% significance level? Why or why not? Which number in the regression report you reference to get this conclusion? (5 points)

Yes because the P value is less the 0.05.

P-Value Temperature

3.7 Using the estimated linear regression equation from part 3.2, predict and compute the cups of coffee sold on a 90-Fahrenheit day and round up the predicted cups of coffee sold to the nearest integer. Show the computation process a little bit. (5 points)

= 605.714 + (-5.9428)(x)

605.714 + (-5.9428)(90)

ANS = 70.862