

## MATH 115 - FINAL REVIEW

1. Statistics
  - a. Consists of the collection, organization, summarization and presentation of data.
  - b. Consists of generalizing from a sample to populating, performing estimations and hypothesis tests, determining relationships among variables, and making predictions.
  - c. Proves relationships are true.
  - d. Both A and B.
2. Which of the following correctly describes the relationship between a sample and a population?
  - a. A sample is a group of populations that are subject to observation.
  - b. A population is a group of samples that may or may not be included in a study.
  - c. A sample is a group of subjects selected from a population to be studied.
  - d. A population and a sample are not related.
3. The number of points scored in a basketball game is an example of a
  - a. Quantitative variable
  - b. Discrete variable.
  - c. Continuous variable.
  - d. Both A and B.
4. Suppose a researcher assigns numbers to possible study participants and then chooses every 10<sup>th</sup> subject after randomly selecting a starting value. This is an example of
  - a. Random sampling.
  - b. Systematic sampling.
  - c. Stratified sampling.
  - d. Cluster sampling.
5. If a researcher manipulates one of the variables and tries to determine how the manipulation influences other variables, the researcher is conducting a(n)
  - a. Observational study.
  - b. Experimental study.
  - c. Independent study.
  - d. Manipulative study.
6. The following data represents the total number of points accumulated by teams in the English Premier League through April:

Chelsea	80 points	Blackburn	44 points
Manchester United	79 points	Fulham	43 points
Arsenal	72 points	Stoke	43 points
Tottenham	64 points	Bolton	36 points
Aston Villa	64 points	Wolverhampton	35 points
Manchester City	63 points	Wigan	35 points
Liverpool	62 points	West Ham	34 points
Everton	57 points	Hull	28 points
Birmingham	47 points	Burnley	27 points
Sunderland	44 points	Portsmouth	16 points

In constructing a frequency polygon for the above data, what values should be marked on the x-axis if divided into 7 classes?

  - a. 9.5, 19.5, 29.5, 39.5, 49.5, 59.5, 69.5, 79.5, 89.5
  - b. 19.5, 29.5, 39.5, 49.5, 59.5, 69.5, 79.5
  - c. 14.5, 24.5, 34.5, 44.5, 54.5, 64.5, 74.5, 84.5
  - d. 14.5, 24.5, 34.5, 44.5, 54.5, 64.5, 74.5

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7. The following data represents the total number of runs scored by both teams during the St. Louis Cardinal's first 25 games this season:

10, 12, 11, 3, 8, 13, 3, 3, 13, 19, 11, 15, 12,  
10, 7, 20, 7, 9, 13, 5, 3, 8, 13, 8, 7

If you were to construct a frequency distribution for the above data and were instructed to use 5 classes, what would be the appropriate width?

- 3
  - 3.4
  - 4
  - 5
8. Given the appropriate class width and a starting value of 3, what would be the appropriate class limits to use in the frequency distribution?
- 3-7, 7-11, 11-15, 15-19, 19-23
  - 3-6, 7-10, 11-14, 15-18, 19-22
  - 2.5-6.5, 6.5-10.5, 10.5-14.5, 14.5-18.5, 18.5-22.5
  - 3-6.4, 6.4-9.8, 9.8-13.2, 13.2-16.6, 16.6-20.0
9. In constructing an ogive for the above data, what is the  $y$  value that corresponds to the  $x$  value 18.5?
- 1
  - 2
  - 15
  - 23
10. If you were to construct a pie graph using the previous data, the largest wedge would be
- $72^\circ$
  - $129.6^\circ$
  - $115.2^\circ$
  - $28.8^\circ$
11. **Ignoring the raw data**, what is the mean of the grouped data if you were only given the frequency distribution (with the above class limits)?
- 9.5
  - 10
  - 10.3
  - 11.2
12. What data value(s) would be used to calculate the median?
- 9 and 10
  - 10
  - 10 and 11
  - 7
13. What is the mode of the above data?
- 3 and 13
  - 3
  - 13
  - 3 or 13
14. Find the interquartile range for the following data: 6, 12, 5, 18, 15, 13, 22, 50
- 45
  - 11
  - 9
  - 44

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15. According to Chebyshev's theorem, the proportion of values from a data set that is further than 2 standard deviations from the mean is

- a. 0.50
- b. 0.13
- c. 1.00
- d. 0.25

16. What type of probability uses sample spaces to determine the numerical probability that an event will occur?

- a. Classical probability.
- b. Conditional probability.
- c. Empirical probability.
- d. Subjective probability.

