Permutations Ex 16.3 Q2

We have,

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow \quad r = 4 \qquad \begin{bmatrix} \because \ r \le n \\ \therefore \ r - 9 \ne 0 \end{bmatrix}$$

Hence, $r = 4$

Permutations Ex 16.3 Q3

We have,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow \quad n - 3 = 0 \qquad \begin{bmatrix} \because n \le 4 \\ \therefore n \ne 8 \end{bmatrix}$$

$$\Rightarrow \quad n = 3$$

Hence, $n = 3$

Permutations Ex 16.3 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, $n = 8$

Permutations Ex 16.3 Q5

We have,

$${}^{n}P_4 = 360$$

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

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

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

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

Hence, $n = 6$

*********** END **********