Aror University of Art, Architecture, Design & Heritage Sukkur.

Department of Artificial Intelligence and Multimedia Gaming

Fundamentals of Programming (Fall-2023)

LAB No. 04

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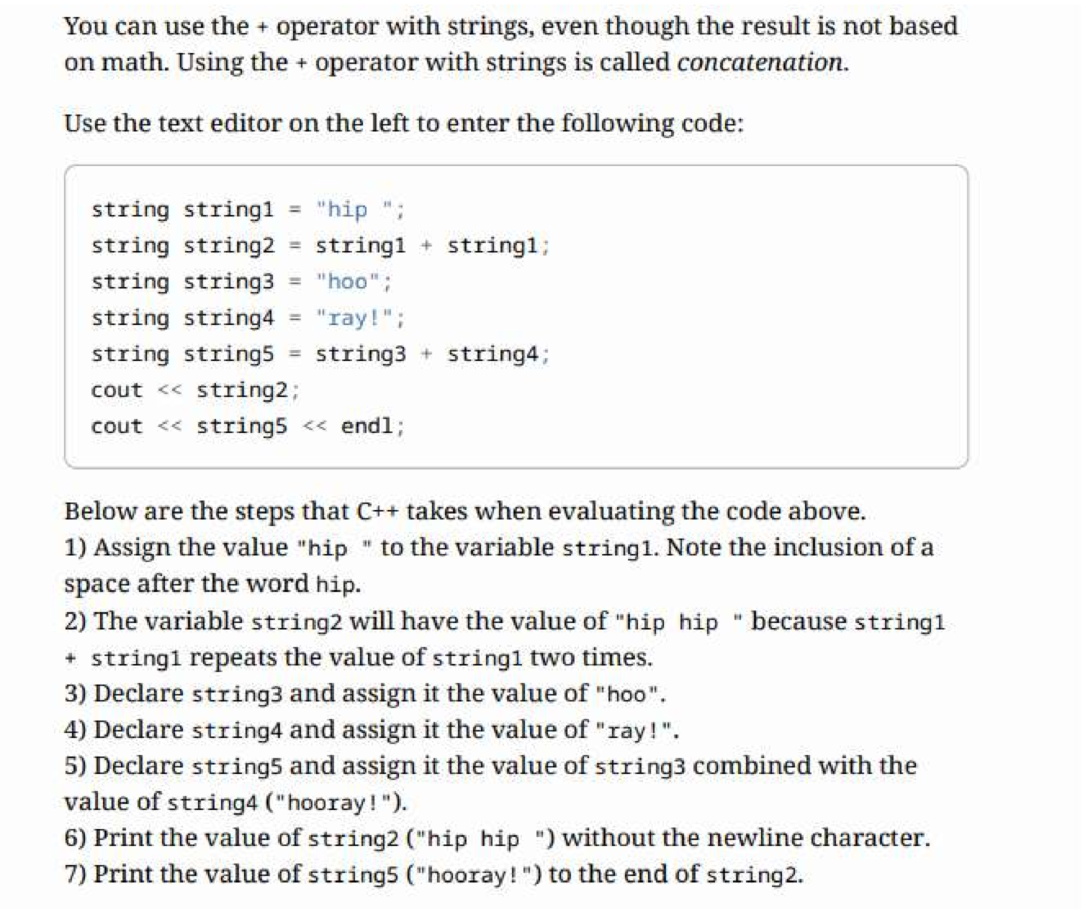
Objective of Lab No. 04:

After performing lab 4, students will be able to:

- Understand String concatenation
- Understand PEMDAS in Arithmetic Operations
- Use Relational and Logical Operators
- Use Ternary operator

Concept of String Concatenation:



