

## ACTM State Statistics Exam 2010

1. Which of the following would be best for graphing a data set of 12 exam scores.
  - a. pie chart
  - b. dot plot
  - c. histogram
  - d. Pareto diagram
  - e. none of these are appropriate
2. Which of the following would be best for graphing a data set of 125 exam scores.
  - a. pie chart
  - b. dot plot
  - c. histogram
  - d. Pareto diagram
  - e. none of these are appropriate
3. Which of the following would be best for graphing the reasons (categories) for 250 manufacturing defects in Ford automobiles.
  - a. pie chart
  - b. dot plot
  - c. histogram
  - d. Pareto diagram
  - e. none of these are appropriate
4. Enormous State University teaches ten sections of basic statistics in the spring semester. Five students from each section are randomly selected to participate in a study. This sampling method is called what?
  - a. simple random sampling
  - b. cluster random sampling
  - c. stratified random sampling
  - d. convenience sampling
  - e. systematic random sampling
5. To survey cell phone usage by drivers, a data collector is positioned at the corner of 5<sup>th</sup> Street and Main Avenue. At 10:00 am she begins to count the cars which pass going east to west. For every 15<sup>th</sup> car which passes she notes whether or not the driver is talking on a cell phone. This sampling method is called what?
  - a. simple random sampling
  - b. cluster random sampling
  - c. stratified random sampling
  - d. convenience sampling
  - e. systematic random sampling

6. To establish causation, a statistician must
- take surveys in multiple locations
  - conduct a t-test
  - use a sample size of at least  $n=30$
  - use regression analysis
  - none of the above are correct
7. Suppose that  $P(A) = 0.8$ ,  $P(B) = 0.6$  and  $P(A \cup B) = 0.9$ . Based on this information  $P(A \cap B) = ?$
- 0.48
  - 0.5
  - 1.4
  - 0.8
  - none of the above are correct
8. Three balls are to be drawn without replacement from a container which initially has 9 red balls and 6 white balls. The probability that exactly two of the three balls drawn is red is ? (round answer to 2 decimal places)
- 0.47
  - 0.43
  - 0.16
  - 0.74
  - none of the above is correct
9. Suppose the distribution of the results of a nation-wide achievement test are normally distributed with a mean of 645 and a standard deviation of 100. What is the 95<sup>th</sup> percentile of that distribution? (round answer to a whole number)
- 449
  - 809
  - 841
  - 480
  - none of the above is correct
10. Referring to problem 9, what is the probability that a randomly selected score will exceed 800? (round answer to 2 decimal places)
- 0.05
  - 0.10
  - 0.45
  - 0.35
  - none of the above is correct

11. To test the null hypothesis that a normal distribution has a mean of 80, a random sample of size  $n=25$  is obtained from this distribution. The sample has a mean of 77.4 and a standard deviation of 8.5. Which of the following is not true?

- a. If the population standard deviation isn't known one would use a t-test.
- b. The standard error is 8.5
- c. The test statistic is -1.529
- d. To compute the p-value one would have to know the alternate hypothesis
- e. The degrees of freedom for the test are 24.

12. A 95% confidence interval is to be constructed for the true proportion of U.S. veterans (former military personnel) that have not used veteran's retirement benefits. For a random sample of  $n=1000$ , 214 reported that they had never used such. The correct interval (rounded to 3 decimal places) is

- a. (0.181, 0.247)
- b. (0.189, 0.239)
- c. (.0.193, 0.235)
- d. ((0.184, 0.244)
- e. none of these is correct

13. A 98% confidence interval is to be constructed for the mean number of flaws in a large spool of steel cable. Assuming the distribution of such flaws to be normally distributed, determine the interval if a random selection of  $n=10$  such spools had an average of 17.4 flaws with a standard deviation of 3.6 flaws. The correct interval would be (rounded to 2 decimal places)

- a. (14.19, 20.61)
- b. (14.75, 20.05)
- c. ((14.47, 20.33)
- d. (13.70, 21.10)
- e. none of these is correct

14. To estimate the difference in the proportion of individuals who "regularly" purchase Arkansas Scholarship Lottery tickets in two different regions the following data were collected. In a rural survey of  $n=500$  adults, 214 reported that they regularly purchased tickets while in an urban survey of  $n=1000$  adults, 541 reported that they regularly purchased tickets. Use these data to construct a 98% confidence interval for the difference (rural – urban) in proportion (rounded to 3 decimal places).

