Chapter-2

Variables, Data Types & Operators

Our First Program

Output in C++

```
cout << " apna college ";
```

C++ case sensitive

lower   UPPER

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

int main() {
    cout << "apna college";
    return 0;
}
```

for Mac users

PORTS   PROBLEMS   DEBUG CONSOLE   OUTPUT   TERMINAL   >_ zsh

apnacollege@Shradha YTSeries % g++ code.cpp

Compile command for Window users is g++ -o code code.cpp

Ln 7, Col 2   Spaces: 4   UTF-8   LF   {} C++

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

int main() {
    cout << "apna college";
    return 0;
}
```

for Mac users

apnacollege@Shradha YTSeries % g++ code.cpp
apnacollege@Shradha YTSeries % ./a.out

Run command for Window users is code.exe

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

int main() {
    cout << "apna college";
    return 0;
}
```

for Window users g++ -o code code.cpp && code.exe
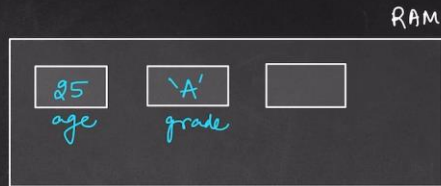
PORTS   PROBLEMS   DEBUG CONSOLE   OUTPUT   TERMINAL

apnacollege@Shradha YTSeries % g++ code.cpp
apnacollege@Shradha YTSeries % ./a.out
apna college
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
apna college
apnacollege@Shradha YTSeries %

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

int main() {

    return 0;
}

//Boilerplate Code - comment
```

PORTS   PROBLEMS   DEBUG CONSOLE   OUTPUT   TERMINAL

apnacollege@Shradha YTSeries %

Variables

Containers to store data

RAM

| 25 | `A` | |
| age | grade | |

a-z A-Z

identifier

Data Types

int age = 25 → integer

0/1 ↓ Binary

- int **4 Bytes**

  $8 \times 4 = 32$ bits $\times 4$

  $1 \leftarrow$ Bit
  8 Bits $\Rightarrow$ byte

  – – – – – – – –

  0 0 1 1 0 1 0 1

- char

- float

- bool

- double

Data Types

66 67
A B C ... Z
65

@ b c d – – –
97 98 99 . . – –

↓
ASCII value

↓
m/m

- int 4 Bytes

- char 1 Byte

- float

- bool

- double
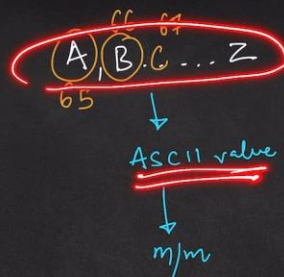
Data Types ← Primitive

arrays
String
↓

- int   4 Bytes

- char   1 Byte

- float 4 Bytes

- bool   1 Byte

- double 8 Bytes

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

int main() {
    int age = 25;
    char grade = 'a';
    float PI = 3.14f;

    bool isSafe = true;
    double price = 100.99;

    cout << isSafe << endl; //true -> 1 & false -> 0
    return 0;
}
```

```
PORTS   PROBLEMS   DEBUG CONSOLE   OUTPUT   TERMINAL                    zsh

apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
0
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
1
apnacollege@Shradha YTSeries % clear
```

Ln 10, Col 27   Spaces: 4   UTF-8   LF   {}   C++

Type Casting

char → int
1B   4B

Converting data from one type to another

↓
conversion
[implicit]

↓
casting

small → big

float 3.14 → double
4 Bytes

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

int main() {
    char grade = 'a'; //97

    int value = grade;
    cout << value << endl;
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
65
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
97
apnacollege@Shradha YTSeries %
```