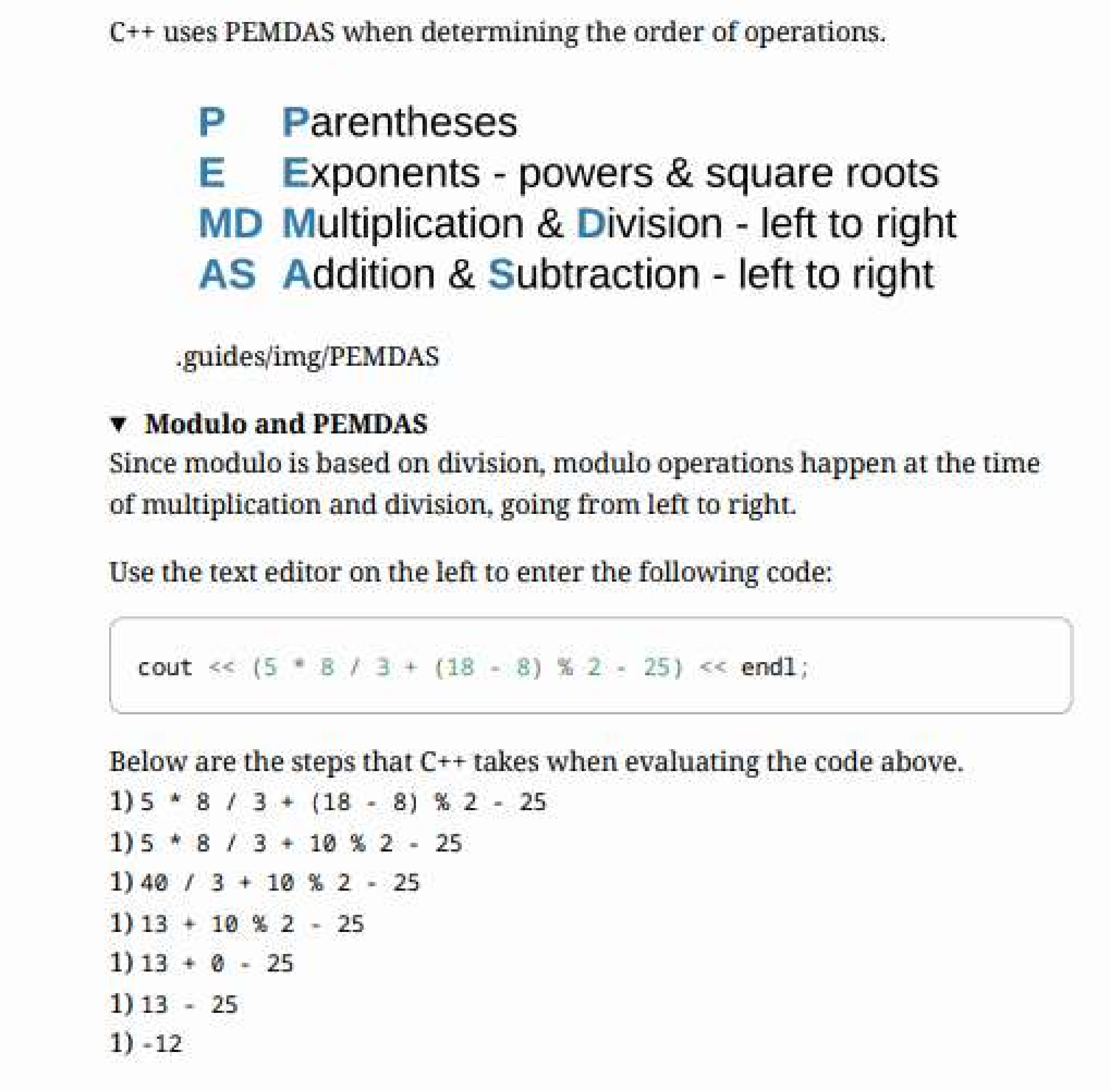
You can use the + operator with strings, even though the result is not based on math. Using the + operator with strings is called *concatenation*.

