

TMTA STATISTICS TEST 2010

1. Given the following stem and leaf plot of 15 test scores, find the median score.

4		9
5		7
6		1 4 5 6 6
7		2 4 5 9
8		0 3 8
9		3

- (a) 66
- (b) 69
- (c) 70
- (d) 72
- (e) 74

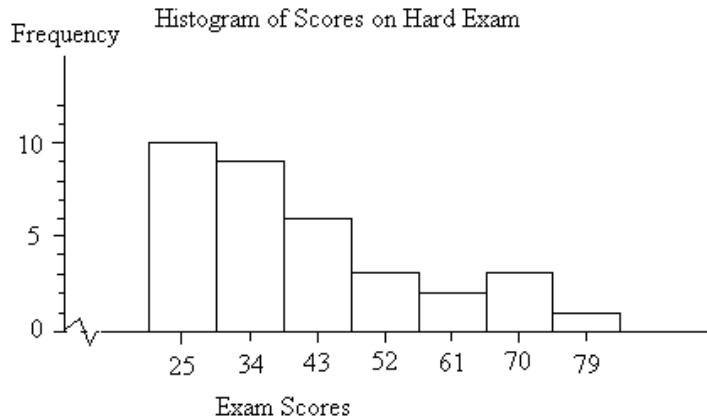
2. Forty students took a test. The mean score was 75.700 and the standard deviation was 13.453. Carmen scored a 90 on the test. Find her z-score (also known as her standardized score). Round your final answer to two decimal places.

- (a) 1.43
- (b) 1.06
- (c) 1.72
- (d) 2.91
- (e) 14.30

3. In order to be accepted into a good university, applicants must score within the top 15% on an entrance exam. Given that scores on the exam have an approximate normal distribution with a mean of 70.71 and a standard deviation of 9.85, what is the lowest possible score (rounded to the closest integer) a student needs in order to qualify for acceptance into this university?

- (a) 77
- (b) 79
- (c) 81
- (d) 83
- (e) 85

4. Below is a frequency histogram based on a data set of 34 test scores on a hard exam. The midpoint of each age class is noted on the horizontal axis. Note that the first class limits are 21 and 29. The respective frequencies for the classes are 10, 9, 6, 3, 2, 3, and 1.



Find the percentage of scores above 65.

- (a) 35.0%
- (b) 26.5%
- (c) 11.8%
- (d) 7.6%
- (e) 4.0%

5. If random variable Z has standard normal distribution, then find the probability that Z takes on a value in the interval $(-2.00, 1.50)$. [Round your answer to 2 decimal places.]

- a. .69
- b. .76
- c. .79
- d. .82
- e. .91

6. In hypothesis testing, if the p -value is less than the level of significance, then . . .

- (a) we have committed a Type I error.
- (b) we have committed a Type II error.
- (c) we have sufficient evidence to reject H_0 .
- (d) we do not have sufficient evidence to reject H_0 .
- (e) we have increased the power of the test.

7. In a group of college students, 55% attend every class session, 35% study every night, 25% do both. What is the probability that a randomly selected student from the group has at least one of these good habits?

- (a) .25
- (b) .45
- (c) .65
- (d) .75
- (e) .90

8. Suppose the birth weights of babies born at City General Hospital have a normal distribution with mean weight 7.25 pounds and standard deviation 1.15 pound. Approximately 95% of the babies will weigh between

- (a) 6.00 and 8.50 pounds
- (b) 5.65 and 8.85 pounds
- (c) 3.80 and 10.7 pounds
- (d) 6.10 and 8.40 pounds
- (e) 4.95 and 9.55 pounds

9. Which, if any, of the following statements are true?

I. One can usually reduce the margin of error for a confidence interval by increasing the sample size.

II. One can reduce the margin of error for a confidence interval by increasing the level of confidence.

- (a) Only statement I is correct.
- (b) Only statement II is correct.
- (c) Both statements are correct.
- (d) Neither statement is correct.
- (e) Statement I is correct whenever statement II is correct.

