1. A statistician took a random sample of 15 newborn babies at City General Hospital. The sample provided the following statistics (in lb): $\bar{x} = 7.26$ and $s = 1.13$. Construct a 90% confidence interval for the mean weight (in lb.) of all babies born at City General Hospital in recent times? (Assume the population of baby weights has a normal distribution.) We are about 90% certain that the average weight (in lb) of all babies born at the hospital falls in the interval...

a. (6.39, 8.13)
b. (6.69, 7.83)
c. (6.78, 7.74)
d. (6.75, 7.77)
e. (6.87, 7.65)

2. A nutritionist wants to estimate the mean amount of cholesterol in a certain variety of chicken eggs. She wants to be within 3 mg with 99% confidence. It is believed that the standard deviation is 23 mg. How large a sample of eggs should she use?

a. 15  
b. 20  
c. 141  
d. 226  
e. 391

3. A political candidate wants to estimate his chances of winning the coming election for governor. Out of a random sample of 1000 voters, 475 voters stated they supported the candidate. Find the 95% confidence interval for $p$, the true proportion of supporters.

a. (.425, .525)  
b. (.444, .506)  
c. (.455, .495)  
d. (.466, .484)  
e. (.472, .478)

4. Given data from a random sample, which confidence level below would give the smallest confidence interval for the population mean?

a. 90%  
b. 95%  
c. 97%  
d. 98%  
e. 99%
5. A random sample of 300 females provided the following sample statistics:

\[ \bar{x} = 98.29 \]  
\[ s = .76 \]

Find the margin of error \( E \) for a 95% confidence interval for the mean body temperature of all females in the population that was sampled.

a. .023  
b. .061  
c. .086  
d. 1.49  
e. 1.52

6. Suppose a 95% confidence interval for the mean heart rate (beats/min) of a particular population was (69.7, 74.5). Which one of the following statements is correct?

(a) Ninety-five percent of the population has a heart rate somewhere between 69.7 and 74.5.  
(b) Five percent of the population has a heart rate outside the range 69.7 to 74.5.  
(c) Ninety-five percent of the time each person's heart has a rate somewhere between 69.7 and 74.5.  
(d) Ninety-five percent of the population has an average heart rate and five percent does not.  
(e) We are 95% certain that average heart rate of the population is between 69.7 and 74.5.

7. Jane wants to find a 95% confidence interval for the mean \( \mu \) of a normal population with unknown standard deviation \( \sigma \). If the sample size is 15, what critical value would she use?

a. 1.645  
b. 1.960  
c. 2.131  
d. 2.145  
e. 2.576

8. A quality control expert wants to estimate the proportion \( p \) of defective components that are being manufactured by his company. A preliminary sample of 1000 components showed that 75 were defective. How large a sample is needed to estimate the true proportion of defective components with 99% confidence and have a .01 margin of error?

a. 2666  
b. 4604  
c. 1878  
d. 7231  
e. 5315
9. A machine that fills cola bottles is supposed to fill each bottle with a mean amount of cola equal to 12 ounces. An operator suspects that the true mean is more than 12 ounces. If a statistical hypothesis test is to be performed, how should the hypotheses be stated? Let \( \mu \) represent the true mean amount of cola.

a. \( H_0: \mu > 12 \) vs. \( H_a: \mu = 12 \)
b. \( H_0: \mu < 12 \) vs. \( H_a: \mu \geq 12 \)
c. \( H_0: \mu = 12 \) vs. \( H_a: \mu \neq 12 \)
d. \( H_0: \mu = 12 \) vs. \( H_a: \mu < 12 \)
e. \( H_0: \mu = 12 \) vs. \( H_a: \mu > 12 \)

10. A machine that fills cola bottles is supposed to fill each bottle with a mean amount of cola equal to 12 ounces. An operator suspects that that the true mean is more than 12 ounces. Two hundred bottles are randomly checked and their mean is found to be 12.07 ounces, with the sample standard deviation being 0.43 ounces. If a statistical hypothesis test is performed, what is the \( p \)-value?

