MATH-1110 (DUPRÉ) FALL 2011 PRACTICE TEST 3

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 FALL 2011 MATH-1110 SECTION NUMBER DIRECTLY UNDERNEATH YOU FIRST NAME ON EACH SHEET TURNED IN.

FOURTH: THERE ARE K QUESTIONS AND EACH IS WORTH n POINTS. WRITE ALL YOUR ANSWERS NEATLY IN THE SPACE PROVIDED UNDER EACH QUESTION. NEATNESS COUNTS. IF I CANNOT READ IT WITHOUT STRAINING MY EYES YOU GET NO CREDIT.

Suppose K is the statement that the fish in my pond have normally distributed length with mean length **7 inches** with a standard deviation of **2 inches**, and mean weight **3 pounds** with a standard deviation of **1 pound**. Suppose that a fish (henceforth to be referred to as "the fish") is taken from my pond with length X and weight Y.

1. What is the optimal guess for the length of the fish, that is, what is $E(X|K)$?

2. What is $E(Y|K)$?

3. What is the expected squared error if you guess the LENGTH of the fish to be $E(X|K)$?

4. If you have the information that the fish is actually 11 inches long, would that have any influence on your guess of the weight of the fish? For instance, is

$$E(Y|K\&(X=9)) < E(Y|K\&(X=11))?$$

5. What is $E(3X|K)$?

6. What is $E(3X+2Y|K)$?

7. What is $P(X \leq 8.5|K)$?

8. What is $P(X \geq 8|K)$?

9. What is $P(6 \leq X \leq 9|K)$?

10. What is $P([6 \leq X] \& [X \leq 9]|K)$?

11. What is $P(6 \leq X|[X \leq 9]\&K)$?

12. If Y is not normally distributed and we use Tchebeychev's Inequality, what is the least that the probability that Y is between 1 and 5 can possibly be? What is the least the probability that Y is between 0 and 6 can be?

Suppose that a box contains 5 RED blocks, 4 BLUE blocks, and 3 GREEN blocks. Suppose that three blocks are drawn from the box without replacement one after another.

13. What is the probability that the first block drawn is red?

14. What is the probability that the second block drawn is red?

15. What is the probability that the third block drawn is red given that the first is red and the second is blue?

16. What is the probability that the first block drawn is red given that the second is blue and the third is red?

17. What is the probability that two of the drawn blocks are red and one is blue?

18. What is the expected number of BLUE blocks drawn? What is the standard deviation in the number of BLUE blocks drawn?

19. What is the standard deviation in the number of BLUE blocks drawn?

Suppose in addition to the preceding information, that red blocks are worth ONE dollar, that blue blocks are worth TWO dollars and green blocks are worth THREE dollars.

20. What is the total worth of the blocks in the box?

21. If X is the value of the first block drawn, then what is $E(X)$?

22. If Y is the value of the second block drawn, then what is $E(Y)$?

23. If W is the value of the third block drawn, then what is $E(W)$?

24. If T is the total value of the three blocks drawn, then what is $E(T)$? What is the standard deviation of T?

Suppose that X is an unknown which has the possible values 1,2,3,5,6, and it is three times as likely to be even as odd, but all even numbers are equally likely and all odd numbers are equally likely. That is,

$$P(X = 1) = P(X = 3) = P(X = 5),$$

and

$$P(X = 2) = P(X = 6).$$

25. What is the probability that X is odd?

26. What is the probability that X is even?

27. What is the probability that $X = 5$?

28. What is the expected value of X?

29. What is the standard deviation of X?

29. If T is the total of ten observations of X, then what is the expected value of T?

30. If T is the total of ten independent observations of X, then what is the standard deviation of T?

31. If $\bar{X}$ is the average of ten observations of X, then what is the expected value of $\bar{X}$?

32. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the number of ducks in the survey we expect to say they will vote for Goofy for mayor of Duckburg? What is the standard deviation?

33. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the probability that the number of ducks in the survey who say they will vote for Goofy for mayor of Duckburg is less than or equal to 8?

34. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the probability that the number of ducks in the survey who say they will vote for Goofy for mayor of Duckburg is less than or equal to 8?

35. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the probability that the number of ducks in the survey who say they will vote for Goofy for mayor of Duckburg is less than or equal to 8 but more than 4?

36. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the probability that the number of ducks in the survey who say they will vote for Goofy for mayor of Duckburg is less than or equal to 8 and at least 4?

37. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the probability that the number of ducks in the survey who say they will vote for Goofy for mayor of Duckburg is less than or equal to 8 given that at least 4 say they will vote for Goofy for mayor?

38. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the probability that the proportion of ducks in the survey who say they will vote for Goofy for mayor of Duckburg is less than or equal to 8/20?

39. If 40 percent of the ducks in Duckburg say they will vote for Goofy for mayor, and if 20 ducks are asked in a survey, what is the expected proportion of ducks in the survey who say they will vote for Goofy for mayor of Duckburg? What is the standard deviation in this sample proportion?