10. Let A and B denote two events associated with a probability experiment. If $P(A|B) = P(A)$ and $P(B|A) = P(B)$, then events A and B are said to be ...

- (a) mutually exclusive events
- (b) disjoint events
- (c) independent events
- (d) dependent events
- (e) complementary events

11. New Age Granola sells boxes of cereal which are advertised to have an average weight of 19 ounces. Every month Genuine Grocery buys thousands of boxes of New Age Granola but suspects that lately the cereal boxes have been underweight. Genuine Grocery randomly selects 15 boxes from this month's shipment and weighs their contents. The summary statistics from the sample are: sample mean = 18.27 oz and sample standard deviation = 1.54 oz. Assuming that the cereal weights have a normal distribution, construct a 90% confidence interval for the true average weight.

- (a) (15.19, 21.35)
- (b) (15.63, 20.91)
- (c) (16.55, 19.99)
- (d) (17.62, 18.92)
- (e) (17.57, 18.97)

12. An observation that is extremely small or extremely large relative to the rest of the data in a data set is called . . .

- (a) a standard deviate
- (b) a standard score
- (c) an outlier
- (d) a percentile
- (e) a data entry error

13. Which, if any, of the following events has the highest probability?

A = getting 4 heads when randomly tossing a fair coin 12 times

B = getting 3 heads when randomly tossing a fair coin 9 times

C = getting 2 heads when randomly tossing a fair coin 6 times

D = getting 1 head when randomly tossing a fair coin 3 times

- (a) Event A
- (b) Event B
- (c) Event C
- (d) Event D
- (e) Events A, B, C and D are all equally likely.

14. Donna runs a carnival game in which he charges \$1 for a player to randomly roll a single six-sided, fair die. If the player rolls a "6", Donna gives the player \$5 and thus Donna loses \$4. If the player rolls any other number, Donna gives back nothing and thus Donna profits \$1. What is Donna's expected profit per play (to the nearest cent)?

- (a) \$0.00
- (b) \$0.17
- (c) \$0.27
- (d) \$0.37
- (e) \$0.67

15. A student randomly and independently guesses at 20 True/False questions. What is the probability that the student gets 10 or less correct answers? (Round to 3 decimal places.)

- (a) 0.500
- (b) 0.571
- (c) 0.588
- (d) 0.625
- (e) 0.176

16. A machine that fills water bottles is supposed to fill a mean amount of water equal to 64 ounces. An inspector suspects that the true mean is less than 64 ounces. If a statistical hypothesis test is to be performed, how should the hypotheses be stated? Let μ represent the true mean fill-amount of water.

- (a) $H_0: \mu > 64$ vs. $H_1: \mu \leq 64$
- (b) $H_0: \mu = 64$ vs. $H_1: \mu \neq 64$
- (c) $H_0: \mu = 64$ vs. $H_1: \mu > 64$
- (d) $H_0: \mu \neq 64$ vs. $H_1: \mu = 64$
- (e) $H_0: \mu = 64$ vs. $H_1: \mu < 64$

17. A political candidate wants to estimate her chances of winning the coming election for mayor. Out of a random sample of 2000 voters, 980 voters stated they supported the candidate. Find the 95% confidence interval for p , the true proportion of supporters. (Round to 3 decimal places).

- (a) (.468, .512)
- (b) (.465, .485)
- (c) (.461, .519)
- (d) (.476, .504)
- (e) (.483, .497)

18. If one obtains a random sample of size n from a population with finite mean and finite standard deviation, which of the following statements best captures the essence of central limit theorem?

- (a) The sample mean is a biased estimator of the population mean.
- (b) The sample mean has an approximate normal distribution if the population has a normal distribution.
- (c) The sample mean has a uniform distribution.
- (d) The sample mean has an approximate normal distribution when n is large.
- (e) The sample mean has a t distribution with $n-1$ degrees of freedom.

19. Suppose a 95% confidence interval for the mean heart rate (beats/min) of a particular population is (69.7, 74.5). Find the margin of error.

