Question

Solve the question by (i) factorial method, (ii) using Venn diagram.
An employer wishes to hire 3 people from a group of 15 applicants, 8 men and 7 women who are equally qualified, to fill the position. If he selects the three at random, what is the probability that

    (i)   all three will be men;

    (ii)   at least one will be a woman?

Solution

(i) $P = \left\{ \dfrac{number\ of\ triples\ of\ men}{number\ of\ triples} \right\} = \dfrac{C_8^3}{C_{15}^3} = \dfrac{8!3!12!}{3!5!15!} = \dfrac{8\cdot7\cdot6}{15\cdot14\cdot13} = \dfrac{8}{65}.$

(ii) Let S denote the set of all possible outcomes for the employer's selection. Let A denote the subset of outcomes corresponding to the selection of three men and B the subset corresponding to the selection of at least one woman.
$\bar{B} = \{no\ women\} = A \Rightarrow A \cup B = S.$

$$P(B) = 1 - P(A) = 1 - \frac{8}{65} = \frac{57}{65}.$$

Answer: (i) $\dfrac{8}{65}$; **(ii)** $\dfrac{57}{65}$.