Simon Chen

HUDM 4125 Due September 23, 2021

HW 2

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1. Suppose that three fair dice are tossed. Let A_i be the event that a 6 shows on the i^{th} die, $i = 1, 2, 3$. Find $P(A_1 \cup A_2 \cup A_3)$.

2. Two fair dice are tossed. Find the probability that the sum equals 4 *given* that it less than 11.

3. Eight equally qualified marketing assistants are candidates for promotion. Four of them are men and the other four are women. The company will choose randomly to promote six of the eight candidates. What is the probability that all four women will be promoted?

4. Let A and B be two events defined on a sample space S such that

$$P(A \cap \bar{B}) = 0.4,\ P(\bar{A} \cap B) = 0.3, \text{ and } P(\overline{A \cup B}) = 0.2$$

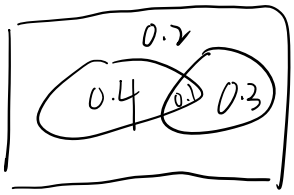
Find the probability that at least one of the two events occurs *given* that at most one occurs.

5. From Devore's textbook: p. 89: Q70

1. $P(A_1 \cup A_2 \cup A_3) = P(\text{at least one 6})$
$= 1 - P(\text{no 6})$
$= 1 - (\frac{5}{6})^3 = 1 - \frac{125}{216} = \frac{91}{216}$

2. Assume $P(A) = \text{sum equals 4} = \frac{1}{12}$
$P(B) = \text{sum less than 11} = \frac{11}{12}$
$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{\frac{3}{36}}{\frac{11}{12}} = \frac{3}{33} = \frac{1}{11}$

3. Company have $\binom{8}{6}$ ways to choose.
All women be choosen in $\binom{4}{4}$ ways
Men have $\binom{4}{2}$ ways
All women to be choosen $\frac{\binom{4}{4}\binom{4}{2}}{\binom{8}{6}} = \frac{1 \times \frac{4!}{2!2!}}{\frac{8!}{6!2!}} = \frac{6}{7\times4} = \frac{3}{14}$

4. 

$P(A \cup B) = 1 - P(\overline{A \cup B}) = 0.8$

$P(A \cap B) = P(A \cup B) - P(\bar{A} \cap B) - P(A \cap \bar{B}) = 0.1$

$P(\text{At most one occurs}) = 1 - P(A \cap B) = 0.9$

$P(\text{At least one occurs} \mid \text{At most one occurs}) = \frac{P(\bar{A} \cap B) + P(A \cap \bar{B})}{P(\text{At most one})}$

$= \frac{0.7}{0.9} = \frac{7}{9}$

5. a) $p = 0.44 \times 0.44 = 0.1936$

b) $p = 0.42 \times 0.42 + 0.1 \times 0.1 + 0.04 \times 0.04 + 0.44 \times 0.44$

$= 0.3816$