

TMTA Statistics Exam 2013

1. A Statistics student scored 82, 86, and 90 on the first three exams of the semester. If the student scores an 86 on the next test, the

- A) mean score and standard deviation will increase.
- B) mean score and standard deviation will decrease.
- C) mean score will stay the same, but the standard deviation will decrease.
- D) mean score and standard deviation will stay the same.
- E) mean score will stay the same, but the standard deviation will increase.

2. A researcher wants to study the speed at which a virus would spread if it was released on a New York City subway. What method of data collection would be most appropriate?

- A) Experiment
- B) Survey
- C) Observational Study
- D) Simulation
- E) Census

3. The five countries earning the most medals in the 2012 Summer Olympics Games are given in the chart below. What type of graph would be the most appropriate to display the data?

<b>Country</b>	<b>Total Medal Count</b>
United States of America	104
People's Republic of China	88
Russian Federation	82
Great Britain	65
Germany	44

- A) Pie Chart
- B) Boxplot
- C) Stem-and-Leaf Plot
- D) Scatterplot
- E) Timeline Chart

4. A survey was conducted at a local high school and 138 out of 432 Freshmen, 119 out of 399 Sophomores, 152 out of 414 Juniors, and 109 out of 342 Seniors were chosen to participate. What sampling method was used?

- A) Cluster
- B) Stratified
- C) Systematic
- D) Simple Random
- E) Convenience

5. Summary statistics for students' test scores are given below. Based on this data, if a student has a z-score of 0.8, what was her test score?

<i>Summary Statistics</i>	
Mean	76.8
Standard Error	6.724417
Median	80.5
Mode	#N/A
Standard Deviation	21.26447
Sample Variance	452.1778
Kurtosis	0.416603
Skewness	-0.93976
Range	67
Minimum	33
Maximum	100

- A) 82.2
- B) 93.8
- C) 78.5
- D) 97.5
- E) 85.9

6. If it rains each day independently with chance 60% for the next three days, what is the probability that it will rain on at least one of the days?

- A) 0.936
- B) 0.600
- C) 0.216
- D) 0.180
- E) 0.288

7. Which one of the following statements involving correlation is plausible?

- A) The correlation between blood type and IQ is 0.
- B) The correlation between blood type and age is negative.
- C) The correlation between shoe size and IQ is 0.975.
- D) The correlation between shoe size and height is 1.96.
- E) The correlation between height and arm length is 0.84.

8. Two college applicants are competing for the last available academic scholarship at a particular college. The decision comes down to college entrance exam scores. Student A took the SAT and scored 2130. The national mean score on the SAT that year was 1498. Student B took the ACT and scored a 30.6 for the composite score. The national mean composite score on the ACT that year was 21.1. What measure of central tendency for both is needed to determine which student had the higher percentile ranking on their respective college entrance exams?

- A) The correlation coefficient
- B) The median
- C) The population size
- D) The standard deviation
- E) The interquartile range

9. The Ship-Em Delivery Company has experienced a surge in their business lately and must increase the amount of routes each of their drivers have. Not all route drivers have the same amount of routes. If each driver receives 3 more routes, which of the following will be true?

- A) The mean and median routes per driver will stay the same, but the standard deviation will increase by 3.
- B) The mean and median number of routes per driver will triple and the standard deviation will stay the same.
- C) The information cannot be determined because the sample size is not given.
- D) The mean and median number of routes per driver will increase by 3, and the standard deviation will also increase by 3.
- D) The mean and median number of routes per driver will increase by 3, but the standard deviation will stay the same.

10. A manufacturing facility creating computer components claims less than 3 percent of their products are defective. A random sample of 250 of these components is tested and 8 are found to be defective. Which of the following would be the most appropriate for determining the validity of the company's claim?

- A) A one-sample proportion z-test
- B) A matched pairs t-test
- C) A Chi-square test of association
- D) A one-sample z-test
- E) A two-sample proportion z-test

11. For a particular scratch off lottery game, tickets cost \$2 each. Ten percent of the tickets are winning tickets and the prize for the winning ticket is \$50. What is the expected total gain or loss for a player who purchases 10 of these tickets?

