True/False: Indicate whether the statement is true or false. Questions are worth 2 points each.

1. T / **F**   The field of statistics can be roughly subdivided into two areas: descriptive statistics and probability.

2. **T** / F   Circle graphs and bar graphs are graphs that are used to summarize qualitative, or attribute, or categorical data.

3. **T** / F   There are several kinds of measures ordinarily known as averages and each gives a different picture of the figures it is called on to represent.

4. **T** / F   The first quartile and the 25th percentile are the same.

5. **T** / F   If there is high positive linear correlation between two variables, then there is a strong relationship between the two variables.

6. T / **F**   Correlation analysis is a method of obtaining the equation that represents the relationship between two variables.

7. **T** / F   The probabilities of complementary events always sum to 1.0.

8. T / **F**   If P(A) = 0.2, P(B) = 0.5, and P(A and B) = 0.05, then A and B are mutually exclusive events.

9. T / **F**   The sum of all the probabilities in any probability distribution is always exactly 1.25.

10. T / **F**   The number of hours you waited in line to register this semester is an example of a binomial random variable.

11. **T** / F   For a binomial distribution with a fixed value of p, the binomial distribution begins to look like a normal distribution as n increases in size.

12. T / **F**   The middle 0.90 of the standard normal distribution is bounded by -1.96 and 1.96.

13. T / **F**   If the random variable z is the standard normal score, then the area to the left of $z = 0.30 >$ the area to the left of $z = 0.20$.

14. **T** / F   A sugar company packages sugar in 5-pound bags. The amount of sugar per bag varies according to a normal distribution and has a mean equal to 5.0 pounds and a standard deviation equal to 0.05 pounds. The computation of probabilities of events involving weights of individual bags of sugar will utilize the variable $z = (x - 5.0) / 0.05$ while the computation of probabilities of events involving the weights of sample means for samples of size $n = 25$ each will utilize the variable $z = (x - 5.0) / 0.01$.

15. **T** / F   A confidence interval estimate for µ will always contain the corresponding point estimate for µ .

16. T / **F**   When we reject the null hypothesis, we are certain that the null hypothesis is false.

17. **T** / F   In a particular hypothesis test, if α = 0.01 and p-value = 0.019, then the correct decision would be to fail to reject the null hypothesis.

18. T / **F**   For a sample of size $n = 31$, the critical value of the t-distribution equals the corresponding critical value of the standard normal distribution.

19. T / **F**   In hypothesis testing about population mean µ, if the test statistic falls in the critical region, then the null hypothesis has been proven to be true.

20. **T** / F   The t-distribution approaches the standard normal distribution as the number of degrees of freedom increases.

Multiple Choice: Identify the choice that best completes the statement or answers the question. 5 points each.

_a__ 21. If a histogram is constructed for the following frequency distribution, what shape would it have?

Class Boundaries	Frequency
$20 \le x < 30$	5
$30 \le x < 40$	15
$40 \le x < 50$	20
$50 \le x < 60$	18
$60 \le x < 70$	13
$70 \le x < 80$	10
$80 \le x < 90$	5
$90 \le x \le 100$	1

 a.   Skewed to the right   b.   Skewed to the left   c.   symmetrical   d.   uniform

_b__22. The following set of data represents the ages of students in a small seminar: 20, 21, 22, 25, 26, 27, 68. Select the most appropriate measure of central tendency for the data described.
 a.   Mean
 b.   Median
 c.   Mode
 d.   Midrange

_b__23. Consider the following sample: 26, 49, 9, 42, 60, 11, 43, 26, 30, and 14. Find the median.
 a.   31.0
 b.   28.0
 c.   26.0
 d.   34.5

_a__24. A group of children had the following heights in inches: 45, 46, 42, 56, 37, 50, 51, 50, 47, 47. Find the variance.
 a.   27.211
 b.   5.22
 c.   19
 d.   22137

_d__25. Select the most likely value for the coefficient of linear correlation for the following two variables: $x =$ the number of police patrol cars cruising in a given neighborhood, and $y =$ the number of burglaries committed in the neighborhood
A) $r = 1.14$
B) $r = 0.78$
C) $r = -0.13$
D) $r = -0.75$

_a__26. The moisture content of a chemical compound is determined for different relative humidity values. Treat
 the humidity as the independent variable and the moisture content as the dependent variable and find the
 equation of the line of best fit.

