Homework 6: The Binomial Random Variable

1. §3.1, #2, 9.

2. In a local lumberyard, 10% of all boards are warped, twisted, or otherwise unusable. Suppose that a customer buys 50 boards. Let X be the number of usable boards among the 50. Find the probability function $f_X(x)$.

3. Doomsday Airlines has two dilapidated airplanes, one with two engines, and the other with four. Each plane will land safely only if at least half of its engines are working. Each engine on each aircraft operates independently and each has probability $p = 0.4$ of failing. Assuming you wish to maximize your survival probability, which plane should you fly on?

4. If a family has four children, is it more likely that they will have two boys and two girls or three of on sex and one of the other? Assume that the probability of a child being a girl is 1/2.

5. A particle moves along the x-axis begining at 0. It moves one integer step to the left or right, with a move to the right being three times as likely as a move to the left. What is the p.f. of its position after six steps? What is the probability that after six steps the particle is back at where it started?

6. Replicants are synthetic, robotic beings designed to look indistinguishable from humans. In the near future, 20% of the population will be replicants. The Voight-Kampff test (VK test for short) is used to distinguish replicants from humans. A human has a 90% chance of giving the correct response to a question on a VK test, whereas a replicant only has a 60% chance. On a 10 question test, Leon gives the correct response to 6 questions. What is the probability that Leon is a replicant?