

Factorial

Definition: Factorials are very simple. They're just products, indicated by an exclamation mark. The factorial of an integer $n \geq 0$, written $n!$, is

$$n! = n(n-1)(n-2)(n-3)\dots \times 4 \times 3 \times 2 \times 1$$

In particular, $0! = 1$.

Example 1: Evaluate $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

Example 2: Evaluate $\frac{13!}{9!}$

$$\frac{13!}{9!} = \frac{13 \times 12 \times 11 \times 10 \times \cancel{9!}}{\cancel{9!}} = 13 \times 12 \times 11 \times 10 = 17160$$

Example 3: Simplify $\frac{(n-3)!}{(n-5)!}$

$$\frac{(n-3)!}{(n-5)!} = \frac{(n-3) \times (n-4) \times \cancel{(n-5)!}}{\cancel{(n-5)!}} = (n-3) \times (n-4) = n^2 - 7n + 12$$

Factorial Table

n	$n!$
0	$0! = 1$
1	$1! = 1$
2	$2! = 2$
3	$3! = 6$
4	$4! = 24$
5	$5! = 120$
6	$6! = 720$
7	$7! = 5040$
8	$8! = 40320$
9	$9! = 362880$
10	$10! = 3628800$