1. A public opinion poll surveyed a simple random sample of voters. Respondents were classified by gender (male or female) and by voting preference (Republican, Democrat, or Independent). Results are shown below.

|  |  |
| --- | --- |
|  | Voting Preferences |
|  | Republican | Democrat | Independent | Row total |
| Male | 200 | 150 | 50 | 400 |
| Female | 250 | 300 | 50 | 600 |
| Column total | 450 | 450 | 100 | 1000 |

If you conduct a chi-square test of independence, what is the expected frequency count of male Independents?

(A) 40
(B) 50
(C) 60
(D) 180
(E) 270

*2.* A pet food manufacturer runs an experiment to determine whether three brands

of dog food are equally preferred by dogs. In the experiment, 150 dogs are individually

presented with three dishes of food, each containing a different brand, and their choices are noted. Tabulations show that 62 dogs go to brand A, and 43 to brand B, and 45 go to brand C. Is this sufficient evidence to say that dogs have preferences among the brands? Test at the 10% level (of significance).

(A) No, with Chi2 = 2.09, there is not sufficient evidence even at the 25% level.

(B) No, with Chi2  = 4.36, there is not sufficient evidence at the 10% level.

(C) No, with Chi2 = 19.0, there is not sufficient evidence even at the 0.1% level.

(D) Yes, with Chi2  = 4.36, there is sufficient evidence at the 10% level.

(E) Yes, with Chi2 = 19.0, there is sufficient evidence even at the 0.1% level.

3. The American Medical Association (AMA) wishes to determine the percentage

of obstetricians who are considering leaving the profession because of the rapidly

increasing number of lawsuits against obstetricians. How large a sample should

be taken to find the answer to within ±3% at the 95% confidence level?

(A) 6 (B) 33 (C) 534 (D) 752 (E) 1068

4. Which of the following are true statements?

I. If there is sufficient evidence to reject a null hypothesis at the 10% level, then

there is sufficient evidence to reject it at the 5% level.

II. If the p-value (the risk of a Type 1-error) is larger than the level of significance (alpha), the null-hypothesis should be accepted.

III. If a hypothesis test is conducted at the 1% level, the value of the test statistic will be ≤1.

(A) I only

(B) II only

(C) III only

(D) I, II, and III

(E) None are true.

5. When carrying out a large sample test about a population proportion p where we are testing H0: p = 0.4 against H1: p < 0.4 and z is the calculated test statistic, we reject H0 at level of significance a (alpha) if and only if

|  |  |
| --- | --- |
| A. | E:\Bowerman_Stuff\Bowerman_Student_Quizzes\Quizzes\b9140001.jpg |
| B. | Z < - Za/2 |

|  |  |
| --- | --- |
| C. | Z <- Za |

|  |  |
| --- | --- |
| D. | Z > Za |

|  |  |
| --- | --- |
| E. | p-value <a |

|  |  |
| --- | --- |
| F. | Both C and E |

6. We have computed the probability of an event to be 0.001. Which of the following

statements is correct?

(A) The event is unlikely to occur.

(B) We would expect the event to occur about 10 percent of the time.

(C) The event cannot occur.

(D) All of the above.

7. All of the following are assumptions of the error terms in the simple linear regression model except

|  |  |
| --- | --- |
| **A.** | normality. |

|  |  |
| --- | --- |
| **B.** | error terms with a mean of zero. |

|  |  |
| --- | --- |
| **C.** | constant variance. |

|  |  |
| --- | --- |
| **D.** | variance of one. |

8. For a given hypothesis test, if we do not reject H0, and H0 is true,

|  |  |
| --- | --- |
| **A.** | no error has been committed. |

|  |  |
| --- | --- |
| **B.** | type I error has been committed. |

|  |  |
| --- | --- |
| **C.** | type II error has been committed. |

|  |  |
| --- | --- |
| **D.** | type III error has been committed. |

9. What is one way to decrease the width (=size) of a confidence interval?

(a) Increase the sample size

(b) Use a smaller confidence level

(c) Both (a) and (b) are correct

(d) Neither (a) nor (b) are correct

(e) Answer (b) is correct, (a) is wrong

10. For the same set of observations on a specified dependent variable, two different independent variables were used to develop two simple linear regression models. The results are summarized as follows:

**Based on the above results, we can conclude that:

|  |  |
| --- | --- |
| **A.** | The SSE for Model II is smaller than the SSE for Model I. |

|  |  |
| --- | --- |
| **B.** | A prediction based on Model II is likely better than a prediction based on Model I. |

|  |  |
| --- | --- |
| **C.** A Prediction based on Model I is likely better than a prediction based on Model II. |  |

11. If the sample mean of a data set is 15 and the sample standard deviation is 9,

what percent of the data would you expect to fall between 6 and 24, assuming that the

data distribution is fairly symmetric?

