

String Manipulation

- **Basic operations**
 - Initialization, length, C-string conversion
 - Assignment, concatenation, comparison, insertion, extraction
- **What else can we do?**

string Character Access

```
string str10 = "abcdefghi";
char ch = str10 [3];
cout << ch << endl; // 'd'
str10 [5] = 'x';
cout << str10 << endl;
// "abcdeXghi"
```

Character access (subscript like array or vector)

string Insertion

```
string str11 = "abcdefghi";
string str12 = "0123";
str11.insert (3, str12);
cout << str11 << endl;
// "abc0123defghi"
str12.insert (1, "XYZ");
cout << str12 << endl;
// "0XYZ123"
```

Insert string at position

string Substring Deletion

```

string str13 = "abcdefghi";

str13.erase (5, 3);
cout << str13 << endl;
// "abcdei"

```

Index of first character to delete
 Number of characters to delete

string Substring Replacement

```

string str14 = "abcdefghi";
string str15 = "XYZ";
str14.replace (4, 2, str15);
cout << str14 << endl;
// "abcdXYZghi"

```

Index of first character to replace
 Number of characters to replace
 Replacement string

string Substring Search

```

string str16 = "abcdefghi";
string str17 = "def";
size_t pos;
pos = str16.find (str17, 0);
cout << pos << endl; // 3
pos = str16.find ("AB", 0);
cout << pos << endl; // npos

```

Position found (or npos)
 Substring to search for
 Starting position for search

Substring Search

- **What if multiple matches?**
–E.g., search for "AB" in "XABYABZ"
- **First occurrence: find**
- **Last occurrence: rfind**
- **Both search from start position**

string Substring Selection

```
string str18 = "abcdefghi";
string str19 =
    str18.substr (6, 2);
cout << str19 << endl;
// "gh"
```

Index of first character to select Number of characters to select

Reading From Input Streams

- **Have extraction operator**
–Reads from input stream to string
–But stops on whitespace!
- **Read a whole line?**
–Possibly with embedded spaces
–Use getline function

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getline Stream Input

```

ifstream infile ("in.txt");
string str;
getline (infile, str, '\n');

```

Input stream

String to read characters into

Delimiter character (stops input)

Function return value can be tested for success

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Character Classification

- **Often classify characters**
 - E.g., is character valid in a C++ identifier (letters, digits, underscore)?
- **Library functions available**
 - Return Boolean value
 - True if character in class

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Classification Functions

```

// in <cctype>
bool isxxx (char c);

    isalnum    ispunct
    isalpha    isspace
    isdigit    isupper
    islower    <more>

```

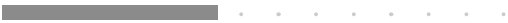
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Case Conversion Functions

```
// in <cctype>
char tolower (char c);
char toupper (char c);
```

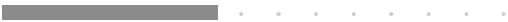
In C-compatible libraries, may be int instead of char, but works the same way



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Design Exercise

- **Read a text file**
 - Prompt user for file name
- **Read one line at a time**
 - Convert to all lower case
 - Reverse each line
- **Write to new text file**



Handwritten notes for Case Conversion Functions section.

Handwritten notes for Design Exercise section.