# C++ Basics Quick Reference

## Basic Program Structure

```
#include <iostream>
using namespace std;

int main() {
    cout << "Hello, World!" << endl;
    return 0;
}
```

## Essential Headers

```
#include <iostream>    // For input/output operations
#include <string>      // For string operations
#include <vector>      // For dynamic arrays
#include <cmath>       // For mathematical functions
```

## Variable Declarations

```
// Integer types
int age = 25;
long population = 1000000L;
short count = 100;

// Floating point
double price = 19.99;
float temperature = 98.6f;

// Character and string
char grade = 'A';
string name = "John Doe";

// Boolean
bool isActive = true;
bool isComplete = false;
```

## Basic Data Types

- **int**: integers (-2,147,483,648 to 2,147,483,647)
- **double**: double-precision floating point
- **float**: single-precision floating point
- **char**: single character
- **string**: sequence of characters
- **bool**: true or false

## Input and Output

```
// Output
cout << "Hello World" << endl;           // With newline
cout << "Age: " << age << endl;          // With variable
cout << "Price: $" << price;             // Without newline

// Input
int userAge;
string userName;
cout << "Enter your age: ";
cin >> userAge;
cout << "Enter your name: ";
cin >> userName;
```

# Basic Operations

```
// Arithmetic
int sum = 10 + 5;         // 15
int difference = 10 - 3; // 7
int product = 4 * 6;      // 24
int quotient = 15 / 3;    // 5
int remainder = 17 % 5;  // 2

// Comparison
bool isEqual = (5 == 5);     // true
bool isGreater = (10 > 5);   // true
bool isNotEqual = (3 != 8);  // true
```

# Control Structures

```
// If statement
if (age >= 18) {
    cout << "Adult" << endl;
} else {
    cout << "Minor" << endl;
}

// For loop
for (int i = 1; i <= 5; i++) {
    cout << "Count: " << i << endl;
}

// While loop
int count = 0;
while (count < 3) {
    cout << "Count: " << count << endl;
    count++;
}
```

# Common Functions

```
#include <cmath>

// Mathematical functions
```

```
double result = sqrt(16);      // Square root: 4.0
double power = pow(2, 3);      // Power: 8.0
int absolute = abs(-5);        // Absolute value: 5

// String functions
string text = "Hello";
int length = text.length();    // 5
string upper = text;           // Need algorithm for uppercase
```

# Memory and Pointers (Basic)

```
// Variables store values
int x = 10;

// Pointers store memory addresses
int* ptr = &x;        // ptr points to x
int value = *ptr;     // value = 10 (dereference)

// References (aliases)
int& ref = x;         // ref is another name for x
ref = 20;            // x is now 20
```