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 10th 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. The following table presents the purchase totals (in dollars) of a random sample of gasoline purchases at a convenience store.

Construct a relative frequency distribution using a class width of 10, and using 0 as the lower class limit for the first class.

57.46	27.21	6.12	97.99	68.22
28.97	39.41	77.56	37.06	73.09
88.82	61.29	93.24	65.96	42.37
94.38	7.67	16.95	71.17	65.37

A)

Convenience Store Gas Purchases

Amount (dollars)	Relative Frequency
0.00-9.99	0.100
10.00-19.99	0.050
20.00-29.99	0.100
30.00-39.99	0.100
40.00-49.99	0.030
50.00-59.99	0.070
60.00-69.99	0.200
70.00-79.99	0.150
80.00-89.99	0.050
90.00-99.99	0.150

B)

Convenience Store Gas Purchases

Amount (dollars)	Relative Frequency
0.00-9.99	0.100
10.00-19.99	0.050
20.00-29.99	0.100
30.00-39.99	0.100
40.00-49.99	0.050
50.00-59.99	0.050
60.00-69.99	0.200
70.00-79.99	0.150
80.00-89.99	0.050
90.00-99.99	0.150

C)

Convenience Store Gas Purchases

Amount (dollars)	Relative Frequency
0.00-9.99	0.100
10.00-19.99	0.050
20.00-29.99	0.100
30.00-39.99	0.100
40.00-49.99	0.050
50.00-59.99	0.040
60.00-69.99	0.210
70.00-79.99	0.150
80.00-89.99	0.050
90.00-99.99	0.150

D)

Convenience Store Gas Purchases

Amount (dollars)	Relative Frequency
0.00-9.99	0.100
10.00-19.99	0.050
20.00-29.99	0.100
30.00-39.99	0.080
40.00-49.99	0.070
50.00-59.99	0.050
60.00-69.99	0.200
70.00-79.99	0.150
80.00-89.99	0.050
90.00-99.99	0.150

6. The following data represents the total number of runs scored by both teams during the St. Louis Cardinal's first 25 games of a recent 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, with a starting value of 3, and were instructed to use 5 classes, what would be appropriate width?
a. 3
b. 3.4
c. 4
d. 5

7. Given the appropriate class width and a starting value of 3, what would be the appropriate class limits to use in the frequency distribution?
   a. 3 – 7, 7 – 11, 11 – 15, 15 – 19, 19 – 23
   b. 3 – 6, 7 – 10, 11 – 14, 15 – 18, 19 – 22
   c. 2.5- 6.5, 6.5 – 10.5, 10.5 – 14.5, 14.5 – 18.5, 18.5 – 22.5
   d. 3 – 6.4, 6.4 – 9.8, 9.8 – 13.2, 13.2 – 16.6, 16.6 – 20.0

8. In constructing an ogive for the above data, what is the *y* value that corresponds to the x value 18.5?
   a. 1
   b. 2
   c. 15
   d. 23

9. If you were to construct a pie graph using the previous data, the largest wedge would be
   a. 72°
   b. 129.6°
   c. 115.2°
   d. 28.8°

10. **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)?
    a. 9.5
    b. 10
    c. 10.8
    d. 11.2

11. What data value(s) would be used to calculate the median?
    a. 9 and 10
    b. 10
    c. 10 and 11
    d. 7

12. What is the mode of the above data?
    a. 3 and 13
    b. 3
    c. 13
    d. 3 or 13

13. Find the interquartile range for the following data: 6, 12, 5, 18, 15, 13, 22, 50
    a. 45
    b. 11
    c. 9
    d. 44

14. 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

15. The local university's sports teams consist of the following number of members: 13 basketball 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. 95/108

16. 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

17. 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

18. 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

19. 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

20. 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?
    a. Mean of 900, variance of 100
    b. Mean of 90, variance of 10
    c. Mean of 10, variance of 90
    d. Mean of 100, variance of 90

21. Find the area, to the nearest thousandth, of the standard normal distribution between the given z-scores: $z = -0.69$ and $z = 1.85$.
    a. 0.213
    b. 0.723
    c. 0.277
    d. 0.287

22. 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 is tree is less than 13 feet tall.
    a. 0.67
    b. 0.89
    c. 0.95
    d. 0.78

23. 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.
    a. 0.3821
    b. 0.4979
    c. 0.5939
    d. 0.6179

24. 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.
    a. (9.96, 10.04)
    b. (9.68, 10.32)
    c. (9.98, 10.42)
    d. (9.92, 10.08)

25. 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?
    a. (0.316, 0.384)
    b. (0.321, 0.379)
    c. (0.309, 0.391)
    d. (0.305, 0.395)

26. 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?
    a. 751
    b. 1062
    c. 1301
    d. 532

27. 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?
    a. 427
    b. 510
    c. 612
    d. 576

Consider the following situation when answering the next three 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?