Type Casting

Converting data from one type to another

$$100.99 \Rightarrow 101$$

$$100.01 \longrightarrow 100$$
$$100.9999 \longrightarrow 100$$

conversion
[implicit]

casting
[Explicit]

small ⟶ big

float 3.14 ⟶ double
4 Byte

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

int main() {
    double price = 100.99;

    int newPrice = (int)price;
    cout << newPrice << endl;
    return 0;
}
```
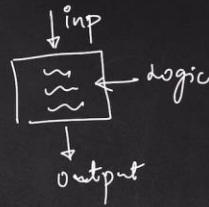
```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
100
apnacollege@Shradha YTSeries %
```

Input in C++

Input in C++

$cin >> data ;$

inp

logic

output

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

int main() {
    int age;
    cout << "Enter the age : ";
    cin >> age;

    cout << "you age is : " << age << endl;
    return 0;
}
```

```
code.cpp > main()
```

```
PORTS    PROBLEMS    DEBUG CONSOLE    OUTPUT    TERMINAL                    zsh

apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
Enter the age : 25
you age is : 25
apnacollege@Shradha YTSeries %
```

Ln 7, Col 16   Spaces: 4   UTF-8   LF   {} C++

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

int main() {
    double price;
    cout << "Enter the price : ";
    cin >> price;

    cout << "you entered price = " << price << endl;
    return 0;
}
```

```
code.cpp > main()
```

```
PORTS    PROBLEMS    DEBUG CONSOLE    OUTPUT    TERMINAL                    zsh

apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
Enter the price : 99.99
you entered price = 99.99
apnacollege@Shradha YTSeries %
```

Ln 9, Col 33   Spaces: 4   UTF-8   LF   {} C++

Operators

- Arithmetic

$+ , - , * , / , \%$
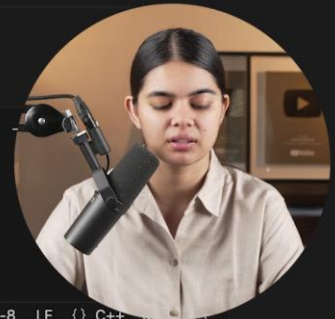
modulo

$a \% b$

asterisk

- Relational

- Logical

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

int main() {
    int a = 11, b = 5;

    cout << "sum = " << (a+b) << endl;
    cout << "difference = " << (a-b) << endl;
    cout << "product = " << (a*b) << endl;
    cout << "division = " << (a/b) << endl; //2
    cout << "modulo = " << (a % b) << endl; //1
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
sum = 16
difference = 6
product = 55
division = 2
modulo = 1
apnacollege@Shradha YTSeries %
```
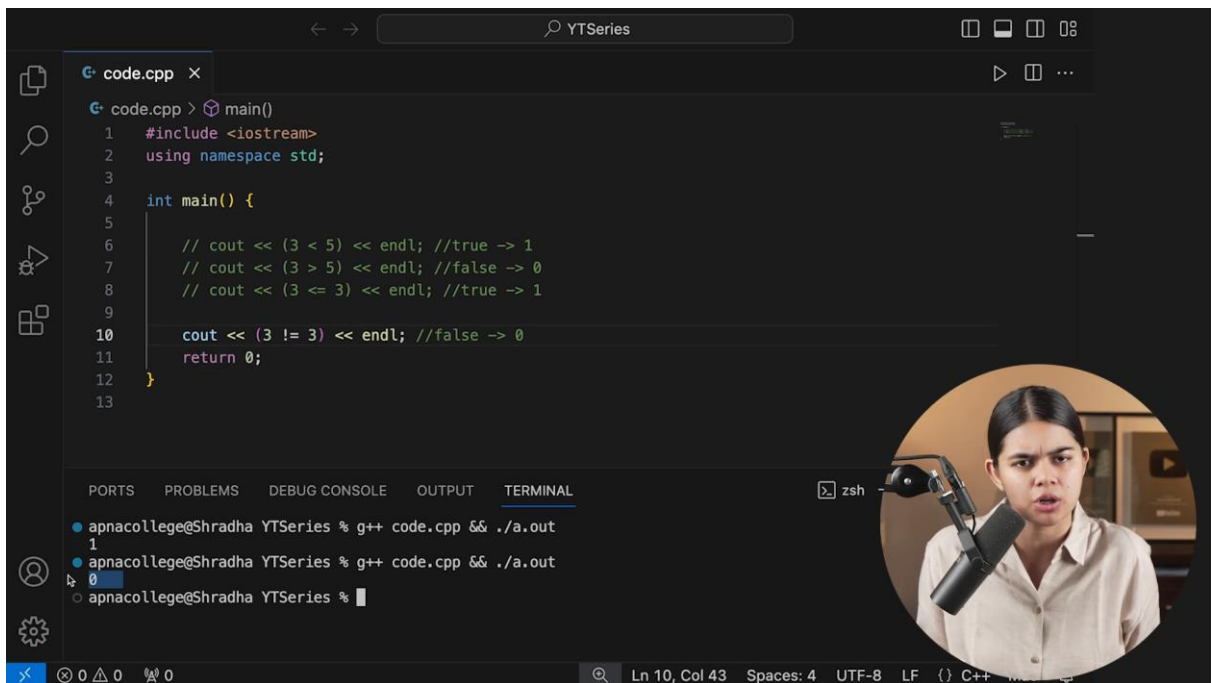

