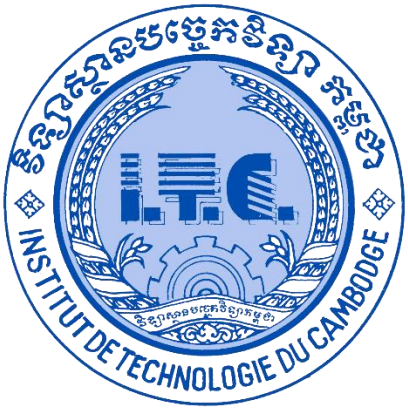

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Institute of Technology of Cambodia

TP-02

Basic Data Types, Operators and Math in C++

Academic Year: 2022 - 2023

1. Data Types

A variable in C++ must be a specified data type:

Example:

```
int myNum = 5;               // Integer (whole number)
float myFloatNum = 5.99;     // Floating point number
double myDoubleNum = 9.98;   // Floating point number
char myLetter = 'D';         // Character
bool myBoolean = true;       // Boolean
string myText = "Hello";     // String
```

Note: To use strings, you must include an additional header file in the source code, the <string> library:

```
// Include the string library
#include <string>
```

2. Operators

Operators are used to perform operations on variables and values.

C++ divides the operators into the following groups:

- Arithmetic operators
- Assignment operators
- Comparison operators
- Logical operators
- Bitwise operators

Arithmetic Operators

Operator	Name	Description	Example
+	Addition	Adds together two values	x + y
-	Subtraction	Subtracts one value from another	x - y
*	Multiplication	Multiplies two values	x * y
/	Division	Divides one value by another	x / y
%	Modulus	Returns the division remainder	x % y
++	Increment	Increases the value of a variable by 1	++x
--	Decrement	Decreases the value of a variable by 1	--x

Example:

```
int sum1 = 100 + 50;         // 150 (100 + 50)
int sum2 = sum1 + 250;       // 400 (150 + 250)
```

Assignment operators

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3
&=	x &= 3	x = x & 3
|=	x |= 3	x = x | 3
^=	x ^= 3	x = x ^ 3
>>=	x >>= 3	x = x >> 3
<<=	x <<= 3	x = x << 3

Example:

```
int x = 10;
x += 5;
```

Comparison operators

Operator	Name	Example
==	Equal to	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

Example:

```
int x = 5;
int y = 3;
cout << (x > y); //returns 1(true) because 5 is greater than 3
```

Logical operators

Operator	Name	Description	Example
&&	Logical and	Returns true if both statements are true	x < 5 && x < 10
||	Logical or	Returns true if one of the statements is true	x < 5 || x < 4
!	Logical not	Reverse the result, returns false if the result is true	!(x < 5 && x < 10)

Example:

```
int x = 5;
int y = 3;
cout << (x > y && x < 10);    // returns 1 (true)
cout << (x > y || x < 10);    // returns 1 (true)
cout << (!(x > y && x < 10)); // returns 0 (false)
```

3. C++ Math

C++ has many functions that allows you to perform mathematical tasks on numbers.

Max and min

The max(*x*,*y*) function can be used to find the highest value of *x* and *y*.
And the min(*x*,*y*) function can be used to find the lowest value of *x* and *y*.

Example:

```
cout << max(5, 10);    // returns 10
cout << min(5, 10);    // returns 5
```

C++ <cmath> Header

Other functions, such as sqrt (square root), round (rounds a number) and log (natural logarithm), can be found in the <cmath> header file:

Example:

```
// Include the cmath library
#include <cmath>

cout << sqrt(64);      // returns 8
cout << round(2.5);    // returns 3
cout << pow(2, 3);     // returns 8
```

Other Math Functions

Function	Description
abs(x)	Returns the absolute value of x
acos(x)	Returns the arccosine of x
asin(x)	Returns the arcsine of x
atan(x)	Returns the arctangent of x
cbrt(x)	Returns the cube root of x
ceil(x)	Returns the value of x rounded up to its nearest integer
cos(x)	Returns the cosine of x
cosh(x)	Returns the hyperbolic cosine of x
exp(x)	Returns the value of E^x
expm1(x)	Returns e^x -1
fabs(x)	Returns the absolute value of a floating x
fdim(x, y)	Returns the positive difference between x and y
floor(x)	Returns the value of x rounded down to its nearest integer
hypot(x, y)	Returns sqrt(x^2 +y^2) without intermediate overflow or underflow
fma(x, y, z)	Returns x*y+z without losing precision
fmax(x, y)	Returns the highest value of a floating x and y
fmin(x, y)	Returns the lowest value of a floating x and y
fmod(x, y)	Returns the floating point remainder of x/y
pow(x, y)	Returns the value of x to the power of y
sin(x)	Returns the sine of x (x is in radians)
sinh(x)	Returns the hyperbolic sine of a double value
tan(x)	Returns the tangent of an angle
tanh(x)	Returns the hyperbolic tangent of a double value

Problem1:
Write a C++ program to display the following message:
--
****
** Institute of Technology of Cambodia **
****

##########
\\ Deparment of Information and Communication Engineering \\
##########

##########
// Génie Informatique et Communication //
##########
--

Problem2:
Write a C++ program to get a number from a user. Then find the square as well as the cube of that number.
Ex:
Input: 2
Output: Square of 2 is 4 AND Cube of 2 is 8.

--

Problem3:
Write a C++ program that can convert the time (hour, minute, second) to second
Enter hour : 5
Enter minute : 45
Enter second : 50
=> The above time is equal to 20750 seconds.
--

Problem4:
Write a C++ program to convert time in second to a
time format including hour, minute and second.
Ex:
Input time in second (s) : 10000
=> It is: 2h 46mn 40s

--

Problem5:

Write a C++ program that can calculate some formula and display result. This program ask a user to input x and y then compute all formula below:

f1 = 2x - 3y
f2 = 3x/2
f3 = x^3 - 5x/2 + y^(3/2)
f4 = (x + y^(1/2)) / (2x)
f5 = sin(x) + tan(y)

Remark: create x and y as float
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