

#### 4.2 Notes on Probability: The addition rule (OR probabilities)

Two events are mutually exclusive events if they cannot occur at the same time.

When two events A and B are mutually exclusive, the probability that A or B will occur is

$$P(A \text{ or } B) = P(A) + P(B)$$

If A and B are not mutually exclusive, then:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

#### Examples:

1. The distribution of blood types in a certain population is: O (45%), A (40%), B (11%), and AB (4%). If one person is selected at random from this population, what is the probability that the person is blood type A or O?

$P(A \text{ or } O) = P(A) + P(O)$  Ans: 0.85 or 85% Notice that blood types are mutually exclusive.

2. For patients suffering from a specific medical condition, the probability of experiencing a headache (H) is 40%, and the probability of experiencing nausea (N) is 25%. The probability of experiencing both symptoms simultaneously is 15%. What is the probability that a person will experience either a headache or nausea or both?

$P(H \text{ or } N) = P(H) + P(N) - P(H \text{ and } N) = 0.40 + 0.25 - 0.15 = 0.50$  Ans : 0.50 or 50%

3. An insurance company analyzes the probability of two types of claims: home insurance claims and car insurance claims. The probability of a home insurance (A) claim being filed in a year is 10%, and the probability of a car insurance (B) claim being filed is 20%. The probability of both claims being filed is 5%. What is the probability that a policyholder will file either a home insurance claim or a car insurance claim or both in a given year?

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = 0.10 + 0.20 - 0.05 = 0.25$  or 25%