

Name:

Student ID:

BNAD/ECON/MGMT 276. STATISTICAL INFERENCE IN MANAGEMENT

Pre-session. Summer 2016.

TEST 1. DATE: 20 MAY 2016

Time: 75 minutes

NOTE:

1. There are total 31 questions. Answer all questions. The total points are 30.
2. You can use calculator. Your calculator may be programmable but you are not allowed to use the programmable tools.

Good luck!

1. (3 points) You are given 12 formulas/descriptions/notations on the left and 15 statistical concepts on the right column. Please match each formulas/description to its corresponding statistical concepts. Notice there are **3 redundant concepts**, i.e. 3 concepts that do not have the corresponding descriptions.

Hence, you need to **match 12 formulas/descriptions to the correct 12 concepts**. Each correct match worths 0.25 point.

- | | |
|---|------------------------------|
| 1. $\frac{s_{xy}}{s_x s_y}$ | A. Sample mean |
| 2. $s_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{n-1}$ | B. Sample variance |
| 3. $A \cup B$ | C. Standard deviation |
| 4. Largest Value – Smallest Value | D. Sample covariance |
| 5. $\frac{\sum x_i}{n}$ | E. Correlation coefficient |
| 6. $A \cap B$ | F. Mode |
| 7. $P(A \cap B) = 0$ | G. Interquartile Range |
| 8. $P(A^c) = 1 - P(A)$ | H. Range |
| 9. $P(A B) = P(A)$ | I. Union event |
| 10. Choose k objects out of N objects, order matters, without replacement | J. Intersection event |
| 11. $s = \sqrt{s^2}$ | K. Mutually exclusive events |
| 12. $\frac{\sum(x_i - \bar{x})^2}{n-1}$ | L. Independent events |
| | M. Complement event |
| | N. Combination rule |
| | O. Permutation rules |

(Note, for descriptions 7 and 8, please pick the corresponding most relevant concepts.)

Please write down your answer as specific as 1A, 2B, 3C... below:

- | | |
|----|-----|
| 1. | 7. |
| 2. | 8. |
| 3. | 9. |
| 4. | 10. |
| 5. | 11. |
| 6. | 12. |

2. (1 point)

The measure of dispersion which is not measured in the same units as the original data is the

- a. median
- b. standard deviation
- c. coefficient of determination
- d. variance

3. (1 point)

The interquartile range is used as a measure of variability to overcome what difficulty of the range?

- a. the sum of the range variances is zero
- b. the range is difficult to compute
- c. the range depends too much on extreme values
- d. the range is negative

4. (0.5 point) The maximum grade of the test is 10, i.e. the test grade scale is 1 – 10. The result shows that the median grade of the class is 6. Which of the following statements is correct?

- a. Because the midpoint of the grade is $10/2 = 5$, the variance is $6 - 5 = 1$
- b. Because the midpoint of the grade is $10/2 = 5$, the standard deviation is $6 - 5 = 1$
- c. Half of the class has the grade above 6 and half of the class has the grade below 6
- d. Because the midpoint of the grade is $10/2 = 5$, the median grade is greater than the mean grade.

5. (0.5 point) The class has 10 students and the maximum grade of the test is 10, i.e. the test grade scale is 1 – 10. The result shows that the median grade of the class is 6. Which of the following statements is correct?

- a. Because the midpoint of the grade and the midpoint of the class (size) is $10/2 = 5$, the variance is $6 - 5 = 1$
- b. Because the midpoint of the grade and the midpoint of the class (size) is $10/2 = 5$, the standard deviation is $6 - 5 = 1$
- c. Half of the class has the grade above 6 and half of the class has the grade below 6
- d. Because the midpoint of the grade and the midpoint of the class (size) is $10/2 = 5$, the median grade is greater than the mean grade.

Name:

Student ID:

The following data set is used to answer questions 6, 7, 8

After graduation ceremonies at a university, six graduates were asked whether they were in favor of (identified by 1) or against (identified by 0) abortion. Some information about these graduates is shown below.

Graduate	Sex	Age	Abortion Issue	Class Rank
Marissa	F	24	1	1
Jason	M	22	1	2
Wendy	F	41	0	3
Edward	M	38	0	20
Jennifer	F	25	1	4
Tim	M	19	0	8

6. How many elements are in the above data set? (0.5 point)

7. How many variables are in the above data set? What are they?(0.5 point)

8. Which variable(s) is/are categorical? Which is/are quantitative? (1 point)

The following data is used for questions 9, 10, 11, 12, 13

The closing stock price of MNM Corporation for the last 7 trading days is shown below.

Day	Stock Price
1	84
2	87
3	84
4	88
5	85
6	90
7	91

9. (1 point) What is the type of this data set? (Choose a or b or c or d)
- Cross-sectional data
 - Time-series data
 - Panel data
 - Longitudinal data
10. (1 point) What is the **mean** value of the stock price?
11. (1 point) What is the **median** value of the stock price?
12. (1 point) What is the **range** of the stock price?
13. (1 point) What is the **mode** value of the stock price? Hint: the value that occurs ...?.. frequently

Name:

Student ID:

The following data set is used for questions 14, 15, 16, 17, 18, 19

The Michael Painting Company has purchased paint from several suppliers. The purchase price per gallon and the number of gallons purchased are shown below.

