PEN203

Introduction to Computer Programming

C++ How to Program
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Outline

- First C++ Program: Printing a Line of Text
- Second C++ Program: Adding Two Integers
- Memory Concepts
- Arithmetic in C++
- Decision Making: Equality and Relational Operators

Memory Concepts

- The variable names actually correspond to locations in the computer's memory.
- Each variable has a name, type, size and a value.
- Reading variables does not modify their values.
- When you place a new value to a variable, it overwrites the old value.

Arithmetic

- +, - addition and subtraction
- *, / multiplication and division
- İnteger division produce integer result.
- % operator finds the remainder
  - 9%4 returns 1
- Some operators have precedence over other operators
  - Multiplication and division have higher precedence than addition and subtraction
- You may use parenthesis.

Arithmetic

C opetration	Arithmetic operator	Algebraic expression	C expression
Addition	+	$f + 7$	`f + 7`
Subtraction	-	$p - c$	`p - c`
Multiplication	*	bm	`b * m`
Division	/	x/y or $\frac{x}{y}$ or $x \div y$	`x / y`
Remainder	%	r mod s	`r % s`

Operator(s)	Operation(s)	Order of evaluation (precedence)
( )	Parentheses	Evaluated first. If the parentheses are nested, the expression in the innermost pair is evaluated first. If there are several pairs of parentheses “on the same level” (i.e., not nested), they are evaluated left to right.
* / %	Multiplication Division Remainder	Evaluated second. If there are several, they are evaluated left to right.
+ -	Addition Subtraction	Evaluated last. If there are several, they are evaluated left to right.

Decision Making

- If the condition given in a if control statement is true, the body of if statement is executed.
- If the condition given in a if control statement is false, the body of if statement is not executed.
- 0 is false, non-zero values is true.

Decision Making

Standard algebraic equality operator or relational operator	C equality or relational operator	Example of C condition	Meaning of C condition
Equality operators			
=	==	x == y	x is equal to y
≠	!=	x != y	x is not equal to y
Relational operators			
>	>	x > y	x is greater than y
<	<	x < y	x is less than y
≥	>=	x >= y	x is greater than or equal to y
≤	<=	x <= y	x is less than or equal to y

Decision Making

```
1  // Fig. 1.14: fig01_14.cpp
2  // Using if statements, relational
3  // operators, and equality operators.
4  #include <iostream>
5
6  using std::cout;  // program uses cout
7  using std::cin;   // program uses cin
8  using std::endl;  // program uses endl
9
10 // function main begins program execution
11 int main()
12 {
13    int num1;  // first number to be read from user
14    int num2;  // second number to be read from user
15
16    cout << "Enter two integers, and I will tell you\n"
17         << "the relationships they satisfy: ";
18    cin >> num1 >> num2;   // read two integers
19
20    if ( num1 == num2 )
21       cout << num1 << " is equal to " << num2 << endl;
22
23    if ( num1 != num2 )
24       cout << num1 << " is not equal to " << num2 << endl;
25
```

Decision Making

```
26    if ( num1 < num2 )
27       cout << num1 << " is less than " << num2 << endl;
28
29    if ( num1 > num2 )
30       cout << num1 << " is greater than " << num2 << endl;
31
32    if ( num1 <= num2 )
33       cout << num1 << " is less than or equal to "
34            << num2 << endl;
35
36    if ( num1 >= num2 )
37       cout << num1 << " is greater than or equal to "
38            << num2 << endl;
39
40    return 0;   // indicate that program ended successfully
41
42 } // end function main
```

Decision Making

```
Enter two integers, and I will tell you
the relationships they satisfy: 22 12
22 is not equal to 12
22 is greater than 12
22 is greater than or equal to 12
```

- Enter two integers, and I will tell you
- the relationships they satisfy: 7 7
- 7 is equal to 7
- 7 is less than or equal to 7
- 7 is greater than or equal to 7

Operators Associativitiy

Operators	Associativity
( )	left to right
* / %	left to right
+ -	left to right
< <= > >=	left to right
== !=	left to right
=	right to left