1. The Null and alternative hypotheses are statements about:
   a. Population parameters
   b. Sample parameters
   c. Sample statistics
   d. Sometimes population parameters and sometimes sample statistics

2. The average number of acres burned by forest and range fires in a large New Juaben District is 4,300 acres per year, with a standard deviation of 750 acres. The distribution of the number of acres burned is normal. What is the probability that between 2,500 and 4,200 acres will be burned in any given year?
   a. 0.0082
   b. 0.1333
   c. 0.4483
   d. 0.4401

3. A hypothesis test is done in which the alternative hypothesis is that "more than 10% of a population is left-handed." The p-value for the test is calculated to be 0.25. Which of the following statement is correct?
   a. We can conclude that more than 10% of the population is left-handed.
   b. We can conclude that more than 25% of the population is left-handed.
   c. We can conclude that exactly 25% of the population is left-handed.
   d. We cannot conclude that more than 10% of the population is left-handed.

4. In hypothesis testing, a Type 2 error occurs when
   a. The null hypothesis is not rejected when the null hypothesis is true.
   b. The null hypothesis is rejected when the null hypothesis is true
   c. The null hypothesis is not rejected when the alternative hypothesis is true.
   d. The null hypothesis is rejected when the alternative hypothesis is true.

5. Assume the cholesterol levels in a certain population have mean $\mu = 200$ and standard deviation $\sigma = 24$. The cholesterol levels for a random sample of $n = 9$ individuals are measured and the sample mean $\bar{x}$ is determined. What is the z-score for a sample mean $\bar{x} = 180$?
   a. -3.75
   b. -2.50
   c. -0.83
   d. 2.50

6. The Edwards's Theater chain has studied its movie customers to determine how much money they spend on concessions. The study revealed that the spending distribution is approximately normally distributed with a mean of $4.11 and a standard deviation of $1.37. What percentage of customers will spend less than $3.00 on concessions?
   a. 2.09%
   b. 20.9%
   c. 81.0%
   d. 209.0%

7. A randomly selected sample of 1,000 college students was asked whether they had ever used the drug, Ecstasy. Sixteen percent (16% or 0.16) of the 1,000 students surveyed said they had. Which one of the following statements about the number 0.16 is correct?
   a. It is a sample proportion
   b. It is a population proportion
   c. It is a margin of error
   d. It is a randomly chosen number

8. One problem with hypothesis testing is that a real effect may not be detected. This problem is most likely to occur when
   a. The effect is small and the sample size is small
   b. The effect is large and the sample size is small
   c. The effect is small and the sample size is large
   d. The effect is large and the sample size is large

9. Most graduate schools of business require applicants for admission to take the Graduate Management Admission Council's GMAT examination. Scores on the GMAT are roughly normally distributed with a mean of 527 and a standard deviation of 112. What is the probability of an individual scoring above 500 on the GMAT?
   a. 0.2411
   b. 0.4052
   c. 0.5948
   d. 0.6014

10. Based on the information from Question 8, how high must an individual score on the GMAT in order to score in the highest 5%.
   a. 342.76
   b. 442.76
   c. 711.24
   d. 811.24

11. A test to screen for a serious but curable disease is similar to hypothesis testing, with a null hypothesis of no disease, and an alternative hypothesis of disease. If the null hypothesis is rejected treatment will be given. Otherwise, it will not. Assuming the treatment does not have serious side effects, in this scenario it is better to increase the probability of:
   a. Making a type I error, providing treatment when it is not needed
   b. Making a type I error, providing treatment when it is needed
   c. Making a type II error, providing treatment when it is not needed
   d. Making a type II error, not providing treatment when it is needed

12. A random variable X that follows a normal distribution can also be classified under what type of distribution?
   a. Continuous
   b. Discrete
   c. Irregular
   d. Binomial

13. Which of the following best describes the shape of the normal curve?
    a. Flat
    b. Cone
    c. Spiked
    d. Bell

