**LaGuardia Community College – Last Update**

08

**Fall**

Part 10: Strings

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Lecture Notes for MAC 101 (Introduction to Computer Science)

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# How C++ Stores Text?

All information in the computer is stored using 0s and 1s. Therefore all data is stored as a number. When it comes to text, each character is stored using the corresponding ASCII number. Each character gets one byte of memory space.

**Question:** How many different characters can be represented with one byte of memory space?

Example displaying the ASCII value of a char variable:

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| --- |
| CharToASCII.cpp |
| #include <iostream>  #include <bitset>  #include <iomanip>  using namespace std;  int main()  {  char c;  cout << "Enter any character: ";  cin >> c;  cout << "The character you entered is: " << c << endl;  cout << "Its ASCII code (decimal) is: " << (int)c << endl;  bitset<8> x(c);  cout << "Its ASCII code (binary) is: " << x << endl;  cout << "Its ASCII code (hexadecimal) is: " << setw(2) << setfill('0') << hex << (int)c << endl;  return 0;  } |
| Output |
| Enter any character: K  The character you entered is: K  Its ASCII code (decimal) is: 75  Its ASCII code (binary) is: 01001011  Its ASCII code (hexadecimal) is: 4b |

Example displaying the char value of a ASCII integer variable:

|  |  |
| --- | --- |
| ASCIIToChar.cpp | Output |
| #include <iostream>  #include <bitset>  #include <iomanip>  using namespace std;  int main(){  int ascii;  cout << "Enter an integer between 0 and 255: ";  cin >> ascii;  cout << "The integer you entered is: " << ascii << endl;  cout << "The ASCII character is: " << (char) ascii << endl;  return 0;  } | Enter an integer between 0 and 255: 75  The integer you entered is: 75  The corresponding ASCII character is: K |

**Try now:** Write a program that uses a for loop to print all the ASCII characters and their corresponding decimal values in tabular format. See the sample output for one of the characters below:

35 #

36 $

37 %

# String Manipulation Functions?

C++ has a number of pre-defined functions that help the programmer manipulate arrays of characters or strings. The example below illustrates some of these functions.

|  |  |
| --- | --- |
| StringFunctions.cpp | Output |
| #include <iostream>  using namespace std;  int main()  {  char s[80];  strcpy(s, "One");  strcat(s, "Two");  strcat(s, "Three ");  cout << "The string created is: " << s << endl;  cout << "The length of the string is: " << strlen(s);  return 0;  } | The string created is: OneTwoThree  The length of the string is: 12 |

# Reading String Input?

Here we explore how a user can input a string value to a C++ program.

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| --- | --- |
| StringInput1.cpp | Output |
| #include <iostream>  using namespace std;  int main()  {  char s[80];  cout << "Enter string: ";  cin >> s;  cout << "The string entered is: " << s << endl;  cout << "The length of the string is: " << strlen(s);  return 0;  } | Enter string: Hello Andi  The string entered is: Hello  The length of the string is: 5 |

**Try now:** Follow these steps:

1. Substitute the line cin >> s; with line cin.getline(s,79);
2. Run the program and input the string “Hello World”. What is different from the original program?
3. Now input a long string of more than 80 characters. What do you notice? What is happening?

Another example: Converting all characters of a string to upper case.

|  |  |
| --- | --- |
| UpperCase.cpp | Output |
| #include <iostream>  #include <cstring>  #include <cctype>  using namespace std;  void convert\_to\_upper(char \*s);  int main() {  char s[100];  cout << "Enter string to convert & press ENTER: ";  cin.getline(s, 100);  convert\_to\_upper(s);  cout << "The converted string is:" << endl;  cout << s << endl;  return 0;  }  void convert\_to\_upper(char \*s) {  int length = strlen(s);  for (int i = 0; i < length; i++)  s[i] = toupper(s[i]);  } | Enter string to convert & press ENTER: Hello all  The converted string is:  HELLO ALL |

**Try now:** Modify the program to convert all characters to lower case.

# The string Class

The new <string> class makes it easier for the programmer to manipulate strings.

|  |  |
| --- | --- |
| StringClassExample1.cpp | Output |
| #include <iostream>  #include <string>  using namespace std;  int main() {  string str, name, addr, work;  // Get three strings from the user.  cout << "Enter name and press ENTER: ";  getline(cin, name);  cout << "Enter address and press ENTER: ";  getline(cin, addr);  cout << "Enter workplace and press ENTER: ";  getline(cin, work);  // Build the output string, and then print it.  str = "\nMy name is " + name + ", " + "I live at " + addr + ",\nand I work at " + work + ".\n";  cout << str << endl;  return 0;  } | Enter name and press ENTER: Andi Toce  Enter address and press ENTER: New Rochelle  Enter workplace and press ENTER: LaGuardia College  My name is Andi Toce, I live at New Rochelle,  and I work at LaGuardia College. |

|  |  |
| --- | --- |
| ComparingStrings.cpp | Output |
| #include <iostream>  #include <string>  using namespace std;  int main(){  string string1 = "one";  string string2("one");  string string3("five");  string string4("ten");  if(string1 == string2)  cout << "The two strings are the same" << endl;  else  cout << "the strings are different" << endl;  if(!string1.compare(string2))  cout << "The two strings are the same" << endl;  else  cout << "the strings are different" << endl;  cout << string1.compare(string2);  return 0;  } | The two strings are the same  The two strings are the same  0 |

|  |  |
| --- | --- |
| FunWithStrings.cpp | Output |
| #include <iostream>  #include <string>  using namespace std;  int main(){  string college = "Laguardia";  cout << "Initial string: " << college << endl;  college.append(" college");  cout << "The string after appending: " << college << endl;  college[2]='G';  college[10]='C';  cout << "The string after char change: " << college << endl;  string s2 = "Community ";  college.insert(10, s2);  cout << "The string after insert: " << college << endl;  for (int i = 0; i < college.size(); i++){  for(int j=0;j<i;j++)  cout << " ";  cout << college[i] << endl;  }  return 0;  } | Initial string: Laguardia  The string after appending: Laguardia college  The string after char change: LaGuardia College  The string after insert: LaGuardia Community College  L  a  G  u  a  r  d  i  a    C  o  m  m  u  n  i  t  y    C  o  l  l  e  g  e |

**Try now:** Write a program *ReverseString.cpp* that takes a string as an input and prints the string in reverse order.

**Try now:** Write a C++ program *FindSubstring.cpp* that takes as an input two strings from the user and determines whether the first string is a substring of the second. If yes, also print at what position the substring starts.