

MATH 2050
QUIZ (CHAP. 5 and 6)

NAME _____

Use a pencil. Be neat. Show all pertinent work.
Circle the best answer or fill in the blanks.

1. A statistician took a random sample of 10 newborn babies at City General Hospital. The sample provided the following weight data (in lb):

6.5 7.5 6.8 8.4 5.9 7.4 6.7 8.1 7.5 9.3

Construct a 95% 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. Note that the sample size is considered small.)

We are about 95% certain that the average weight of all babies born at the hospital falls in the interval...

- a. (5.45, 9.37)
- b. (6.69, 8.13)
- c. (6.79, 8.03)
- d. (6.82, 8.00)
- e. (7.21, 7.61)

2. A nutritionist wants to estimate the mean amount of cholesterol in a certain variety of chicken eggs. She wants to be within 10 mg with 99% confidence. It is believed that the standard deviation is 25 mg. How large a sample of eggs should she use?

- a. 7
- b. 17
- c. 42
- d. 163
- e. 248

3. A political candidate wants to estimate his chances of winning the coming election for mayor. Out of a random sample of 500 voters, 125 voters stated they supported the candidate. Find the 99% confidence interval for p , the true proportion of supporters.

- a. (.157, .343)
- b. (.179, .321)
- c. (.200, .300)
- d. (.228, .272)
- e. (.241, .259)

4. If (97.2, 99.3) is a confidence interval for a population mean μ , what is the sample mean \bar{x} and the margin of error E ?

$$\bar{x} = \underline{\hspace{2cm}}$$

$$E = \underline{\hspace{2cm}}$$

5. A random sample of 65 females provided the following sample statistics:

sample mean body temperature: $\bar{x} = 98.39^\circ$
sample standard deviation of body temperatures: $s = .74^\circ$

Find a 99% confidence interval for the mean body temperature (μ) of all females in the population that was sampled.

$$\underline{\hspace{2cm}} \leq \mu \leq \underline{\hspace{2cm}}$$

6. Suppose a 95% confidence interval for the mean heart rate (beats/min) of a particular population was (69.7, 74.5). Which 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 around the mean using the *t-distribution* when $n = 15$. What would the critical value be?

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

8. A quality control expert wants to estimate the percentage of defective components that are being manufactured by his company to within 3.0%. A preliminary sample of 100 components showed that 4 were defective. How large a sample is needed to estimate the true proportion of defective components with 99% confidence? (Note 3% \rightarrow .03 in terms of proportion.)

$$n = \underline{\hspace{2cm}}$$

9. A machine that fills milk bottles is supposed to fill each bottle with a mean amount of milk equal to 64 ounces. An operator suspects that the true mean is more than 64 ounces. If a statistical hypothesis test is to be performed, how should the hypotheses be stated? Let μ represent the true mean amount of milk.

- a. $H_0: \mu < 64$ vs. $H_1: \mu = 64$
- b. $H_0: \mu < 64$ vs. $H_1: \mu \geq 64$
- c. $H_0: \mu \neq 64$ vs. $H_1: \mu = 64$
- d. $H_0: \mu = 64$ vs. $H_1: \mu < 64$
- e. $H_0: \mu = 64$ vs. $H_1: \mu > 64$

10. A machine that fills milk bottles is supposed to fill each bottle with a mean amount of milk equal to 64 ounces. An operator suspects that that the true mean is more than 64 ounces. Fifty bottles are randomly checked and their mean is found to be 64.10 ounces, with the sample standard deviation being 0.35 ounces. If a statistical hypothesis test is to be performed, what is the p -value?

- a. .011
- b. .022
- c. .044
- d. .066
- e. .088

11. A machine that fills milk bottles is supposed to fill each bottle with a mean amount of milk equal to 64 ounces. An inspector suspects that that the true mean is more than 64 ounces. Fifty bottles are randomly checked and their mean is found to be 64.10 ounces, with the sample standard deviation being 0.35 ounces. If a statistical hypothesis test is to be 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 μ is less than 64 ounces.
- b. There is sufficient evidence at the .05 level of significance to say that μ is more than 64 ounces.
- c. There is not sufficient evidence at the .05 level of significance to say that μ is less than 64 ounces.
- d. There is not sufficient evidence at the .05 level of significance to say that μ is more than 64 ounces.
- e. A larger sample is needed if we want to perform this test.

12. A machine that fills milk bottles is supposed to fill each bottle with a mean amount of milk equal to 64 ounces. Find a 90% confidence interval for μ , the true mean, given that 50 bottles are randomly checked and their mean is found to be 64.10 ounces, with the sample standard deviation being 0.35 ounces.

90% CI: _____ $\leq \mu \leq$ _____

13. When finding a confidence interval, increasing the sample size increases the margin of error.

True

False

- 14. In hypothesis testing, if the p-value is greater than the level of significance α , we**
- have committed a Type I error
 - have committed a Type II error
 - have sufficient evidence to reject H_0
 - do not have sufficient evidence to reject H_0
 - have increased the power of the test

- 15. Releasing a guilty person for lack of evidence is analogous to**
- committing a Type I error
 - committing a Type II error
 - increasing the level of significance
 - increasing the power of the test
 - taking an introductory statistics course

16. When you use a larger value for α , what type of error becomes more likely?

- a. Typo error b. Bowen error c. Type I error d. Type II error e. Typical error

17. By increasing the sample size n while keeping a fixed level of significance α , we increase the power of a test.

True

False

18 – 20. A manufacturer claims that no more than 3% of the widgets it ships out to wholesalers are “defective”. A wholesaler finds 9 defective widgets in a random sample of 200 widgets from the last shipment of 100,000 widgets. If p denotes the true proportion of defectives in the shipment, do we have sufficient evidence to conclude that $p > .03$? Use $\alpha = .05$. Find the hypotheses, the decision rule, the test statistic value, the p -value, and the conclusion. [Note that the exact binomial test is most appropriate here.]

18. Hypotheses.. $H_0: p$ _____ vs. $H_a: p$ _____

Decision rule: Reject H_0 if the p -value \leq _____.

19. Test statistic value: $x =$ number of defectives in sample $=$ _____.

p -value $= P(X \geq x | X \sim \text{binomial}(n = 200, p = .03)) =$ _____.

20. Choose the best conclusion:

- There is sufficient evidence at the .05 level of significance to conclude that $p > .03$.
- There is sufficient evidence at the .05 level of significance to conclude that $p \leq .03$.
- There is not sufficient evidence at the .05 level of significance to conclude that $p > .03$.
- There is not sufficient evidence at the .05 level of significance to conclude that $p \leq .03$.
- No conclusion is appropriate since the sample size is too small for the population.