Sample Exam for Test 3

1. Woman's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. Find the probability that a single randomly selected woman will be 67 inches tall.
2. Find the following probabilities:
    a. $P(z < 1.89)$
    b. $P(-1.13 < z < -0.67)$
    c. $P(z > 2.14)$
3. Birth weights are normally distributed with a mean of 3570 g and a standard deviation of 495 g. If a hospital wants to watch carefully the lightest 2% of infants, find the weight that separates the bottom 2% from the others.
4. Assume that healthy human body temperatures are normally distributed with a mean of 98.6 degrees and a standard deviation of 0.62 degrees. Find the probability of a healthy adult person having a body temperature below 97 degrees.
5. IQ scores are normally distributed with a mean of 100 and a standard deviation of 15. Find the probability that a sample of 25 randomly selected people will have an average IQ of 102 or less.
6. Women's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. The US army requires that women's heights be between 58 inches and 80 inches. Is the percentage of women being denied the opportunity to join the Army large?
7. Human body temperatures are normally distributed with a mean of 98.20 and a standard deviation of 0.62. Find the temperature that separates the top 7% from the bottom 93%.
8. The heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 16 women are selected at random, find the mean of the population of sample means.
9. The heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 16 women are selected at random, find the standard error of the population of sample means.
10. Assume that adults have IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15:

a) Find the probability that a randomly selected adult has an IQ that is less than 130. (0.9772)
b) Find the probability that a randomly selected adult has an IQ greater than 131.5. (0.0179)
c) Find the probability that a randomly selected adult has an IQ between 90 and 110. (0.49720
d) Find the probability that a randomly selected adult has an IQ between 110 and 120. (0.1596)
e) Find P_{10}, which is the IQ score separating the bottom 10% from the top 90%. (80.8)
f) Find P_{60}, which is the IQ score separating the bottom 60% from the top 40%. (103.8)
g) Find the IQ score separating the top 35% from the others. (105.9)
h) Find the probability of selecting a random sample of 36 people and finding their average IQ is less than 95. (0.0228)

11. What is the total area under the normal curve? How much area is to the left of the mean?
12. Which is always greater: the variation found among sample means taken from groups of 49 subjects or the variation found for measurements taken from the individual subjects?
13. Use the given degree of confidence and sample data to construct a confidence interval for the population mean μ. Assume that the population has a normal distribution.

    n = 49, $\overline{X} = 58$, $\sigma = 14$, and $CILevel = 95\%$
14. A local university registrar's office wants to know the average length of time that students wait at the counter for assistance. A sample of 64 students has a mean wait time of 25 minutes. From previous studies we can assume that we know the population standard deviation is equal to 8 minutes. Form a 99% confidence interval for the true average wait time at the office of the registrar.

15. Interpret the interval found above.
16. Find the margin of error using the information below:

    $\overline{X} = 38$, $\sigma = 15$, n = 81, 98% confidence interval
17. If y is used to estimate the population parameter λ and the expected value of y is given by E(y) = λ -7 , is y an unbiased estimator?

Answers Sample Exam 3

1. P(x = 67) = 0, because x is a continuous random variable
2. a. 0.9706 b. 0.1222 c. 0.0162
3. 2555.25
4. 0.0049
5. 0.7486
6. 1 – p(accepted) = 1 – 0.9875 = 0.0125
7. 99.12
8. 63.6 same as the original mean by the CLT
9. 2.5/4 = 0.625 by the CLT
10. Answers are given in parenthesis next to each part of the problem.
11. 1.00; 0.5000
12. The individual measurements will always have greater variation than the sample means taken from groups of those same subjects.
13. [54.08, 61.92]
14. [22.424, 27.576]
15. We are 99% confident that the true mean wait time at the registrar's office is between 22.4 and 27.6 minutes.
16. 3.877
17. No, y is not unbiased because its expected value is not equal to λ. To be unbiased we would need E(y) = λ.