MATH-1140 (DUPRÉ) 2014 SPRING TEST 3 ANSWERS

DATE: WEDNESDAY 9 APRIL 2014

FIRST: PRINT YOUR LAST NAME IN LARGE CAPITAL LETTERS ON THE UPPER RIGHT CORNER OF EACH SHEET TURNED IN.

SECOND: PRINT YOUR FIRST NAME IN CAPITAL LETTERS DIRECTLY UNDERNEATH YOUR LAST NAME ON EACH SHEET TURNED IN.

THIRD: WRITE YOUR MATH COURSE NUMBER AND SECTION NUMBER DIRECTLY UNDERNEATH YOUR FIRST NAME ON EACH SHEET TURNED IN.

Use the TABLES in your textbook where necessary.

Suppose that the time X in minutes for a trolley to arrive is uniformly distributed with minimum value 15 and maximum value 35. Calculate:

1. $E(X) = 25$

2. $P(X \leq 30) = 0.75$

3. $P(X > 30) = 0.25$

A box contains 40 red blocks and 60 blue blocks. We draw 25 blocks from the box at random and count the number T of red blocks. Calculate:

4. $E(T) = 10$

5. To four significant digits, σ_T(given drawing with replacement)

$$= \sqrt{(25)(.4)(.6)} = \sqrt{24/4} = \sqrt{6} = 2.449$$

6. σ_T(given drawing without replacement)

$$= \sqrt{(75/99)}\sqrt{6} = 2.132$$

7. $P(T = 6|\text{drawing with replacement}) = .074 - .029 = .045$

8. $P(T = 6|\text{drawing without replacement}) =$**A**

A. $C(40, 6) \cdot C(60, 19)/C(100, 25)$

B. $C(40, 6) \cdot (.4)^6 \cdot (.6)^{19}$

C. $C(25, 6) \cdot C(25, 19)/C(100, 25)$

D. $C(25, 6) \cdot (.25)^6 \cdot (.75)^{19}$

E. NONE OF THE ABOVE

Suppose that we are studying the population of bears in Smokey Mountain National Park. We have an independent random sample of 16 bears from the population with a sample mean weight of 900 pounds and a sample standard deviation of 80 pounds. We assume that bear weight is normally distributed for bears in the population.

9. What is the MARGIN OF ERROR in the 99 percent confidence interval for the true mean weight of bears in the population if we know that the POPULATION standard deviation for the weight of bears in the population is 75 pounds?

$$\mathbf{ME} = (2.576)\frac{75}{\sqrt{16}} = 48.3$$

10. If we know that the POPULATION standard deviation in bear weight is 75 pounds, does our sample data establish that the true mean weight of bears exceeds 850 pounds at the .005 significance level? Give the value of the standardized test statistic for the sample data and give the P-Value or significance of the data.

$$\mathbf{YES},\ \text{test statistic} = z_{data} = \frac{900-850}{75/4} = \frac{200}{75} = \frac{8}{3} = 2.667,$$
$$P - \text{Value} = \text{Data Significance} = P(Z \geq 8/3) = .5 - .4962 = .0038 \leq .005$$

11. What is the MARGIN OF ERROR in the 99 percent confidence interval for the true mean weight of bears in the population if we DO NOT know that the population standard deviation in weight of bears is 75 pounds but instead use our sample standard deviation of 80 pounds?

$$\mathbf{ME} = (2.947)\frac{80}{\sqrt{16}} = 58.94$$

12. If we run a hypothesis test to try and establish that the true mean weight of bears in the population exceeds 850 pounds, then the TYPE I ERROR is: **B.**

A. the true mean weight of the bears is more than 850 pounds, but our data leads us to believe it is at most 850 pounds.

B. the true mean weight of the bears is at most 850 pounds, but our data leads us to believe that it is more than 850 pounds.

C. the true mean weight of the bears is more than the sample mean of our data.

D. the true mean weight of the bears is less than the sample mean of our data.

E. NONE OF THE ABOVE

Suppose we are comparing mean weight of blue fish and red fish and we assume both populations have the same standard deviation, σ, in weight. Suppose we have a sample of 4 blue fish with variance 9 and a sample of 8 red fish with a variance of 5.

13. The pooled variance estimate (using this sample data), denoted S^2_{pool}, of the true population variance is

$$S^2_{pool} = \frac{3 \cdot 9 + 7 \cdot 5}{10} = 6.2.$$

14. The number of degrees of freedom, denoted df, for chi-square=$(df)S^2_{pool}/\sigma^2$ is $df = 10$.