- A) A gain of \$38
- B) A gain of \$30
- C) A loss of \$20
- D) A loss of \$30
- E) A loss of \$38

12. The National ACT mean composite score for all students taking the ACT in 2010 was 21.1 with a standard deviation of 5.1. Correct to one decimal place what interval would contain the middle 95% of all composite scores?

- A) 11.1 to 31.1
- B) 16.3 to 25.9
- C) 31.3 to 36.0
- D) 5.8 to 36.0
- E) 16.0 to 26.2

13. A study found that 225 students who did not miss more than 2 days of class for the semester had a better final average than the 293 students who did miss more than 2 days of class. The study indicates:

- A) Missing more than 2 days of class will cause a lower average.
- B) Nothing because the two factors have no relationship.
- C) Those students who are prone to lower averages will miss more than 2 days of class.
- D) There seems to be an association between class attendance and final average.
- E) The correlation coefficient between the two variables will be close to 1.

14. A survey was conducted recently of 275 college students to determine which social media outlet was the favorite given the choices Facebook, Twitter, or Google Plus. The following data table shows the results of the survey.

	Facebook	Twitter	Google Plus	Total
Male	41	80	9	130
Female	77	62	6	145
Total	118	142	15	275

What is the probability that a randomly selected student is Male or favored Google Plus?

- A) 0.549
- B) 0.115
- C) 0.600
- D) 0.069
- E) 0.495

15. Using the data table from the previous problem, what is the probability that a randomly selected student favored Twitter, given he was male?

- A) 0.473
- B) 0.563
- C) 0.615
- D) 0.495
- E) 0.800

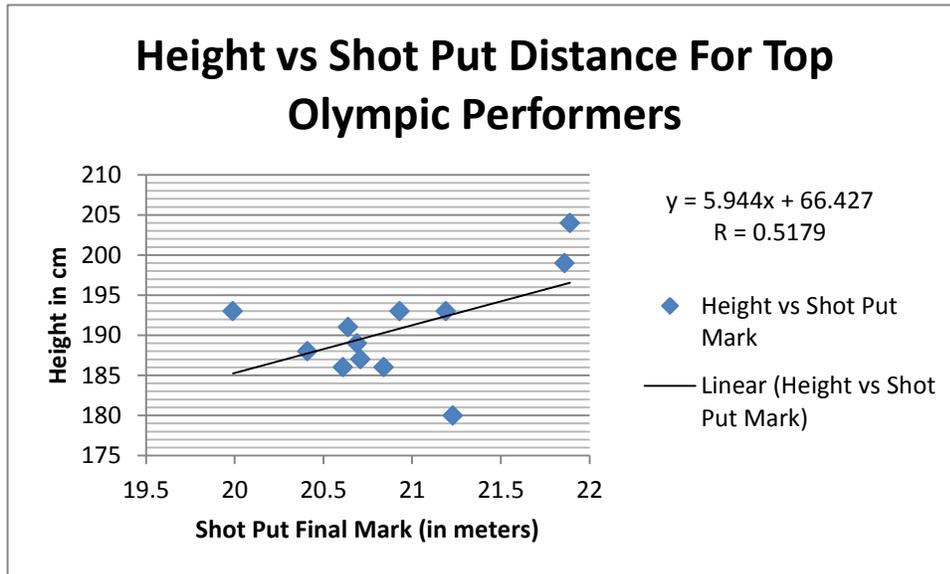
16. A certification test consists of 12 true-false questions, and students must get at least 8 correct to pass. If a particular student guesses on every question, what is the probability of passing the test?

