

RD Sharma
Solutions
Class 11 Maths
Chapter 16
Ex 16.3

Q1(i)

We have,

$$\begin{aligned} {}^8P_3 &= \frac{8!}{(8-3)!} \left[\because {}^nP_r = \frac{n!}{(n-r)!} \right] \\ &= \frac{8 \times 7 \times 6 \times 5!}{5!} \\ &= 336 \end{aligned}$$

Hence, ${}^8P_3 = 336$

Q1(ii)

We have,

$$\begin{aligned} {}^{10}P_4 &= \frac{10!}{(10-4)!} \left[\because {}^nP_r = \frac{n!}{(n-r)!} \right] \\ &= \frac{10!}{6!} \\ &= \frac{10 \times 9 \times 8 \times 7 \times 6!}{6!} \\ &= 5040 \end{aligned}$$

$\therefore {}^{10}P_4 = 5040$

Q1(iii)

We have,

$$\begin{aligned} {}^6P_6 &= \frac{6!}{(6-6)!} \left[\because {}^nP_r = \frac{n!}{(n-r)!} \right] \\ &= \frac{6!}{0!} \\ &= \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{1} \quad [\because 0! = 1] \\ &= 720 \end{aligned}$$

Hence, ${}^6P_6 = 720$

Q1(iv)

We have,

$$\begin{aligned}P(6, 4) &= \frac{6!}{(6-4)!} & \left[\because {}^n P_r &= \frac{n!}{(n-r)!} \right] \\&= \frac{6!}{2!} \\&= \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{2!} \\&= 360\end{aligned}$$

Hence, $P(6, 4) = 360$

Q2.

We have,

$$P(5, r) = P(6, r-1)$$

$$\Rightarrow \frac{5!}{(5-r)!} = \frac{6!}{[6-(r-1)]!} \quad \left[\because {}^n P_r = \frac{n!}{(n-r)!} \right]$$

$$\Rightarrow \frac{1}{(5-r)!} = \frac{6}{[7-r)!}$$

$$\Rightarrow \frac{1}{(5-r)!} = \frac{6}{(7-r) \times (7-r-1)(7-r-2)!}$$

$$\Rightarrow \frac{1}{(5-r)!} = \frac{6}{(7-r) \times (6-r)(5-r)!}$$

$$\Rightarrow 1 = \frac{6}{(7-r) \times (6-r)}$$

$$\Rightarrow (6-r) \times (7-r) = 6$$

$$\Rightarrow 42 - 6r - 7r + r^2 = 6$$

$$\Rightarrow r^2 - 12r + 42 - 6 = 0$$

$$\Rightarrow r^2 - 12r + 36 = 0$$

$$\Rightarrow r^2 - 9r - 4r + 36 = 0$$

$$\Rightarrow r(r-9) - 4(r-9) = 0$$

$$\Rightarrow (r-9)(r-4) = 0$$

$$\Rightarrow r = 4 \quad \left[\begin{array}{l} \because r \leq n \\ \therefore r-9 \neq 0 \end{array} \right]$$

Hence, $r = 4$

Q3.

We have,

$${}^5P(4, n) = 6. \quad P(5, n-1)$$

$$\Rightarrow 5 \times \frac{4!}{(4-n)!} = 6 \times \frac{5!}{[5-(n-1)]!} \quad \left[\because {}^nP_r = \frac{n!}{(n-r)!} \right]$$

$$\Rightarrow 5 \times \frac{4!}{(4-n)!} = \frac{6 \times 5 \times 4!}{[5-n+1]!}$$

$$\Rightarrow \frac{1}{(4-n)!} = \frac{6}{[6-n]!}$$

$$\Rightarrow \frac{1}{(4-n)!} = \frac{6}{(6-n)(6-n-1)(6-n-2)!}$$

$$\Rightarrow \frac{1}{(4-n)!} = \frac{6}{(6-n)(5-n)(4-n)!}$$

$$\Rightarrow \frac{(6-n)(5-n)(4-n)!}{(4-n)!} = 6$$

$$\Rightarrow (6-n)(5-n) = 6$$

$$\Rightarrow 30 - 6n - 5n + n^2 = 6$$

$$\Rightarrow n^2 - 11n + 30 = 6$$

$$\Rightarrow n^2 - 11n + 24 = 0$$

$$\Rightarrow n^2 - 8n - 3n + 24 = 0$$

$$\Rightarrow n(n-8) - 3(n-8) = 0$$

$$\Rightarrow (n-8)(n-3) = 0$$

$$\Rightarrow n-3 = 0 \quad \left[\begin{array}{l} \because n \leq 4 \\ \therefore n \neq 8 \end{array} \right]$$

$$\Rightarrow n = 3$$

Hence, $n = 3$

We have,

$${}^n P (n, 5) = 20. \quad {}^n P (n, 3)$$

$$\Rightarrow \frac{n!}{(n-5)!} = 20 \times \frac{n!}{(n-3)!}$$

$$\Rightarrow \frac{1}{(n-5)!} = \frac{20}{(n-3)(n-3-1)(n-3-2)!}$$

$$\Rightarrow \frac{1}{(n-5)!} = \frac{20}{(n-3)(n-4)(n-5)!}$$

$$\Rightarrow \frac{(n-3)(n-4)(n-5)!}{(n-5)!} = 20$$

$$\Rightarrow (n-3)(n-4) = 20$$

$$\Rightarrow n^2 - 4n - 3n + 12 = 20$$

$$\Rightarrow n^2 - 7n - 8 = 0$$

$$\Rightarrow n^2 - 8n + 1n - 8 = 0$$

$$\Rightarrow n(n-8) + 1(n-8) = 0$$

$$\Rightarrow (n-8)(n+1) = 0$$

$$\Rightarrow n-8 = 0 \quad [\because n \neq -1]$$

$$\Rightarrow n = 8$$

Hence, $n = 8$

Q5.

We have,

$${}^n P_4 = 360$$

$$\Rightarrow \frac{n!}{(n-4)!} = 360$$

$$\Rightarrow \frac{n(n-1)(n-2)(n-3)(n-4)!}{(n-4)!} = 360$$

$$\Rightarrow n(n-1)(n-2)(n-3) = 6 \times 5 \times 4 \times 3$$

$$\Rightarrow n = 6 \quad [13y \text{ comparing}]$$

Hence, $n = 6$

Q6.

We have,

$$P(9, r) = 3024$$

$$\Rightarrow \frac{9!}{(9-r)!} = 3024 \quad \left[\because {}^n P_r = \frac{n!}{(n-r)!} \right]$$

$$\Rightarrow \frac{1}{(9-r)!} = \frac{3024}{9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}$$

$$\Rightarrow \frac{1}{(9-r)!} = \frac{336}{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}$$

$$\Rightarrow \frac{1}{(9-r)!} = \frac{42}{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}$$

$$\Rightarrow \frac{1}{(9-r)!} = \frac{1}{5 \times 4 \times 3 \times 2 \times 1}$$

$$\Rightarrow \frac{1}{(9-r)!} = \frac{1}{5!}$$

$$\Rightarrow (9-r)! = 5!$$

$$\Rightarrow 9-r = 5$$

$$\Rightarrow 9-5 = r$$

$$\Rightarrow 4 = r$$

$$\Rightarrow r = 4$$

Hence, $r = 4$