

TMTA Statistics Test Spring 2019

1. Calculate the mean of scores obtained by 8 students: 13, 15, 16, 19, 20, 14, 17 and 18.
 - (a) 14.9
 - (b) 15.6
 - (c) 16.6
 - (d) 16.9
 - (e) 16.5

2. Consider the random sample of scores from 9 students on an exam. The scores are 2, 3, 56, 57, 59, 63, 73, 821, 934. Which measure(s) of central tendency will best describe the performance of the typical student?
 - (a) Median
 - (b) Mode
 - (c) Mean
 - (d) (a) & (b)
 - (e) Standard deviation

3. All of the following are measures of variability and spread except
 - (a) Variance
 - (b) Standard deviation
 - (c) Range
 - (d) Coefficient of variation
 - (e) Mean

4. Which of the following is false?
 - (a) Sample variance is the sum of squares of deviations divided by the sample size minus one.
 - (b) The square root of the variance is the standard deviation.
 - (c) It is the second central moment about the sample mean.
 - (d) Variance sometimes yields a negative value.
 - (e) None of the above are false.

5. If a fair die of only three faces will be rolled twice, what is the probability that the outcome will result in a double?
 - (a) $\frac{2}{4}$
 - (b) $\frac{4}{9}$
 - (c) $\frac{3}{9}$
 - (d) $\frac{6}{9}$
 - (e) 1

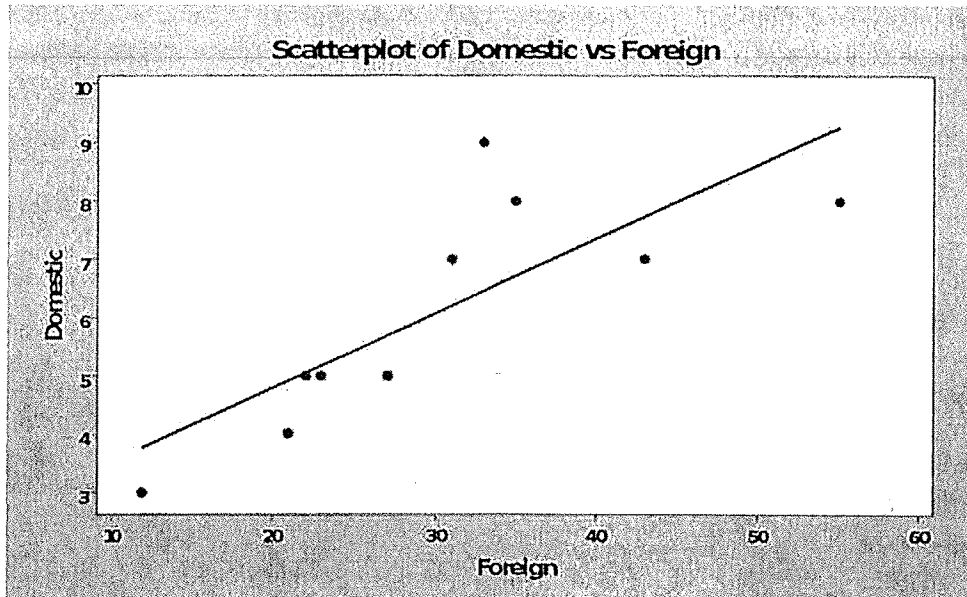
For question 6: Below are the inspection results of 100 rustic campsites in the Great Smoky Mountains National Park.

Electric \ Water	YES	NO	TOTAL
YES	23	28	51
NO	32	17	49
TOTAL	55	45	100

6. Given that a sampled campsite has electricity, what is the probability that it will also have water supply?
- 23/55
 - 23/51
 - 55/100
 - 23/100
 - 51/100
7. The average emergency room waiting time for a sample of 45 patients is 3 hours. After removing one patient from the sample, the revised average waiting time for the remaining 44 patients is 3.05 hours. Calculate the waiting time of the patient who was removed from the sample.
- 0.7 hours
 - 0.8 hours
 - 1.2 hours
 - 1.5 hours
 - 2.0 hours
8. If two fair dice are rolled, what is the probability that the sum of the dots showing will be at least 7?
- 21/36
 - 15/36
 - 18/36
 - 23/36
 - 12/36
9. A student fitted a simple linear regression $\hat{Salary} = 1.07 - 0.35(Inflation)$. If a hypothesis test for the slope showed that -0.35 is significant, what could be the possible correlation between the salary and inflation?
- Positively correlated
 - Negatively correlated
 - No linear relationship
 - Cannot be determined
 - R^2 is never positive