14. The length of human pregnancies from conception to birth approximates a normal distribution with a mean of 266 days and a standard deviation of 16 days. What proportion of all pregnancies will last between 240 and 270 days?
    a. 0.0516
    b. 0.2500
    c. 0.5471
    d. 0.5987

15. For a standard normal variate, the value of the mean is?
    a. ∞
    b. 1
    c. 0
    d. Not defined

16. The standard normal curve is symmetric about what value?
    a. 0.5
    b. 1
    c. ∞
    d. 0

17. Suppose that the null hypothesis is true and it is rejected, what type of error are we making?
    a. A type-I error and its probability is β
    b. A type-I error and its probability is α
    c. A type-II error and its probability is α
    d. A type-II error and its probability is β

18. If the population equals p_0, then $Z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$ is distributed:
    a. As a standard normal variable if $n > 30$
    b. As a Poisson variable
    c. As the t-distribution with $n-1$ degrees of freedom
    d. As a distribution with v degrees of freedom

19. An advertising agency wants to test the hypothesis that the proportion of adults in Ghana who read the Sunday Magazine is 25%. The alternative hypothesis is that the proportion reading the Sunday Magazine is
    a. Different from 25%
    b. Equal to 25%
    c. Less than 25%
    d. More than 25%

20. What is the main purpose of statistical inference?
    a. To collect sample of data and use them to formulate hypothesis about a population
    b. To draw conclusion about populations and the collect sample data to support the conclusions
    c. To draw conclusions about population from sample data
    d. To draw conclusions about the known value of population parameter

21. A test that requires the use of t-statistic is only applicable when
    a. N<30 and σ is known
    b. N >30 and σ is unknown
    c. N = 30 and σ is known
    d. All of the above

22. The probability of rejecting the null hypothesis when it is true is called
    a. Level of significance
    b. Level of confidence
    c. Type I error
    d. Power of the test

23. The chance of rejecting a true hypothesis decreases when the sample size is
    a. Decreased
    b. Increased
    c. Constant
    d. None of the above

24. The significance level considered in hypothesis testing is the risk of
    a. Rejecting H₀ when H₀ is correct
    b. Rejecting H₀ when H₁ is correct
    c. Rejecting H₁ when H₁ is correct
    d. Accepting H₀ when H₀ is correct

25. The number of independent values in a set of values is called
    a. Test statistic
    b. Degree of freedom
    c. Level of significance
    d. Level of confidence

26. The P-value for a hypothesis test is P = 0.0256. What decision will one make if the level of significance is 0.05
    a. Accept the null hypothesis
    b. Fail to reject the null hypothesis
    c. Reject the null hypothesis
    d. Not enough information to make a decision

27. The P-value for a hypothesis test is P = 0.0256. What decision will one make if the level of significance is 0.01
    a. Accept the null hypothesis
    b. Fail to reject the null hypothesis
    c. Reject the null hypothesis
    d. Not enough information to make a decision

28. In the hypothesis testing for variance, the most appropriate distribution used is the
    a. Standard normal
    b. F distribution
    c. Chi-square
    d. T distribution

29. The point where the null hypothesis gets rejected is called as?
    a. Significant value
    b. Rejection value
    c. Acceptance value
    d. Critical value

30. A statement whose validity is tested on the basis of a sample is called?
    a. Null hypothesis
    b. Statistical hypothesis
    c. alternative hypothesis
    d. composite hypothesis

31. Given $H_0: \mu = \mu_0, H_1: \mu \neq \mu_0$, $\alpha = 0.05$ and we reject the null hypothesis: the absolute value of the Z statistic must have equaled or been beyond what value?
    a. 1.96
    b. 1.65
    c. 2.58
    d. 2.33

32. A state university wants to increase its retention rate of 4% for graduating students from the previous year. After implementing several new programs during the last two years, the university re-evaluates its retention rate and comes up with a P-value of 0.075. What is reasonable to conclude about the new programs?
    a. We can say there is a 7.5% chance of seeing the new programs having no effect on retention in the results we observed from natural sampling variation. There is no evidence the new programs are more effective, but we cannot conclude the new programs have no effect on retention.

b. There is a 92.5% chance of the new programs having no effect on retention.

c. There is a 7.5% chance of the new programs having no effect on retention.

d. There's only a 7.5% chance of seeing the new programs having no effect on retention in the results we observed from natural sampling variation. We conclude the new programs are more effective.

