STAT 2011

Q1 Six chips 1 2 3 4 5 6

Event A : " second largest chip is a 3 "

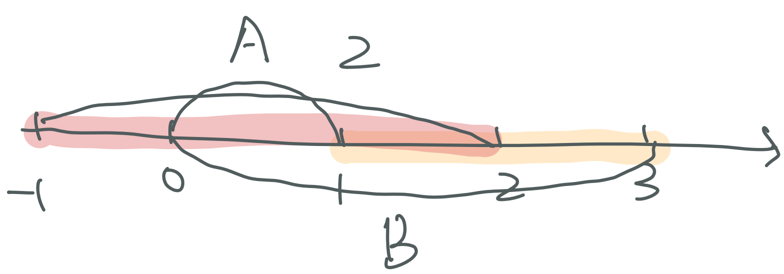
$A = \{ (i\ j\ k) : 1 \le i < j < k \le 6,\ j = 3 \}$

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

Q3

$B = \{ (9,9), (9, \underbrace{\text{not}7 \,\&\, \text{not}9, \cdots}_{n}, 9) \}$

Q4



(a) $A^c \cap B \cap C$

$A^c = R \setminus [0,1]$

$= (-\infty, 0) \cup (1, \infty)$

$A^c \cap B = (1, 3]$

$\underbrace{A^c \cap B}\ \cap C = (1, 2]$

6. (a) $\overset{M}{(A \cap B)^c} = \overset{N}{A^c \cup B^c}$

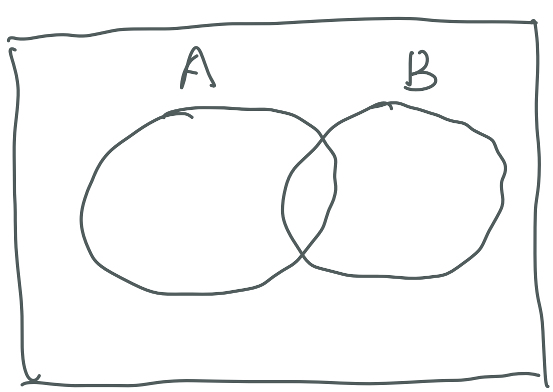
if $s \in (A \cap B)^c$

$s \notin (A \cap B)$

$s \notin A$ or $s \notin B$

$s \in A^c$ or $s \in B^c$

$s \in A^c \cup B^c$ $\quad M \subseteq N$



$N \subseteq M$ if $s \in N$

$s \in A^c \cup B^c$

$s \in A^c$ or $s \in B^c$

$s \notin A$ or $s \notin B$

$s \notin (A \cap B)$

$s \in (A \cap B)^c$ #

$N \subseteq M$

$N = M$

Q 13

K : knows

R : get right

$\mathbb{P}(R \mid \bar{K}) = 0.2$

$\mathbb{P}(K \mid R) = 0.92$

$\mathbb{P}(R \mid K) = 1$

$\mathbb{P}(K)$

$$\mathbb{P}(K \mid R) = \frac{\mathbb{P}(K \cap R)}{\mathbb{P}(R)} = \frac{\mathbb{P}(R \mid K) \cdot \mathbb{P}(K)}{\mathbb{P}(R \mid K) \cdot \mathbb{P}(K) + \mathbb{P}(R \mid \bar{K}) \cdot \mathbb{P}(\bar{K})}$$

$$\frac{\mathbb{P}(K)}{\mathbb{P}(K) + \mathbb{P}(R \mid \bar{K}) \cdot (1 - \mathbb{P}(K))} = 0.92$$

$$\frac{\mathbb{P}(K)}{\mathbb{P}(K) + 0.2 \times (1 - \mathbb{P}(K))} = 0.92$$

$\Rightarrow \mathbb{P}(K) = 0.697$

$20 \times 0.697 = 14$

Q 14 $\mathbb{P}(A) = 1/4$ $\mathbb{P}(B) = 1/8$

(i) $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B)$

$= \frac{1}{4} + \frac{1}{8}$

$= 3/8$

$\mathbb{P}(AB) = \mathbb{P}(A) \cdot \mathbb{P}(B)$

(ii) $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(A \cap B)$

$= \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(A) \cdot \mathbb{P}(B)$

$= \frac{1}{4} + \frac{1}{8} - \frac{1}{4} \times \frac{1}{8}$

$= 11/32$

$\mathbb{P}(A|B)$

15. A_1 1 or 2 on red dice

A_2 : 3, 4, 5 on green

A_3 : total 4, 11, 12

$\mathbb{P}(A_1) = \frac{2}{6} = \frac{1}{3}$

$\mathbb{P}(A_2) = \frac{1}{2}$

$\mathbb{P}(A_3) = \frac{3+2+1}{36}$

$= 1/6$

$\mathbb{P}(A_1 \cap A_2 \cap A_3) = \mathbb{P}(A_1) \cdot \mathbb{P}(A_2) \cdot \mathbb{P}(A_3)$

$i \neq j$ $\mathbb{P}(A_i \cap A_j) \neq \mathbb{P}(A_i) \cdot \mathbb{P}(A_j)$

$\mathbb{P}(A_1 \cap A_2 \cap A_3) = \mathbb{P}($1 on red, 3 on green$)$

$= 1/36$

$\mathbb{P}(A_1 \cap A_2 \cap A_3) = \mathbb{P}(A_1) \cdot \mathbb{P}(A_2) \cdot \mathbb{P}(A_3)$ #.

$\mathbb{P}(A_2 \cap A_3) = \frac{2}{36} = \frac{1}{18}$ $\neq$

$\mathbb{P}(A_2) \cdot \mathbb{P}(A_3) = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$