- A) 0.500
- B) 0.927
- C) 0.492
- D) 0.806
- E) 0.194

17. Which of the following statements about correlation and linear regression is correct?

- A) If the sign of the slope of the linear regression line is negative, the correlation coefficient will also be negative.
- B) The closer the correlation coefficient gets to 1, the higher the slope.
- C) The lower the slope, the lower the correlation coefficient.
- D) A negative slope will result in a correlation coefficient close to 0.
- E) The value of the slope indicates how strongly two variables are related.

18. A study to determine what factors contribute to success in Olympic athletes was conducted. The top 13 performers in the the 2012 Olympics Shot Put competition were chosen and their heights were compared with their throwing distances. The following scatterplot shows the results of the correlation study:



Which of the following is a correct interpretation of the data?

- A) For every centimeter increase in height, the throwing distance increases by 5.944 m.
- B) For every meter of increase in throwing distance, the height of the athlete increases by approximately 0.5179.
- C) There is no correlation between an athlete's height and throwing distance.
- D) For every meter of increase in throwing distance, the height of the athlete increases by 5.944 cm.
- E) For every centimeter increase in height, the throwing distance increases by 0.5179 m.

19. Based on the data in the previous problem, if you changed the height to the x-axis and shot put distance to the y-axis, what would be the correct result?

- A) The slope and correlation coefficient values would stay the same but the signs for both would change.
- B) The new linear regression equation would be  $y = 66.427x + 5.944$ .
- C) The slope would change but the correlation coefficient would stay the same.
- D) The correlation coefficient would change but the slope would stay the same.
- E) The slope would increase.

20. A standard deck of cards has 52 cards, 12 of which are face cards, 4 are aces, and 36 are numbered cards. If two cards are drawn successively without replacement, what is the probability that two face cards are drawn?

- A) 0.0498
- B) 0.0533
- C) 0.4615
- D) 0.0488
- E) 0.2308

21. The average number of doctor's visits per year for each household in Madison County, Georgia is 6.7 with a standard deviation of 2.1. If a cluster sample of 400 households in Madison County is selected, what is the probability the mean number of doctor's visits per year for each household for the sample is less than 6.5?

- A) 0.9713
- B) 0.0287
- C) 0.4602
- D) 0.5398
- E) 0.0233

22. A recent poll was conducted to determine the percent of Tennessee residents who had fishing licenses. A random sample of 1560 Tennessee residents was taken and 326 of those had fishing licenses. The margin of error with a 95% confidence level was  $\pm 2\%$ . Based on those results, which of the following statements is true:

- A) We can be 95% confident that the percentage of residents in this survey who have fishing licenses is between approximately 19% and 23%.
- B) We can be 95% confident that the percentage of all Tennessee residents who have fishing licenses is between approximately 19% and 23%.
- C) We can be 95% confident that the percentage of all US residents who have fishing licenses is between approximately 19% and 23%.
- D) We can be 95% confident that the number of residents in the survey who have fishing licenses is between 324 and 328.
- E) 95% of all Tennessee residents have fishing licenses with a margin of error of  $\pm 2\%$

23. A simple random sample of 16 dog owners in the Nashville metropolitan area is selected and asked how much money they spend each month on dog food. The mean of the sample was \$21.25 with a standard deviation of \$5.43. Find the 99% confidence interval for the population mean amount of money spent on dog food each month. Assume the amount of money spent on dog food for Nashville residents follows a normal distribution.

- A) (\$17.75, \$24.75)
- B) (\$15.82, \$26.68)
- C) (\$17.74, \$24.76)
- D) (\$15.76, \$26.62)
- E) (\$17.25, \$25.25)

24. Each bag of a certain brand of tortilla chips is printed with a weight of 25.6 ounces. Customers question whether there actually are 25.6 ounces in each bag, so a researcher decides to test the tortilla company's claim with. Which of the following describes what a Type II error would be in this situation?

- A) The true weight is 25.6 ounces, but the researcher decides it is lower.
- B) The true weight is 25.6 ounces, but the researcher decides it is higher.
- C) The true weight is 25.6 ounces, but the researcher decides it is not 25.6 ounces
- D) The researcher fails to reject the company's claim, but the true weight is not 25.6 oz.
- E) The p-value ended up smaller than  $\alpha$ .

