Permutations Ex 16.3 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, $r = 4$

Permutations Ex 16.3 Q7

We have,

$$P(11, r) = P(12, r-1)$$

$$\Rightarrow \quad \frac{11!}{(11-r)!} = \frac{12!}{[12-(r-1)]!} \qquad \left[\because {}^nP_r = \frac{n!}{(n-r)!}\right]$$

$$\Rightarrow \quad \frac{11!}{(11-r)!} = \frac{12 \times 11!}{[12-r+1]!}$$

$$\Rightarrow \quad \frac{1}{(11-r)!} = \frac{12}{[13-r]!}$$

$$\Rightarrow \quad \frac{1}{(11-r)!} = \frac{12}{(13-r)(13-r-1)(13-r-2)!}$$

$$\Rightarrow \quad \frac{1}{(11-r)!} = \frac{12}{(13-r)(12-r)(11-r)!}$$

$$\Rightarrow \quad \frac{(13-r)(12-r)(11-r)}{(11-r)!} = 12$$

$$\Rightarrow \quad (13-r)(12-r) = 12$$

$$\Rightarrow \quad 156 - 13r - 12r + r^2 = 12$$

$$\Rightarrow \quad r^2 - 25r + 156 - 12 = 0$$

$$\Rightarrow \quad r^2 - 25r + 144 = 0$$

$$\Rightarrow \quad r^2 - 16r - 9r + 144 = 0$$

$$\Rightarrow \quad r(r-16) - 9(r-16) = 0$$

$$\Rightarrow \quad (r-16)(r-9) = 0$$

$$\Rightarrow \quad r - 9 = 0 \qquad \begin{bmatrix} \because r \le 11 \\ \therefore r \ne 16 \end{bmatrix}$$

$$\Rightarrow \quad r = 9$$

Permutations Ex 16.3 Q8

We have,

$$P(n,4) = 12. \quad P(n,2)$$

$$\Rightarrow \quad \frac{n!}{(n-4)!} = 12 \times \frac{n!}{(n-2)!} \qquad \left[\because \ {}^{n}P_{r} = \frac{n!}{(n-r)!}\right]$$

$$\Rightarrow \quad \frac{1}{(n-4)!} = \frac{12}{(n-2)!}$$

$$\Rightarrow \quad \frac{1}{(n-4)!} = \frac{12}{(n-2)(n-2-1)(n-2-2)!}$$

$$\Rightarrow \quad \frac{1}{(n-4)!} = \frac{12}{(n-2)(n-3)(n-4)!}$$

$$\Rightarrow \quad \frac{(n-2)(n-3)(n-4)!}{(n-4)!} = 12$$

$$\Rightarrow \quad (n-2)(n-3) = 12$$

$$\Rightarrow \quad n^2 - 3n - 2n + 6 = 12$$

$$\Rightarrow \quad n^2 - 5n + 6 - 12 = 0$$

$$\Rightarrow \quad n^2 - 5n - 6 = 0$$

$$\Rightarrow \quad n^2 - 6n + 1n - 6 = 0$$

$$\Rightarrow \quad n(n-6) + 1(n-6) = 0$$

$$\Rightarrow \quad (n-6)(n+1) = 0$$

$$\Rightarrow \quad n - 6 = 0 \qquad [\because n \neq -1]$$

$$\Rightarrow \quad n = 6$$

Hence, $n = 6$

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