# Class 23

Strings and Characters
(Modified slightly from Rebecca Schley's class)

# Text in C++

- There are three types:
  - char – stores a single character
  - string – stores a sequence of characters
  - char[] – also known as c-strings; stores sequence of characters

# Characters

- In C++ characters are actually stored as numbers
- Every character is understood as a number using the ASCII code

| | |
|---|---|
| ‘A’ = 65 | ‘a’ = 97 |
| ‘B’ = 66 | ‘b’ = 98 |
| ‘C’ = 67 | ‘c’ = 99 |

- https://www.asciitable.com

# Type Casting

- cout << (int) ‘F’ << endl; // 70
- int i = 80;
- cout << (char) i; // P

# Example 1

- Write function to print a table listing the ASCII codes and characters for ASCII 33 to 126

# Characters v. Strings

- char values are always written in single quotes
- string values are always written in double quotes
- Examples:
  - char x = ‘H’;
  - string s = “Hello”, s1 = “Queens College”, s2 = “”, s3 = “A”;
  - char cs[] = “Hello”;

# Strings and Arrays

- With a c-string we can change chars using array notation
  - char cs[] = “hello”;
  - cs[0] = ‘H’; // cs now stores Hello
- Same array notation works on string data
  - string s = “hello”;
  - s[2] = ‘L’; // s now stores heLlo

# Example 2

- Write function to convert text to all lower case
- Title line: char toLower(char c)

```
int main() {
  string s = “HELLO”;
  for(int i = 0; i < 5; i++){
    s[i] = toLower(s[i]);
  }
  cout << s << endl;
  return 0;
}
```

# String Class

- String is a class type
- Class types have methods, which are special functions to call on
- Use methods: VariableName.MethodName(Arguments)
  - The "." is called the method selection operator
- Creating user-defined classes and methods is a CS 211 topic

# String Methods

- String class methods include:
  - length(), size()
  - find(target), find(target, start_index)
  - rfind(target)
  - erase(index, amount)
  - replace(index, amount, addition)
  - insert(index, addition)
  - substr(index), substr(index, amount)
  - c_str()

# Call on class methods

- Variable.Method(Required_Input)
- Example:

```
string s = “Hello”;
cout << s.length() << endl;
cout << s.size() << endl;
```

# Example 3

- Rewrite function to convert any size string to all lower case
- Title line:  void toLower(string &a)

```
int main() {
   string s = “HELLO”;
   toLower(s);
   cout << s << endl;
   return 0;
}
```

# Example 4

- Rewrite function to convert any size string to all lower case
- Title line:  string toLower(string a)

```
int main() {
   string s = “HELLO”;
   string s1 = toLower(s);
   cout << s1 << endl;
   return 0;
}
```

# c_str()

- There are two ways to store sequences of characters in C++
  - string – class type
  - char[] – c-string pointer (left over from C language)
- Work with string and if you absolutely need a c-string convert the string to it using .c_str()
- c-strings do not have methods, instead there are library functions
- To use c-string functions #include<cstring>
- These function names begin with str

# c-string functions

```
char cs[] = “Queens College”;
cout << strlen(cs) << endl;
string s = “Hello”;
cout << s.c_str() << endl;
cout << strlen(s.c_str()) << endl;
strcpy(cs, s.c_str());
cout << cs << endl;
```