Operators

- Arithmetic

- Relational

$<$
$<=$
$>$
$>=$
$==$
$!=$

true / false

- Logical

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

int main() {

    // cout << (3 < 5) << endl; //true -> 1
    // cout << (3 > 5) << endl; //false -> 0
    // cout << (3 <= 3) << endl; //true -> 1

    cout << (3 != 3) << endl; //false -> 0
    return 0;
}
```
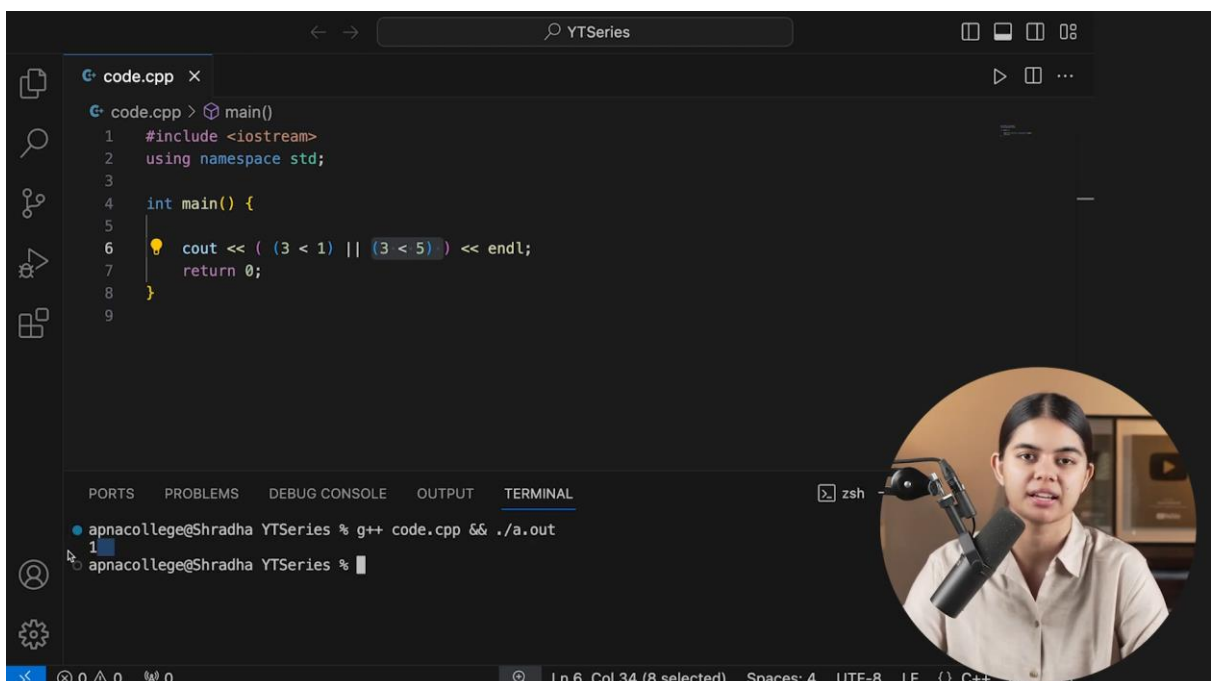
```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
1
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
0
apnacollege@Shradha YTSeries %
```


Operators

- Arithmetic

- Relational

- Logical

OR ||

AND   &&

NOT   !

true → false
false → true


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

int main() {

    cout << ( (3 < 1) || (3 < 5) ) << endl;
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
1
apnacollege@Shradha YTSeries %
```

