

Permutation Combination

Q. ${}^nC_5 = {}^nC_7$, find the value of n .

Sol. ${}^nC_5 = {}^nC_7$

$$\Rightarrow \frac{1}{15(n-5)} = \frac{1}{17(n-7)}$$

$$\Rightarrow \frac{1}{15(n-5)(n-6)(n-7)} = \frac{1}{17(n-7)}$$

$$\Rightarrow \frac{17(n-7) \times \cancel{17}}{15(n-5)(n-6)(n-7)} = \frac{17 \times \cancel{17}}{15(n-5)(n-6)(n-7)}$$

$$\Rightarrow 17 = 15(n-5)(n-6)$$

$$\Rightarrow \frac{17}{15} = (n-5)(n-6)$$

$$\Rightarrow \frac{7 \times 6 \times \cancel{15}}{\cancel{15}} = (n-5)(n-6)$$

$$\Rightarrow 7 \times 6 = (n-5)(n-6)$$

$$\Rightarrow n-5 = 7$$

$$n-6 = 6$$

$$\Rightarrow n = 7+5$$

$$n = 6+6$$

$$\therefore n = 12.$$

Q. ${}^nC_{10} = {}^nC_{12}$ find the value of n . then find nC_5

Sol ${}^nC_{10} = {}^nC_{12}$

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$$\Rightarrow \frac{n!}{10!(n-10)!} = \frac{n!}{12!(n-12)!}$$

$$\Rightarrow \frac{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 \times 11 \times 12 \times 13 \times 14 \times 15 \times 16 \times 17 \times 18 \times 19 \times 20 \times 21 \times 22 \times 23 \times 24 \times 25 \times 26 \times 27 \times 28 \times 29 \times 30 \times 31 \times 32 \times 33 \times 34 \times 35 \times 36 \times 37 \times 38 \times 39 \times 40 \times 41 \times 42 \times 43 \times 44 \times 45 \times 46 \times 47 \times 48 \times 49 \times 50 \times 51 \times 52 \times 53 \times 54 \times 55 \times 56 \times 57 \times 58 \times 59 \times 60 \times 61 \times 62 \times 63 \times 64 \times 65 \times 66 \times 67 \times 68 \times 69 \times 70 \times 71 \times 72 \times 73 \times 74 \times 75 \times 76 \times 77 \times 78 \times 79 \times 80 \times 81 \times 82 \times 83 \times 84 \times 85 \times 86 \times 87 \times 88 \times 89 \times 90 \times 91 \times 92 \times 93 \times 94 \times 95 \times 96 \times 97 \times 98 \times 99 \times 100}{10 \times 11 \times 12 \times 13 \times 14 \times 15 \times 16 \times 17 \times 18 \times 19 \times 20 \times 21 \times 22 \times 23 \times 24 \times 25 \times 26 \times 27 \times 28 \times 29 \times 30 \times 31 \times 32 \times 33 \times 34 \times 35 \times 36 \times 37 \times 38 \times 39 \times 40 \times 41 \times 42 \times 43 \times 44 \times 45 \times 46 \times 47 \times 48 \times 49 \times 50 \times 51 \times 52 \times 53 \times 54 \times 55 \times 56 \times 57 \times 58 \times 59 \times 60 \times 61 \times 62 \times 63 \times 64 \times 65 \times 66 \times 67 \times 68 \times 69 \times 70 \times 71 \times 72 \times 73 \times 74 \times 75 \times 76 \times 77 \times 78 \times 79 \times 80 \times 81 \times 82 \times 83 \times 84 \times 85 \times 86 \times 87 \times 88 \times 89 \times 90 \times 91 \times 92 \times 93 \times 94 \times 95 \times 96 \times 97 \times 98 \times 99 \times 100} = \frac{1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 \times 11 \times 12 \times 13 \times 14 \times 15 \times 16 \times 17 \times 18 \times 19 \times 20 \times 21 \times 22 \times 23 \times 24 \times 25 \times 26 \times 27 \times 28 \times 29 \times 30 \times 31 \times 32 \times 33 \times 34 \times 35 \times 36 \times 37 \times 38 \times 39 \times 40 \times 41 \times 42 \times 43 \times 44 \times 45 \times 46 \times 47 \times 48 \times 49 \times 50 \times 51 \times 52 \times 53 \times 54 \times 55 \times 56 \times 57 \times 58 \times 59 \times 60 \times 61 \times 62 \times 63 \times 64 \times 65 \times 66 \times 67 \times 68 \times 69 \times 70 \times 71 \times 72 \times 73 \times 74 \times 75 \times 76 \times 77 \times 78 \times 79 \times 80 \times 81 \times 82 \times 83 \times 84 \times 85 \times 86 \times 87 \times 88 \times 89 \times 90 \times 91 \times 92 \times 93 \times 94 \times 95 \times 96 \times 97 \times 98 \times 99 \times 100}{12 \times 13 \times 14 \times 15 \times 16 \times 17 \times 18 \times 19 \times 20 \times 21 \times 22 \times 23 \times 24 \times 25 \times 26 \times 27 \times 28 \times 29 \times 30 \times 31 \times 32 \times 33 \times 34 \times 35 \times 36 \times 37 \times 38 \times 39 \times 40 \times 41 \times 42 \times 43 \times 44 \times 45 \times 46 \times 47 \times 48 \times 49 \times 50 \times 51 \times 52 \times 53 \times 54 \times 55 \times 56 \times 57 \times 58 \times 59 \times 60 \times 61 \times 62 \times 63 \times 64 \times 65 \times 66 \times 67 \times 68 \times 69 \times 70 \times 71 \times 72 \times 73 \times 74 \times 75 \times 76 \times 77 \times 78 \times 79 \times 80 \times 81 \times 82 \times 83 \times 84 \times 85 \times 86 \times 87 \times 88 \times 89 \times 90 \times 91 \times 92 \times 93 \times 94 \times 95 \times 96 \times 97 \times 98 \times 99 \times 100}$$

