ECE 139 H.w. 2 Snehith Nayak 3961497

Problem 1

a.

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Total : 36

$P[A_k]$ for k =

$2 = \frac{1}{36}$ $7 = \frac{6}{36}$

$3 = \frac{2}{36}$ $8 = \frac{5}{36}$

$4 = \frac{3}{36}$ $9 = \frac{4}{36}$

$5 = \frac{4}{36}$ $10 = \frac{3}{36}$

$6 = \frac{5}{36}$ $11 = \frac{2}{36}$

$12 = \frac{1}{36}$

$P[B_k]$ for k =

$2 = 1$ $8 = \frac{15}{36}$

$3 = \frac{35}{36}$ $9 = \frac{10}{36}$

$4 = \frac{33}{36}$ $10 = \frac{6}{36}$

$5 = \frac{30}{36}$ $11 = \frac{3}{36}$

$6 = \frac{26}{36}$ $12 = \frac{1}{36}$

$7 = \frac{21}{36}$

b. $P[E \mid B_7] = \frac{P[E \cap B_7]}{P[B_7]} = \frac{9/36}{21/36} = \frac{3}{7} = 42.9\%$

$P[B_7] = 21/36$ $P[E \cap B_7] = 9/36$

c. $P[A_{10} \cup A_{11} \mid B_7] = 5/21$

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d. $P[B_7 \mid E] = 9/18 = 1/2$

e. $P[B_9 \mid B_6] = 10/26 = 5/13$

f. $P[O \cap B_8 \mid B_7] = 6/21$

g. $\frac{6 \times 5}{6 \times 6} = \frac{5}{6} = 83.3\ \%$

Problem 2

$S = \{a, b, c, d\}$

$P[\{a,b\}] = 2/3$

$P[\{a,c\} \mid \{c,d\}] = 1/4$

$P[\{a,d\} \mid \{a,b\}] = 1/2$

$P[\{a,b\}] = P[a] + P[b]$

$P[\{a,c\} \mid \{c,d\}] = \frac{P[\{a,c\} \cap \{c,d\}]}{P[\{c,d\}]} = P[c] = \frac{1}{4}\left[P[c,d]\right]$

$P(\{a,d\} \mid \{a,b\}) = \frac{P[\{a,d\} \cap \{a,b\}]}{P[\{a,b\}]} = \frac{P[a]}{2/3} = \frac{1}{2}$

$P[a] = \frac{1}{2} \times \frac{2}{3} = 1/3$

$P[\{a,b\}] = P[a] + P[b] = \frac{1}{3} + P[b] < \frac{2}{3} \rightarrow P[b] = \frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

$P[c] = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

↳ remaining

$P[D] = \frac{2}{3} \times \frac{3}{4} = \frac{3}{12} = \frac{1}{4}$

$P[A] = 1/3$

$P[B] = 1/3$

$P[C] = 1/12$

$P[D] = 1/4$

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Problem 3

$P[C] = 0.2$
$P[A] = 0.1$

$$P[C \cap A \mid C \cup A] = 0.5$$

a. $P[A \cap C] = 0.5[P(A) + P(C)] = 0.15$

b. $P[A|C] = \frac{P(A \cap C)}{P(C)} = \frac{0.15}{0.2} = \frac{3}{4} = 0.75$

c. $P(C|A) = \frac{P(A \cup C) P(C)}{P(A)} = \frac{0.15 \times 0.2}{0.1} = 0.3$

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Problem 4.

$P[A] + P[B] - 2P[A \cap B]$

only one occurring =

$P(\bar{A} \cap B) \cup (A \cap \bar{B})$

$= P[(\bar{A} \cap B)] + P(A \cap \bar{B})$

$= P[B - (A \cap B)] + P(A - (A \cap B))$

$= P(B) - P(A \cap B) + P[A - (A \cap B)]$

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

$= P(A) + P(B) - 2P(A \cap B)$

Problem 5

$P(A \cap B \cap C) = P[A \mid B \cap C]\, P[B \mid C]\, P[C]$

$= \frac{P[A \cap B \cap C]}{P(B \cap C)} \times \frac{P(B \cap C)}{P(C)} \times P(C)$

$= P[A \cap B \cap C]$

Problem 6

$P(A) = 10^{-3} \quad P(B) = 3 \times 10^{-3} \quad P(B|A) = 6 \times 10^{-3}$

a. $P(A \cap B) =$

$P(B|A) = \frac{P(B \cap A)}{P(A)} = 6 \times 10^{-3} \times 10^{-3}$

$= 6 \times 10^{-6}$

b. $P(A|B) = \frac{P(B|A) \times P(A)}{P(B)} = \frac{6 \times 10^{-6}}{3 \times 10^{-3}} = 2 \times 10^{-3}$

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