28. What are the null and alternate hypotheses for this situation?
    a. $H_0: \mu = 125,150$ vs $H_1: \mu \neq 125,150$
    b. $H_0: \mu = 125,150$ vs $H_1: \mu > 125,150$
    c. $H_0: \mu = 125,150$ vs $H_1: \mu < 125,150$
    d. $H_0: \mu = 123,550$ vs $H_1: \mu = 125,150$

29. What is the p-value for the test statistic calculated for the above example?
    a. 0.0853
    b. 0.0951
    c. 0.1327
    d. 0.0036

30. State a conclusion for this situation at the $\alpha = .05$ level.
    a. We conclude that that the average price of homes may be $125,150.
    b. We conclude that the average price of homes is $123,550.
    c. We conclude that the average price of homes is less than $125,150.
    d. We conclude that the average price of homes is not 125,150.

31. A garden supplier claims that its new variety of giant tomato produces fruit with a mean weight of 38 ounces. A test is made of $H_0: \mu = 38$ versus $H_1: \mu \neq 38$. The null hypothesis is rejected. State the appropriate conclusion.
    a. The mean weight is not equal to 38 ounces.
    b. There is not enough evidence to conclude that the mean weight differs from 38 ounces.
    c. There is not enough evidence to conclude that the mean weight is 38 ounces.
    d. The mean weight is equal to 38 ounces.

32. In a sample of 80 Americans, 55% wished they were rich. In a sample of 90 Europeans, 45% wished they were rich. If $\alpha = 0.01$, is there a difference in the proportions?
    a. The critical value is 1.23 and there is not a difference in the proportions.
    b. The critical value is -1.302 and there is a difference in the proportions.
    c. The critical value is 1.302 and there is enough evidence to say that there is a difference in the proportions.
    d. The critical value is -1.23 and there is not enough evidence to say that there is a difference in the proportions.

33. 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 costs are greater this semester. What is the test value for this hypothesis?
    a. 0.29
    b. 0.50
    c. 2.08
    d. 14.71

34. A group of six individuals with high blood pressure volunteered to test whether petting cats for 10 minutes can alter systolic blood pressure levels. Systolic blood pressures (in millimeters of mercury, or mmHg) were measured for each subject before and after petting cats for 10 minutes, with the following results:

Individual	Before	After
1	177	162
2	174	168
3	175	191
4	188	163
5	182	178
6	188	163

Find the 95% confidence interval for the mean reduction in systolic blood pressure.
A) (−6.45, 26.11)
B) (−7.26, 26.93)
C) (−8.07, 27.74)
D) (−9.38, 29.04)

35. The mean annual tuition and fees for a sample of 15 private colleges was $38,500 with a standard deviation of $5,900. A dotplot shows that it is reasonable to assume that the population is approximately normal. You wish to test whether the mean tuition and fees for private colleges is different from $34,700.

    Compute the value of the test statistic and state the number of degrees of freedom.
    a. 2.494; 14 degrees of freedom

    b. 0.644; 15 degrees of freedom

    c. 2.494; 15 degrees of freedom

    d. 0.644; 14 degrees of freedom

36. Traffic engineers compared rates of traffic accidents at intersections with raised medians with rates at intersections with two-way left-turn lanes. They found that out of 4644 accidents at intersections with raised medians, 2280 were rear-end accidents, and out of 4584 accidents at two-way left-turn lanes, 1982 were rear-end accidents. Assuming these to be random samples of accidents from the two types of intersections, construct a 95% confidence interval for the difference between the proportions of accidents that are of the rear-end type at the two-types of intersections.
    a. E (0.38, 0.64)
    b. (0.025, 0.064)
    c. (0.038, 0.079)
    d. (0.179, 0.346)

37. For the previous situation, does the confidence interval contradict the claim that the proportion of rear-end accidents is the same of both types of intersections?
    a. Yes
    b. No

38. A garden seed wholesaler wishes to test the claim that tomato seeds germinate faster when each individual seed is "pelletized" within a coating of corn starch. The table below shows the germination times, in days, of six pelletized seeds. The table also shows the germination times in days of six un-coated seeds (the controls).

    Pellitize: 7 8 7 7 7 8
    Control: 8 11 11 10 12 6

    State the null and alternate hypothesis.
    a. $H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 \neq \mu_2$
    b. $H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 < \mu_2$
    c. $H_0: \mu_1 = \mu_2$ vs $H_1: \mu_1 > \mu_2$
    d. None of the above.

39. Can you conclude that the mean germination time for pelletized seeds is less than the mean for the un-pelletized seeds? Use the $\alpha = 0.05$ level of significance.

    a. Yes
    b. No

40. An article in the *Archives of Internal Medicine* reported that in a sample of 244 men, 73 had elevated total cholesterol levels (more than 200 mg per deciliter). In a sample of 232 women, 44 had elevated cholesterol levels. Can you conclude that the proportion of people with elevated cholesterol levels differs between men and women? Use the $\alpha = 0.05$ level and state a conclusion.
   a. Yes. We conclude that the proportion of people with elevated cholesterol levels differs between men and women.
   b. Yes. We conclude that the proportion of people with elevated cholesterol levels is higher in men than in women.
   c. No. We conclude that the proportion of people with elevated cholesterol levels is the same in men and in women.
   d. Yes. We conclude that the proportion of people with elevated cholesterol levels is lower in men than in women.