25. Monster University claims it takes their students, on average, at most 4.5 years to graduate. You decide to test this claim by taking a simple random sample of 100 recent graduates of Monster University and finding out how long it took them to graduate. The mean of the sample was 4.6 years with a standard deviation of 0.8 years. Conduct a hypothesis test of the claim with  $\alpha = 0.05$  and determine which outcome would be the most appropriate.

- A) There is enough evidence to reject the claim.
- B) There is enough evidence to support the claim.
- C) There is not enough evidence to reject the claim.
- D) There is not enough evidence to support the claim.
- E) The test could not be conducted because the population standard deviation is unknown.

26. What is the probability that it takes at least 2 rolls of a regular six-sided die to obtain a 6?

- A)  $1/6$
- B)  $1/36$
- C)  $2/6$
- D)  $5/6$
- E) 1

27. The faculty members of an elementary school spend more than \$50 a month out of their own pockets on average on school supplies. The administration selects a random sample of 12 teachers and asks them to submit expense reports for school supplies purchased in the previous month. A t-test was then conducted to determine the validity of the faculty's claim. The results of the test are shown below:

Stem-and-leaf plot for \$ totals

N=12

Key: 1|2 = 12

2		3	4	9
3		7		
4		0	5	6
5		2	7	7
6		6		
7		0		

Summary Statistics:

Mean: 45.5 , St. Dev: 15.58262, St. Err Mean: 4.498316, p-value: 0.188

Does this data suggest that the faculty's claim is valid using  $\alpha=0.10$ ?

- A) No, because the mean of the sample was less than the faculty's claim.
- B) No, because the sample size was too small.
- C) Probably not because the p-value is 18.8%. However ,the assumptions for running a t-test aren't necessarily satisfied.
- D) Yes, because the p-value was high enough.
- E) Yes, because one standard deviation above the mean results in a value which supports the faculty's claim.

28. All employees at a large national corporation are drug-tested for illegal substance abuse each month . The test is not perfect, and so only ninety-eight percent of the employees who are using illegal drugs will test positive. Eleven percent of the employees who are not using illegal drugs will also test positive. If 1 out of every 100 employees are using illegal drugs, what is the probability that an employee who tests positive is actually using illegal drugs?

- A) 0.08256
- B) 0.10780
- C) 0.11000
- D) 0.98000
- E) 0.00083

29. If a hypothesis test is conducted and the result is that the null hypothesis was not rejected at a significance level of  $\alpha = 0.05$ , I can conclude

- A) the p-value was less than 0.05
- B) the null hypothesis would have been rejected at the level  $\alpha = 0.10$
- C) the null hypothesis would also not have been rejected at the level  $\alpha = 0.01$
- D) the p-value was greater than 0.05
- E) the null hypothesis would also not have been rejected at the level  $\alpha = 0.10$

30. The employment promotional material for a financial company states the mean starting salary for its employees is \$62,000 per year. A review of the material is being conducted and the company wants to verify that this claim is true. A test of the claim is to be conducted. Which of the following would be the most appropriate null and alternative hypothesis statements for the test?

- A)  $H_0 : \sigma = 62,000, H_a : \sigma \neq 62,000$
- B)  $H_0 : \mu = 62,000, H_a : \mu \neq 62,000$
- C)  $H_0 : \mu \geq 62,000, H_a : \mu < 62,000$
- D)  $H_0 : \mu > 62,000, H_a : \mu \leq 62,000$
- E)  $H_0 : \sigma > 62,000, H_a : \sigma = 62,000$

31. A random sample of airline passengers was selected and asked whether or not they purchased their ticket online. The proportion of passengers from the sample who said they purchased their ticket online was 64.9%. The 99% confidence interval based on this data for the population proportion of all airline passengers who purchased their tickets online was (62.1% , 67.7%). What was the sample size?

