

Conditional Probability:

$P(A|B)$ is the probability of A assuming that B has happened.

- $P(A|B) = \frac{P(A \cap B)}{P(B)}, P(B) \neq 0$

- $P(B|A) = \frac{P(A \cap B)}{P(A)}, P(A) \neq 0$

Example 3.4.2 Page 64

From previous example 3.4.1 Page 63 ,
answer

- suppose we pick a person at random and find he is 18 years or younger (E), what is the probability that this person will be one who has no family history of mood disorders (A)?
- suppose we pick a person at random and find he has family history of mood (D) what is the probability that this person will be 18 years or younger (E)?

Calculating a joint Probability :

- Example 3.4.3. Page 64
- Suppose we pick a person at random from the 318 subjects. Find the probability that he will early (E) and has no family history of mood disorders (A).

Multiplicative Rule:

- $P(A \cap B) = P(A \setminus B)P(B)$
- $P(A \cap B) = P(B \setminus A)P(A)$
- Where,
- $P(A)$: marginal probability of A.
- $P(B)$: marginal probability of B.
- $P(B \setminus A)$: The conditional probability.

Example 3.4.4 Page 65

- From previous example 3.4.1 Page 63 , we wish to compute the joint probability of Early age at onset(E) and a negative family history of mood disorders(A) from a knowledge of an appropriate marginal probability and an appropriate conditional probability.
- Exercise: Example 3.4.5. Page 66
- Exercise: Example 3.4.6. Page 67

Independent Events:

- If A has no effect on B, we said that A,B are independent events.
- Then,
 - 1- $P(A \cap B) = P(B)P(A)$
 - 2- $P(A \setminus B) = P(A)$
 - 3- $P(B \setminus A) = P(B)$

Example 3.4.7 Page 68

- In a certain high school class consisting of 60 girls and 40 boys, it is observed that 24 girls and 16 boys wear eyeglasses . If a student is picked at random from this class ,the probability that the student wears eyeglasses , $P(E)$, is $40/100$ or 0.4 .
- What is the probability that a student picked at random wears eyeglasses given that the student is a boy?
- What is the probability of the joint occurrence of the events of wearing eye glasses and being a boy?

Example 3.4.8 Page 69

- Suppose that of 1200 admission to a general hospital during a certain period of time, 750 are private admissions. If we designate these as a set A, then compute $P(A)$, $P(\bar{A})$.
- Exercise: Example 3.4.9. Page 76

Marginal Probability:

- Definition:
- Given some variable that can be broken down into m categories designated by $A_1, A_2, \dots, A_i, \dots, A_m$ and another jointly occurring variable that is broken down into n categories designated by $B_1, B_2, \dots, B_j, \dots, B_n$, the marginal probability of A_i with all the categories of B. That is,
$$P(A_i) = \sum P(A_i \cap B_j), \quad \text{for all value of } j$$
- Example 3.4.9. Page 76
- Use data of Table 3.4.1, and rule of marginal Probabilities to calculate P(E).

Exercise:

- Page 76-77
- Questions :
- 3.4.1, 3.4.3, 3.4.4
- H.W.
- 3.4.5 , 3.4.7