$\Rightarrow$ now by cross multiplication,

$$\Rightarrow 12 = 10(n-10)(n-11)$$

$$\Rightarrow \frac{12}{10} = (n-10)(n-11)$$

$$\Rightarrow \frac{12 \times 11 \times 10}{10} = (n-10)(n-11)$$

$$\Rightarrow n-10 = 12$$

$$n-11 = 11$$

$$\Rightarrow n = 12 + 10$$

$$n = 11 + 11$$

$$\therefore n = 22$$

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$${}^nC_5 = \frac{n!}{5!(n-5)!}$$

$$\Rightarrow \frac{122}{15 \cdot 22-5}$$

$$\Rightarrow \frac{122}{15 \cdot 17}$$

$$\Rightarrow \frac{22 \times 21 \times 20 \times 19 \times 18 \times \cancel{17}}{15 \cdot \cancel{17}}$$

$$\Rightarrow \frac{\overset{11}{\cancel{22}} \times \overset{7}{\cancel{21}} \times \overset{4}{\cancel{20}} \times 19 \times 18}{\cancel{5} \times \cancel{4} \times \cancel{3} \times \cancel{2} \times 1}$$

$$\Rightarrow 71 \times 7 \times 19 \times 18$$

$$\Rightarrow 26,334 \text{ ans.}$$

(8) If ${}^7P_r = 210$, find the value of r .

Sol. $\Rightarrow$

$${}^nP_r = 210$$

$$\Rightarrow {}^7P_r = 210$$

$$\therefore \frac{{}^nP_r}{{}^{n-r}P_r} = {}^nP_r$$

$$\Rightarrow \frac{{}^7P_r}{{}^{7-r}P_r} = 210$$

$$\Rightarrow \frac{{}^7P_r}{{}^{7-r}P_r} = \frac{7 \times 6 \times 5 \times 4}{4}$$

$$\Rightarrow \frac{7 \times 6 \times 5 \times 4}{{}^{7-r}P_r} = \frac{7 \times 6 \times 5 \times 4}{4}$$

$$\Rightarrow 4 = {}^{7-r}P_r$$

$$\Rightarrow r = 7 - 4$$

$$\Rightarrow r = 3$$

$$\Rightarrow r = 3$$

$$\therefore r = 3$$

* Q1 ${}^9P_3 = ?$

given, $n=9$, $r=3$, $P=?$

$${}^nP_r = \frac{n!}{n-r!}$$

$$\Rightarrow \frac{9!}{9-3!} \Rightarrow \frac{9 \times 8 \times 7 \times \cancel{6!}}{\cancel{6}}$$

$\Rightarrow 504$

* Q2 ${}^6P_3 = ?$

given, $n=6$, $r=3$ and $P=?$

$${}^nP_r = \frac{n!}{n-r!}$$

$$\Rightarrow \frac{6!}{6-3!} \Rightarrow \frac{6!}{3!}$$

$$\Rightarrow \frac{6 \times 5 \times 4 \times \cancel{3!}}{\cancel{3!}} = 120$$

Q2

${}^{10}C_3 = 9$

given, $n=10$, $r=3$ and $C=9$

6

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

$$\Rightarrow \frac{10!}{3! \cdot 10-3} \Rightarrow \frac{10!}{3! \cdot 7}$$

$$\Rightarrow \frac{10 \times 9 \times 8 \times \cancel{7}}{3 \times 2 \times 1 \times \cancel{7}}$$

$$\Rightarrow \frac{120}{6}$$

Q6 ${}^nP_4 = 720$, ${}^nC_4 = 120$. find the value of n and r .

$${}^nP_4 = 720$$

$${}^nC_4 = \frac{1}{4!} {}^nP_4$$

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$$\Rightarrow 120 = \frac{1}{r} \times 720$$

$$\Rightarrow 120 = \frac{720}{r}$$

$$\Rightarrow 120 r = 720$$

$$\Rightarrow r = \frac{720}{120}$$

$$\therefore r = 6 \Rightarrow r = 3$$

$$\therefore r = 3$$

putting the value of r in ${}^n P_r$

$$\Rightarrow {}^n P_r = 720 \Rightarrow {}^n P_3 = 720$$

$$\Rightarrow \frac{n!}{n-r!} = 720$$

$$\Rightarrow \frac{n!}{n-3!} = 720$$

$$\Rightarrow n = 720 \times (n-3)$$

$$\Rightarrow n =$$

$$\Rightarrow \frac{n(n-1)(n-2)(n-3)}{4} = 720$$

$$\Rightarrow n(n-1)(n-2) = 720$$

$$\Rightarrow n = 10$$

$$n-1 = 9$$

$$n = 9+1 = 10$$

$$= 10$$

$$n-2 = 8$$

$$n = 8+2$$

$$= 10$$

$$\therefore n = 10$$

9

2. If ${}^n P_4 = 12 \times {}^n P_2$, find n .

$$\Rightarrow {}^n P_4 = 12 \times {}^n P_2$$

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

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

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

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

$$\Rightarrow \begin{aligned} n-2 &= 4 \\ n-3 &= 3 \end{aligned}$$

$$\Rightarrow \begin{aligned} n &= 4+2 \\ n &= 3+3 \end{aligned}$$

$$\therefore n = 6$$