(1)   A , $0 \leq P(A) \leq 1$

    A^c , $P(A^c) = 1 - P(A)$

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

(2)   A , B

   $A \cap B$

   $A \cup B$

$1°$ $P(A \cap B)$

  ① disjoint ? $P(A \cap B) = 0$

  ② independent ? $P(A \cap B) = P(A)P(B)$

  ③ do we know $P(A)$ and $P(A \cap B^c)$?
      $P(A \cap B) = P(A) - P(A \cap B^c)$

  ④ do we know $P(A)$ and $P(B)$ and $P(A \cup B)$?
    $P(A \cap B) = P(A) + P(B) - P(A \cup B)$

  ⑤ do we know the conditional probs ?

    $P(A \cap B) = P(A) \cdot P(B|A) = P(B) \cdot P(A|B)$

2° $P(A \cup B)$

① disjoint ? $P(A \cup B) = P(A) + P(B)$

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

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

③ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(3) conditional prob

$P(A|B)$

1° def : $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$
(if we know $P(B)$)

2° if we don't know $P(B)$, but we know $P(A^c \cap B)$

then, $P(B) = P(A \cap B) + P(A^c \cap B)$

so $P(A|B) = \dfrac{P(A \cap B)}{P(A \cap B) + P(A^c \cap B)}$

3° $P(A \cap B) = P(A) P(B|A) = P(B) \cdot P(A|B)$

$P(A|B) = \dfrac{P(A) P(B|A)}{P(B)}$