Supplier	Price Per Gallon (\$)	Number of Gallons
A	15	40
B	22	30
C	30	10
D	27	20

14. What is the sample **variance** of the **Price Per Gallon**? (1 point) Hint: You are given a mysterious table below, which may be useful.

15	-8.5	72.25
22	-1.5	2.25
30	6.5	42.25
27	3.5	12.25

15. Calculate the **standard deviation** of the Price Per Gallon? (1 point)

Name:

Student ID:

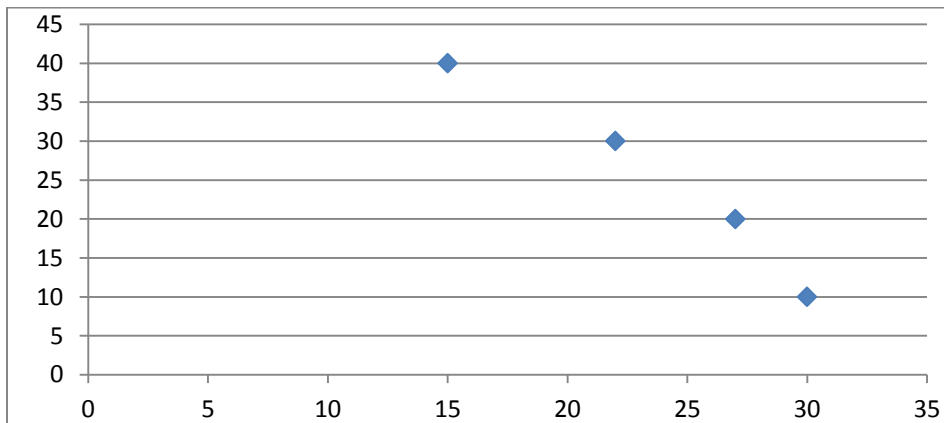
16. Calculate the sample **covariance** of the Price Per Gallon and the Number of Gallons? (1 point).
Hint: You are given a mysterious table below, which may be useful.

15	40	-8.5	72.25	15	225	-127.5
22	30	-1.5	2.25	5	25	-7.5
30	10	6.5	42.25	-15	225	-97.5
27	20	3.5	12.25	-5	25	-17.5

Name:

Student ID:

17. What is the name of the plot below? (0.5 point)



18. What does the sample covariance tell you about the relation between the two variables Price Per Gallon and Number of Gallons? (1 point)

(If you could not calculate the covariance, have a look at the plot in question 17, what can you tell about the relationship between the two variables?)

Name:

Student ID:

19. (1 point) What do you think about the sign and the magnitude of the sample **correlation coefficient** of the Price Per Gallon and the Number of Gallons? Hint: Is it near to - 1, 0, or 1? What does it mean? You can either calculate the correlation coefficient to answer this question, or you can look at the plot in question 17 to answer this question. In case you want to calculate the correlation coefficient, you may find it useful to look at the mysterious table in question 16.

Peter is conducting an experiment of rolling a die. Answer the questions 20, 21, 22

20. How many possible outcomes of the above experiment? (1 point)
21. What is the probability of each outcome if Peter thinks the die is a fair die, i.e. the die does not have any faults? (1 point)

Name:

Student ID:

22. Suppose now, Peter is doing a second step in which he toss a fair coin. How many possible outcomes, in total, of the new experiment, the one includes both rolling a die and tossing the coin? **Show the work why/how you get that number.** (1 point)

23. John is doing an experiment in which he chooses **3 balls out of 4 balls at a time**. How many possible outcomes in this experiment? **Show the work why/how you get that number.** (1 point)

Name:

Student ID:

The following data set is used to answer questions 24, 25, 26, 27

A survey of 300 college seniors resulted in the following crosstabulation regarding their undergraduate major and whether or not they plan to go to graduate school.

Graduate School	Undergraduate Major		Total
	Business	Engineering	
Yes	70	30	100
No	110	90	200
Total	180	120	300

24. Show the joint probability distribution table. Your table should include everything, i.e. including also marginal probabilities. (1 point)

25. What is the probability that we will see a student who majors in engineer and also plans to attend graduate school? (1 point)

26. What is the probability that we will see a student **majoring in business**? (1 point)

27. What is the probability that we will see a student going to the graduate school given that we know the student majors in **engineer**? (1 point)

Name:

Student ID:

Bank of America has conducted a survey on how frequently consumers use credit cards in making a purchase. The results of the study provide the following information. (The survey only interviews people who are above 18 years old.)

37% of consumers use a credit card when making a purchase.

Among those consumers who use a credit card, 60% are **under** 40 years old.

45% of people interviewed for the survey are **above** 40 years old.

Let Y (young) = event that a consumer is under 40 years old (and of course, above 18 years old.)

Let U (use a credit card) = event that a consumer uses a credit card in making a purchase.

28. Determine the value of $P(U)$ (1 point)

29. Determine the value of $P(Y)$ (1 point)

30. What is the probability that a consumer uses a credit card given that the consumer is under 40 (and above 18) years old? (1 point) Hint: conditional probabilities and the formulas in the handed out sheet are useful.

Name:

Student ID:

31. What can you say about the two events Y and U ? (0.5 point) Hint: compare $P(U)$ and $P(U|Y)$, and recall something similar to 'relevant' or 'irrelevant'?

If you can't calculate $P(U|Y)$, think about the real life situation and answer this question, i.e. guess the relation between Y and U ; of course, you need to name the correct statistical concept to get the full credit for this question.