- a. (-0.183, -0.043)
- b. (0.043, 0.183)
- c. (-0.176, -0.050)
- d. (0.050, 0.176)
- e. none of these is correct

15. Which of the following is a correct conclusion based on the previous problem.
- We can conclude that the proportions are the same at the 1% level of significance.
  - We can conclude that the proportions are the same at the 2% level of significance.
  - We can conclude that the proportions are not the same at the 1% level of significance.
  - We can conclude that the urban proportion is greater at the 1% level of significance.
  - None of these is a correct conclusion.
16. It is claimed that the ratio of brown, red, and black ants found in a particular region is 8:4:3. A large number of randomly selected plots are observed and the numbers of hills of each time of ant are recorded. The appropriate hypothesis testing procedure would be
- Abbot's multinomial test
  - Three proportion z-text
  - Chi-Square test of homogeneity
  - Chi-Square goodness of fit test
  - none of these is appropriate.
17. An experiment was conducted in which  $n=15$  subjects were timed in the 400 meter run on Monday, fed a carbohydrate heavy diet for the week, and timed in the 400 meter run on Friday. To determine if there is a difference in average performance the appropriate hypothesis testing procedure would be
- a two sample F-test
  - matched pairs t-test
  - 2 sample z test
  - Chi-Square test of homogeneity
  - none of these is appropriate.
18. A basic assumption of linear regression analysis is that
- X and Y are measured on the same numerical scale
  - X's have a smaller standard deviation than Y's do
  - residuals are normally distributed with the same variance.
  - X's and Y's are independent
  - None of these is correct.
19. To test the claim that at least 65% of doctors recommend the use of BRANDX aspirin, which of the following would be the proper alternate hypothesis ( $p$  represents the population proportion of doctors).
- $p < 0.65$
  - $p \neq 0.65$
  - $p \geq 0.65$
  - any one of a. – c.
  - None of these is correct

20. For the hypothesis test mentioned in item 19, the level of significance is 5% and the p-value of the test is 0.04. What action is called for?

- a. the results are inconclusive
- b. reject the null hypothesis
- c. fail to reject the null hypothesis
- d. reject the alternate hypothesis
- e. None of these is correct.

Questions 21 – 22 refer to the linear regression equation that would be used to predict usage from composite based on these data.

<i>Usage</i>	15	19	21	26	31	34	38	42	50
<i>Composite</i>	9	11	19	24	25	28	38	44	49

21. The slope of the linear regression equation indicated above is (rounded to two decimal places)

- a. 2.32
- b. 8.33
- c. 0.81
- d. 0.96
- e. None of these is correct

22. The coefficient of correlation for *Usage and Composite* is

- a. 2.32
- b. 8.33
- c. 0.81
- d. 0.96
- e. None of these is correct

## Statistics Tie Breakers

Name: \_\_\_\_\_

(Please Print!)

### TIE BREAKER #1

X	10	15	20	25	30	35	40	45	50	55
Y	7.4	11.3	21.5	26.7	25	33.4	37	42.5	48	51

1. Determine the slope of the linear regression line that will predict Y from X.
2. Is the relationship statistically significant?
3. What proportion of the variation in Y is explained by this model?



## Statistics Tie Breakers

Name: \_\_\_\_\_

(Please Print!)

### TIE BREAKER #3

Urn 1 contains 6 red marbles and 4 blue marbles. Urn 2 contains 3 red marbles and 7 blue marbles. An urn is randomly selected with Urn 1 having 2:1 odds of being chosen and then a marble is selected at random from the selected urn.

If the chosen marble is blue, is it more likely that it came from Urn 1 (higher probability of being chosen) or is it more likely that it came from Urn 2 (higher probability for blue marble being drawn)? Explain your reasoning in detail.



## Answers

1. b
2. c
3. d
4. c
5. e
6. e
7. b
8. a
9. b
10. e
11. b
12. b
13. a
14. c
15. e
16. d
17. b
18. c
19. a
20. b
21. b
22. e

## TIE BREAKER ANSWERS

**#1. 1. Slope = 1.018                      2. P-value= .00000005 highly statistically significant**

**3. R-sq = 97.9%**

**#2. 1. .055 (rounded to 3 places)                      2. 0.159 (rounded to 3 places)**

**#3. P(urn 1|blue)=16/30 so it it more probable.**