- (a) 1.2
- (b) 2.4
- (c) 3.8
- (d) 4.8
- (e) none of the above

20. A random sample of 100 Big State University students provided the data in the contingency table below.

Gender/ Residence	Live on Campus	Live Off Campus
Men	5	40
Women	15	40

If residence were independent of gender, what is the expected count for the table cell “men who live off campus”?

- (a) 40.00
- (b) 26.67
- (c) 38.40
- (d) 65.45
- (e) 36.00

21. An investigator suspects that the proportion, p , of MTSU students that own a computer is close to .70. What sample size is needed to find an interval estimate of p that has a .05 margin of error and a 95% confidence level? (Use .7 as a preliminary estimate of p .)

- (a) 49
- (b) 210
- (c) 323
- (d) 471
- (e) 768

22. A random sample of the ACT scores of 300 students at Big State University provided a sample mean score of 22.76 with a sample standard deviation of 4.391. Find the large-sample 95% confidence interval for the mean score of all Big State students who had taken the ACT.

- (a) (20.70, 24.82)
- (b) (22.34, 23.18)
- (c) (21.90, 23.62)
- (d) (22.26, 23.26)
- (e) (22.10, 23.42)

23. If a data set has a mean of 500 and a standard deviation of 100, at least what percentage of the data will fall in the interval (300, 700)?
[Hint. Use Chebyshev's Inequality.]

- (a) 50%
- (b) 68%
- (c) 75%
- (d) 88%
- (e) 95%

24. A random sample of the ACT scores of 400 students at Big State University provided a sample mean score of 22.48 with a sample standard deviation of 5.76. Find the p-value when testing the claim that μ , the population mean ACT score, is greater than 22.

- (a) .024
- (b) .048
- (c) .096
- (d) .192
- (e) .256

25. A random sample of 300 females from a large population provided the following sample statistics:

sample mean body temperature: 98.29°

sample standard deviation of body temperatures: 0.76°

Find the margin of error for a large-sample 95% confidence interval for the mean body temperature of all females in the population that was sampled.

- (a) 0.030°
- (b) 0.086°
- (c) 0.115°
- (d) 0.141°
- (e) 1.490°

26. Two hundred headache sufferers were randomly divided into two groups of 100. The first group received a new drug called "Cloud Nine" and the second group received a phony sugar pill (a placebo). Of the 100 in the first group, 68 found headache relief from their treatment. Of the 100 in the second group, 37 found headache relief from their treatment. Find a 95% confidence interval for the difference in proportion of headache relief for the two treatments.

- (a) (.18, .44) (b) (.23, .39) (c) (.27, .35) (d) (.29, .33) (e) (.30, .32)

27. A machine that fills milk bottles is supposed to fill each bottle with a mean amount of milk equal to 64 ounces. An inspector suspects that the true mean μ is less than 64 ounces. Fifty bottles are randomly checked and their mean fill is found to be 63.90 ounces, with the sample standard deviation being 0.35 ounces. If a statistical hypothesis test is to be performed, using a significance level of .05, what is the proper conclusion?

- (a) There is sufficient evidence to conclude that μ is less than 64 ounces.
- (b) There is sufficient evidence to conclude that μ is more than 64 ounces.
- (c) There is not sufficient evidence to conclude that μ is less than 64 ounces.
- (d) There is not sufficient evidence to conclude that μ is more than 64 ounces.
- (e) A larger sample is needed if we want to perform this test.

28. For the probability distribution given in the table below, find the mean.

x	0	1	2
P(x)	1/6	2/3	1/6

- (a) 1/3
- (b) 2/3
- (c) 1
- (d) 5/6
- (e) 5/4

29. Suppose a 95% confidence interval for the mean heart rate (beats/min) of a particular population is (69.7, 74.5). Which one of the following statements is correct?

