

MBA 608 Statistical Models for Business Decisions

Fall 2010

First Class Test

Name: Key
I.D.: _____

DIRECTIONS: The exam is divided into 2 parts: PART A) "Multiple Choice", and PART B) Problems to be solved. For part A, indicate the most appropriate answer. For part B, work problems in the space provided and please show all work and the formulas used. You may use your book, notes and a calculator. GOOD LUCK!

Question	Maximum	Your Grade
Part A	60	
Part B		
1	14	
2	12	
3	14	
Total:	100	

PART A

Multiple Choice (2.5 points each)

Use **TABLE 1** below to answer questions 1 through 7

A manager of a child day-care center takes care of 40 children whose ages are given below along with the weekly charge for each age group:

Age	fX	Number	Cost (\$)	fX
1	2	2	100	200
2	16	8	80	640
3	18	6	50	300
4	40	10	60	600
5	70	14	80	1120
	146			2860

1. The median age for these data is
- 2
 - 3
 - 4
 - 5

Answer: C

2. The modal age for these data is
- 2
 - 3
 - 4
 - 5

Answer: d

3. The arithmetic mean age for these data is
- 2.85
 - 3.00
 - 3.65
 - 4.05

$$\frac{\sum fX}{n} = \frac{146}{40} = 3.65$$

Answer: C

4. The median cost for a week's care at the day-care center is

- a. \$50
- b. \$60
- c. \$80
- d. \$90

50 60 80 100
6 10 22 2

Answer: C

5. The modal cost for a week's care at the day-care center is

- a. \$50
- b. \$60
- c. \$80
- d. \$100

Answer: C

6. The arithmetic mean cost for a week's care at the day-care center is

- a. \$71.50
- b. \$65.70
- c. \$78.75
- d. \$80.00

$$\frac{\sum fx}{n} = \frac{2860}{40} = 71.5$$

Answer: a

7. A student obtained the following grades on 5 tests: 84, 78, 88, 72, and 72. What is the median grade?

- a. 88
- b. 72
- c. 78
- d. 80

72, 72, 78, 84, 88

Answer: C

8. The mean life of a particular brand of light bulb is 1000 hours and the standard deviation is 50 hours. Tests show that the life of the bulb is approximately normally distributed. It can be concluded that approximately 68% of the bulbs will last between

- a. 900 and 1100 hours
- b. 950 and 1050 hours
- c. 850 and 1150 hours
- d. 800 and 1200 hours

Answer: b

9. Patty Pierce, president of Pierce Products, is reviewing the warranty policy for her company's new mode of automobile batteries. Life tests performed on a sample of 100 batteries indicated; (1) an average life of 75 months, (2) a standard deviation of 5 months, and (3) battery life is approximately normally distributed. Approximately, what percentage of the batteries will fail within the first 65 months of use?
- a. 0.5%
 - b. 1%
 - c. 2.5%
 - d. 5%

Answer: c

10. Which of the following is always true?
- a. the median is always one-half of the mean
 - b. the mode is always greater than the mean
 - c. the mean is always equal to the median.
 - d. the standard deviation is always the square root of the variance.

Answer: d

11. Betty Barnes, Chief Financial Officer of Plano Piano, Inc., suspects irregularities in the payroll system, and orders an inspection of "each and every payroll voucher issued since January 1, 1993". Each payroll voucher was inspected and the following frequency distribution was compiled.

Errors Per Voucher	Number of Vouchers
0-under 2	500
2-under 4	400
4-under 6	300
6-under 8	200
8-under 10	100

The distribution of errors per voucher is _____

- a. symmetrical with respect to its mean
- b. skewed to the right
- c. not skewed
- d. negatively skewed.

Answer: b

12. George Smith, VP of Human Resources for the Royal Bank of Canada, is reviewing the employee training programs of the Royal Bank. His staff compiled the following table of regional statistics on teller training hours.