10. Calculate the standard deviation of scores obtained by 8 students; 13, 15, 16, 19, 20, 14, 17 and 18.
- (a) 16.3
 - (b) 6.6
 - (c) 5.6
 - (d) 2.4
 - (e) 2.6
11. $\widehat{Salary} = 2.65 + 3.34(Investment)$ is the output result of a simple linear regression model. Choose the best interpretation for the above model.
- (a) A 1 unit increase in investment will accompany a \$2.65 increase in mean salary.
 - (b) A 1 unit increase in investment will accompany a \$2.65 decrease in mean salary.
 - (c) A 1 unit increase in investment will accompany a \$3.34 decrease in mean salary.
 - (d) A 1 unit increase in investment will accompany a \$3.34 increase in mean salary.
 - (e) Cannot be determined.
12. Which of type of plot is most appropriate for checking the normality of a distribution?
- (a) Bar Chart
 - (b) Pie chart
 - (c) Line plot
 - (d) Box plot
 - (e) Histogram
13. Sixteen students were randomly selected from a class; their average age is 20 years with a standard deviation of 8 years. Compute the standard error of their mean ages.
- (a) 4 years
 - (b) 3 years
 - (c) 2 years
 - (d) 5 years
 - (e) 3.5 years
14. A student solved an exercise of fitting a simple linear regression model, she obtained the coefficient of determination $R^2 = 0.95$. What is the correlation coefficient between the variables likely to be?
- (a) ± 0.975
 - (b) $+0.975$
 - (c) -0.975
 - (d) $+0.9025$
 - (e) -0.9025

For question 15: Scatterplot of domestic and foreign car prices.



15. The best interpretation of the scatterplot above is that
- (a) An increase in the price of domestic cars seems to accompany a decrease in the mean price of foreign cars.
 - (b) A decrease in the price of domestic cars seems to accompany an increase in the mean price of foreign cars.
 - (c) An increase in the price of domestic cars seems to accompany an increase in the mean price of foreign cars.
 - (d) A decrease in the price of domestic cars seems to accompany a decrease in the mean price of foreign cars.
 - (e) Not sufficient information to interpret the output.
16. A report claimed that a new mentorship program has decreased the rate of crimes committed in Knoxville each month. Before the program, the rate was 15% (e.g. 15 crimes per 100 citizens). What is the alternative hypothesis for determining if the mentorship program is effective?
- (a) $H_a: p > 15\%$
 - (b) $H_a: \mu < 15\%$
 - (c) $H_a: p < 15\%$
 - (d) $H_a: p = 15\%$
 - (e) None of the above
17. The scores of students on a random aptitude test are 24, 23, 32, 40, 16, 20, 32 and 25. Compute the interquartile range of the scores above.
- (a) 8.0
 - (b) 7.5
 - (c) 13.5
 - (d) 10.5
 - (e) 5.25

18. A researcher is interested in selecting a sample of 40 students total from four different departments (e.g. mathematics, medicine, psychology and engineering). If he wishes to eliminate bias caused by drawing more students from one department than another, what is the most appropriate sampling technique to use?
- (a) Stratified Sampling
 - (b) Cluster sampling
 - (c) Judgemental sampling
 - (d) Extra-terrestrial sampling
 - (e) (a) or (b)
19. To construct a confidence interval to gain inference on the population mean, Dr Jacobs drew a sample of 36 randomly selected students' test scores. They had a mean of 35 points with a standard deviation of 15 points. What is the margin of error for the 95% confidence interval for estimating the mean test score of all students?
- (a) 5.0000
 - (b) 5.0753
 - (c) 5.3775
 - (d) 5.5663
 - (e) 5.9462

For questions 20 and 21: The table below represents the distribution of students who play tuba in a randomly selected 5th grade class at Hilldale Elementary.

