

# Final Exam

MAT 203, Elementary Statistics, Term IV  
Coker College

Dowman P Varn, Instructor  
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Please complete the following problems. You may use your text, class notes, a calculator, paper and pencil, and any other written resources you have brought. You must, however, work alone. You are encouraged to use a calculator wherever possible to make the calculations easier. If you do use a calculator function to calculate a quantity, please indicate what function you use. Please write legibly. **Please clearly indicate how you do each problem.** This test counts 25% toward your final grade. Good Luck!

1. Sunny Grove Forest covers an area of 100 acres and contains a random distribution of 350 walnut trees. (a) What is the average number of walnut trees per acre in Sunny Grove Forest? (b) What is the probability that a randomly selected acre has 5 walnut trees?
2. Marvin has invited Lisa over for a nice spaghetti dinner with a side salad. Marvin enjoys cooking Italian, and in fact makes a mean marinara sauce. But, 20% of the time he adds meatballs, and 30% of the time he adds sausage. It is found that 10% of the time he adds *both* meatballs *and* sausage to a pot of sauce. (Marvin is not a man of moderation.) Unbeknownst to Marvin, however, Lisa is a vegan, and won't eat meat. When Lisa arrives for the dinner, what are the chances that the sauce has meat in it, thus reducing Lisa's meal to a side salad?
3. John has a fair coin. But for the last six tosses it has come up heads. What is the probability that the next toss will also be heads?
4. The number of eggs female house flies lay during their lifetimes is normally distributed, with a mean of 800 eggs and a standard deviation of 100 eggs. Random samples of size 15 are drawn from this population and the mean of each sample is determined. Use the Central Limit Theorem to find (a) the mean and (b) the standard error of the mean of the sampling distribution.
5. The distribution of cholesterol levels in teenage boys is approximately normal with  $\mu = 170$  and  $\sigma = 30$ . Levels above 200 warrant attention. Manuel is a 15 year-old boy randomly chosen at Lyttleton High School. What is the probability that his cholesterol level is 220 or above?

70	72	71	70	69	73	69	68	70	71
67	71	70	74	69	68	71	71	71	72
69	71	68	67	73	74	70	71	69	68

Table 1: For use with Problems 6 - 12. The height in inches of 30 randomly selected adult males from the fictional town of San Martini, California.

6. For the heights in Table 1, make a histogram of the frequency distribution of the heights.
7. What is the range of the heights in Table 1?
8. What is the mode of the heights in Table 1?
9. What is the mean of the heights in Table 1?
10. What is the interquartile range of the heights in Table 1?
11. What is the sample standard deviation of the heights in Table 1?
12. Find the 98% confidence interval for the actual mean (population mean) of the height of adult males in the fictional town of San Martini, California, using the data in Table 1.

13. Police Chief Sammy “The Enforcer” Jones, who is running for reelection, claims that the mean prison time for car thieves is less than the required 4 years. (A situation which Sammy finds intolerable.) A sample of 80 convicted car thieves was randomly selected, and the mean length of prison time was found to be 3.5 years, with a standard deviation of 1.25 years. For this claim, state the null hypothesis and the alternative hypothesis mathematically, and indicate which is the claim.
14. At the  $\alpha = 0.05$  level, test the claim made by “The Enforcer” in Problem 13.
15. What is the area under the standard normal curve to the left of  $z = 0.3$ ?

Participant Number	1	2	3	4	5	6	7	8	9	10	11	12
Before Weight (in pounds)	178	210	156	188	193	225	190	165	168	200	186	172
After Weight (in pounds)	182	205	156	190	183	220	195	155	165	200	180	173

Table 2: For use with Problem 16. The before and after weights of twelve randomly chosen individuals participating in a study on the effectiveness of physical exercise on weight loss.

16. To test the effectiveness of physical exercise on weight loss, 12 people were randomly selected to participate in a 30 day program. Each person was weighed at the beginning of the study, and then weighed again after 30 days of exercise. The data is given in Table 2. Test the claim that exercise has no bearing on weight loss at the  $\alpha = 0.05$  level. Assume that the data is normally distributed.
17. Suzie Beancounter, the Dean of Students at Shady Grove College, claims that there is no difference in the ages between day students and night students at Shady Grove. She takes a random sample of 100 day students and 90 night students. For the day students, the average age is 20.3 years old with a sample standard deviation of 1.9 years. For the night students, the average age is 21.0 with a sample standard deviation of 2.3 years. Test this claim at the  $\alpha = 0.02$  level.

Rainfall (in)	Yield (bpa)
10.5	50.5
8.8	46.2
13.4	58.8
12.5	59.0
18.8	82.4
10.3	49.2
7.0	31.9
15.6	76.0
16.0	78.8

Table 3: For use with Problems 18 - 20. The yield of wheat (in bushels per acre) vs. rainfall (in inches) for Lonesome Prairie.

18. In Lonesome Prairie, an area in the Midwest, records were kept on the relationship between the rainfall (in inches or in) and the yield of wheat (in bushels per acre or bpa), as shown on Table 3. (a) Using rainfall as the independent variable and yield as the dependent or response variable, find the coefficient of correlation for this data. (b) Is this correlation significant at the  $\alpha = 0.01$  level? Justify your answer.
19. Perform a linear regression on the data in Table 3, and state the slope of the line and the y-intercept.
20. David Rainwater, a very ambitious meteorologist, predicts that the rainfall will be exactly 14.0 inches next year in Lonesome Prairie. Using your results from Problem 19, and assuming that Mr. Rainwater is correct, predict the yield for next year.