	Eastern Region	Western Region
Mean	20	28
Median	20	20
Mode	20	21
Standard Deviation	5	7

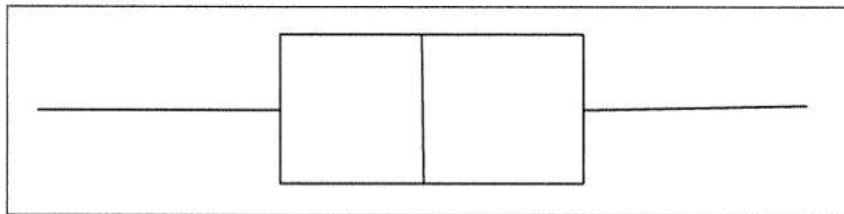
What can George conclude from these statistics?

The distribution of errors per voucher is _____

- a. the Western Regions distribution has the greater dispersion.
- b. the Western Regions distribution is skewed to the right.
- c. the Eastern Regions distribution has a greater dispersion.
- d. the Eastern Regions distribution is skewed to the left.

Answer: b

13. The following box and whisker plot was constructed for the age of accounts receivable.



The box and whisker plot reveals that the accounts receivable ages are _____.

- a. skewed to the left
- b. skewed to the right
- c. not skewed
- d. normally distributed

Answer: c

14. Given $P(A) = 0.25$, $P(B) = 0.40$, $P(A \text{ and } B) = 0.10$. Which of the following is true?
- A and B are independent
 - A and B are mutually exclusive
 - A and B are collectively exhaustive
 - A and B are not independent

Answer: a

15. Given $P(A) = 0.6$, $P(B) = 0.4$, $P(A|B) = 0.50$. Which of the following is true?
- A and B are independent
 - $P(A \text{ and } B) = .30$
 - $P(A \text{ and } B) = .20$
 - None of the above is true

Answer: c

16. A market research team compiled the following discrete probability distribution for families residing in Randolph County. In the distribution X represents the number of evenings the family dines outside their home during a week.

X	P(X)	$X \cdot P(X)$
0	0.30	0
1	0.50	.5
2	0.10	.2
3	0.10	.3

1.0

The mean (average) value of X is _____

- 1.0
- 1.5
- 2.0
- 2.5

Answer: a

17. The sales manager at Moss Pont Metropolitan Motors compiled the following discrete probability distribution. In this distribution X represents the number of cars sold per day at their dealership.

X	P(X)
0	0.25
1	0.50
2	0.25

Which of the following statements is true?

- a. this distribution is skewed to the right.
- b. this distribution is skewed to the left.
- c. this distribution is symmetric.
- d. this is a normal distribution.

Answer: c

18. The distribution of scores on a test is normal with a standard deviation of 6. Given that 93.32% of the students who took the test scored 90 or below, find the mean test score.

- a. $90 + (0.9332)(6)$
- b. $90 - (0.9332)(6)$
- c. $90 + (1.5)(6)$
- d. $90 - (1.5)(6)$
- e. $90 - (2)(6)$

$$z = \frac{x - \mu}{\sigma}$$

$$1.9 = \frac{90 - \mu}{6}$$

$$90 - \mu = 6(1.5)$$

$$\mu = 90 - 6(1.5)$$

Answer: d

19. The binomial distribution appears symmetrical when p =

- a. 0
- b. .1
- c. .5
- d. 1
- e. None of the above

Answer: c

20. Which of the following measurements randomly selected from a population could be considered a rare event (outlier) from any population distribution?

- a. $x = 0$ where $\mu = -3$ and $\sigma = 2$ $0 + 3 / 2 = 1.5$
- b. $x = -5$ where $\mu = 1$ and $\sigma = 4$ $-5 - 1 / 4 = -1.25$
- c. $x = 7$ where $\mu = 3$ and $\sigma = 2$ $7 - 3 / 2 = 2$
- d. $x = 4$ where $\mu = 0$ and $\sigma = 1$ $4 - 0 / 1 = 4.0 *$
- e. $x = 10$ where $\mu = 0$ and $\sigma = 5$ $10 - 0 / 5 = 2$

Answer: d

21. In general, which of the following descriptive summary measures cannot be easily approximated from a box-and-whisker plot?

