TOPICS COVERED BY THE STATISTICS EXAM AND DS 712

The following is a list of topics which will be covered on the Statistics Exam and DS 712 Course. You must satisfy this requirement by passing either the Statistics Exam or DS 712. **THIS REQUIREMENT CANNOT BE WAIVED WITH PREVIOUS COURSE WORK OR OTHER EXAMS.** No notes, calculators or tables are allowed for the exam. Suggested texts for studying are located below. If you wish to take the Statistcs Exam rather than DS 712, please contact the testing center in ADMIN 152, (515)338-2271.

Displaying data
Descriptive statistics – frequency, relative frequency
Summation notation
Measures of central tendency
Measures of dispersion (variation)

Probability introduction
Basic rules of probability
Conditional probability
Independent events
Discrete probability distributions, including binomial
Normal distribution
Normal approximation to the binomial

Concept of a sampling distribution
Sampling distribution of means and proportions
Central Limit Theorem
Confidence intervals of means; sample size
Confidence intervals of proportions; sample size

Hypothesis testing of means (known variance)
Hypothesis testing of means (unknown variance)
Hypothesis testing of proportions
Types I and II errors

Regression lines
Correlation coefficient
Inference in regression
Coefficient of determination

- Application and calculation of arithmetic mean, median, geometric mean
- Difference between standard deviation of a population and a sample
- Understand the concept of random variables
- Understand the concept of a probability distribution and its mean, variance, and standard deviation
- Recognize the difference between binomial, hypergeometric, uniform, triangular, and normal distributions
- Recognize and calculate binomial probabilities using tables, formula, and the normal approximation, including the continuity correction
- Apply the normal distribution in a variety of situations
- Understand the concept of sampling distributions of mean and proportion
- Understand the basic meaning and importance of the Central Limit Theorem
- Compute probabilities related to the sampling distribution of the mean and proportion
- Understand the concept and significance of t-distributions, when they are used, and they may be approximated with a normal distribution
- Calculate and interpret confidence intervals of the population mean, proportion, regression coefficient, estimate of y for a given x, estimate of the mean of y for a given x
- Perform and interpret hypothesis tests for a mean, proportion, and regression coefficient
- Interpret meaning and limitations of regression and correlation coefficient

Texts:
The Basic Practice of Statistics, by Moore
Business Statistics, by Black
Contemporary Business Statistics, by Anderson

PRACTICE EXAM FOR THE STATISTICS REQUIREMENT

1. Confidence intervals
   (a) can be used in place of hypothesis tests
   (b) can be used in place of hypothesis tests only if the sample size is large
   (c) are not related to hypothesis tests
   (d) are less useful than point estimates
   (e) none of these

2. In regression, if our model is $y = \alpha + \beta x + \varepsilon$, then *y* in this equation is the
   (a) independent variable (b) dependent variable (c) error (d) regression coefficient (e) none of these

3. If P(A) = 0.6 and P(B) = 0.2 and if A and B are independent events, then P(A $\bigcup$ B) =
   (a) 0 (b) 0.12 (c) 0.68 (d) 0.80 (e) none of these

4. Suppose the Consumer Price Index was 100 in 1967, 200 in 1990, and 225 now. If a house cost $495,000 now, what would be the current cost expressed in 1990 dollars?
   (a) $371,250 (b) $440,000 (c) $556,875 (d) 25% less (e) none of these

5. Assume that we have the simple linear regression model $y = \alpha + \beta x + \varepsilon$ and estimated coefficients *a* and *b*. Also $s_{y|x} = \sqrt{\Sigma(y - a - bx)^2 / (n-2)}$. Suppose that we collected data on weights (lbs.) and age (yrs.) for a randomly selected group of children. We then chose to model weight as a linear function of age. We would use the following confidence interval for α, $a \pm t_{n-1} \cdot s_{y|x} \sqrt{\frac{1}{n} + \frac{\overline{x}^2}{\Sigma(x - \overline{x})^2}}$ to estimate

   (a) the average weight for children
   (b) the average age for children
   (c) the average change in weight for children who are one year apart in age
   (d) the average weight for newborns
   (e) none of these

6. For a hypothesis test, the level of confidence equals the
   (a) probability of a Type I error (b) probability of a Type II error
   (c) power of the test (d) level of significance (e) none of these

7. Suppose we toss a pair of dice twelve times. The probability that the dice will come up a "three" at most seven times is
   (a) the probability of getting at least five numbers that are not "threes"
   (b) 1 minus the probability of getting at a "three" at least eight times
   (c) the probability of getting a "seven" at most three times
   (d) 1 minus the probability of getting at a "three" at least seven times
   (e) none of these

8. The population of individuals has a mean μ and a standard deviation σ. Suppose we took all possible samples of size *n* and found the mean of each sample. We then calculated the standard deviation of this distribution of sample means. If we wished to change the sample size, which of the following would be true about the new standard deviation of the distribution of sample means?
   (a) making the sample size nine times larger would give us a standard deviation three times larger
   (b) doubling the sample size would halve the standard deviation
   (c) doubling the sample size would double the standard deviation
   (d) squaring the sample size would halve the standard deviation
   (e) none of these

9. Find the mean and median for the following data: 3, 8, 14, 11, 3, 16, 19, 3, 8, 15

Answers: 1a, 2b, 3c, 4b, 5d, 6e, 7b, 8e, 9 mean = 10, median = 9.5