17. The local university's sports teams consist of the following number of members: 13 basketball players, 12 baseball players, 85 football players, and 13 track athletes. Moreover, 3 of the athletes run track and play football. If a player is randomly chosen from one of the teams, what is the probability that he/she is a football player or a track athlete?

- a.  $85/98$
- b.  $101/123$
- c.  $98/123$
- d.  $95/123$

18. Using the above data, given that an athlete runs track, what is the probability that he also plays football?

- a. 0.024
- b. 0.035
- c. 0.231
- d. 0.797

19. There are 4 different mathematics courses, 5 different science courses, and 6 different history courses. If a student must take one of each, how many different ways can this be done?

- a. 120
- b. 15
- c. 40
- d. 100

20. What probability value would be needed to correctly complete the following probability distribution?

$x$	0	1	2	3	4
$P(x)$	0.09	0.27	0.31	0.11	?

- a. The probability of getting a 3.
- b. 0
- c. 0.22
- d. 0.78

21. Give the variance of the following distribution:

$x$	0	1	2	3	4
$P(x)$	0.20	0.35	0.10	0.25	0.10

- a. 1.83
- b. 1.31
- c. 1.25
- d. 1.71

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22. If a gambler rolls two dice and gets a sum of 10, he wins \$10, and if he gets a sum of 3, he wins \$20. The cost to play the game is \$5. What is the expectation of this game?
- \$3.06
  - \$2.78
  - \$3.06
  - \$2.78
23. Only 10% of people pass the Foreign Service Written Exam. If 1,000 people take the same exam each year, what is the expected mean and variance for the number of people that pass the exam?
- Mean of 900; variance of 100
  - Mean of 90; variance of 10
  - Mean of 10; variance of 90
  - Mean of 100; variance of 90
24. Using the information from the previous question, in a room with 25 test takers, what is the probability that *exactly* 3 pass the exam? Hint: Consider the distribution type.
- Less than 1 percent
  - 0.226
  - 0.357
  - 0.729
25. Which of the following properties does not apply to a theoretical normal distribution?
- The normal distribution is bell-shaped.
  - The mean, median, and mode are equal.
  - The normal distribution is bimodal.
  - The curve never touches the x-axis.
26. Find the probability  $P(z > 0.78)$  using the standard normal distribution.
- 0.2200
  - 0.7823
  - 0.7177
  - 0.2177
27. Find the area, to the nearest thousandth, of the standard normal distribution between the given  $z$ -scores.  
 $z = -0.69$  and  $z = 1.85$
- 0.213
  - 0.723
  - 0.277
  - 0.287
28. The average height of flowering cherry trees in a nursery is 11 feet. If the heights are normally distributed with a standard deviation of 1.6, find the probability that a tree is less than 13 feet tall.
- 0.67
  - 0.89
  - 0.95
  - 0.78
29. The average age of doctors in a certain hospital is 45.0 years old with a population standard deviation of 6.0 years. If 16 doctors are chosen at random for a committee, find the probability that the mean age of those doctors is *less than* 45.45 years. Assume that the variable is normally distributed.
- 0.3821
  - 0.4979
  - 0.5939
  - 0.6179

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30. A food snack manufacturer samples 15 bags of pretzels off the assembly line and weighed their contents. If the sample mean is 10.0 and the sample standard deviation is 0.15, find the 95% confidence interval of the true mean.
- (9.96, 10.04)
  - (9.68, 10.32)
  - (9.98, 10.42)
  - (9.92, 10.08)
31. A recent study of 750 Internet users in Europe found that 35% of Internet users were women. What is the 95% confidence interval of the true proportion of women in Europe who use the Internet?
- $0.316 < p < 0.384$
  - $0.321 < p < 0.379$
  - $0.309 < p < 0.391$
  - $0.305 < p < 0.395$
32. A recent poll of 700 people who work indoors found that 278 of them smoke. If the researchers want to be 98% confident of their results to within 3.5%, how large of a sample is necessary?
- 751
  - 1062
  - 1301
  - 532
33. A study of elephants wishes to determine the average weight of a certain subspecies of elephants. The standard deviation of the population is 2000 pounds. How many elephants need to be weighed so that we can be 99% confident that we are accurate within 250 pounds?
- 427
  - 510
  - 612
  - 576

*Consider the following situation when answering the next two questions:*

The Eagle Ridge Contractors Association claims the average price of a home in their subdivision is \$125,150 and that the population standard deviation is \$7,350. A sample of 36 homes for sale in this subdivision had an average selling price of \$123,550. Is there evidence that the costs of the homes for sale in this subdivision are actually lower than claimed?

