CH # 7 (Ist Year)

CH # 7 TAHIR F.A/F.Sc Part: I

Permutation, Combination and Probability

Factorial Notation:-

If n is a positive integer then the product

$n(n-1)(n-2)(n-3)\ldots\ldots 4\cdot3\cdot2\cdot1$

is called factorial of n and is denoted as $n!$ or $\lfloor n$.

Factorial notation was introduced by christian Krampion 1808.

There are some charactristics of factorial:

(i) $n! = n(n-1)! = n(n-1)(n-2)! = n(n-1)(n-2)(n-3)!$

(ii) $0! = 1$ (iii) $1! = 1$

Exercise: 7.1

Q:1 Evaluate each of the followings:-

(i) $4! = 4\cdot3\cdot2\cdot1$

$4! = 24$ Ans.

(ii) $6! = 6\cdot5\cdot4\cdot3\cdot2\cdot1$

$6! = 720$ Ans.

(iii) $\frac{8!}{7!} = \frac{8\cdot7!}{7!}$

$\frac{8!}{7!} = 8$ Ans.

(iv) $\frac{10!}{7!} = \frac{10\cdot9\cdot8\cdot7!}{7!}$

$\frac{10!}{7!} = 720$ Ans.

(v) $\frac{11!}{4!7!} = \frac{11\cdot10\cdot9\cdot8\cdot7!}{4\cdot3\cdot2\cdot1\cdot7!}$

$\frac{11!}{4!7!} = 330$ Ans.

(vi) $\frac{6!}{3!3!} = \frac{6\cdot5\cdot4\cdot3!}{3\cdot2\cdot1\cdot3!}$

$\frac{6!}{3!3!} = 20$ Ans.

(vii) $\frac{8!}{4!2!} = \frac{8\cdot7\cdot6\cdot5\cdot4!}{2\cdot1\cdot4!}$

$\frac{8!}{4!2!} = 840$ Ans.

(viii) $\frac{11!}{2!4!5!} = \frac{11\cdot10\cdot9\cdot8\cdot7\cdot6\cdot5!}{2\cdot1\cdot4\cdot3\cdot2\cdot1\cdot5!}$

$\frac{11!}{2!4!5!} = 6930$ Ans.

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(ix) $\frac{9!}{2!(9-2)!} = \frac{9!}{2.7!}$

$\frac{9!}{2!(9-2)!} = \frac{9.8.7!}{2.1.7!}$

$\frac{9!}{2!(9-2)!} = 36$ Ans.

(x) $\frac{15!}{15!(15-15)!} = \frac{15!}{15!\,0!}$

$\frac{15!}{15!(15-15)!} = \frac{15!}{15!\,1}$ $(\because 0!=1)$

$\frac{15!}{15!(15-15)!} = 1$ Ans.

(xi) $\frac{3!}{0!} = \frac{3.2.1}{1}$

$\frac{3!}{0!} = 6$ Ans.

(xii) $4!\,0!\,1! = 4.3.2.1.1.1$

$4!\,0!\,1! = 24$ Ans.

Q:2 Write each of the following in factorial form:-

(i) $6.5.4 = \frac{6.5.4.3.2.1}{3.2.1}$

$6.5.4 = \frac{6!}{3!}$ Ans.

(ii) $12.11.10 = \frac{12.11.10.9.8.7.6.5.4.3.2.1}{9.8.7.6.5.4.3.2.1}$

$12.11.10 = \frac{12!}{9!}$ Ans.

(iii) $20.19.18.17 = \frac{20.19.18.17.16!}{16!}$

$20.19.18.17 = \frac{20!}{16!}$ Ans.

$(\because n=(n-1)n!)$

(iv) $\frac{10.9}{2.1} = \frac{10.9.8!}{8!.2.1}$

$\frac{10.9}{2.1} = \frac{10!}{8!\,2!}$ Ans.

(v) $\frac{8.7.6}{3.2.1} = \frac{8.7.6.5!}{5!\,3.2.1}$

$\frac{8.7.6}{3.2.1} = \frac{8!}{5!\,3!}$ Ans.

(vi) $\frac{52.51.50.49}{4.3.2.1} = \frac{52.51.50.49.48!}{4.3.2.1.48!}$

$\frac{52.51.50.49}{4.3.2.1} = \frac{52!}{4!\,48!}$ Ans.

(vii) $n(n-1)(n-2) = \frac{n(n-1)(n-2)(n-3)!}{(n-3)!}$

$n(n-1)(n-2) = \frac{n!}{(n-3)!}$ Ans.

(viii) $(n+2)(n+1)(n) = \frac{(n+2)(n+1)(n)(n-1)!}{(n-1)!}$

$(n+2)(n+1)(n) = \frac{(n+2)!}{(n-1)!}$ Ans.

(ix) $\frac{(n+1)(n)(n-1)}{3.2.1} = \frac{(n+1)(n)(n-1)(n-2)!}{3.2.1\,(n-2)!}$

$\frac{(n+1)(n)(n-1)}{3.2.1} = \frac{(n+1)!}{3!\,(n-2)!}$ Ans.

(x) $n(n-1)(\cdots)(n-r+1) = \frac{n(n-1)\cdots(n-r+1)(n-r)!}{(n-r)!}$

$n(n-1)(n-2)\cdots(n-r+1) = \frac{n!}{(n-r)!}$ Ans.

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