41. A simple random sample of 75 people are given a new drug that is designed to relieve pain. A second sample of 50 people are given a standard drug. The question of interest is whether the proportion of people experiencing relief is greater among those taking the new drug. To address this question, which of the following is the most appropriate type of hypothesis test
   a. A test for the difference between two population means sing independent samples.
   b. A test for the difference between two population proportions.
   c. A test for the difference between two population means using matched pairs.
   d. A test for the difference between two population standard deviations.

42. A simple random sample of 75 people are given a new drug that is designed to relieve pain. After taking the drug for a month, they switch to a standard drug. The question of interest is whether the proportion of people who experienced relief is greater when taking the new drug. To address this question, which of the following is the most appropriate type of hypothesis test?
   a. A test for the difference between two population means sing independent samples.
   b. A test for the difference between two population proportions.
   c. A test for the difference between two population means using matched pairs.
   d. A test for the difference between two population standard deviations.

43. A biology professor claims that, on the average, 10% of her students get a grade of A, 25% get a B, 40% get a C, 15% get a D, and 10% get an F. The grades of a random sample of 73 students were recorded. The following table presents the results.

Grade	A	B	C	D	F
Observed	2	20	33	8	10

Compute the expected frequencies.
a. 0.027, 0.274, 0.452, 0.11, 0.137
b. 14.6, 14.6, 14.6, 14.6, 14.6
c. 2, 20, 33, 8, 10
d. 7.3, 18.25, 29.2, 10.95, 7.3

44. A study was conducted to determine if there was a relationship between the price 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

45. One of the primary feeds for beef cattle is corn. The following table presents the average price in dollars for a bushel of corn and a pound of ribeye steak for 10 consecutive months.

Corn Price ($/bu)	Ribeye Price ($/lb)
6.26	13.32
6.00	12.25
5.76	12.53
6.33	13.33
6.46	13.28
6.44	13.01

Calculate the least-squares regression line for predicting the ribeye price from the corn price.

  e. $y = 1.310 + 4.819x$
  f. $y = 4.819 + 1.310x$
  g. $y = -1.310 + 4.819x$
  h. $y = 1.422 + 4.819x$

46. Predict the ribeye price in a month when the corn price was $6.63 per bushel.
  a. $13.51 per lb
  b. $8.69 per lb
  c. $12.83 per lb
  d. $14.37 per lb

47. A biology professor claims that, on the average, 20% of her students get a grade of A, 15% get a B, 40% get a C, 10% get a D, and 15% get an F. The grades of a random sample of 125 students were recorded. The following table presents the results.

Grade	A	B	C	D	F
Observed	24	22	33	24	22

What is the value of x^2?

  a. 13.277
  b. 19.667
  c. 17.527
  d. 14.860

48. A computer software magazine compares the rates of malware infection for computers protected by security software A with the rates of infection for computers protected by security software B.

They found that out of 750 computers with security software A, 85 became infected with some type of malware after 1000 hours of internet interaction. For security software B, 62 out of 548 computers became infected after 1000 hours of internet interaction.

Assuming these to be random samples of infection rates for the two security software packages, construct a 98% confidence interval for the difference between the proportions of infection for the two types of security software packages.
   a. (-0.039, 0.040)
   b. (-0.037, 0.037)
   c. (-0.041, 0.042)
   d. (-0.031, 0.036)

49. A paint manufacturer discovers that the mean volume of paint in a gallon-sized pail is 1 gallons with a standard deviation of 0.1 gallons. The paint volumes are approximately bell-shaped. Estimate the percent of pails with volumes between 0.9 gallons and 1.1 gallons.
   a. 95%
   b. 32%
   c. 68%
   d. Almost all (greater than 95%)

50. What is the correct relationship between events A and B:

A: Laura participated in an out-of-town volleyball game at 11:00AM last Friday.
B: Laura met with her academic advisor on campus at 11:00AM last Friday.

   a. A and B are mutually exclusive.
   b. A and B are complementary.
   c. A and B are not mutually exclusive. A and B are not mutually exclusive.
   d. If B is true, A is true.

ANSWERS TO FINAL REVIEW

1. d
2. c
3. d
4. b
5. b
6. c
7. b
8. d
9. b
10. c
11. b
12. a
13. b
14. d
15. d
16. c
17. a
18. c
19. d
20. d
21. b
22. b
23. d
24. d
25. a
26. b
27. a
28. c
29. b
30. a
31. a
32. a
33. c
34. a
35. a
36. c
37. a
38. b
39. a
40. a
41. b
42. c
43. d
44. b

45. f
46. a
47. c
48. c
49. c
50. a