

The Factorial Function

You may be familiar with the notation $n!$, pronounced "n factorial", the **product** of all of the positive integers less-than, or equal to n . In mathematical notation it is written like this.

$$\begin{aligned} n! &= \prod_{k=1}^n k \\ &= 1 \cdot 2 \cdot 3 \cdots (n-2) \cdot (n-1) \cdot n \\ &= n(n-1)(n-2) \cdots (2)(1) \end{aligned}$$

Using a **loop**, we can implement the function in C++ like this:

```
int factorial(n)
{
    int result = 1;
    for (int i = 1; i <= n; ++i) { result *= i; }
    return result;
}
```

Algorithms that use loops like this are **iterative**. Let's see how to write the function **recursively**.



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