a. .01 b. .03 c. .04 d. .05 e. .07

11. A machine that fills cola bottles is supposed to fill each bottle with a mean amount of cola equal to 12 ounces. An operator suspects that that the true mean is more than 12 ounces. Two hundred bottles are randomly checked and their mean is found to be 12.07 ounces, with the sample standard deviation being 0.43 ounces. If a statistical hypothesis test is performed, using a significance level of .05, what is the proper conclusion?

a. There is sufficient evidence at the .05 level of significance to say that \( \mu = 12 \) ounces.
b. There is sufficient evidence at the .05 level of significance to conclude that \( \mu > 12 \) ounces.
c. There is not sufficient evidence at the .05 level of significance to conclude \( \mu = 12 \) ounces.
d. There is not sufficient evidence at the .05 level of significance to conclude that \( \mu > 12 \) ounces.
e. A larger sample is needed if we want to perform this test.

12. A machine that fills cola bottles is supposed to fill each bottle with a mean amount of cola equal to 12 ounces. Find a 90% confidence interval for \( \mu \), the true mean, given that 200 bottles are randomly checked and their mean is found to be 12.07 ounces, with the sample standard deviation being 0.43 ounces. Which one of the statements below is true?

a. The confidence interval is totally below the number 12.
b. The confidence interval is totally above the number 12.
c. The confidence interval contains the number 12.
d. The confidence interval is centered around 12.
e. None of the above statements are true.

13. In a large-sample, right-tail test for a population mean, suppose the null value was 12, the test statistic value was 2.3, and the \( p \)-value was .01. The \( p \)-value of .01 means that if the mean of the population was truly ______, then repeated random samples from the population would give a test statistic value larger than 2.3 about ______ % of the time.
14. A manufacturer claims that no more than 1% of the widgets it ships out to wholesalers are “defective”. A wholesaler finds 6 defective widgets in a random sample of 300 widgets from the last shipment of 100,000 widgets. Let \( p \) denote the proportion of defective in the whole shipment of 100,000. Using \( \alpha = .05 \), what is the proper conclusion for the hypothesis test performed by the wholesaler. (Hint: use binomial probabilities to calculate the \( p \)-value).

(a) At the .05 level of significance, there is sufficient evidence to conclude that \( p > .01 \).
(b) At the .05 level of significance, there is sufficient evidence to conclude that \( p \leq .01 \).
(c) At the .05 level of significance, there is not sufficient evidence to conclude that \( p > .01 \).
(d) At the .05 level of significance, there is not sufficient evidence to conclude that \( p \leq .01 \).
(e) No conclusion can be drawn from a random sample of only 300.

15. In hypothesis testing, a small \( p \)-value indicates evidence for the alternative hypothesis.

True \hspace{1cm} False

16. In hypothesis testing, if the \( p \)-value is less than the level of significance \( \alpha \), we
   a. have committed a Type I error
   b. have committed a Type II error
   c. have sufficient evidence to reject \( H_0 \)
   d. do not have sufficient evidence to reject \( H_0 \)
   e. have increased the power of the test

17. Convicting an innocent person is analogous to
   a. committing a Type I error
   b. committing a Type II error
   c. increasing the level of significance
   d. increasing the power of the test
   e. taking an introductory statistics course

18. When you use a larger value for \( \alpha \), say \( \alpha = .10 \) in place of \( \alpha = .05 \), what type of error becomes more likely?
   a. Type I error \hspace{1cm} b. Type II error \hspace{1cm} c. Typo error \hspace{1cm} d. Bowen error \hspace{1cm} e. Bygone error

19. When performing a hypothesis test, increasing the sample size \( n \) while keeping a fixed level of significance \( \alpha \), increases the power of the test.
   TRUE \hspace{1cm} FALSE

20. If the null hypothesis is not rejected, what type of error might occur?
   a. Type I error \hspace{1cm} b. Type II error \hspace{1cm} c. Typo error \hspace{1cm} d. Bowen error \hspace{1cm} e. Bygone error