1) The average number of mosquitoes in a stagnant pond is 80 per square meter with a standard deviation of 12. If 36 square meters are chosen at random for a mosquito count, find the probability that the average of those counts is more than 81.8 mosquitoes per square meter. Assume that the variable is normally distributed.
   A) 81.6%  B) 31.6%  C) 18.4%  D) 0.3%

2) Six measurements were made of the magnesium ion concentration (in parts per million, or ppm) in a city's municipal water supply, with the following results. It is reasonable to assume that the population is approximately normal.

   189  175  140  188  179  211

   Construct a 98% confidence interval for the mean magnesium ion concentration.
   A) 176.4 < μ < 184.3  B) 176.7 < μ < 184.0
   C) 145.2 < μ < 215.5  D) 148.3 < μ < 212.4

3) Find the critical value z_{α/2} needed to construct a(n) 79% confidence interval.
   A) 1.25  B) 1.98  C) 0.97  D) 0.81

4) A sample of 35 different payroll departments found that employees worked an average of 240.6 days a year. If the population standard deviation is 18.8 days, find the 90% confidence interval for the average number of days μ worked by all employees who are paid through payroll departments.
   A) 235.4 < μ < 245.8  B) 232.4 < μ < 248.8
   C) 236.8 < μ < 244.4  D) 230.9 < μ < 250.3

5) A study of peach trees found that the average number of peaches per tree was 1025. The standard deviation of the population is 35 peaches per tree. A scientist wishes to find the 99% confidence interval for the mean number of peaches per tree. How many trees does she need to sample to obtain an average accurate to within 18 peaches per tree?
   A) 21  B) 26  C) 23  D) 4

6) Find the values for χ^2_left and χ^2_right when α = 0.05 and n = 27.
   A) 16.151 and 40.113  B) 15.379 and 38.885
   C) 14.573 and 43.194  D) 13.844 and 41.923
7) For a random sample of 23 European countries, the variance on life expectancy was 7.3 years. What is the 95% confidence interval for the variance of life expectancy in all of Europe?
   A) 28.9 < \sigma^2 < 115.0
   B) 5.6 < \sigma^2 < 10.3
   C) 27.2 < \sigma^2 < 118.3
   D) 4.4 < \sigma^2 < 14.6

8) Measurements were made of the milk fat content (in percent) in six brands of feta cheese (a variety of goat cheese), with the following results. Assume that the population is normally distributed.

| 27.5 | 19.3 | 32.0 | 23.5 | 24.6 | 16.9 |

Construct a 90% confidence interval for the population standard deviation \( \sigma \).
   A) 3.44 < \sigma < 9.56
   B) 3.77 < \sigma < 10.47
   C) 4.02 < \sigma < 9.63
   D) 3.67 < \sigma < 11.42

9) In a study of 100 new cars, 29 are white. Find \( \hat{p} \) and \( \hat{q} \), where \( \hat{p} \) is the proportion of new cars that are white.
   A) \( \hat{p} = 0.71, \hat{q} = 0.29 \)
   B) \( \hat{p} = 0.29, \hat{q} = 0.29 \)
   C) \( \hat{p} = 0.71, \hat{q} = 0.71 \)
   D) \( \hat{p} = 0.29, \hat{q} = 0.71 \)

10) It was found that in a sample of 90 teenage boys, 70% of them have received speeding tickets. What is the 90% confidence interval of the true proportion of teenage boys who have received speeding tickets?
   A) 0.620 < \hat{p} < 0.780
   B) 0.584 < \hat{p} < 0.830
   C) 0.615 < \hat{p} < 0.805
   D) 0.591 < \hat{p} < 0.812

11) A recent poll of 700 people who work indoors found that 278 smoke. If the researchers want to be 98% confident of their results to within 3.5 percentage points, how large a sample is necessary?
   A) 751
   B) 33
   C) 532
   D) 1062

12) A lumber mill is tested for consistency by measuring the variance of board thickness. The target accuracy is a variance of 0.0035 square inches or less. If 28 measurements are made and their variance is 0.006 square inches, is there enough evidence to reject the claim that the standard deviation is within the limit at \( \alpha = 0.01 \)?
   A) No, since the \( \chi^2 \) test value is less than the critical value 46,963.
   B) No, since the \( \chi^2 \) test value is less than the critical value 48,278.
   C) Yes, since the \( \chi^2 \) test value is less than the critical value 46,963.
   D) Yes, since the \( \chi^2 \) test value is less than the critical value 48,278.

13) What is the critical value for a right-tailed \( \tau \) test when \( \alpha = 0.025 \) and \( n = 13 \)?
   A) 0.695
   B) 2.179
   C) 2.201
   D) 0.697
14) At a certain university, the average attendance at basketball games has been 2825. Due to the dismal showing of the team this year, the attendance for the first 14 games has averaged only 2515 with a standard deviation of 485. The athletic director claims that the attendance is the same as last year. What is the test value needed to evaluate the claim?
A) -8.94 B) -5.66
C) -2.39 D) -6.76

15) A chi-square variable cannot be negative, and the distributions are positively skewed.
A) True B) False

16) An interval estimate may or may not contain the true value of the parameter being estimated.
A) True B) False

17) The distribution must be used when the sample size is greater than 30 and the variable is normally or approximately normally distributed.
A) False B) True

SHORT ANSWER. For each problem below (1) State the hypotheses and identify the claim (2) Find the critical value(s) from appropriate table (3) Compute the test value (4) Make the decision to reject or not reject the null hypothesis, and (5) Summarize the results.

18) Science fiction novels average 290 pages in length. The average length of 10 randomly chosen novels written by I. M. Wordy was 365 pages in length with a standard deviation of 50. At \( \alpha = 0.05 \), are Wordy's novels significantly longer than the average science fiction novel? (Round critical value(s) and test value to three decimal places)

3 1) \( H_0: \mu = 290 \) and \( H_1: \mu > 290 \) (claim)

3 2) C.V. = 1.883
\( n = 10 \), d.f. = 10 - 1 = 9

3 3) Test value: \( t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{365 - 290}{\frac{50}{\sqrt{10}}} \approx 4.743 \)

3 4) Reject the null hypothesis

3 5) There's enough evidence to support the claim that Wordy's novels are longer than the average science fiction novel.
At a certain university, 16% of students fail general chemistry on their first attempt. Professor Brown teaches at this university and believes that the rate of first-time failure in his general chemistry classes is 33%. He samples 96 students from last semester who were first-time enrollees in general chemistry and finds that 15 of them failed his course. Using \( \alpha = 0.05 \), can you conclude that the percentage of failures differs from 33%? Round critical value(s) and test value to two decimal places.

1) \( H_0: p = 0.33 \) and \( H_1: p \neq 0.33 \) (claim)

2) \( C.V. = \bar{p} \pm 1.96 \)

\[ \bar{p} = \frac{15}{96} = 0.15625 \]

3) \( z = \frac{0.15625 - 0.33}{\sqrt{\frac{(0.33)(0.67)}{96}}} = -3.62 \) or -3.63

4) Reject the null hyp. -3.62 < -1.96

5) There is enough evidence to reject the claim that percentage of failures differs from 33%.