(A) 68 percent

(B) 81.5 percent

(C) 95 percent

(D) 99.7 percent

12. In performing a chi-square test of independence, as the difference between the respective observed and expected frequencies decrease, the probability of concluding that the row variable is independent of the column variable

|  |  |
| --- | --- |
| **A.** | decreases. |

|  |  |
| --- | --- |
| **B.** | increases. |

|  |  |
| --- | --- |
| **C.** | may decrease or increase depending on the number of rows and columns. |

|  |  |
| --- | --- |
| **D.** | remains the same. |

13. In a multiple regression analysis, if the normal probability plot \_\_\_\_\_\_\_\_\_\_\_\_\_\_, then it can be concluded that the assumption of normality is not violated.

|  |  |
| --- | --- |
| **A.** | is a straight line |

|  |  |
| --- | --- |
| **B.** | has the shape of a symmetric bell shaped curve |

|  |  |
| --- | --- |
| **C.** | is greatly curved |

|  |  |
| --- | --- |
| **D.** | Is left skewed |

|  |  |
| --- | --- |
| **E.** | has the shape of a parabola that opens upward |

14. True or False? The correlation measures the strength and direction of the linear

relationship between two quantitative variables.

(A) True (B) False

15. What is a matched-pairs experiment?

(A) It is an experiment that matches control subjects with experimental subjects.

(B) It is an experiment where subjects are randomly assigned to one of two treatments.

(C) It is an experiment where each subject provides two responses; one to one treatment,

and one to another.

(D) It is an experiment where a statistically significant difference is observed.

16. In a simple regression, when the constant variance assumption holds, a plot of the residuals versus x

|  |  |
| --- | --- |
| **A.** | fans out. |

|  |  |
| --- | --- |
| **B.** | funnels in. |

|  |  |
| --- | --- |
| **C.** | fans out, but then funnels in. |

|  |  |
| --- | --- |
| **D.** | suggests a decreasing error variance. |

|  |  |  |
| --- | --- | --- |
| **E.** | forms a horizontal band pattern | . |

17. The death rate from a particular form of cancer is 23% during the first year.

When treated with an experimental drug, only 15 out of 84 patients die during

the initial year. Is this strong evidence to claim that the new medication reduces

the mortality rate?

(A) Yes, because the P-value is .0459.

(B) Yes, because the P-value is .1314.

(C) No, because the P-value is only .0459.

(D) No, because the P-value is above .10.

(E) An answer cannot be given without first knowing if a placebo was also used

and what the results were.

18. In a simple random survey of 89 teachers of high school AP Statistics, 73 said

that it was the most satisfying, most enjoyable course they had ever taught.

Establish a 98% confidence interval estimate of the proportion of all high school

AP Statistics teachers who feel this way.

(A) 0.820 ± 0.004

(B) 0.820 ± 0.041

(C) 0.820 ± 0.084

(D) 0.820 ± 0.095

(E) 0.820 ± 0.223

19. The manager of the quality department for a tire manufacturing company wants to study the average tensile strength of rubber used in making a certain brand of radial tire. The population is normally distributed and the population standard deviation is known. She uses a Z test to test the null hypothesis that the mean tensile strength is less than or equal to 800 pounds per square inch. The calculated Z test Statistic is a positive value that leads to a p-value of 0.067 for the test. If the significance level is 0.10, H0 would be rejected.

|  |  |
| --- | --- |
| A. | True |

|  |  |
| --- | --- |
| B. | False |

20. In testing the equality of population variances, these two statements are true:

1) two assumptions are required: independent samples and normally distributed populations.