Use the text editor on the left to enter the following code:

```
string string1 = "hip ";
string string2 = string1 + string1;
string string3 = "hoo";
string string4 = "ray!";
string string5 = string3 + string4;
cout << string2;
cout << string5 << endl;
```

Below are the steps that C++ takes when evaluating the code above.
1) Assign the value `"hip "` to the variable `string1`. Note the inclusion of a space after the word `hip`.
2) The variable `string2` will have the value of `"hip hip "` because `string1 + string1` repeats the value of `string1` two times.
3) Declare `string3` and assign it the value of `"hoo"`.
4) Declare `string4` and assign it the value of `"ray!"`.
5) Declare `string5` and assign it the value of `string3` combined with the value of `string4` (`"hooray!"`).
6) Print the value of `string2` (`"hip hip "`) without the newline character.
7) Print the value of `string5` (`"hooray!"`) to the end of `string2`.

PEMDAS in Arithmetics:



C++ uses PEMDAS when determining the order of operations.

P	Parentheses
E	Exponents - powers & square roots
MD	Multiplication & Division - left to right
AS	Addition & Subtraction - left to right

.guides/img/PEMDAS

▼ **Modulo and PEMDAS**

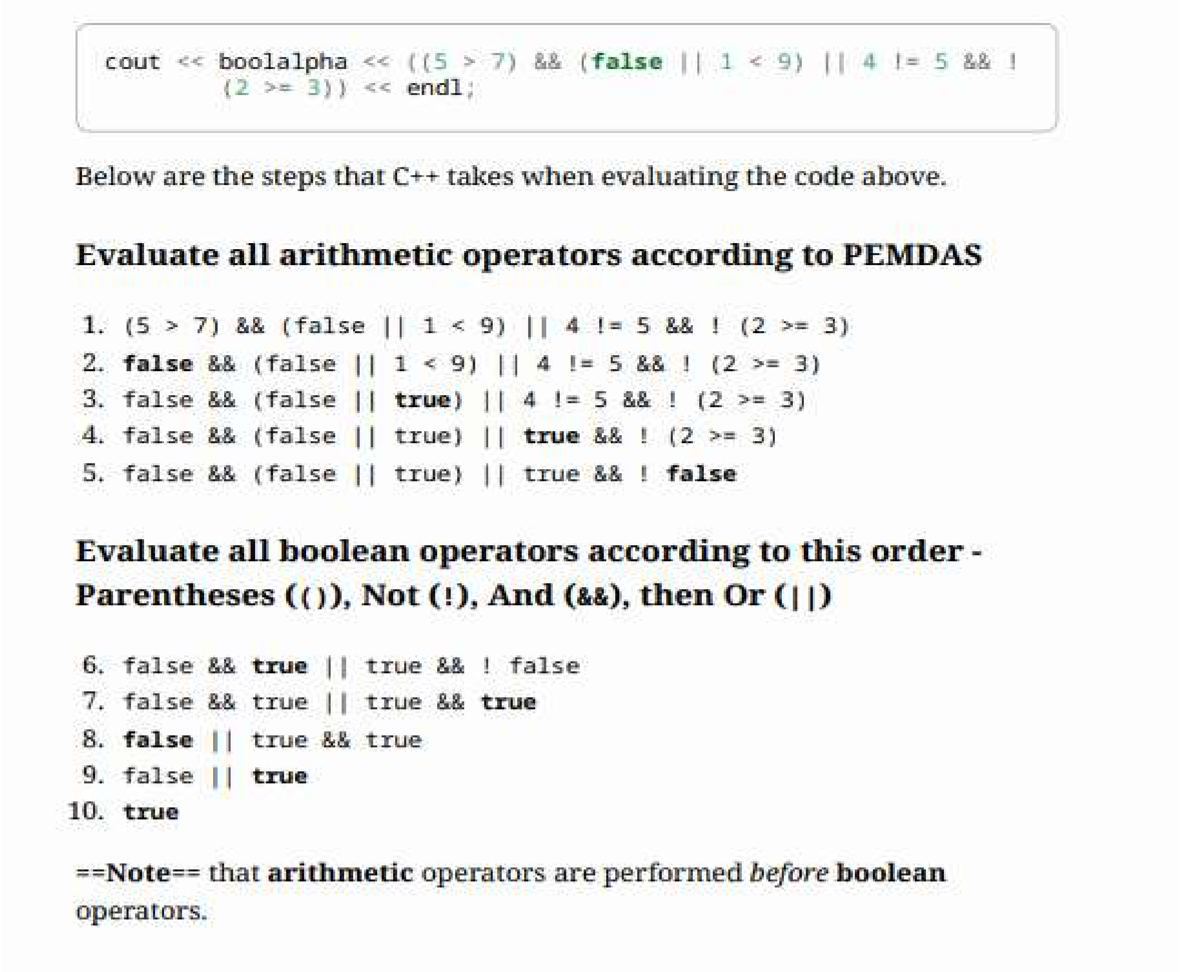
Since modulo is based on division, modulo operations happen at the time of multiplication and division, going from left to right.

