Answers to homework

Chapter 2

Section 2.4 46 , 50, 58,63

46. Let A be that the individual is more than 6 feet tall. Let B be that the individual is a professional basketball player. Then $P(A|B)$ = the probability of the individual being more than 6 feet tall, knowing that the individual is a professional basketball player, while $P(B|A)$ = the probability of the individual being a professional basketball player, knowing that the individual is more than 6 feet tall. $P(A|B)$ will be larger. Most professional basketball players are tall, so the probability of an individual in that reduced sample space being more than 6 feet tall is very large. On the other hand, the number of individuals that are pro basketball players is small in relation to the number of males more than 6 feet tall.

50.

a. $P(\mathbf{M} \cap \mathbf{LS} \cap \mathbf{PR}) = .05$, directly from the table of probabilities.

b. $P(\mathbf{M} \cap \mathbf{Pr}) = P(\mathbf{M} \cap \mathbf{LS} \cap \mathbf{PR}) + P(\mathbf{M} \cap \mathbf{SS} \cap \mathbf{PR}) = .05 + .07 = .12$.

c. $P(\mathbf{SS})$ = sum of 9 probabilities in the SS table = .56. $P(\mathbf{LS}) = 1 - .56 = .44$.

d. From the two tables, $P(\mathbf{M}) = .08 + .07 + .12 + .10 + .05 + .07 = .49$. $P(\mathbf{Pr}) = .02 + .07 + .07 + .02 + .05 + .02 = .25$.

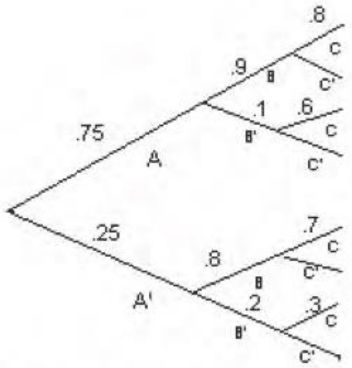
e. $P(\mathbf{M}|\mathbf{SS} \cap \mathbf{PI}) = \dfrac{P(\mathbf{M} \cap \mathbf{SS} \cap \mathbf{PI})}{P(\mathbf{SS} \cap \mathbf{PI})} = \dfrac{.08}{.04 + .08 + .03} = .533$.

f. $P(\mathbf{SS}|\mathbf{M} \cap \mathbf{PI}) = \dfrac{P(\mathbf{SS} \cap \mathbf{M} \cap \mathbf{PI})}{P(\mathbf{M} \cap \mathbf{PI})} = \dfrac{.08}{.08 + .10} = .444$. $P(\mathbf{LS}|\mathbf{M} \cap \mathbf{PI}) = 1 - P(\mathbf{SS}|\mathbf{M} \cap \mathbf{PI}) = 1 - .444 = .556$.

58. $P(A \cup B \mid C) = \dfrac{P[(A \cup B) \cap C)}{P(C)} = \dfrac{P[(A \cap C) \cup (B \cap C)]}{P(C)} = \dfrac{P(A \cap C) + P(B \cap C) - P(A \cap B \cap C)}{P(C)} = P(A \mid C) + P(B \mid C) - P(A \cap B \mid C)$

63

a.



b. From the top path of the tree diagram, $P(A \cap B \cap C) = (.75)(.9)(.8) = .54$.

c. Event $B \cap C$ occurs twice on the diagram: $P(B \cap C) = P(A \cap B \cap C) + P(A' \cap B \cap C) = .54 + (.25)(.8)(.7) = .68$.

d. $P(C) = P(A \cap B \cap C) + P(A' \cap B \cap C) + P(A \cap B' \cap C) + P(A' \cap B' \cap C) = .54 + .045 + .14 + .015 = .74$.

e. Rewrite the conditional probability first: $P(A \mid B \cap C) = \dfrac{P(A \cap B \cap C)}{P(B \cap C)} = \dfrac{.54}{.68} = .7941$.