- A) There is not enough information to determine the sample size.
- B)  $n = 100$
- C)  $n = 649$
- D)  $n = 2033$
- E)  $n = 1929$

32. A hypothesis test with a sample size of 300 is to be conducted with  $\alpha = 0.05$ . The null,  $H_0$ , is  $\mu = 12$  and the alternative,  $H_a$ , is  $\mu \neq 12$ . The p-value is calculated to be 0.041. Which of the following is true?

- A) At the 5% level, if the null is rejected, the probability of a Type II error is 0.041.
- B) The 95% confidence interval for the population mean will be centered at a value of 12.
- C) The value  $\mu = 12$  will not be included in the 95% confidence interval for the population mean based on this data.
- D) The null hypothesis should not be rejected.
- E) There is not enough evidence to reject the null.

33. Which of the following is a true statement about the population standard deviation,  $\sigma$ ?

- A)  $\sigma$  is always less than or equal to zero.
- B)  $\sigma$  is equal to the variance squared.
- C)  $\sigma$  is not affected by outliers
- D)  $\sigma$  can never be zero.
- E)  $\sigma$  will only be zero if all the x-values are the same.

34. If the histogram for a data set is skewed left, which of the following would most likely be true?

- A) The mean would be greater than the median.
- B) There would be no outliers.
- C) The data would be normally distributed.
- D) The mean would be less than the median.
- E) The mean and median would be equal.

35. The heights of adult American males are normally distributed with a mean of 70 inches and a standard deviation of 2.8 inches. If a randomly selected adult American male is chosen, what is the probability his height is between 72 and 76 inches?

- A) 0.2227
- B) 0.9326
- C) 0.7773
- D) 0.1674
- E) 0.2458

36. A telemarketer makes a sale on 17% of his calls. Given that information, what is the probability that on a randomly selected day, it takes more than 8 calls before he gets his first sale?

- A) 0.775
- B) 0.225
- C) 0.813
- D) 0.187
- E) 0.368

37. The mean score on a particular employment test is 82.1 with a standard deviation of 4.9. Only those scoring in the top 15% will be considered for hiring. What is the lowest test score possible to still be considered for hiring? Assume the scores are normally distributed.

- A) 85
- B) 90
- C) 89
- D) 88
- E) 84

38. A university course syllabus states that 65% of the final grade in the course comes from the test average, 15% comes from the project grade, and 20% comes from the final exam. Each test is weighted equally. John scored a 92, 87, 76, 96, and 83 on his tests and a 95 on his project. He wants his final grade in the course to be at least a 90 so he can get an A. What is the lowest grade he can get on his final exam to get an A for his final course grade?

- A) 93
- B) 94
- C) 90
- D) 97
- E) There is not enough information to determine.

39. According to a recent poll of 550 Americans, the approval rating of the President was 44%. The margin of error was 2.8% with a level of confidence of 95%. What of the following statements is the correct interpretation of these results?

- A) In about 95% of all random samples of this size from the same population, the difference between the population approval rating and that of the sample will be more than 2.8%.
- B) In about 2.8% of all random samples of this size from the same population, the difference between the population approval rating and that of the sample will be less than 95%.
- C) In about 95% of all random samples of this size from the same population, the difference between the population approval rating and that of the sample will be less than 2.8%.
- D) The probability that a 95% confidence interval based on this poll does not cover the population approval rating is 2.8%
- E) In about 2.8% of all random samples of this size from the same population, the sample approval rating will be the same as the population approval rating.

40. The ages of 345 residents of a particular retirement community range from 52 to 101. The community management office decides to upgrade their computer system and has to re-enter data for each resident by hand. In doing so, the age of the oldest resident is incorrectly recorded as 1001. Which of the following is the best answer?

- A) The five-number summary will not be affected.
- B) The mean and standard deviation will increase but the median and IQR will barely (if at all) be affected.
- C) Neither the variance nor the mean will be affected.
- D) The median and IQR will increase, but the mean and standard deviation will be the same.
- E) The mean, median, standard deviation, and IQR will all be substantially affected.