RD Sharma Solutions Class 11 Maths Chapter 16 Ex 16.3

Q1(i)

We have,

$${}^{8}P_{3} = \frac{8!}{(8-3)!} \quad \left[\because\ {}^{n}P_{r} = \frac{n!}{(n-r)!}\right]$$

$$= \frac{8\times7\times6\times5!}{5!}$$

$$= 336$$

Hence, ${}^{8}P_{3} = 336$

Q1(ii)

We have,

$${}^{10}P_{4} = \frac{10!}{(10-4)!} \quad \left[\because\ {}^{n}P_{r} = \frac{n!}{(n-r)!}\right]$$

$$= \frac{10!}{6!}$$

$$= \frac{10\times9\times8\times7\times6!}{6!}$$

$$= 5040$$

$\therefore\ {}^{10}P_{4} = 5040$

Q1(iii)

We have,

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

$$= \frac{6!}{0!}$$

$$= \frac{6\times5\times4\times3\times2\times1}{1} \quad [\because\ 0! = 1]$$

$$= 720$$

Hence, ${}^{6}P_{6} = 720$

Q1(iv)

We have,

$$P(6,4) = \frac{6!}{(6-4)!} \qquad \left[\because \; {}^nP_r = \frac{n!}{(n-r)!}\right]$$

$$= \frac{6!}{2!}$$

$$= \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{2!}$$

$$= 360$$

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

Q2.

We have,

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

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

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

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

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

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

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

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

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

$$\Rightarrow \quad r^2 - 13r + 36 = 0$$

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

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

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

$$\Rightarrow \quad r = 4 \qquad \left[\begin{array}{l} \because \; r \le n \\ \therefore \; r - 9 \ne 0 \end{array}\right]$$

Hence, $r = 4$

Q3.

We have,

$$5P(4,n) = 6.\ P(5,n-1)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow \quad n = 3$$

Hence, $n = 3$

Q4.

We have,

$$P(n,5) = 20.\ P(n,3)$$

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow \quad n = 8$$

Hence, $n = 8$

Q5.

We have,

$$^nP_4 = 360$$

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

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

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

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

Hence, $n = 6$

Q6.

We have,

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

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

$$\Rightarrow \quad \frac{1}{(9-r)!} = \frac{3024}{9\times8\times7\times6\times5\times4\times3\times2\times1}$$

$$\Rightarrow \quad \frac{1}{(9-r)!} = \frac{336}{8\times7\times6\times5\times4\times3\times2\times1}$$

$$\Rightarrow \quad \frac{1}{(9-r)!} = \frac{42}{7\times6\times5\times4\times3\times2\times1}$$

$$\Rightarrow \quad \frac{1}{(9-r)!} = \frac{1}{5\times4\times3\times2\times1}$$

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

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

$$\Rightarrow \quad 9-r = 5$$

$$\Rightarrow \quad 9-5 = r$$

$$\Rightarrow \quad 4 = r$$

$$\Rightarrow \quad r = 4$$

Hence, $r = 4$