33. A consumer product magazine recently ran a story concerning the increasing prices of digital cameras. The story stated that digital camera prices dipped a couple of years ago, but now are beginning to increase in price because of added features. According to the story, the average price of all digital cameras a couple of years ago was $215.00. A random sample of n = 22 cameras was recently taken and entered into a spreadsheet. It was desired to test to determine if that average price of all digital cameras is now more than $215.00. Find a rejection region appropriate for this test if we are using $\alpha = 0.05$.

    a. reject H_0 if t > 1.725

    b. reject H_0 if t < 1.725

    c. reject H_0 if t > 1.721

    d. reject H_0 if t < 1.721

34. *For the given binomial sample size and null-hypothesized value of p_0, determine whether the sample size is large enough to use the normal approximation methodology to conduct a test of null hypothesis $H_0: p = p_0$*

    n=65, p_0 = 0.8

    a. Yes

    b. No

35. A national organization has been working with utilities throughout the nation to find sites for large wind machines that generate electricity. Wind speeds must average more than 19 miles per hour (mph) for a site to be acceptable. Recently, the organization conducted wind speed tests at a particular site. Based on a sample of n = 45 wind speed recordings (taken at random intervals), the wind speed at the site averaged $\bar{x} = 19.9\ mph$, with a standard deviation of s = 4.5 mph. To determine whether the site meets the organization's requirements, consider the test, $H_0: \mu = 19$ $H_a: \mu > 19$ where μ is the true mean wind speed at the site and $\alpha = 0.01$. Suppose the value of the test statistic were computed to be 1.34. State the conclusion

    a. At $\alpha = 0.01$, there is insufficient evidence to conclude the true mean wind speed at the site exceeds 19 mph

    b. We are 99% confident that the site meets the organization's requirements.

    c. At $\alpha = .01$, there is sufficient evidence to conclude the true mean wind speed at the site exceeds 19 mph.

    d. We are 99% confident that the site does not meet the organization's requirements.

36. A company claims that 9 out of 10 doctors (i.e., 90%) recommend its brand of cough syrup to their patients. To test this claim against the alternative that the actual proportion is less than 90%, a random sample of doctors was taken. Suppose the test statistic is z = -2.30. Can we conclude that H_0 should be rejected at $\alpha = 0.10, 0.05$ and 0.01 level?

    a. yes, yes, no

    b. yes, yes, yes

c. no, no, no
d. no, no, yes

37. Write the null and alternative hypothesis.
You are considering moving to Nkawkaw-Kwahu, and are concerned about the average one-way commute time. Does the average one-way commute time exceed 25 minutes? You take a random sample of 50 Nkawkaw-Kwahu residents and find an average commute time of 29 minutes with a standard deviation of 7 minutes.
    a. $H_0: \mu \leq 25 \quad H_a: \mu > 25$
    b. $H_0: \mu > 29 \quad H_a: \mu < 29$
    c. $H_0: \mu = 25 \quad H_a: \mu \neq 25$
    d. $H_0: \mu \leq 29 \quad H_a: \mu > 29$

38. Consider a test of $H_0: \mu = 6$. For the following case, give the rejection region for the test in terms of the z-statistic. $H_a: \mu \neq 6, \alpha = 0.10$.
    a. $|z| > 1.28$
    b. $z > 1.28$
    c. $z > 1.645$
    d. $|z| > 1.645$

