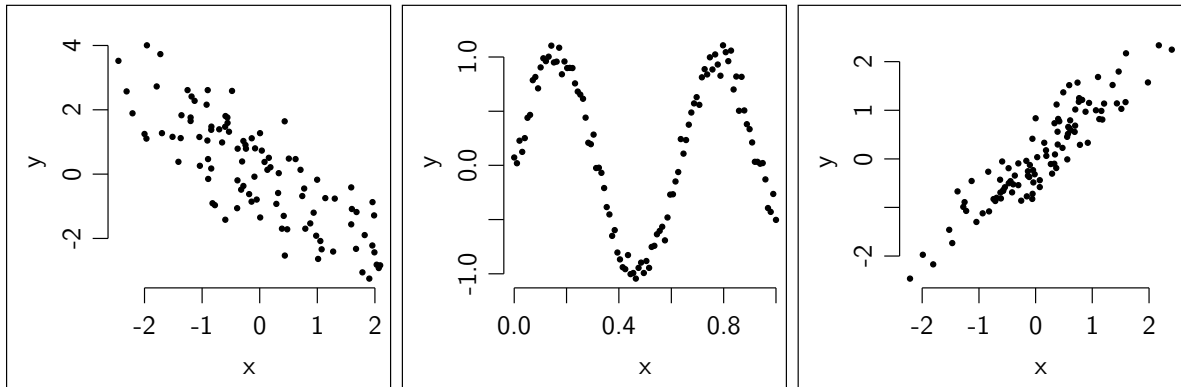


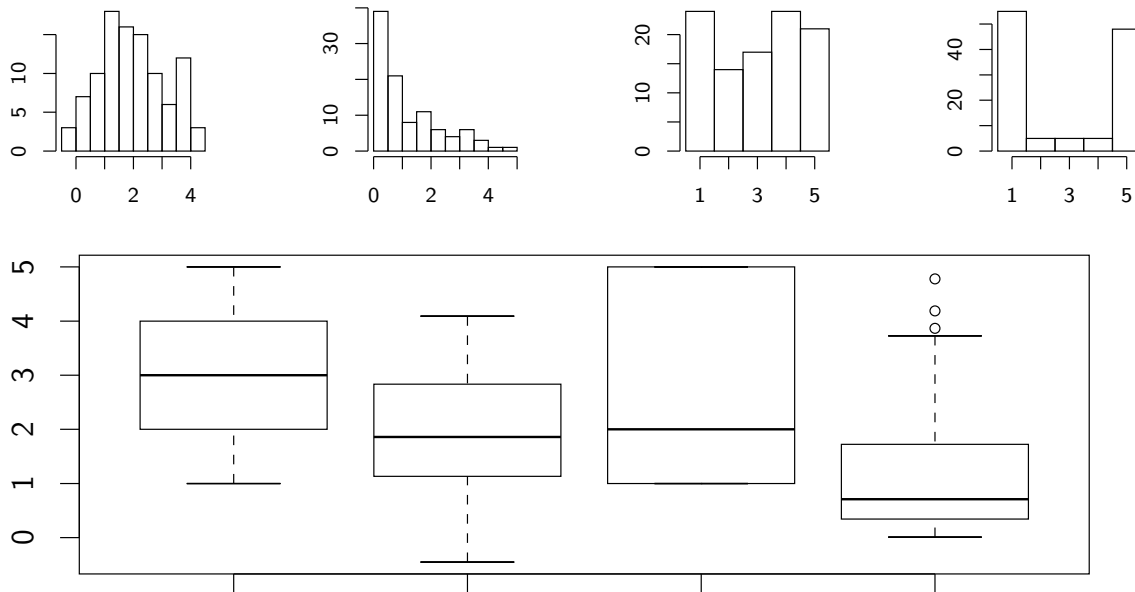
1. (1-R4) Suppose there are 12 lab animals that can be used for the testing of the effectiveness of three treatments. A standard procedure is to divide the 12 animals randomly into three groups of 4, and to apply treatment A to one group, B to another, and C to the third. Find the number of distinct ways of assigning animals to treatment groups.
2. Two litters of mice have been born, one with two brown-haired and one gray-haired (litter 1), and the other with three brown-haired and two gray-haired (litter 2). We select a litter at random, and then select a mouse at random from that litter. What's the probability that the mouse chosen is brown-haired? Given that a brown-haired mouse was selected, what's the probability it came from litter 1?
3. (There will be a question about recognizing common distributions, as on the second exam.)
4. Let $X \sim \text{Poi}(\lambda)$, and $Y|(X = k) \sim \text{Bin}(k, p)$.
 - a) Find $P(X = 1, Y = 0)$.
 - b) Find $P(X = 1, Y = 2)$.
 - c) Find $E(Y)$.
 - d) Are X and Y independent? Why or why not?
5. (5-R16) Given that X has the cdf $F(x) = 1 - 0.9e^{-x}$ for $x \geq 0$ and $P(X < 0) = 0$, find
 - a) $P(X = 2)$.
 - b) $P(X = 0)$.
 - c) $P(X > 2)$.
6. Let X, Y , and Z be independent $\text{Unif}(0, 1)$ random variables. Find
 - a) $E(2X + Y - Z)$.
 - b) $\text{Var}(2X + Y - Z)$.
 - c) $\text{Cov}(2X + Y - Z, X - Z)$.
7. The lifetime (measured in hours) of a certain electronic device is a random variable, denoted by X , with pdf $f(x) = 10/x^2$ for $x > 10$ and 0 otherwise.
 - a) Find the cdf and the median.
 - b) Let $Y = 1/X$. Find the cdf of Y .
 - c) Among 1000 tubes, on average, how many will function for at least 15 hours?
8. Let $X \sim N(4, 4)$. Find $P(0 < X < 8)$ (using a table). Give the distribution of $2(X - 1)$. Give the distribution of $Y = ((X - 4)/2)^2$. Find $P(Y < 4)$ (using a table).
9. Let the joint distribution for X and Y be uniform on the region where $0 < X < 1$ and $0 < Y < X + 1$.
 - a) What is the conditional distribution of $X|(Y = 1/2)$? of $X|(Y = 3/2)$?
 - b) What is the marginal distribution of Y ? The expected value of Y ?
 - c) Are X and Y independent?
10. X and Y are independent, and both have the mgf e^{2t+8t^2} . Use this to find the variance of $Z = X + Y$.

11. Scatterplots and sample correlations are below for three datasets. Which scatterplot corresponds with which correlation?



The three sample correlations are -0.09, -0.82, and 0.92.

12. Match the histogram with the corresponding boxplot.



13. (Bonus) At your family holiday gathering, you tell someone you took “Theory of Statistics I” this past semester. To your surprise, they reply, “That sounds interesting, tell me about it!” What do you tell them? That is, summarize in a few sentences what you learned in this class, using everyday language.