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Lecture #3
Some predefined Functions, Characters, Strings

Chapter: 3.2, 3.2.3, 4.11.3

Objectives

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- To be able to use predefined functions.
- To represent and use characters using the **char** type.
- To represent special characters using the escape sequences.
- To cast a numeric value to a character and cast a character to an integer.
- To compare and test characters.
- To test and convert characters using the C++ character functions.
- To represent strings using the **string** type and introduce objects and instance functions.
- To use the subscript operator for accessing and modifying characters in a string.
- To use the + operator to concatenate strings.
- To compare strings using the relational operators.
- To read strings from the keyboard.

Some useful predefined functions

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ceil(x) x is rounded up to its nearest integer. This integer is returned as a double value.
floor(x) x is rounded down to its nearest integer. This integer is returned as a double value.

max(2, 3)	returns 3
max(2.5, 3.1)	returns 3.1
min(2.5, 3.1)	returns 2.5
abs(-2)	returns 2
abs(-2.5)	returns 2.5

PreDefined.cpp

Character Data Type

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char letter = 'A'; (ASCII)

char numChar = '4'; (ASCII)

NOTE: The increment and decrement operators can also be used on char variables to get the next or preceding character. For example, the following statements display character b.

```
char ch = 'a';
cout << ++ch;
```

Problem: Reading Characters and casting to integer

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Write a program that can read characters, print them out as char and integer.

CastingCharacters

Problem: Converting a Lowercase to Uppercase

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Write a program that prompts the user to enter a lowercase letter and finds its corresponding uppercase letter.

ToUppercase

Case Study: Generating Random Characters

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Computer programs process numerical data and characters. You have seen many examples that involve numerical data. It is also important to understand characters and how to process them.

Every English character has a unique ASCII code between 0 and 127.

To generate a random character is to generate a random integer between 0 and 127. You can use the srand(seed) function to set a seed and use rand() to return a random integer. You can also use it to write a simple expression to generate random numbers in any range.

Case Study: Generating Random Characters (cont.)

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```
rand() % 10
```
→ Returns a random integer between 0 and 9.

```
50 + rand() % 50
```
→ Returns a random integer between 50 and 99.

```
a + rand() % b
```
→ Returns a random number between a and a + b, excluding a + b.

Random_char

Character Functions

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Function	Description
`isdigit(ch)`	Returns true if the specified character is a digit.
`isalpha(ch)`	Returns true if the specified character is a letter.
`isalnum(ch)`	Returns true if the specified character is a letter or digit.
`islower(ch)`	Returns true if the specified character is a lowercase letter.
`isupper(ch)`	Returns true if the specified character is an uppercase letter.
`isspace(ch)`	Returns true if the specified character is a whitespace character.
`tolower(ch)`	Returns the lowercase of the specified character.
`toupper(ch)`	Returns the uppercase of the specified character.

The string Type

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string s;

string message = **"Programming is fun"**;

Function	Description
`length()`	Returns the number of characters in this string.
`size()`	Same as length();
`at(index)`	Returns the character at the specified index from this string.

String Subscript Operator

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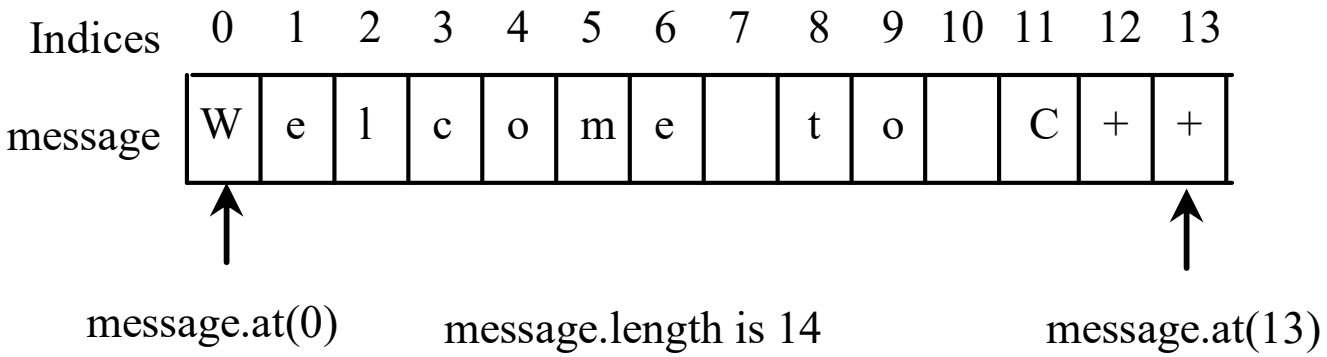

For convenience, C++ provides the subscript operator for accessing the character at a specified index in a string using the syntax **stringName[index]**. You can use this syntax to retrieve and modify the character in a string.

String Subscript Operator

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```
string s = "ABCD";
s[0] = 'P';
cout << s[0] << endl;
```

Concatenating Strings

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```
string s3 = s1 + s2;
```

```
message += " and programming is fun";
```

Comparing Strings

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You can use the relational operators **==**, **!=**, **<**, **<=**, **>**, **>=** to compare two strings.

This is done by comparing their corresponding characters on by one from left to right.

For example,

```
string s1 = "ABC";
string s2 = "ABE";
cout << (s1 == s2) << endl; // Displays 0 (means false)
cout << (s1 != s2) << endl; // Displays 1 (means true)
cout << (s1 > s2) << endl; // Displays 0 (means false)
cout << (s1 >= s2) << endl; // Displays 0 (means false)
cout << (s1 < s2) << endl; // Displays 1 (means true)
cout << (s1 <= s2) << endl; // Displays 1 (means true)
```

Reading Strings

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Version 1:

```
string city;
cout << "Enter a city: ";
cin >> city; // Read to string city
cout << "You entered " << city << endl;
```

Reading_Strings

Version 2:

```
string city;
cout << "Enter a city: ";
getline(cin, city, '\n'); // Same as getline(cin, city)
cout << "You entered " << city << endl;
```

Example

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Write a program that prompts the user to enter firstname, lastname and a lucky number and displays them.

MixedInputs

Input and Output Redirections

if you have a large number of data to enter, it would be cumbersome to type from the keyboard. You may store the data separated by whitespaces in a text file, say **input.txt**, and run the program using the following command:

ReadValues.exe < input.txt

Thank you