Arithmetric C++

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Calculations

- Often when we develop programs calculations are embedded as part of it.
- It could be something as simple as counting number of tries user has enter his or her password.
- Or something complex like simulating path of a meteor that would crash into earth.
- We need to be able to perform calculations!

Arithmetic

- Note: C++ does not directly support Exponent operation.

Operation	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulus (remainder)
( )	Parentheses

Order of Operation

Operation	Name	Precedence
( )	Parentheses	Contents of the parentheses has highest precedence should evaluated first.
^	Exponent	(Operation does NOT exist in C++)
* / %	Multiplication Division Modulus	Equal Precedence Evaluated from left to right
+ -	Addition Subtraction	Equal Precedence Evaluated from left to right

Examples of Expressions

- Finding the remainder of 5 / 2

  5 % 2 =

- Find the remainder of the sum of two numbers divided by 2

  A) number1 + number2 % 2 =

  B) 2 % number1 + number2 =

  C) (number1 + number2) % 2 =

- Is the answer A, B or C?

Integer Division

- Integer division in C++ will truncate any decimal value, for example:
  - 5 / 2 = 2 for an integer division
  - 4 / 2 = 2 this means 5 / 2 = 4 / 2
  - 10/ 3 = 3
  - 11 / 2 = 5
- The resulting type is an Integer.
- What makes this an integer division?
  - Both the dividend and divisor are integers (not decimal).

Double (decimal) Division

- Double division in C++ will retain the appropriate decimal value, for example:
  - 5 / 2.0 = 2.5
  - 4 / 2.0 = 2
  - 10/ 3.0 = 3.333333…
  - 11 / 2.0 = 5.5
- The resulting type is a **Double.**
- What makes this an decimal division?
  - Either the dividend or divisor must be a decimal.

All Other Operations

- Same rule apply to Addition, Subtraction and Multiplication.
- If both of the values are of type int, result will be int.
- If either one of the type is double, result will be double.

Data Types and Order of Operation

- Look at the example below:
- 5.0 + 5 / 2
  - What is the resulting data type of the first operation?
    - int
  - What is the resulting data type of the second operation?
    - double
- 5 + 5 / 2.0
  - What is the resulting data type of the first operation?
    - double
  - What is the resulting data type of the second operation?
    - double

Type Casting

- If we want to convert from a **int to a double for a more** precise result we can do so with type casting.
- Type casting is a temporary change from one type to another.
- To type cast from int to double we can do the following:

```
double value = (double) 5 / 2;
 //value = 2.5
```

Type Casting (cont.)

- We can also type cast from double to an int, this will truncate the decimal value.

- Example:

```
double total = 100.5;
int value = (int) total;
//value = 100
```

Lab Exercise

- Write a program to convert Temperature from Fahrenheit to Celsius:

  Note: C = (F – 32) * 5 / 9

Solution

```
#include <iostream>
using namespace std;
int main()
{
    int f;
    cout << "Enter a temperature in degrees Fahrenheit :" ;
    cin >> f;
    double c;
    c = (f - 32) * 5 / (double) 9; //makes 9 to 9.0
    cout << "In Celsius that is: " << c << endl;
    return 0;
}
```