

Statistics Quiz

You have 75 minutes to complete this quiz. There are 30 total points. Please round to three decimal places when necessary.

Because the normal distribution table is slightly imprecise, you may have to round to the nearest value. You will not be penalized for whether you round up or down.

1. (6 points) Consider two random variables. D is the number of dogs owned by residents of La Brea county. C is the number of cats owned by the residents of La Brea county. Because of strict local ordinances, no La Brea resident is allowed to have more than 2 dogs and 2 cats.

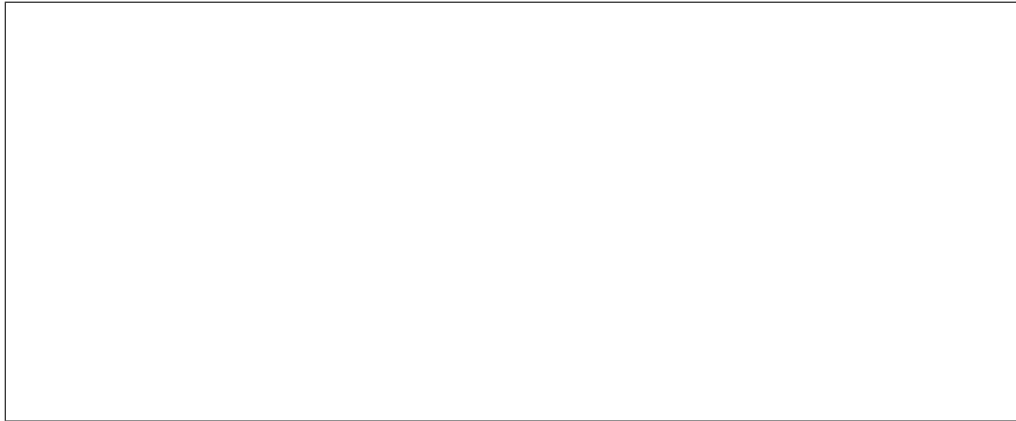
Joint probability distribution of dog and cat ownership in La Brea county

	No cats	1 cat	2 cats
No dogs	0.34	0.15	0.08
1 dog	0.14	0.10	0.01
2 dogs	0.10	0.05	0.03

- (a) Write or draw the marginal probability distribution of D . Write or draw the marginal probability distribution of C . (2 points)

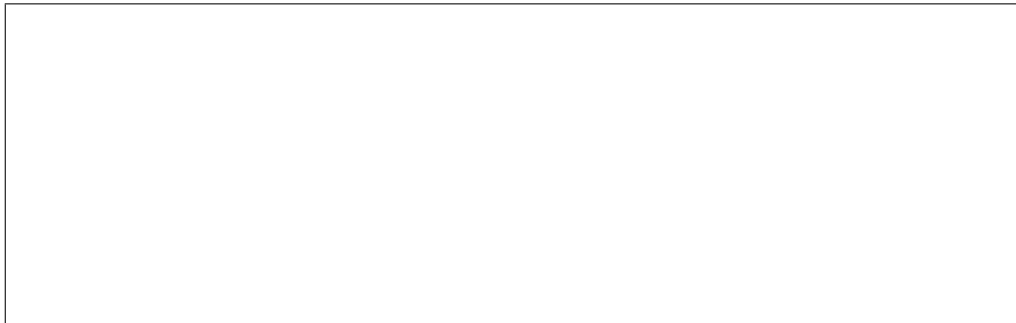
- (b) Compute $E(C)$ and $E(D)$ and write one sentence to interpret your results. (2 points)

- (c) What is the expected number of dogs owned by La Brea residents with no cats? (2 points)

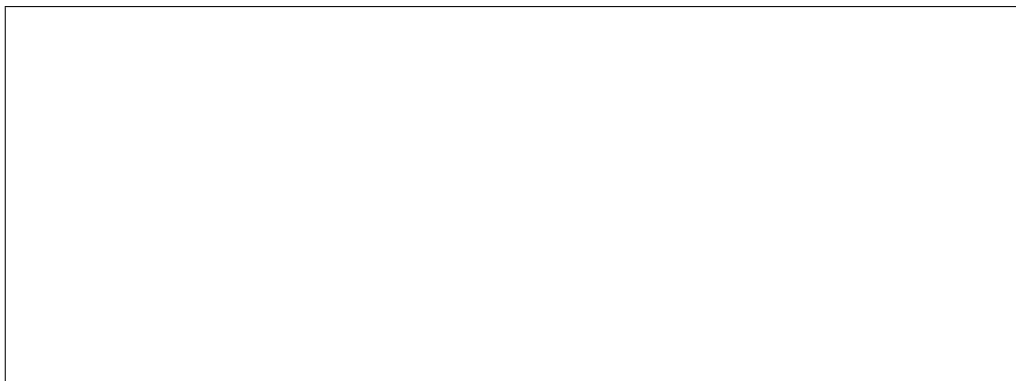


2. (10 points) The UVM development office has provided you with anonymous matches of starting salaries and GPAs for 121 graduating economics majors. The average starting salary for the graduates was \$39,000 with a standard deviation of \$7,000.