2) if s12 =s22, the calculated value of the F-distributed Test Statistic will be equal to one.

|  |  |
| --- | --- |
|  **A.** | \*) Statement 1 is true, statement 2 is false. |

|  |  |
| --- | --- |
|  **B.** Both statements are false. |  |
|

|  |  |
| --- | --- |
| **C.** |  Both statements are true. |

 |  |
|  **D.** Statement 1 is false, statement 2 is true. |  |

\*) Please don’t bother about the A-response already being marked with a black dot – I could not remove it

21. To survey the opinions of the students at your high school, a researcher plans to

select every twenty-fifth student entering the school in the morning. Assuming

there are no absences, will this result in a simple random sample of students

attending your school?

(A) Yes, because every students has the same chance of being selected.

(B) Yes, but only if there is a single entrance to the school.

(C) Yes, because the 24 out of every 25 students who are not selected will form

a control group.

(D) Yes, because this is an example of systematic sampling, which is a special

case of simple random sampling.

(E) No, because not every sample of the intended size has an equal chance of

being selected.

22. A simple random sample of size *n* = 25 is drawn from a population with mean 50

and standard deviation 5. What is the standard deviation of the sample mean *x*?

(A) 1

(B) 2

(C) 5

(D) 10

23. To determine the mean cost of groceries in a certain city, an identical grocery

basket of food is purchased at each store in a random sample of ten stores. If the

average cost is $47.52 with a standard deviation of $1.59, find a 98% confidence

interval estimate for the cost of these groceries in the city.

(A) $47.52 ± $0.45

(B) $47.52 ± $1.17

(C) $47.52 ± $1.39

(D) $47.52 ± $1.42

(E) $47.52 ± $4.49

24. The coefficient of determination not only indicates the strength of the relationship between independent and dependent variable in a simple linear regression model, but also shows whether the relationship is positive or negative.

|  |  |
| --- | --- |
| **A.** | True |

|  |  |
| --- | --- |
| **B.** | False |

25. A study was conducted to determine the effectiveness of taking varying amounts of

vitamin C in reducing the number of common colds.

A survey of 450 people provided the following information:

 Daily amount of vitamin C taken

|  |  |  |  |
| --- | --- | --- | --- |
|  | None | 500 mg | 1000 mg |
| No colds | 57 | 26 | 17 |
| At least one cold | 223 | 84 | 43 |

Is there evidence of a relationship between catching a cold and taking vitamin C?

(A) The data prove that vitamin C reduces the number of common colds.

(B) The data prove that vitamin C has no effect on the number of common colds.

(C) There is sufficient evidence at the 1% significance level of a relationship

between taking vitamin C and catching fewer colds.

(D) There is sufficent evidence at the 10% significance level, but not at the 1%

significance level, of a relationship between taking vitamin C and catching fewer colds.

(E) There is not sufficient evidence at the 10% level of a relationship between taking vitamin C and catching fewer colds.

26. Both over-the-counter niacin and the prescription drug Lipitor are known to

lower blood cholesterol levels. In one double-blind study Lipitor outperformed

niacin. The 95% confidence interval estimate of the difference in mean cholesterol

level lowering was [18 ; 41]. Which of the following is a reasonable conclusion?

(A) Niacin lowers cholesterol an average of 18 points, while Lipitor lowers cholesterol

an average of 41 points.

(B) There is a 0.95 probability that Lipitor will outperform niacin in lowering

the cholesterol level of any given individual. (continued next page)

(C) There is a 0.95 probability that Lipitor will outperform niacin by at least 23

points in lowering the cholesterol level of any given individual.

(D) We should be 95% confident that Lipitor will outperform niacin as a

cholesterol-lowering drug.

(E) None of the above.

27. In the language of experiments, what is a treatment?

(A) a data frame that consists of all experimental units

(B) a group of individuals that are similar in some way

(C) a randomization procedure

(D) a condition or intervention which is applied to individuals

28. A national achievement test is administered annually to 3rd graders. The test has a mean score of 100 and a standard deviation of 15. If Jane's z-score is 1.20, what was her score on the test?

(A) 82
(B) 88
(C) 100
(D) 112
(E) 118

29. A phenomenon or process that produces results that cannot be predicted with

certainty is

(A) unbiased

(B) systematic

(C) random

(D) reliable

30. A measurement process is said to be biased if

(A) it does not preserve subject anonymity. (continued next page)

(B) it produces nearly the same result every time.