- (a) 95% of the population has a heart rate somewhere between 69.7 and 74.5.
- (b) 5% of the population has a heart rate outside the range 69.7 to 74.5.
- (c) 95% of the time each person's heart has a rate somewhere between 69.7 and 74.5.
- (d) 95% of the population has an average heart rate and five percent does not.
- (e) none of the above

30. If a jury returns a guilty verdict when the defendant is actually innocent, the jury's mistake is analogous to _____ in terms of hypothesis testing.

- (a) Committing a Type I error.
- (b) Committing a Type II error.
- (c) Increasing the level of significance.
- (d) Increasing the power of the test.
- (e) Decreasing the level of significance.

31. Suppose we are testing $\mu = 0$ versus $\mu \neq 0$, using level of significance .05, and we have a very large random sample. If a 95% confidence interval for μ is $(-2.45, 6.21)$, then the best conclusion for the hypothesis test is

- (a) We have sufficient evidence to conclude that $\mu = 0$.
- (b) We have sufficient evidence to conclude that $\mu \neq 0$.
- (c) We do not have sufficient evidence to conclude that $\mu = 0$.
- (d) We do not have sufficient evidence to conclude that $\mu \neq 0$.
- (e) We have sufficient evidence to conclude that $\mu > 0$.

32. A student randomly guesses at 15 true-false questions. What is the probability that the student gets at least 9 correct? (Round to 3 decimal places.)

- (a) 0.151
- (b) 0.153
- (c) 0.196
- (d) 0.304
- (e) 0.469

33. Which of the following confidence levels will result in the smallest margin of error?

- (a) 90% (b) 95% (c) 97% (d) 98% (e) 99%

34. Suppose that after losing \$200 in a dice game, you obtain one of the dice that was used. You roll the die 600 times to assess whether the die was “loaded” and obtain the following frequencies:

Outcome	1	2	3	4	5	6
Observed frequency	105	85	110	95	97	108
Expected frequency	100	100	100	100	100	100

Find the chi-squared test statistic for performing a goodness-of-fit test.

- (a) 2.71 (b) 3.95 (c) 4.48 (d) 7.72 (e) none of the previous

35. Four different brands of golf balls were tested for distance traveled when hit by a golf club. An incomplete analysis of variance table is given below.

Source of variation	Degrees of freedom	Sum of Squares	Mean Squares	F statistic value
Brand	3	2371.581		
Error	36	1185.109		
Total	39	3556.690		

Determine the value of the F statistic value.

- (a) 0.333
- (b) 0.667
- (c) 2.001
- (d) 13.629
- (e) 24.014

36. If a basketball team has 11 players, how many possible sets of 5 starters are there?

- (a) 6
- (b) 55
- (c) 130
- (d) 462
- (e) 55,440

37. A random sample of 10 students provided the following bivariate data, where x denotes the number of hours a student studied for the final exam and y denotes the student's exam score.

x	8	10	5	7	10	6	3	9	7	6
y	91	95	70	80	92	64	48	87	83	75

Use the least-squares regression line to estimate the exam score for a student who studies 5 hours.

- (a) 57
- (b) 60
- (c) 63
- (d) 66
- (e) 69

38. A shipment of 100 TV's contains 10 defective TV's. If a random sample (without replacement) of 3 TV's is taken from the shipment, what is the probability that the sample will contain no defective TV's? (Round your answer to 3 decimal places.)

- (a) .531
- (b) .690
- (c) .727
- (d) .884
- (e) .930

39. In hypothesis testing, a Type II error occurs if . . .

- (a) the null hypothesis is not rejected when the null hypothesis is actually false.
- (b) the null hypothesis is rejected when the null hypothesis is actually true.
- (c) the level of significance is set at a very high value.
- (d) the sample size is very large.
- (e) the test statistic is very large.

40. Which of the following does not characterize a normal distribution?

- (a) a symmetric density curve
- (b) its mean equals its median
- (c) a bell-shaped density curve
- (d) the approximate distribution of a sample mean from a large random sample
- (e) almost all of the probability is beyond 3 standard deviations of the mean