Operators

OR

1	2	Res
T	T	T
T	F	T
F	T	T
F	F	F

AND

1	2	Res
T	T	T
T	F	F
F	T	F
F	F	F

- Arithmetic

- Relational

- Logical

Bitwise Operators

Sum of 2 numbers

① Input a & b

② sum = a + b

③ Print sum

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

int main() {
    int a, b;
    cout << "enter a : ";
    cin >> a;

    cout << "enter b : ";
    cin >> b;

    int sum = a + b;
    cout << "sum = " << sum << endl;
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
enter a : 3
enter b : 10
sum = 13
apnacollege@Shradha YTSeries %
```

Unary Operators

- Increment ++

- Decrement --

Binary — 2 numbers

$a \; 2$

$a + b$
$a - b$
$a * b$
a / b

Unary Operators

- Increment ++

- Decrement --

Loops

$a = a + 1 \implies a{+}{+};$
$i = i + 1$
$var = var + 1$
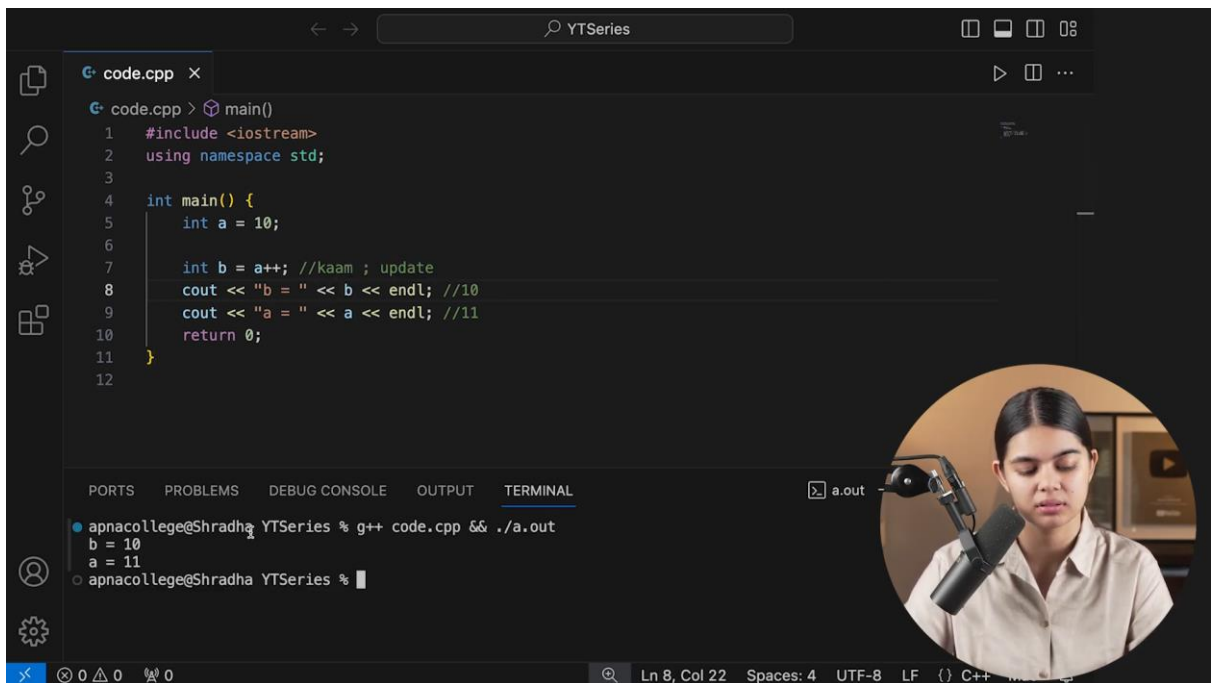
$\quad \to a = a + 1$

Unary Operators

- Increment ++

- Decrement --

$a{+}{+} \longrightarrow$ kaam ; update

${+}{+}a \longrightarrow$ update ; kaam
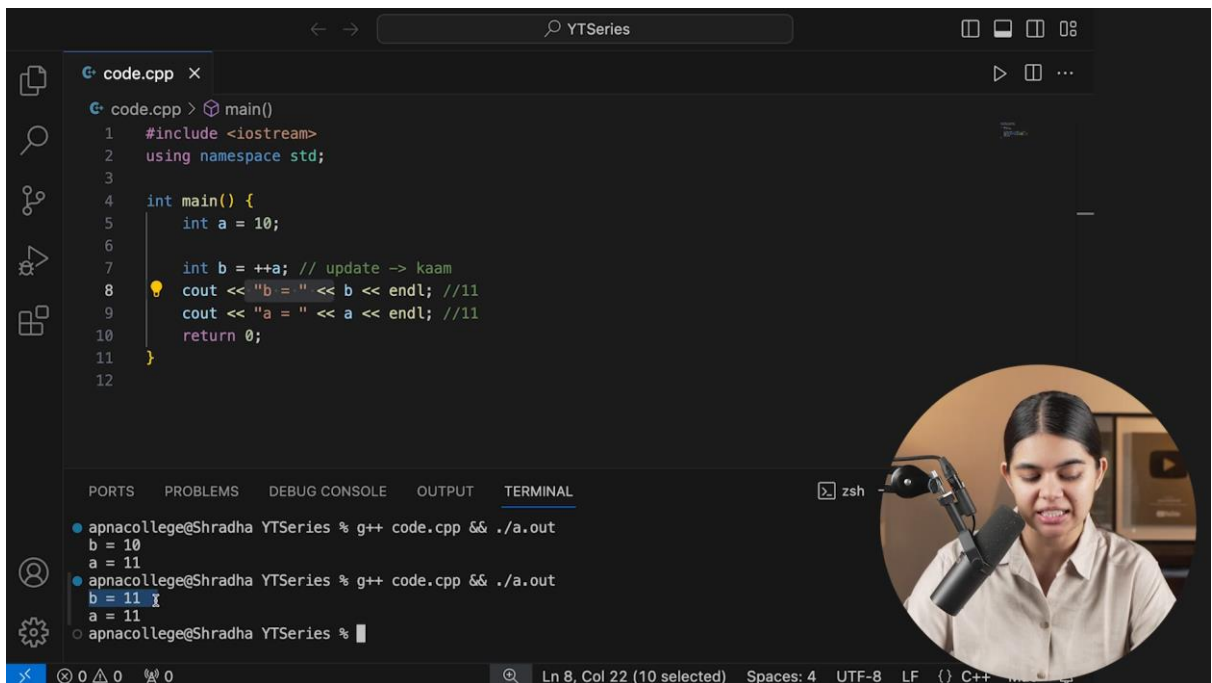
$a = 10$

int b = a++;

b	a
10	10

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

int main() {
    int a = 10;

    int b = a++; //kaam ; update
    cout << "b = " << b << endl; //10
    cout << "a = " << a << endl; //11
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
b = 10
a = 11
apnacollege@Shradha YTSeries %
```



