Multiple Choice (35 Points)
Identify the choice that best completes the statement or answers the question. Please fill in answers on your Scantron Sheet.
The spaces on this test are for your records only. Keep the test with your answers circled on the multiple choice questions for review purposes.

1) Given the following information about the sampling distribution:

Sampling technique #1:
\[ \mu = 50 \]
\[ n = 10 \]
\[ \hat{\sigma}_x = 10 \]

Sampling technique #2:
\[ \mu = 50 \]
\[ n = 100 \]
\[ \hat{\sigma}_x = 5 \]

As the sample size increases from technique one to technique two:

a) the probability that a given sample has a mean value of 45 while \( \mu = 50 \) increases.
b) the probability that a given sample has a mean value of 45 while \( \mu = 50 \) decreases.
c) the confidence in the estimated population parameter decreases.
d) B and C.
e) None of the Above.

2) The probability that the event \{H,H,H\} occurs in a three-round game of "Toss-the-coin" is:

a) 1/3.
b) 1/2.
c) 1/8.
d) 1/2 * 1/2 * 1/2.
e) c or d.

3) Given that the sample space is: \( S = \{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20\} \)
   If event \( A = \{1,3,5,7,9\} \) and event \( B = \{1,2,3,4,5,6,7,8\} \) then the probability that \( A \) occurs given \( B \) is:

a) 1/4
b) 1/3
c) 5/8
d) 1/2

4) If an event has the following outcomes in it:
   \( A = \{1,1,1,2,2,2,3,3,3,4,4,4,5,5,5,6,6,6\} \), then the event is distributed:

a) Normally
b) Abnormally
c) Uniformly
d) Multilaterally
e) Binomially

5) If there are sufficient numbers of observations per sample, then the law of large numbers will come into effect which states that:

a) the median of the data in each sample is the same as the median in the population.
b) the average of the sample averages will tend towards the population mean -even- if the population data is not normally distributed.
c) the average of the sample averages will tend towards the population mean -only- if the population data is not normally distributed.
d) a sample size of ten is plenty big enough to be confident in your prediction of the population mean.
6) The means of samples with a small number of observations will tend to have:
   a) a smaller variance than the means of samples with a large number of observations.
   b) a larger variance than the means of samples with a large number of observations.
   c) will be biased when compared to the means of samples with large numbers of observations.
   d) will be less efficient when compared to the medians of samples with equal numbers of observations.

7) If the following hypothesis test is proposed then:
   \[ H_0: \mu = 3 \]
   \[ H_a: \mu \neq 3 \]
   a) A right-tailed hypothesis test is appropriate.
   b) A left-tailed hypothesis is appropriate.
   c) A two-tailed hypothesis test is appropriate.
   d) All of the above.

8) If the following hypothesis test is proposed then:
   \[ H_0: \mu \leq 3 \]
   \[ H_a: \mu > 3 \]
   a) A right-tailed hypothesis test is appropriate.
   b) A left-tailed hypothesis is appropriate.
   c) A two-tailed hypothesis test is appropriate.
   d) None of the above.

9) If the following hypothesis test is proposed and the difference of means is calculated by subtracting \( \mu_1 \) from \( \mu_2 \) when running the test:
   \[ H_0: \mu_1 \leq \mu_2 \]
   \[ H_a: \mu_1 > \mu_2 \]
   a) A right-tailed hypothesis test is appropriate.
   b) A left-tailed hypothesis is appropriate.
   c) A two-tailed hypothesis test is appropriate.
   d) None of the above.

10) Type 1 error is ______________ while Type 2 error is ______________.
    a) when we reject the null in error, when we fail to reject the null in error.
    b) when we fail to reject the null in error, when we reject the null in error.
    c) the equivalent of sending innocent people to jail, the equivalent of letting guilty people go free.
    d) A and C.
    e) B and C.

11) The alpha-level is the amount of type 1 error that you as the researcher are comfortable with.
    i.e. The number of innocent people you are willing to send to jail.
    a) True
    b) False

12) The P-value tells us the likelihood that both the null is true and the observed sample mean occur simultaneously.
    a) True
    b) False

13) If we have a large sample, \( H_0: \mu = 10 \), a standard error of 2 and a sample mean of 9; \( \alpha=0.05 \), you will:
    a) reject the null.
    b) fail to reject the null.

14) If we have a large sample, \( H_0: \mu = 10 \), a standard error of 0.1 and a sample mean of 9; \( \alpha=0.05 \), you will:
    a) reject the null.
    b) fail to reject the null.

