

MATH-1110 (DUPRÉ) SPRING 2011 TAKE HOME TEST 1

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

**FOURTH: THERE ARE TWENTY FIVE QUESTIONS AND EACH IS WORTH 4 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 that the fish in my pond have mean length 7 inches with a standard deviation of 1.3 inches, and mean weight 2.2 pounds with a standard deviation of 0.4 pounds. Suppose that the correlation between length and weight is  $\rho = .7$ . 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  $E(X)$ ?
2. What is  $E(Y)$ ?
3. What is the expected squared error if you guess the length of the fish to be  $E(X)$ ?
4. What is the expected squared error if you guess the weight of the fish to be  $E(Y)$ ?

5. If you have the information that the fish is actually 9.6 inches long, then what is the optimal guess for the weight of the fish using that information?

6. What is  $E(Y|X = 9.6)$ ?

7. What is the expected squared error in your guess of the weight of a 9.6 inch fish when you guess  $E(Y|X = 9.6)$ ?

Suppose that a wildlife biologist is studying the relationship between length and weight of Pacific salmon. In a sample of 100 fish, the sample mean length of the fish was 27 inches with a sample standard deviation  $s = 7.2$  inches and the sample mean weight was 8.3 pounds with a sample standard deviation of  $s = 3.8$  pounds, and additionally, the sample correlation coefficient between length and weight is  $r = .8$ . The wildlife biologist is told that a Pacific salmon of length  $X$  and weight  $Y$  was caught by a local fisherman (henceforth referred to as "the fish"). Let  $D$  denote the statement of the wildlife biologist's sample data.

8. What should the wildlife biologist guess for the length of the fish given his sample data, that is, what is  $E(X|D)$ ?

9. What is  $E(Y|D)$ ?

10. If the wildlife biologist finds that the length of the fish is 34.2 inches long, using this information along with the sample data, what should the wildlife biologist guess for the weight of the fish, that is, what is  $E(Y|(X = 34.2)\&D)$ ?



Suppose that we are writing a string of letters in line (that is a "word") taken from the alphabet  $A, B, C, D, K, L, M$ .

18. How many words of length 5 letters are possible?

19. How many 5 letter words are possible if all the letters in the word must be different?

20. How many 10 letter words are possible which have three  $A$ 's, four  $B$ 's and three  $K$ 's?

Suppose that  $X$  and  $Y$  are unknowns and that  $\mu_X = 8$ , that  $\sigma_X = 4$ , that  $\mu_Y = 9$ , that  $\sigma_Y = 5$ , and that the correlation of  $X$  with  $Y$  is  $\rho = .7$ .

21. What is  $Cov(X, Y)$ ?

22. What is  $E(X)E(Y)$ ?

23. What is  $E(XY)$ ?

24. What is  $E[(X - 5)(Y - 4)]$ ?

25. What is the standard deviation of  $X - Y$ ?