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

int main() {
    int a = 10;

    int b = ++a; // update -> kaam
    cout << "b = " << b << endl; //11
    cout << "a = " << a << endl; //11
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
b = 10
a = 11
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
b = 11
a = 11
apnacollege@Shradha YTSeries %
```


Unary Operators

- Increment ++

- Decrement --

post increment $a++$ → kaam ; update

$++a$ → update ; kaam
pre increment

post dec $a--$ → kaam ; upd $a = a-1$

pre dec $--a$ → update ; kaam $a = a-1$

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

int main() {
    int a = 10;

    int b = --a;
    cout << "b = " << b << endl; //9
    cout << "a = " << a << endl; //9
    return 0;
}
```

```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
b = 9
a = 9
apnacollege@Shradha YTSeries %
```

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

int main() {
    int a = 10;

    int b = a--;
    cout << "b = " << b << endl; //10
    cout << "a = " << a << endl; //9
    return 0;
}
```
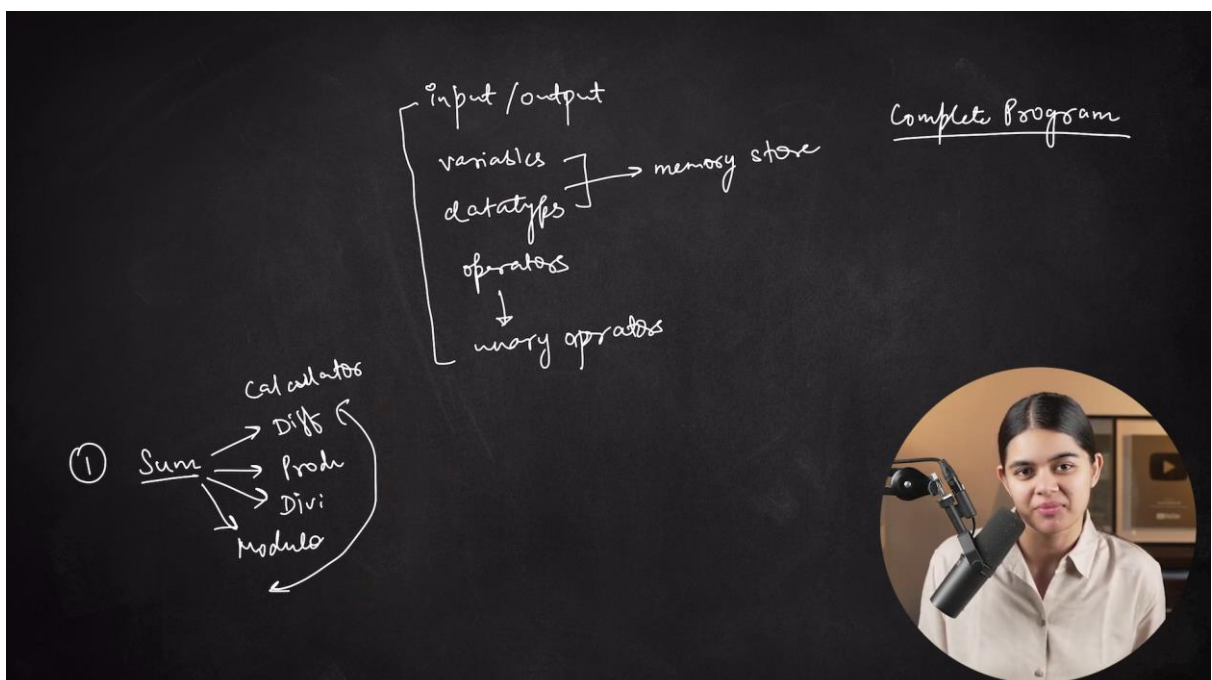
```
apnacollege@Shradha YTSeries % g++ code.cpp && ./a.out
b = 10
a = 9
apnacollege@Shradha YTSeries %
```

input /output
variables
datatypes   → memory store
operators
     ↓
  unary operators

Complete Program

Calculator
          → Diff
① Sum → Prod
          → Divi
     → Modulo

Homework Solution:

```cpp
#include<iostream>
using namespace std;
int main() {
    int num1, num2;
    char opera;
    cout << "********* Welcome To Calculator *********" << endl;
    cout << "Enter 1st Number : ";
    cin >> num1;
    cout << "Enter 2nd Number : ";
    cin >> num2;
    cout << "Enter The Operation You Want to Perform (+, -, *, /, %) : ";
    cin >> opera;

    if (opera == '+') {
        cout << "Sum = " << num1 + num2 << endl;
    } else if (opera == '-') {
        cout << "Substraction = " << num1 - num2 << endl;
    } else if (opera == '*') {
        cout << "Multiplication = " << num1 * num2 << endl;
    } else if (opera == '/') {
        cout << "Division = " << num1 / num2 << endl;
    } else if (opera == '%') {
        cout << "Modulo (Remainder) = " << num1 % num2 << endl;
    } else {
        cout << "Invalid Operator" << endl;
    }
    cout << "Thank you for using calculator" << endl;
    return 0;
}
```