- a. the range
- b. the variance
- c. the interquartile range
- d. the median

Answer: b

22. Which of the following is NOT a measure of central tendency?

- a. the arithmetic mean
- b. the geometric mean
- c. the interquartile range
- d. the mode

Answer: c

23. The estimation of the population average family expenditure on food based on the sample average expenditure of 1,000 families is an example of?

- a. inferential statistics
- b. a parameter
- c. descriptive statistics
- d. a statistic

Answer: a

24. The universe or “totality of items or things” under consideration is called?

- a. a parameter
- b. a statistic
- c. a population
- d. a sample

Answer: c

PART B

Work problems in the space provided and please show all work and the formulas used. You may use your book, notes and a calculator.

Question 1 (14 Points)

A certain type of automobile battery is known to have a life length which is normally distributed with a mean of 1100 days and a standard deviation of 80 days.

- a) For how long should these batteries be guaranteed if the manufacturer wants to replace only five percent of the batteries sold? (7 points)

$$\begin{aligned}z &= \frac{x - 111}{80} \\80(-1.645) &= x - 1100 \\x &= 1100 - 131.6 \\x &= 968.4\end{aligned}$$

- b) What percentage of batteries will last between 900 and 1200 days? (7 points)



$$z = \frac{1200 - 1100}{80} = \frac{100}{80} = 1.25$$

T.R.
.8944

$$z = \frac{900 - 1100}{80} = \frac{200}{80} = -2.50$$

.0062

.8882

Question 2 (12 points)

An airline's records show that during the busy summer vacation system, 80% of all flights arrive on schedule. If the airline plans to fly 1000 flights next month,

- a) Give the expected value $E(x)$ of the number of flights (x) that will arrive on time. (4 points)

$$a) E(x) = 1000(.8) = 800$$

- b) Give the standard deviation of the number of flights. (4 points)

$$\sigma = \sqrt{np(1-p)} = \sqrt{1000(.8)(.2)} = \sqrt{160} = 12.649$$

- c) If a random sample of 4 of the 1000 flights next month is selected, what is the probability that exactly 2 arrive on time and two do not?

$$4C_2 (.8)^2 (.2)^2 = \frac{4!}{2!2!} (.8)^2 (.2)^2 = 6 \cdot .64 \cdot .04 = .1536$$

Question 3 (14 points)

A market survey of 800 people found the following facts about the ability to recall a television commercial for a product and the actual purchase of the produce:

	Recalled	Did not recall	Total
Purchased	150	90	240
Did not purchase	250	310	560
Total	400	400	800

Let R denote the event that a person could recall the television commercial, and let P denote the event that a person purchased the product.

- a) Find $P(R)$, $P(P)$, and $P(R \text{ and } P)$, $P(R \text{ or } P)$. (8 points)

$$P(R) = 400/800 = .5$$

$$P(P) = 240/800 = .3$$

$$P(R \text{ and } P) = 150/800 = .1875$$

$$\begin{aligned} P(R \text{ or } P) &= P(R) + P(P) - P(R \text{ and } P) \\ &= \frac{400}{800} + \frac{240}{800} - \frac{150}{800} = \frac{490}{800} = .6125 \end{aligned}$$

- b) What is the probability that a person who recalled seeing the television commercial actually purchased the product? (3points)

$$P(P|R) = \frac{150}{400} = .375$$

c) Are R and P independent events? Use probability values to explain. (3 points)

$$P(R) = .4 \quad P(P) = .3$$

$$P(R \text{ and } P) = 150/800 = .1875$$

$$P(R \text{ and } P) = (.4)(.3) \text{ if Ind.}$$

$$.12 \neq .1875 \therefore$$

Not Ind.