X=Number of students	1	2	3
P (X=x)	1/8	1/2	3/8

20. What is the probability of obtaining at least two students who play tuba?
- (a) 6/8
 - (b) 7/8
 - (c) 3/8
 - (d) 1/2
 - (e) 5/8
21. Calculate the mean of the distribution depicted in the table above
- (a) 0.375
 - (b) 0.125
 - (c) 2.125
 - (d) 5.5
 - (e) 2.25

22. The scores of 16 randomly selected students in a math class have an average of 22 with a standard deviation of 6. Calculate the 95% confidence interval for the population average score.
- (a) (16.94, 23.65)
 - (b) (17.23, 25.76)
 - (c) (19.06, 24.94)
 - (d) (17.56, 25.56)
 - (e) (18.80, 25.19)
23. The sample average weekly gasoline consumption of a family across 9 randomly selected weeks is 20 gallons with a standard deviation of 2 gallons. Mom wishes to test the hypothesis that the population average weekly consumption is greater than 15 gallons. She believes the nine data points could be coming from a normal distribution. Compute the appropriate test statistic for this scenario.
- (a) $t = 7.50$
 - (b) $t = 4.50$
 - (c) $z = 7.50$
 - (d) $z = 4.50$
 - (e) $z = 5.0$
24. You are testing a hypothesis to infer if more than half of the population of students have passed an exam. The standard error is given as 0.1118. Twelve out of the sample of 20 students passed the exam. Compute the test statistic.
- (a) $z = -0.89$
 - (b) $z = -1.11$
 - (c) $z = 0.89$
 - (d) $z = 1.11$
 - (e) $z = 2.45$
25. Of the 200 students that sat for an exam, 150 made the cut-off mark which was set at 85%. Calculate the standard error of the proportion of students who made the cut off.
- (a) 0.056
 - (b) 0.043
 - (c) 0.052
 - (d) 0.047
 - (e) 0.031
26. The probability of John and Mathew meeting their target CGPA at the end of the semester are $\frac{2}{5}$ and $\frac{4}{5}$ respectively, what is the probability that both of them will make the desired CGPA?
- (a) $\frac{3}{10}$
 - (b) $\frac{1}{25}$
 - (c) $\frac{8}{25}$
 - (d) $\frac{3}{25}$
 - (e) $\frac{24}{25}$

27. The mean and standard deviation of scores on a national test are 65 and 10 respectively. If a sample of 36 applicants take the test, what is the probability that their sample average is greater than 70? Assume that the scores are normally distributed.
- (a) 0.029
 - (b) 0.0013
 - (c) 0.3085
 - (d) 0.0022
 - (e) 0.999

For question 28: The table below summarizes results for students who took an English exam.

Gender \ Results	PASSED	FAILED	TOTAL
MALE	33	24	57
FEMALE	12	11	23
TOTAL	45	35	80

28. For testing if the results on the English exam are independent of gender, obtain the expected value E_{11} for the above table.
- (a) 26.65
 - (b) 25.75
 - (c) 28.03
 - (d) 26.73
 - (e) 32.06

For question 29: The following table displays salary counts for 100 university lecturers by salary tier.

Salary Tier	\$20,000 - \$26,999	\$27,000 - \$33,999	\$34,000 - \$40,999	\$41,000 - \$47,999
Count	17	28	32	23

29. Compute the chi-square goodness-of-fit test statistic for testing the claim that each age category is equally likely.
- (a) 0
 - (b) 3.33
 - (c) 2.64
 - (d) 5.04
 - (e) 5.79

30. There is a linear relationship between Skid Length (ft) and Speed on Dry Asphalt (mph). Use the following data to determine the linear correlation coefficient, r .

Skid Length = {10, 20, 27, 35, 43, 57, 62, 75, 88, 97}

Speed on Dry Asphalt = {14.46, 20.45, 23.76, 27.06, 29.99, 34.53, 36.01, 39.61, 42.91, 45.05}

- (a) 0.979
 - (b) -0.979
 - (c) -0.989
 - (d) 0.989
 - (e) 0.859
31. A researcher is interested in testing the significance of a medication in decreasing patients' blood pressure. He gathered 20 patients and measured their blood pressures before the drug and after the drug. What statistical method will you propose for this analysis?
- (a) Paired sample t-test
 - (b) Independent sample t-test
 - (c) One sample t-test
 - (d) One sample proportion test
 - (e) Two sample proportion test

For question 32: A market analyst is interested in testing the sales campaign for two products (A and B), the results of the analysis are below. The level of significance is 0.05.