- (a) Construct a 95% confidence interval for the starting salary of all economics majors at UVM. Recall that when $n > 100$, the t -distribution can be approximated with a z -distribution. (3 points)



- (b) Suppose that nationally, the average starting salary for economics graduates is \$40,500. Formally test the null hypothesis that the average starting salaries for UVM economics graduates are different from the national average at the 1-percent level. For full credit, report the null hypothesis, alternate hypothesis, decision rule, test statistic, and your conclusion. (4 points)



- (c) Calculate the p-value of the test in part (b). Explain in one sentence what it means.

(3 points)

3. (10 points) The Minnesota Aardvarks are playing in the Sportsball Grand Championship next week! In Sportsball, your team earns three points per “basket” (putting the ball in the other team’s basket). Additionally, your team loses one point every time a player on your team is hit with the ball, called “getting tagged.”

The number of baskets that the Aardvarks score per game (B) is distributed normally with a mean of 30 and a standard deviation of 20. The number of times they get tagged (T) is distributed normally with an mean of 60 and a standard deviation of 30. The covariance between B and T is -20.

Note that even though baskets and tags are technically discrete, they happen frequently enough that they can be well modeled by a continuous normal distribution. Recall that a linear combination of two normally distributed variables remains normal.

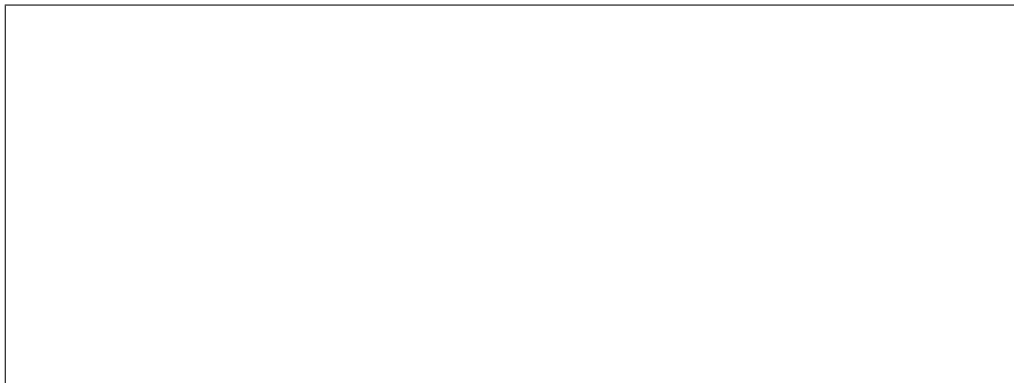
- (a) What is the expected value of the Aardvarks’ **total score** per game? (2 points)

- (b) What is the standard deviation of the Aardvark’s **total score** per game? (2 points)

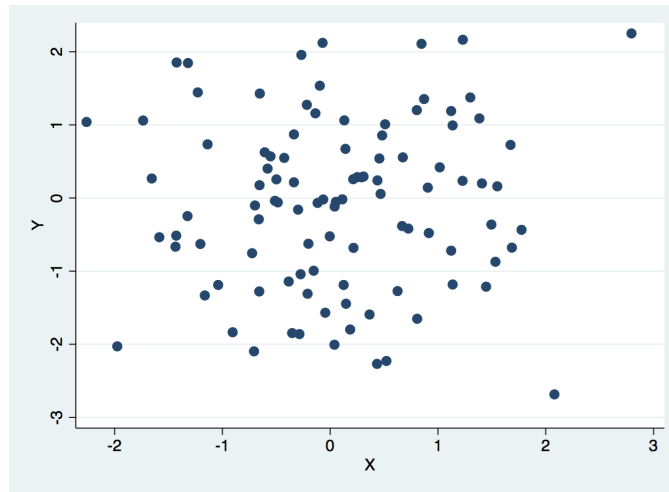
- (c) What is the probability the Aardvarks score more than 40 **baskets** this game? (*3 points*)



- (d) What is the probability the Aardvarks end up with a **negative total score** this game?
(*3 points*)



4. (4 points) Consider the following scatter plot of two random variables, X and Y .



(a) Based on the figure, would you say that $Cov(X, Y)$ is positive, negative, or zero? Justify your answer briefly for full credit. (2 points)

(b) Based on the figure and your previous answer, can you say that X and Y are statistically dependent, statistically independent, or is there not enough information? Justify your answer briefly for full credit. (2 points)