34. What are the null and alternative hypotheses for this situation and what is the claim?
- $H_0 : \mu = 125,150$  (claim) and  $H_1 : \mu \neq 125,150$
  - $H_0 : \mu = 125,150$  (claim) and  $H_1 : \mu > 125,150$
  - $H_0 : \mu = 125,150$  (claim) and  $H_1 : \mu < 125,150$
  - $H_0 : \mu = 125,150$  and  $H_1 : \mu < 125,150$  (claim)
35. What is the  $p$ -value for the test statistic calculated for the above example?
- 0.0853
  - 0.0951
  - 0.1327
  - 0.0036
36. A political strategist believes that less than 56% of voters in a certain state support a particular issue. He then commissions a poll of 600 voters and 52% of them support this issue. If  $\alpha = 0.05$ , is the political strategist's belief warranted?
- No, because the test value  $-1.16$  is in the critical region.
  - No, because the test value  $-2.17$  is in the noncritical region.
  - Yes, because the test value  $-1.97$  is in the critical region.
  - Yes, because the test value  $-2.17$  is in the critical region.

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37. A marketing firm asked a random set of married and single men as to how much they were willing to spend for a vacation. At  $\alpha = 0.05$ , is there a difference in the two amounts?

	Married Men	Single Men
Sample size	50	50
Mean spending	380	325
Sample variance	6,000	9,000

- No, because the test value 0.18 is inside the interval  $(-1.96, 1.96)$ .
- Yes, because the test value 3.18 is outside the interval  $(-1.96, 1.96)$ .
- Yes, because the test value 1.50 is inside the interval  $(-1.96, 1.96)$ .
- No, because the test value 1.50 is outside the interval  $(-1.96, 1.96)$ .

38. A conservationist wants to know if the average water level in Horseshoe Lake is more than the average water level in Swan Lake. Test his hypothesis at  $\alpha = 0.01$ .

	Horseshoe Lake	Swan Lake
$\bar{x}$	43	38
$\sigma$	3.2	2.4
$n$	23	23

- Reject  $H_0$ .
- Not reject  $H_0$ .
- Reject  $H_1$ .
- Not reject  $H_1$ .

39. A study of cats and dogs found that 17 of 50 cats and 31 of 55 dogs slept for more than 10 hours per day. If we wanted to test whether or not there is a significant difference in the PROPORTION of cats and dogs that sleep for more than 10 hours per day, what would be the value of the test statistic?

- 2.30
- 1.51
- 2.66
- 0.72

40. In a sample of 80 Americans, 55% wished they were rich. In a sample of 90 Europeans, 45% wished they were rich. At  $\alpha = 0.01$ , is there a difference in the proportions?

- The critical value is 1.302 and there is **not** a difference in the proportions.
- The critical value is -1.302 and there is a difference in the proportions.
- The critical value is 1.302 and there is enough evidence to say that there is a difference in the proportions.
- The critical value is -1.302 and there is **not** enough evidence to say that there is a difference in the proportions.

41. At a certain university, the average cost of books per student was \$330 last semester. In a sample of 50 students this semester, their average cost was \$355 with a standard deviation of \$85. The Dean of Students believes that the costs are greater this semester. What is the test value for this hypothesis?

- 0.29
- 0.50
- 2.08
- 14.71

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42. A researcher wanted to determine if using an octane booster would increase gasoline mileage. A random sample of seven cars were driven for two weeks without the booster and two weeks with the booster. The data obtained is shown in the table below:

MPG Without Booster	MPG With Booster
21.2	23.8
25.4	25.6
20.9	22.4
27.6	28.3
22.8	24.5
27.3	28.8
23.4	25.2

What is the test value needed to test the null hypothesis that the booster does not affect miles per gallon?

