# HW chapter 2

A

2.4)

46) A= individual is more than 6 feet tall

B= individual is a professional basketball player

$P(A|B)$= probability of the individual being more than 6 feet tall, knowing that the individual is prof. player

$P(B|A)$= probability of the individual being a professional player, knowing that they are taller than 6 feet

$P(A|B) > P(B|A)$ most prof. player are tall but not all tall people are prof. player.

50) a) $P(M \cap LS \cap PR) = 0.05$ directly from the table of probability

b) $P(M \cap Pr) = P(M \cap LS \cap PR) + P(M \cap SS \cap PR) = 0.05 + 0.07$
$= 0.12$

c) $P(SS) =$ sum of 9 probability in the ss table
$= 0.56$

$P(LS) = 1 - P(ss) = 0.44$

d) $P(M) = 0.08 + 0.07 + 0.12 + 0.1 + 0.05 + 0.07 = 0.49$

$P(Pr) = 0.02 + 0.07 + 0.07 + 0.02 + 0.05 + 0.02 = 0.25$

e) $P(M | ss \cap PI) = \dfrac{P(M \cap SS \cap PI)}{P(SS \cap PI)} = \dfrac{0.08}{0.04+0.08+0.03} = 0.533$

f) $P(SS | M \cap PI) = \dfrac{P(SS \cap M \cap PI)}{P(M \cap PI)} = \dfrac{0.08}{0.08+0.1} = 0.444$

$P(LS | M \cap PI) = 1 - P(SS | M \cap PI) = 1 - 0.444 = 0.556$

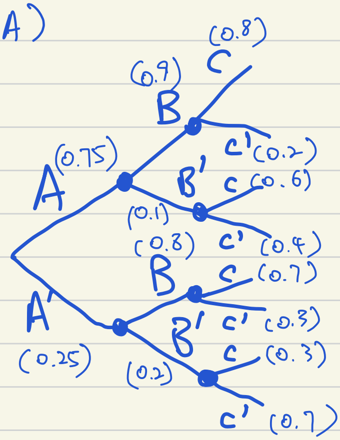
58) $P(A \cup B \mid C) = \dfrac{P[(A \cup B) \cap C]}{P[C]}$

$= \dfrac{P[(A \cap C) \cup (B \cap C)]}{P(C)}$

$= \dfrac{P(A \cap C) + P(B \cap C) - P(A \cap B \cap C)}{P(C)}$

$= P(A)$

A)




B) $P(A \cap B \cap C) = 0.75 \cdot 0.9 \cdot 0.8$
$= 0.54$

c) $P(B \cap C) = P(A \cap B \cap C) + P(A' \cap B \cap C)$
$= 0.54 + 0.25 \times 0.8 \times 0.7 = 0.68$

d) $P(C) = P(A \cap B \cap C) + P(A' \cap B \cap C)$
$+ P(A \cap B' \cap C) + P(A' \cap B' \cap C)$
$= 0.54 + 0.045 + 0.14 + 0.015$
$= 0.74$

e) $P(A \mid B \cap C) = \dfrac{P(A \cap B \cap C)}{P(B \cap C)} = \dfrac{0.54}{0.68}$
$= 0.7941$

2.5)

71) a) $P(B' | A') = 1 - 0.7 = 0.3$

b) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 0.4 + 0.7 - 0.4 \times 0.7$

$= 0.82$

c) $P(AB' | A \cup B) = \dfrac{P[AB' \cap (A \cup B)]}{P(A \cup B)}$

$= \dfrac{P(AB')}{P(A \cup B)}$

$= \dfrac{P(A)P(B')}{P(A \cup B)}$

$= \dfrac{(0.4)(1-0.7)}{0.82}$

$= \dfrac{0.12}{0.82}$

$= 0.146$

A

72) $P(A_1 \cap A_2) = 0.11$ when $P(A_1)P(A_2) \Rightarrow \therefore$ not independent

$P(A_1 \cap A_3) = 0.05$ when $P(A_1)P(A_3) \Rightarrow \therefore$ not independent

$P(A_2 \cap A_3) = 0.07$, $P(A_1) \& P(A_3) = 0.07$ $\Rightarrow$ they're equal, so is independent

80) $A_i$ = component $i$ works, $i = \{1, 2, 3, 4\}$

system work when $(A_1 \cup A_2) \cup (A_3 \cap A_4)$

$P(A_1 \cup A_2) = P(A_1) + P(A_2) - P(A_3 \cap A_4) = 0.9 + 0.9 - 0.9 \times 0.9 = 0.99$

