**LaGuardia Community College – Last Update**

08

**Fall**

Part 3: C++ Syntax and Data Types

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Lecture Notes for MAC 101 (Introduction to Computer Science)

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# C++ Syntax Tokens

Tokens are chunks of a program code each having a special meaning for the compiler.

|  |
| --- |
| GuessNumberGame.cpp |
| // example c++ guess game  #include <iostream>  #include <cstdlib>  #include <ctime>  Constants  Symbols  using namespace std;  int main()  {  srand(time(0)); //seed random number generator  int number = rand() % 100 + 1; // random number between 1 and 100  int guess = 0;  Identifiers  int tries = 0;  Operators  cout << "Guess My Number Game:\n\n";  do  {  cout << "Guess a number between 1 and 100 : ";  cin >> guess;  Keywords  tries++;  if (guess > number)  cout << "Too high!\n\n";  else if (guess < number)  cout << "Too low!\n\n";  else  cout << "\nCorrect! You got it in " << tries << " guesses!\n";  } while (guess != number);  cin.ignore();  Strings  cin.get();  return 0;  } |

# Data Types

Any computer program (algorithm) uses some data (information) during execution.

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Keyword | Size | Example declaration |
| Integer | int | At least 16 bits | int i = 23; |
| Floating-Point | float  double | At least 32 bits  At least 64 bits | float f = 23.7;  double d = 243.6; |
| Character | char | At least 8 bits | char c = ‘g’; |
| String | string | varies | string s = “Hello”; |

Example of different data types and their maximum capacity

|  |  |
| --- | --- |
| DataTypeExamples.cpp | Output |
| #include <iostream>  using namespace std;  int main()  {  cout << "Size of char : " << sizeof(char) << endl;  char c = 'g';  cout << "Example character type: " << c << endl;  cout << "Size of int : " << sizeof(int) << endl;  int i = 12;  cout << "Example integer type: " << i << endl;  cout << "Size of float : " << sizeof(float) << endl;  float f = 22.3;  cout << "Example floating point type: " << f << endl;  cout << "Size of double : " << sizeof(double) << endl;  double d = 125.345;  cout << "Example double precision type: " << d << endl;  return 0;  } | Size of char : 1  Example character type: g  Size of int : 4  Example integer type: 12  Size of float : 4  Example floating point type: 22.3  Size of double : 8  Example double precision type: 125.345 |

**An input-output program with integers**

|  |  |
| --- | --- |
| InputOutputInteger.cpp | Output |
| // input output example  #include <iostream>  using namespace std;  int main ()  {  int i;  cout << "Please enter an integer value: ";  cin >> i;  cout << "The value you entered is " << i;  return 0;  } | Please enter an integer value: 2  The value you entered is 2 |

**Try this:** Enter different numeric and non-numeric values of different sizes as inputs for the InputOutputInteger.cpp program. What do you notice?

**Question:** What is the largest unsigned integer that can be represented with 32 bits?

**Question:** What is the largest unsigned integer that can be represented with 64 bits?

# Arithmetic Operations

Basic C++ Arithmetic Binary Operators:

|  |  |  |
| --- | --- | --- |
| Operation | C++ Operator | Example |
| Addition | + | H + 3 |
| Subtraction | - | A - B |
| Multiplication | \* | 3 \* D |
| Division | / | 7 / 5 |
| Modulus | % | 10 % 3 |
| Parenthesis | ( ) | (a + 2) - 5 |

A program that adds two numbers:

|  |  |
| --- | --- |
| SumTwoNumbers.cpp | Output |
| #include <iostream>  using namespace std;  int main()  {  int number1 = 0;  int number2 = 0;  int sum = 0;  cout << "Enter first integer: ";  cin >> number1; // read first integer  cout << "Enter second integer: ";  cin >> number2; // read second integer  sum = number1 + number2; // add the numbers  cout << "Sum is " << sum << endl;  } | Enter first integer: 34  Enter second integer: 21  Sum is 55 |

**Try this:** Write a program that adds 5 consecutive integers.

**Input:** An integer n

**Output:** The sum of the five consecutive integers starting with n.

Basic C++ Compound Operators

|  |  |
| --- | --- |
| Expression | Equivalent to |
| X +=5 | X = X + 5 |
| X -=Y | X = X - Y |
| X \*= Y+2 | X = X \* (Y + 2) |
| X /= 2 | X = X / 2 |

Increment and Decrement Operators

|  |  |
| --- | --- |
| Expression | Similar to |
| ++X | X = X + 1 |
| X++ | X = X + 1 |
| --X | X = X - 1 |
| X-- | X = X - 1 |

Unary Increment Example

|  |  |
| --- | --- |
| IncrementExamples.cpp | Output |
| #include <iostream>  using namespace std;  int main()  {  int x, y;  cout << "Unary Prefix Example: " << endl;  x = 5;  y = ++x;  cout << "The value of x is : " << x << endl;  cout << "The value of y is : " << y << endl << endl;  cout << "Unary Suffix Example: " << endl;  x = 5;  y = x++;  cout << "The value of x is : " << x << endl;  cout << "The value of y is : " << y << endl;  return 0;  } | Unary Prefix Example:  The value of x is : 6  The value of y is : 6  Unary Suffix Example:  The value of x is : 6  The value of y is : 5 |