40. Suppose that a pond contains 50 fish of which 30 are redfish. If we catch 10 without replacement forming a simple random sample of fish in the pond, what is the probability that the number of redfish we find in our sample is exactly 7?

41. Suppose that a pond contains 50 fish of which 30 are redfish. If we catch 10 **with** replacement, throwing the fish back after each catch so as to form an independent random sample, then what is the probability that exactly 7 of the 10 fish caught will be redfish?

42. Suppose that a pond contains 50 fish of which 30 are redfish. If we catch 10 **with** replacement, throwing the fish back after each catch so as to form an independent random sample, then what is the probability that no more than 7 of the 10 fish caught will be redfish?

43. Suppose that the fish in my pond have mean length 20 inches with a standard deviation of 4 inches, and that we know nothing else about the distribution of lengths for this population of fish. So we assume the distribution is normal. What is the probability that a fish caught from this pond will be over 20 inches in length?

44. Suppose that the fish in my pond have mean length 20 inches with a standard deviation of 4 inches, and that we know nothing else about the distribution of lengths for this population of fish. So we assume the distribution is normal. What is the probability that a fish caught from this pond will be between 22 and 27 inches in length?

45. Suppose that the fish in my pond have mean length 20 inches with a standard deviation of 4 inches, and that we know nothing else about the distribution of lengths for this population of fish. So we assume the distribution is normal. What is the probability that an independent random sample of 5 fish caught from this pond will average between 19 and 23 inches in length?

46 Suppose that the fish in my pond have mean length 20 inches with a standard deviation of 4 inches, and that we know nothing else about the distribution of lengths for this population of fish. So we assume the distribution is normal. What is the probability that in an independent random sample, the total length of 5 fish caught from this pond will be between 95 and 110 inches in length?

47. Suppose that I do not know the mean weight of the fish in my pond and I want to estimate it using the sample mean of an independent random sample. Suppose that I have a sample of 36 fish with sample mean $\bar{x} = 8.3$ pounds. Suppose that I know that the standard deviation in fish weight for the fish in my pond is 2 pounds. What is the margin of error in the 95 percent confidence interval for the true mean weight of the fish in my pond?

48. Suppose that I do not know the mean weight of the fish in my pond and I want to estimate it using the sample mean of an independent random sample. Suppose that I have a sample of 36 fish with sample mean $\bar{x} = 8.3$ pounds. Suppose that I do not know the standard deviation in the weight of fish in my pond, but the sample standard deviation of my sample is 2 pounds. What is the margin of error in the 95 percent confidence interval for the true mean weight of the fish in my pond?

49. Suppose that I do not know the percentage of ducks that will vote for Donald for Mayor of Duckburg in an upcoming election. Suppose that in a simple random sample of 2000 citizens asked, 1078 say they will vote for Donald in the election. What is the 95 percent confidence interval for the true proportion of citzens of Duckburg who say they will vote for Donald in the upcoming election?

50. Suppose that I do not know the mean weight of the fish in my pond and I want to estimate it using the sample mean of an independent random sample. Suppose that I have a sample of 36 fish with sample mean $\bar{x} = 8.3$ pounds. Suppose that I know that the standard deviation in fish weight for the fish in my pond is 2 pounds. What is the significance of this data as evidence that the true mean weight of the fish in my pond actually exceeds 7.5 pounds?

51. Suppose that I do not know the mean weight of the fish in my pond and I want to estimate it using the sample mean of an independent random sample. Suppose that I have a sample of 36 fish with sample mean $\bar{x} = 8.3$ pounds. Suppose that I do not know the standard deviation in the weight of fish in my pond, but the sample standard deviation of my sample is 2 pounds. What is the significance of this data as evidence that the true mean weight of the fish in my pond actually exceeds 7.5 pounds?

52. Suppose that I do not know the percentage of ducks that will vote for Donald for Mayor of Duckburg in an upcoming election. Suppose that in a simple random sample of 2000 citizens asked, 1078 say they will vote for Donald in the election. What is the significance of this data as evidence that the true proportion of citzens of Duckburg who say they will vote for Donald in the upcoming election actually exceeds .51?

53. Suppose that I do not know the percentage of mice who support Goofy for Mayor of Duckburg but I have asked 10 mice and 7 say they support Goofy for Mayor of Duckburg whereas three support other candidates. What is the significance of this as evidence that the true proportion of mice who support Goofy for Mayor of Duckburg exceeds sixty percent?

54. Suppose that I want to make a 95 percent confidence interval for the true mean length of fish in my pond and I know that the length of fish in my pond is normally distributed with a standard deviation of at most $B = 8$ inches. What is the minimum size of an independent random sample from the population of fish in my pond required in order that the margin of error in my confidence interval be at most .25 inches?

55. Suppose that I want to make a 95 percent confidence interval for the true proportion of fish in my pond that are redfish. I want the margin of error to be at most .02. What is the miminum size of an independent random sample that will accomplish this.