Stats 330 Homework 1

Adam Hammes

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Problem 1

(a) Let hth denote the results of flipping a coin three times and getting a heads, then a tails, then a heads in that order. Ω then consists of the following:

- hhh
- hht
- hth
- htt
- thh
- tht
- tth
- ttt

(b) i. $A = \{hhh,\ hht,\ hth,\ thh\}$

ii. $B = \{hhh,\ hht\}$

iii. $C = \{hht,\ htt,\ tht,\ ttt\}$

(c) i. $\overline{A} = \{htt,\ tht,\ tth,\ ttt\}$

ii. $A \cap C = \{hht\}$

iii. $A \cup C = \{hhh,\ hht,\ hth,\ thh,\ htt,\ tht,\ ttt\}$

Problem 2

(a)

- ccc
- ccs

- csc
- css
- scc
- scs
- ssc
- sss

(b) Since all outcomes are equally likely, and only one of the eight possible outcomes results in the commuter not stopping, the probability is $\frac{1}{8} = 0.125$.

(c) i. $A = \{scc,\ scs,\ ssc,\ sss\}$
ii. $B = \{csc,\ css,\ ssc,\ sss\}$
iii. $\overline{B} = \{ccc,\ ccs,\ scc,\ scs\}$
iv. $A \cup B = \{scc,\ scs,\ ssc,\ sss,\ csc,\ css\}$
v. $A \cap B = \{ssc,\ sss\}$
vi. $A \cap \overline{B} = \{scc,\ scs\}$

Problem 3

(a) $\Omega = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6),$
$(2,1), (2,2), (2,3), (2,4), (2,5), (2,6),$
$(3,1), (3,2), (3,3), (3,4), (3,5), (3,6),$
$(4,1), (4,2), (4,3), (4,4), (4,5), (4,6),$
$(5,1), (5,2), (5,3), (5,4), (5,5), (5,6),$
$(6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$

(b) 0

(c) $\frac{5}{36}$

(d) $\frac{7}{36}$

Problem 4

Let the good computer chips be numbered $1,\ 2,\ 3,\ 4$, and the bad ones $a,\ b$. Then $\Omega = \{$
(1,2), (1,3), (1,4), (1, a), (1, b),
(2, 3), (2, 4), (2, a), (2, b),
(3, 4), (3, a), (3, b), (4, a), (4, b), (a, b) $\}$

Since there is only one way of drawing two bad chips out of the bag, the probability of such an event is $\dfrac{1}{|\Omega|} = \dfrac{1}{15}$.

Problem 5

From the book we have $P(MB) = .4$, $P(HD) = .3$, and $P(MB \cap HD) = .15$. Add the probabilities $P(MB)$ and $P(HD)$, then subtract $P(MB) \cap P(HD)$ to avoid double-counting. This will give us the probability that there *is* a failure. To find the probability that there *isn't* a failure, we subtract the previous probability from 1.

$$1 - (.4 + .3 - .15) = .45$$

Problem 6

(a) $P(\underset{\sim}{\mathrm{F}}) = 1 - P(F) = 1 - .6 = .4$

(b)

$$\begin{aligned} P(\overline{F} \cap \overline{C}) &= 1 - (\ P(F) + P(C) - P(F \cap C\ ) \\ &= 1 - (.7 + .6 - .5) \\ &= .2 \end{aligned}$$

(c)

$$\begin{aligned} P(C - F) &= P(C) - P(C \cup F) \\ &= .7 - .5 \\ &= .2 \end{aligned}$$

(d)

$$\begin{aligned} P(F - C) &= P(F) - P(C \cup F) \\ &= .6 - .5 \\ &= .1 \end{aligned}$$