Tutorial 8 - Constants, Manipulators & Operator Precedence

Constants in C++

- **Definition**: Constants are variables whose values cannot be changed once initialized.
- Declared using the `const` keyword.
- Example:

```
const float a = 3.11;
a = 45.6; // Error: Cannot reassign a constant variable

```

- **Error Message**: Trying to modify a constant variable results in a compilation error.

Manipulators in C++

- **Definition**: Manipulators are used to format the output in C++.
- **Common Manipulators**:
  a. `endl`: Moves the cursor to a new line.
  b. `setw`: Sets the width of the output.
- **Example Code**:

```
#include <iomanip>
int a = 3, b = 78, c = 1233;
cout << "Without setw:" << endl;
cout << "a = " << a << endl << "b = " << b << endl << "c = " << c << endl;

cout << "\nWith setw (width = 4):" << endl;
cout << "a = " << setw(4) << a << endl;
cout << "b = " << setw(4) << b << endl;
cout << "c = " << setw(4) << c << endl;

```

Operator Precedence and Associativity

- **Operator Precedence**:
  - Determines the order in which operations are performed in an expression.
  - Example:

```
int c = a * b + c;  // Multiplication (*) is performed before addition (+)

```

- **Operator Associativity**:
  - Determines the order when operators of the same precedence appear together.
  - Most operators follow **left-to-right** associativity.
  - Example:

```
int c = ((((a * 5) + b) - 45) + 87);
// * → + → - → +

```

Code Example

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

int main() {
    // Constants
    const int a = 3;
    cout << "Value of a: " << a << endl;
    // a = 45; // Uncommenting this will cause an error

    // Manipulators
    int x = 3, y = 78, z = 1233;
    cout << "Without setw:" << endl;
    cout << x << " " << y << " " << z << endl;

    cout << "With setw (width = 4):" << endl;
    cout << setw(4) << x << " " << setw(4) << y << " " << setw(4) << z << endl;

    // Operator Precedence
    int p = 3, q = 4;
    int result = ((((p * 5) + q) - 45) + 87);
    cout << "Result of expression: " << result << endl;

    return 0;
}

```

Short Notes

Constants

- Use `const` to declare variables that cannot be modified.
- Example: `const int x = 10;`

Manipulators

- `endl`: New line.
- `setw`: Sets the output width.

Operator Precedence

- Operators like `*`, `/`, `%` have higher precedence than `+`, `-`.
- Associativity defines evaluation order when precedence is the same (usually left-to-right).