Functions in C++ — Mastery Pack

■ Code Clinic Edition

1■■ Why Functions Matter

Reusability — Write once, use many times.
Organization — Break complex problems into smaller pieces.
Readability — Makes code easier to understand and maintain.

2■■ Function Anatomy

```
returnType functionName(parameters) { // Code to run return value; //
optional }
int add(int a, int b) { return a + b; }
```

3■■ Declaring & Defining

Declaration (Prototype) — tells the compiler a function exists.

```
int add(int a, int b); // Prototype
```

Definition — the actual code of the function.

4■■ Parameters

Pass by Value (copy)

```
void changeValue(int x) { x = 100; }
```

Pass by Reference (original)

```
void changeValue(int &x;) { x = 100; }
```

Default Parameters

```
int add(int a, int b = 5) { return a + b; }
```

5■■ Return Types

```
string greet(string name) { return "Hello, " + name; }
```

6■■ Function Overloading

```
int square(int x) { return x * x; } double square(double x) { return x *
x; }
```

7■■ Recursion

```
int factorial(int n) { if (n <= 1) return 1; return n * factorial(n - 1);
}
```

Feature	Pass by Value	Pass by Reference
Data Copy	Yes	No (direct link)
Changes affect original?	■ No	■ Yes
Memory Usage	More (copies)	Less

9■■ Progressive Coding Exercises

- Hello Function — Write a function sayHello() that prints 'Hello World'.
- Sum Function — Write sum(int a, int b) that returns their sum.
- Even/Odd Checker — Function that returns true if number is even.
- Swap Values — Use pass by reference to swap two integers.
- Overloading Practice — Create multiply() for int and double.
- Factorial — Recursive function to compute factorial.
- Array Sum — Function that calculates the sum of an integer array.
- Palindrome Checker — Function that checks if a string is a palindrome.
- Mini Calculator — Functions for add, subtract, multiply, divide.
- ATM Simulation — Deposit, Withdraw, Check Balance functions.

■ Mini Project Challenge

Student Score Manager — Write a program that: - Uses a function to input scores for N students. - Uses another function to calculate average. - Uses another function to find the highest score. - Displays results neatly.