$P(A_3 \cap A_4) = 0.9 \times 0.9 = 0.81$

$P[(A_1 \cup A_2) \cup (A_3 \cap A_4)] = P(A_1 \cup A_2) + P(A_3 \cap A_4) - P[(A_1 \cup A_2) \cap (A_3 \cap A_4)]$

$= P(A_1 \cup A_2) + P(A_3 \cap A_4) - P(A_1 \cup A_2) \cdot P(A_3 \cap A_4)$

$= 0.99 + 0.81 - 0.99 \times 0.81$

$= 0.99$[illegible]

84) $A_i$ = vehicle $i$ passes inspection. $i = \{1, 2, 3\}$, $x$ = number of passes

a) $P(A_1 \cap A_2 \cap A_3) = 0.7 \times 0.7 \times 0.7 = 0.343$

b) $1 - 0.343 = 0.657$

c) $P[(A_1 \cap A_2' \cap A_3') \cup (A_1' \cap A_2 \cap A_3') \cup (A_1' \cap A_2' \cap A_3)]$

$= 0.189$

d) $P(x \leq 1) = P(x=0) + P(x=1)$

$= P(x=0) + 0.189$

$= P(A_1' \cap A_2' \cap A_3') + 0.189$

$= 0.027 + 0.189$

$= 0.216$

e) $P(x \geq 1) = 1 - P(x=0)$

$= 1 - 0.027$

$= 0.973$

$P(A_1 \cap A_2 \cap A_3 \mid A_1 \cup A_2 \cup A_3)$

$= \dfrac{P[(A_1 \cap A_2 \cap A_3) \cap (A_1 \cup A_2 \cup A_3)]}{P(A_1 \cup A_2 \cup A_3)} = \dfrac{P(A_1 \cap A_2 \cap A_3)}{P(A_1 \cup A_2 \cup A_3)}$

$= \dfrac{0.343}{0.973} = 0.3525$

3.1)

4) • $X$ can be 2, 3, 4, 5
• $X = 5$, outcome = 15213
• $X = 4$, outcome = 44074
• $X = 3$, outcome = 90022

5) No.
$I = 1$ if the experiment stop at most 5 tosses.
$I = 0$ for other situations. The sample space is fininite, but
$I$ has only two possible values

8) The possible values are $Y = \{3, 4, 5, 6, 7 \cdots\}$

$y = $
3 : SSS
4 : FSSS
5 : FFSSS, SFSSS
6 : SSFSSS, SFFSSS, FSFSSS, FFFSSS
7 : SSFFSSS, SFSFSSS, SFFFSSS, FSSFSSS, FSFFSSS, FFSFSSS, FFFFSSS

10) a) $T = i$, where $(0 \leq i \leq 10)$

b) $X = i$, where $(-4 \leq i \leq 6)$

c) $U = i$, where $(0 \leq i \leq 6)$

d) $Z = i$, where $(0 \leq i \leq 2)$

3.2)

12)

a) $P(Y \leq 50) = 0.05 + 0.1 + 0.12 + 0.14 + 0.25 + 0.17 = 0.83$

b) $1 - 0.83 = 0.17$

c) more than 49 people are not needed for 1st passenger

$P(Y \leq 49) = 0.05 + 0.1 + 0.12 + 0.14 + 0.25 = 0.66$

more than 47 people are not needed for 3rd passenger

$P(Y \leq 47) = 0.05 + 0.1 + 0.12 = 0.27$

23)

a) $P(2)$

$= P(X=2)$

$= F(3) - F(2)$

$= 0.39 - 0.19$

$= 0.2$

b) $P(X > 3)$

$= 1 - P(X \leq 3)$

$= 1 - F(3)$

$= 1 - 0.67$

$= 0.33$

c) $P(2 \leq X \leq 5)$

$= F(5) - F(1)$

$= 0.92 - 0.19$

$= 0.78$

d) $P(2 < X < 5)$

$= P(2 < X \leq 4) = F(4) - F(2) = 0.92 - 0.39 = 0.53$

25) $P(0)$

$= P(Y=0)$

$= P(B \text{ first})$

$= p$

$P(1)$

$= P(Y=1)$

$= P(G, \text{ then } B)$

$= (1-p)p$

$P(2)$

$= P(Y=2)$

$= P(GGB)$

$= (1-p)^2 p$

$P(y)$

$= P(y\ Gs, \text{ then } B)$

$= (1-p)^y p$ for $y = 0, 1, 2, \ldots$