(C) it consistently understates or overstates the true value.

(D) None of the above.

31. Which of the following is a violation of the independence assumption?

|  |  |
| --- | --- |
| **A.** | Negative autocorrelation |

|  |  |
| --- | --- |
| **B.** | A pattern of cyclical error terms over time |

|  |  |
| --- | --- |
| **C.** | Positive autocorrelation |

|  |  |
| --- | --- |
| **D.** | A pattern of alternating error terms overtime. |

|  |  |
| --- | --- |
| **E.** | All of the above. |

32. Acme Toy Company sells baseball cards in packages of 100. Three types of players are represented in each package -- rookies, veterans, and All-Stars. The company claims that 30% of the cards are rookies, 60% are veterans, and 10% are All-Stars. Cards from each group are randomly assigned to packages.

Suppose you bought a package of cards and counted the players from each group. What method would you use to test Acme's claim that 30% of the production run are rookies; 60%, veterans; and 10%, All-Stars.

(A) Chi-square goodness of fit test
(B) Chi-square test for homogeneity
(C) Chi-square test for independence
(D) One-sample t test
(E) Matched pairs t-test

33. When we carry out a chi-square test for independence, the null hypothesis states that the two relevant classifications

|  |  |
| --- | --- |
| **A.** | are mutually exclusive. |

|  |  |
| --- | --- |
| **B.** | form a contingency table with r rows and c columns. |

|  |  |
| --- | --- |
| **C.** | have (r-1) and (c-1) degrees of freedom where r = number of rows and c = number of columns. |

|  |  |
| --- | --- |
| **D.** | are statistically independent. |

|  |  |
| --- | --- |
| **E.** | are normally distributed. |

34. In any normal distribution, the proportion of observations that are within 2

standard deviations of the mean is closest to

(A) 0.03

(B) 0.68

(C) 0.95

(D) 0.98

35. Suppose a die is tossed 5 times. What is the probability of getting “Four” two times?

(A) 0.028
(B) 0.161
(C) 0.167
(D) 0.333
(E) There is not enough information to answer this question.

36. In testing the equality of two population means by using independent random samples, if the null hypothesis of equal population means is rejected at  = .01, it will \_\_\_\_\_\_\_\_\_\_\_ be rejected at  = .05.

|  |  |
| --- | --- |
| **A.** | always |

|  |  |
| --- | --- |
| **B.** | sometimes |

|  |  |
| --- | --- |
| **C.** | never |

37. When using completely randomized design (one-way) ANOVA, if the between-treatment variability is \_\_\_\_\_ compared to the within-treatment variability, the value of F will be \_\_\_\_\_.

|  |  |
| --- | --- |
| **A.** | small, large. |

|  |  |
| --- | --- |
| **B.** | large, small. (continued next page…) |

|  |  |
| --- | --- |
| **C.** | large, large. |

|  |  |
| --- | --- |
| **D.** | small, small. |

|  |  |
| --- | --- |
| **E.** | Both C and D are correct. |

38. The sample proportion *p-hat* is an unbiased estimator for the population proportion *p*. Which one of the following statements is a result of this fact?

(A) The sample proportion and population proportion will be equal.

(B) The sample proportion will always be within two standard deviations from the real proportion.

(C) The variability in the values of *p-hat* increases as the sample size increases.

(D) None of the above.

39. In hypothesis testing, which of the following statements is always true?

(A) The P-value is greater than the significance level.
(B) The P-value is computed from the significance level.
(C) The P-value is the parameter in the null hypothesis.
(D) The P-value is a test statistic.
(E) The P-value is a probability.

40. When comparing the variances of two normally distributed populations using independent random samples, the correct test statistic to use is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| **A.** | Z statistic. |

|  |  |
| --- | --- |
| **B.** | t statistic. |

|  |  |
| --- | --- |
| **C.** | F. statistic. |

|  |  |
| --- | --- |
| **D.** | Chi-square statistic. |

|  |  |
| --- | --- |
| **E.** | None of the above. |

41. Suppose that we take a random sample of size *n* from a large group of persons and compute *p-hat*, the sample proportion of individuals who are left handed.

Which of the following statements is true?

(A) The larger the sample size, the smaller the standard deviation of the sample.

(B) The larger the sample size, the smaller the bias.