15) The standard error is a measure that tells us:
    a) how likely it is to observe a particular sample mean given the mean of the sampling distribution.
    b) how likely a particular sample mean is given the population mean.
    c) how widely varied the sampling distribution is.
    d) all of the above.
You observe a sample and are then asked to determine a 95% confidence interval as to where the population mean lies. The information about the sample is as follows with all estimations rounded to the second decimal point: (Hint: You should ALWAYS round the degrees of freedom DOWN when using the table of critical values)

\[ N = 100, \bar{X} = 46, S^2 = 100 \]

16) The estimated population variance is:
   a) 99
   b) 100
   c) 101.01
   d) 1000
   e) None of the above

17) The estimated sampling distribution variance is:
   a) 990
   b) 100
   c) 1.01
   d) .99
   e) 1

18) The Standard Error is:
   a) 990
   b) 100
   c) 1.01
   d) .99
   e) 1

19) The Margin of Error is:
   a) 1
   b) 1.01
   c) 1.98
   d) 2.00
   e) 2.01

20) The 95% confidence interval is represented with a lower bound of _____, and an upper bound of_____.
   a) 44, 48
   b) 43.99, 48.01
   c) 45, 47
   d) 44.99, 47.01
   e) 44.02, 46.98

You are given the following information and then asked to do a hypothesis test with a 95% level of confidence to evaluate whether or not it is likely that the population mean is equal to 50 for a given variable. (Round all results to the second decimal point)

\[ N = 100, \bar{X} = 46, S^2 = 100 \]

21) The null and alternative are as follows:
   a) \( H_0: \mu = 50, H_a: \mu \neq 50 \)
   b) \( H_0: \mu \leq 50, H_a: \mu > 50 \)
   c) \( H_0: \mu \geq 50, H_a: \mu < 50 \)
   d) \( H_0: \mu \geq 46, H_a: \mu < 46 \)
   e) \( H_0: \mu = 46, H_a: \mu \neq 46 \)

22) The appropriate graphical representation of the decision rule is:
   a)  
   b)  
   c)  
23) The critical value is (are):
   a) 1.96
   b) 1.98
   c) 1.99
   d) -1.96, 1.96
   e) -1.99, 1.99

24) The appropriate Z or T-stat is:
   a) -2
   b) 2
   c) -3.96
   d) 3.96
   e) 1,000,000,000,000,000.00

25) You decide to:
   a) reject the null.
   b) fail to reject the null.

26) The null and alternative are as follows:
   a) \( H_0: \mu_{HighED} = \mu_{LowED} \)
   b) \( H_0: \mu_{HighED} \leq \mu_{LowED} \)
   c) \( H_0: \mu_{HighED} \geq \mu_{LowED} \)
   d) \( H_0: \mu_{HighED} > \mu_{LowED} \)
   e) \( H_0: \mu_{HighED} < \mu_{LowED} \)

27) The appropriate graphical representation of the decision rule is:

28) Based upon the following STATA output, you decide to:
   a) reject the null.
   b) fail to reject the null.

```
 Two-sample t test with unequal variances

<table>
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<tr>
<th>Group</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
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| diff | -3.56482 | .3963976 | -4.349409 | -2.783554 |

<table>
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<tr>
<th>diff = mean(0) - mean(1)</th>
<th>t = -8.9972</th>
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<tbody>
<tr>
<td>Ho: diff = 0</td>
<td>Satterthwaite's degrees of freedom = 157.852</td>
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</table>

Ha: diff < 0
Pr(T < t) = 0.0000
Pr(|T| > |t|) = 0.0000
Ha: diff > 0
Pr(T > t) = 1.0000
```

29) You are able to claim that education and animal concern are:
   a) Not causally related
   b) Likely to be causally related
   c) Definitely causally related

30) This hypothesis test relied upon the:
   a) Normal Distribution
   b) T-distribution
   c) Law of Large Numbers
   d) A and C
   e) B and C
You are asked to evaluate whether older individuals have a higher level of understanding of how AIDS is transmitted. A categorical variable was created called Old and it equals 1 if the age of an individual is above the median age in the sample.

31) The null and alternative are as follows:
   a) \( H_0: \mu_{\text{Old}} = \mu_{\text{Younger}}, H_a: \mu_{\text{Old}} \neq \mu_{\text{Younger}} \)
   b) \( H_0: \mu_{\text{Old}} \leq \mu_{\text{Younger}}, H_a: \mu_{\text{Old}} > \mu_{\text{Younger}} \)
   c) \( H_0: \mu_{\text{Old}} \geq \mu_{\text{Younger}}, H_a: \mu_{\text{Old}} < \mu_{\text{Younger}} \)

32) The appropriate graphical representation of the decision rule is:

a) ![Diagram](image1)

b) ![Diagram](image2)

c) ![Diagram](image3)

33) Based upon the following STATA output, you decide to:
   a) reject the null.
   b) fail to reject the null.

Two-sample t test with unequal variances

<table>
<thead>
<tr>
<th>Group</th>
<th>obs</th>
<th>mean</th>
<th>std. err.</th>
<th>std. dev.</th>
<th>[95% conf. interval]</th>
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diff = mean(0) - mean(1) t = 7.4674
satterthwaite's degrees of freedom = 29411.1

H0: diff = 0 Ha: diff \neq 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

34) You are able to claim that age and AIDS knowledge are:
   a) Not causally related
   b) Likely to be causally related
   c) Definitely causally related

35) This hypothesis test relied upon the:
   a) Normal Distribution
   b) T-distribution
   c) Law of Large Numbers
   d) A and C
   e) B and C
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