- a. -5.246
- b. -4.856
- c. 4.856
- d. 5.246

43. The average speed of greyhound dogs is about 18.4 meters per second. A particular breeder claims that her dogs are faster than the average greyhound. In a sample of 30 of her dogs, they ran, on average, 18.9 meters per second with a standard deviation of 1.2. At  $\alpha = 0.05$ , does the data support her claim?

- a. Yes, because 0.08 falls in the critical region.
- b. No, because 0.08 falls in the critical region.
- c. Yes, because 2.28 falls in the critical region.
- d. No, because 0.5 falls in the critical region.

44. A sociologist wishes to see whether the number of years of college a person has completed is related to his or her place of residence. A sample of 88 people is selected and classified as shown.

LOCATION	NO COLLEGE	FOUR-YEAR DEGREE	ADVANCED DEGREE	TOTAL
Urban	15	12	8	35
Suburban	8	15	9	32
Rural	6	8	7	21
<b>TOTAL</b>	29	35	24	88

The degrees of freedom for the contingency table is

- a. 3
- b. 9
- c. 6
- d. 4

45. A *goodness-of-fit test*

- a. Requires the use of *t*-distribution.
- b. Is always a left-tailed test.
- c. Is required to see if an observed frequency distribution fits a specific, often theoretical, pattern.
- d. Both B and C.

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46. A study was conducted to determine if there was a relationship between the prices a non-member of a club paid for various publications and the prices that a member paid for the same publications. The data gathered is shown below.

Non-member Price	Member Price
\$58	\$32
\$42	\$22
\$46	\$20
\$32	\$16
\$25	\$19
\$75	\$58
\$35	\$34
\$63	\$48

What is the value of the correlation coefficient?

- a. 0.762
- b. 0.857
- c. 0.679
- d. 0.932

47. Ten pairs of points yielded a correlation coefficient  $r$  of 0.79. If  $\alpha = 0.05$ , which of the following statements is correct if  $H_0: \rho = 0$ ? (Do not calculate a  $t$ -value.)

- a. Because 0.79 is greater than 0.632, the null hypothesis is not rejected.
- b. Because 0.79 is greater than 0.632, the null hypothesis is rejected.
- c. Because 0.79 is greater than 0.602, the null hypothesis is not rejected.
- d. There is no correlation between the variables.

48. What is the equation for the regression line if  $n = 7$ ,  $\sum x = 69$ ,  $\sum y = 528$ ,  $\sum xy = 4754$ , and  $\sum x^2 = 825$ ?

- a.  $y' = 106.089 - 3.110x$
- b.  $y' = 109.638 - 2.168x$
- c.  $y' = -3.110 + 106.089x$
- d.  $y' = -2.168 + 109.638x$

49. What is the value of  $y'$  when  $x = 3$ , if the equation of the regression line is  $y' = 23.1 - 3.8x$ ?

- a. 4.73
- b. 5.29
- c. 34.5
- d. 11.7

50. A study of 100 apple trees showed that the average number of apples per tree was 1000. The standard deviation of the population is 150. Which of the following is the 95% confidence interval for the mean number of apples for all trees?

- a. (975.3, 1024.7)
- b. (970.6, 1029.4)
- c. (967.7, 1032.3)
- d. (965.1, 1034.9)



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### ANSWER KEY

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | D | 26. | D |
| 2.  | C | 27. | B |
| 3.  | D | 28. | B |
| 4.  | B | 29. | D |
| 5.  | B | 30. | D |
| 6.  | A | 31. | A |
| 7.  | C | 32. | B |
| 8.  | B | 33. | A |
| 9.  | D | 34. | C |
| 10. | B | 35. | B |
| 11. | C | 36. | C |
| 12. | B | 37. | B |
| 13. | A | 38. | A |
| 14. | B | 39. | A |
| 15. | D | 40. | A |
| 16. | A | 41. | C |
| 17. | D | 42. | B |
| 18. | C | 43. | C |
| 19. | A | 44. | D |
| 20. | C | 45. | C |
| 21. | D | 46. | B |
| 22. | C | 47. | B |
| 23. | D | 48. | A |
| 24. | B | 49. | D |
| 25. | C | 50. | B |