(C) The larger the sample size, the larger the length of a 95 percent confidence interval

 for the proportion of left-handed individuals.

(D) All of the above are true.

42. When the population is normally distributed, population standard deviation is unknown and the sample size is n = 15, the confidence interval for the population mean is based on

|  |  |
| --- | --- |
| **A.** | the z (normal) distribution. |

|  |  |
| --- | --- |
| **B.** | the t distribution. |

|  |  |
| --- | --- |
| **C.** | the Binomial distribution. |

|  |  |
| --- | --- |
| **D.** | the Poisson Distribution. |

|  |  |
| --- | --- |
| **E.** | None of the above. |

43. Bob is a high school basketball player. He is a 70% free throw shooter. That means his probability of making a free throw is 0.70. What is the probability that Bob makes his first free throw on his fifth shot?

(A) 0.0024
(B) 0.0057
(C) 0.0081
(D) 0.0720
(E) 0.1681

44. You are working at General Electric and are participating in a study that is examining

the starting time of jet engines (*y*, measured in seconds) and the amount of thrust

exerted by them (*x*, measured in a scale similar to “horsepower"). In a recent study, 10 engines were tested and your team computed the least-squares regression line to be

TIME = 3*.*80 *–* 0*.*002 \* THRUST

What is the slope of the regression line for these data?

(A) 3.80

(B) *-*0*.*002

(C) +0*.*002

(D) It is impossible to tell without more information.

45. An application of the multiple regression model generated the following results invol-ving the F test of the overall regression model: p - value = 0.0012, R2 = 0.67, s = 0.076. Thus H0, which states that none of the independent variables are significantly related to the dependent variable, should be rejected, at the 0.05 level of significance.

|  |  |
| --- | --- |
| **A.** | True |

|  |  |
| --- | --- |
| **B.** | False |

46. The Acme Car Company claims that at most 8% of its new cars have a manufacturing defect. A quality control inspector randomly selects 300 new cars and finds that 33 have a defect. Should she reject the 8% claim? Assume that the significance level is 0.05.

(A) Yes, because the P-value is 0.016.
(B) Yes, because the P-value is 0.028.
(C) No, because the P-value is 0.16.
(D) No, because the P-value is 0.28.
(E) There is not enough information to reach a conclusion.

47. The length of human pregnancies (with no complications) from conception to birth

varies according to a normal distribution with mean 260 days and standard deviation 10. Then five percent of pregnancy lengths are larger than which value?

(A) 244 days

(B) 266 days

(C) 276 days

(D) 280 days

48. Which of the following statements about the chi-square test of independence is false?

|  |  |
| --- | --- |
| **A.** | If ri is the row total for row i and cj is the column total for column j, then the estimated expected cell frequency corresponding to row i and column j equals E:\Bowerman_Stuff\Bowerman_Student_Quizzes\Quizzes\58260001.jpg |

|  |  |
| --- | --- |
| **B.** | The chi-square test is valid if all of the estimated expected cell frequencies are at least S. |

|  |  |
| --- | --- |
| **C.** | The chi-square statistic is based on (r-i) (c-i) degrees of freedom where r and c denote the number of rows and columns respectively in the contingency table. |

|  |  |
| --- | --- |
| **D.** | The alternative hypothesis states that the two classifications are statistically independent. |

|  |  |
| --- | --- |
| **E.** | None of the above. |

49. A soft drink dispenser can be adjusted to deliver any fixed number of ounces

of soft drink. If the machine is operating with a standard deviation in delivery

equal to 0.3 ounces, what should be the mean setting so that a 12-ounce cup

will overflow less then 1% of the time? Assume a normal distribution for ounces

delivered.

(A) 11.23 ounces

(B) 11.30 ounces

(C) 11.70 ounces

(D) 12.70 ounces

(E) 12.77 ounces

50. Acme Corporation manufactures light bulbs. The CEO claims that an average Acme light bulb lasts 300 days. A researcher randomly selects 15 bulbs for testing. The sampled bulbs last an average of 290 days, with a standard deviation of 50 days. If the CEO's claim were true, what is the probability that 15 randomly selected bulbs would have an average life of no more than 290 days?

(A) 0.100
(B) 0.226
(C) 0.334
(D) 0.443
(E) 0.775

**End of test.**