39. A random sample of $n = 600$ measurements is drawn from a binomial population with probability of success .08. Give the mean and the standard deviation of the sampling distribution of the sample proportion, $\hat{p}$.
    a. 0.08;0.011
    b. 0.92;0.003
    c. 0.08;0.003
    d. 0.92;0.011

40. The Central Limit Theorem states that the sampling distribution of the sample mean is approximately normal under certain conditions. Which of the following is a necessary condition for the Central Limit Theorem to be used?
    a. The sample size must be large; at least 30
    b. The population size must be large; at least 30
    c. The population from which we are sampling must be normally distributed
    d. None of the above

41. The business college computing center wants to determine the proportion of business students who have laptop computers. If the proportion differs from 25%, then the lab will modify a proposed enlargement of its facilities. Suppose a hypothesis test is conducted and the test statistic is 2.4. Find the p-value for a two-tailed test of hypothesis.
    a. 0.0164
    b. 0.4918
    c. 0.4836
    d. 0.0082

42.) A company claims that 9 out of 10 doctors (i.e.. 90%) recommend its brand of cough syrup to their patients. To test this claim against the alternative that the actual proportion is less than 90%, a random sample of 100 doctors was chosen which resulted in 94 who indicate that they recommend this cough syrup. The test statistic in this problem is approximately:
   a. -1.68
   b. 1.33
   c. 1.68
   d. -1.33

43. Suppose we wish to test $H_0: \mu = 40$ $H_a: \mu > 40$. What will result if we conclude that the mean is greater than 40 when its true value is really 47?
   a. Type I error
   b. a correct decision
   c. type II error
   d. none of the above

44. In the past, the mean battery life for a certain type of flashlight battery has been 9.4 hours. The manufacturer has introduced a change in the production method and wants to perform a hypothesis test to determine whether the mean battery life has increased as a result. The hypotheses are:
   $H_0: \mu = 9.4\ hrs$ $H_a: \mu > 9.4\ hrs$
   Explain the *type II* error
   a. The manufacturer will decide the mean battery life is greater than 9.4 hours when in fact it is greater than 9.4 hours.
   b. The manufacturer will decide the mean battery life is 9.4 hours when in fact it is 9.4 hours.
   c. The manufacturer will decide the mean battery life is less than 9.4 hours when in fact it is greater than 9.4 hours.
   d. The manufacturer will decide the mean battery life is 9.4 hours when in fact it is greater than 9.4 hours.

45. If a hypothesis test were conducted using $\alpha = 0.05$, to which of the following p-values would cause the null hypothesis to be rejected
   a. 0.055
   b. 0.100
   c. 0.040 ,
   d. 0.060

A local balloon company claims that the variance for the time one of its helium balloons will stay afloat is 5 hours. A disgruntled customer wants to test this claim. She randomly selects 23 customers and finds that the variance of the sample is 4.5 seconds.
α= 0.05
Use the information below to answer Question 46-49

46. Calculate the standardized test statistic that would be used in the test
    a. 19.8
    b. 20.7
    c. 23.6
    d. 28.5

47. Determine the critical value that corresponds to the left portion of the curve.
    a. 10.982
    b. 24.471
    c. 36.781
    d. 45.236

48. Determine the critical value that corresponds to the right portion of the curve.
    a. 10.982
    b. 24.471
    c. 36.781
    d. 45.236

49. What decision should be made on the hypothesis?
    a. Reject the null hypothesis
    b. Fail to reject the null hypothesis
    c. Not enough information to make a decision
    d. Support the alternative hypothesis

50. You are conducting a one-sided test of the null hypothesis that the population mean is 532 versus the alternative that the population mean is less than 532. If the sample mean is 529 and the p-value is 0.01, which of the following statements is true?
    a. There is a 0.01 probability that the population mean is smaller than 529.
    b. The probability of observing a sample mean smaller than 529 when the population mean is 532 is 0.01.
    c. There is a 0.01 probability that the population mean is smaller than 532.
    d. none of the above

S. A. GYAMERAH