Use the text editor on the left to enter the following code:

```
cout << (5 * 8 / 3 + (18 - 8) % 2 - 25) << endl;
```

Below are the steps that C++ takes when evaluating the code above.

```
1) 5 * 8 / 3 + (18 - 8) % 2 - 25
1) 5 * 8 / 3 + 10 % 2 - 25
1) 40 / 3 + 10 % 2 - 25
1) 13 + 10 % 2 - 25
1) 13 + 0 - 25
1) 13 - 25
1) -12
```



```
cout << boolalpha << ((5 > 7) && (false || 1 < 9) || 4 != 5 && !
        (2 >= 3)) << endl;
```

Below are the steps that C++ takes when evaluating the code above.

Evaluate all arithmetic operators according to PEMDAS

1. `(5 > 7) && (false || 1 < 9) || 4 != 5 && ! (2 >= 3)`
2. `false && (false || 1 < 9) || 4 != 5 && ! (2 >= 3)`
3. `false && (false || true) || 4 != 5 && ! (2 >= 3)`
4. `false && (false || true) || true && ! (2 >= 3)`
5. `false && (false || true) || true && ! false`

Evaluate all boolean operators according to this order - Parentheses (`()`), Not (`!`), And (`&&`), then Or (`||`)

6. `false && true || true && ! false`
7. `false && true || true && true`
8. `false || true && true`
9. `false || true`
10. `true`

==Note== that **arithmetic** operators are performed *before* **boolean** operators.

Ternary Operator:

A ternary operator evaluates the test condition and executes a block of code based on the result of the condition. It’s syntax is:

```
condition ? expression1 : expression2;
```

Here, `condition` is evaluated and

- if `condition` is `true`, `expression1` is executed.
- And, if `condition` is `false`, `expression2` is executed.

The ternary operator takes **3 operands** (`condition`, `expression1` and `expression2`).

Hence, the name **ternary operator**.

LAB EXCERCISES:

1. **Write C++ Program which takes a number as an input from the user and checks whether it is a positive or negative number, and accordingly the message is displayed on console screen.**

2. **Write C++ Code which takes marks of student and attendance percentage as input from the user, and display's whether student is pass or fail in exam, remember a student must obtain at least 60 marks and 75% attendance to pass the subject, after checking the program should display appropriate message.**

3. **Write C++ Program that asks the user for their age and citizenship status and determine that they are eligible for voting or not, for voting a person must be older than 18 years and must be a Pakistani Citizen**

4. **Write a C++ Program which prompts user to input two strings, concatenate them and store the result in a third variable.**

5. **Write a C++ Program which checks if the user is eligible for entering army or not, the program takes following inputs:**

    a. **Intermediate Percentage**
    b. **Age**
    c. **Height**
    d. **Chest measurement**

    Entry is only allowed when intermediate percentage is at least 55%, age is between 17-22 years, height must be minimum 5.4 and chest measurement is between 77-82cm, If all the conditions are satisfied "You are eligible for Pak Army" is Displayed, otherwise "Sorry, Try Again" is displayed.