Humidity	30	45	60	50	80	65	75	20
Moisture Content	8	10	12	7	15	10	12	8

 a. $\hat{y} = 4.9 + 0.1x$
 b. $\hat{y} = -0.1 - 4.9x$
 c. $\hat{y} = 4.9 - 0.1x$

d. $\hat{y} = 0.1 + 4.9x$

_d__27. Suppose A and B are events of a sample space S with P(A) = 0.22, P(B) = 0.40, and P(A and B) = 0.04, then P(A | B) is
   a. 0.462.
   b. 0.300.
   c. 0.182.
   d. 0.100.

_d__28. Two events A and B are said to mutually exclusive if:
   a. P(A | B) = 1.
   b. P(B | A) =1.
   c. P(A and B) = 1.
   d. P(A and B) = 0.

_c__29. If A and B are mutually exclusive events with P(A) = 0.40, then P(B):
   a. can be any value between 0 and 1.
   b. cannot be larger than 0.40.
   c. cannot be larger than 0.60.
   d. cannot be determined with the information given.

_b__30. Consider the probability function $P(x) = \frac{6-|x-7|}{36}$ for x = 2, 3, 4, 5,.....,12. Find the probability that x
        takes values between 6 and 8 (not inclusive).
   a. 5/36
   b. 6/36
   c. 10/36
   d. 16/36

_a__31. Given the probability function $P(x) = (6 - x)/15$, for x = 1, 2, 3, 4, or 5. Find the mean.
   a. 2.33
   b. 3.00
   c. 0.20
   d. 0.40

_c__32. In a binomial probability experiment with P(success) = p, P(failure) = q, and six trials, what is the
        probability of four successes?
   a. $2p^4q^2$
   b. $2p^2q^4$
   c. $15p^4q^2$
   d. $15p^2q^4$

_b__33. In which of the following binomial distributions is the normal approximation appropriate?
   a. $n = 100, p = 0.01$
   b. $n = 500, p = 0.1$
   c. $n = 100, p = 0.005$
   d. $n = 100, p = 0.03$

_a__34. If heights of a certain group of adult males are normally distributed with a mean of 68.2 inches and a
        standard deviation of 4.1 inches, find the 25th percentile, P_{25}, for this distribution.
   a. 65.5 inches
   b. 70.95 inches

c. 34.3 inches

d. 10.54 inches

_c or d__35. In a particular hypothesis test, the p-value is 0.0211. What must be true of α in order to reject the null

hypothesis?

a. α > 0.0211

b. α ≥ 0.0211

c. α < 0.0211

d. α ≤ 0.0211

_b__36. Which of the following would be the correct hypotheses for testing the claim that the mean lifetime of a

cellular phone battery, while the phone is left on, is less than 24 hours?

a. $H_o : \mu = 24$, $H_a : \mu \neq 24$

b. $H_o : \mu = 24$, $H_a : \mu < 24$

c. $H_o : \mu = 24$, $H_a : \mu > 24$

d. $H_o : \mu > 24$, $H_a : \mu \leq 24$

_c__37. Which of the following statements is false?

a. An interval estimate is a interval bounded by two values and used to estimate the value of a population parameter.

b. The values that bound a confidence interval are statistics calculated from the sample that is being used as the basis for the estimation.

c. Level of confidence, denoted by α, is the proportion of all interval estimates that do not include the parameter being estimated.

d. Confidence interval is an interval estimate with a specified level of confidence.

_b__38. Which of the following statements is false regarding the null hypothesis H_o?

a. It is the hypothesis we will test.

b. This is a statement that a sample statistics has a specific value.

c. It is so named because it is the "starting point" for the investigation. (The phrase "there is no difference" is often used in its interpretation.)

d. None of the above.

_b__39. The measurement of a random sample of 30 female college students produced an average height of 66 inches and a standard deviation of 2.5 inches. The correct symbol for 2.5 inches is:

a. $\bar{x}$

b. s

c. σ

d. μ

_d__40. Which of the following is not a property of the Student's t - distribution?

a. Mean equals zero

b. Standard deviation is larger than one

c. Symmetrical about zero

d. Used in testing hypotheses about the population standard deviation σ .

_b__41. Which of the following statements is false regarding a t-distribution with $df = 15$?

a. Its mean is zero.

b. The value at alpha = .01 (one tailed) is 1.34.

c. The value at alpha = .05 (one tailed) is 1.75.
d. The value of a 95% CI is 2.131.

_a__42. A machine produces 3-inch nails. A sample is obtained and the lengths determined. The results are as follows: 2.89, 2.95, 3.00, 3.05, 2.99, 2.96, 3.10, 3.06, 3.00, and 3.12. Find a 99% confidence interval for μ.
    a. 2.94 to 3.09
    b. 2.89 to 3.12
    c. 2.99 to 3.06
    d. 3.00 to 3.05