Two-sample T for Product A vs Product B

	N	Mean	StDev	SE Mean
Product A	10	20.50	4.17	1.3
Product B	10	25.70	6.55	2.1

Difference = μ (Product A) - μ (Product B)
Estimate for difference: -5.20
95% CI for difference: (-10.43, 0.03)
T-Test of difference = 0 (vs \neq 0): T-Value = -2.12 P-Value = 0.051 DF = 15

32. Which of the below is correct about the results obtained above?
- (a) Product B appears to sell more than A, on average, and the difference is statistically significant.
 - (b) Product B does not appear to sell more than A, on average.
 - (c) Product A appears to sell more than B, on average, and the difference is statistically significant.
 - (d) Product B appears to sell more than A, on average, but the difference is not statistically significant.
 - (e) The products clearly have the same level of sales, on average.

33. The correlation coefficient, r , between SALES and PRODUCTION data gathered in a manufacturing firm resulted in $r = +1$, what is the best interpretation for the result of this scenario?
- There is a positive linear relationship between the sales and production.
 - There is a perfect positive linear relationship between the sales and production.
 - There is no relationship between sales and production.
 - Increase in sales will bring about proportionate decrease in production.
 - The correlation value is weak.
34. A researcher conducted research on sample proportions from two populations to determine if the population proportions were different from one another. When conducting a test of hypothesis, she obtained a test statistic of $z = 3.67$ which yielded a p -value = 0.02. Using a 5% level of significance, what decision should be taken by the researcher?
- Reject the null hypothesis, conclude that the test statistic is significant based on the p -value.
 - Reject the null hypothesis, conclude that the test statistic is not significant based on the p -value.
 - Fail to reject the null hypothesis, conclude that the test statistic is not significant based on the p -value.
 - Fail to reject the null hypothesis, conclude that the test statistic is not significant based on the p -value.
 - The result is inconclusive; the researcher needs more samples to validate the claim.

For question 35: A coin will be tossed three times, let X denote the number of tails you will see. The probability distribution is given in the table below.

X	0	1	2	3
P (X=x)	1/8	3/8	3/8	1/8

35. What is the expected value of X ?
- 2.0
 - 1.5
 - 3.0
 - 2.5
 - 3.5
36. Which of the following is not a measurement scale in statistics?
- Nominal
 - Regular
 - Ordinal
 - Ratio
 - Interval

37. Of a sample of 200 students who applied for admission to a university from Tennessee, 180 gained admission. Compute the 95% confidence interval for estimating the population proportion for this scenario.
- (a) (0.90, 0.96)
 - (b) (0.86, 0.98)
 - (c) (0.86, 0.94)
 - (d) (0.82, 0.98)
 - (e) (0.76, 1.06)
38. The average waiting time for a sample of 30 customers to be served is 15 minutes with a standard deviation of 9.6 minutes. Calculate the coefficient of variation for the sampled waiting times.
- (a) 62%
 - (b) 64%
 - (c) 68%
 - (d) 72%
 - (e) 79%
39. A researcher finds that the number of books a college student reads in a year comes from an approximately normal distribution with a mean of 10 books and a standard deviation of 4 books. What is the probability that a randomly selected student reads between 8 and 12 books inclusive? (Note that the number of books read is, in fact, discrete not continuous).
- (a) 0.9977
 - (b) 0.8375
 - (c) 0.3829
 - (d) 0.2657
 - (e) 0.0014
40. A 97% confidence interval regarding the average SAT score increase of students taking a prep course is (56 points $< \mu <$ 104 points). What does this mean?
- (a) Ninety-seven percent of the time, the average student taking the course will increase his/her score between 56 points and 104 points.
 - (b) There is a 97% chance that a student taking the course will increase his/her SAT score between 56 points and 104 points.
 - (c) With 97% confidence, the true average SAT score increase of students taking the prep course is between 56 points and 104 point.
 - (d) There is a 3% chance that the score increase of a student taking this course will not be between 56 points and 104 points.
 - (e) Ninety-seven percent of the students will increase their average scores between 56 points and 104 points.