

Strings

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Characters

Characters and ints

- Type *char*;
- represents '7-bit ASCII': printable and (some) unprintable characters.
- Single quotes: `char c = 'a'`

Char / int equivalence

Equivalent to (short) integer:

Code:

```
char ex = 'x';  
int x_num = ex, y_num = ex+1;  
char why = y_num;  
cout << "x is at position " << x_num  
    << endl;  
cout << "; one further lies " << why  
    << endl;
```

Output

[string] intchar:

```
x is at position 120  
; one further lies y
```

Also: 'x'-'a' is distance a--x

Exercise 1

Write a program that accepts an integer $1 \cdots 26$ and prints the so-manieth letter of the alphabet.

Extend your program so that if the input is negative, it prints the minus-so-manieth uppercase letter of the alphabet.

Strings

String declaration

```
#include <string>  
using std::string;
```

```
// .. and now you can use 'string'
```

(Do not use the C legacy mechanisms.)

String creation

A *string* variable contains a string of characters.

```
string txt;
```

You can initialize the string variable or assign it dynamically:

```
string txt{"this is text"};  
string moretxt("this is also text");  
txt = "and now it is another text";
```


Quotes in strings

You can escape a quote, or indicate that the whole string is to be taken literally:

Code:

```
string
    one("a b c"),
    two("a \"b\" c"),
    three( R("a ""b ""c")" );
cout << one << endl;
cout << two << endl;
cout << three << endl;
```

Output

[string] quote:

```
a b c
a "b" c
"a ""b ""c
```

Concatenation

Strings can be *concatenated*:

```
txt = txt1+txt2;  
txt += txt3;
```

String indexing

You can query the *size*:

```
int txtlen = txt.size();
```

or use subscripts:

```
cout << "The second character is <<" <<  
      txt[1] << ">>" << endl;
```

Ranging over a string

Ranging by index:

Code:

```
string abc = "abc";  
cout << "By character: ";  
for (int ic=0; ic<abc.size(); ic++)  
    cout << abc[ic] << " ";  
cout << endl;
```

Output

[string] stringindex:

By character: a b c

New syntax: range-based for

Code:

```
cout << "By character: ";  
for ( char c : abc )  
    cout << c << " ";  
cout << endl;
```

Output

[string] stringrange:

By character: a b c

Range with reference

Range-based for makes a copy of the element

You can also get a reference:

Code:

```
for ( char &c : abc )  
    c += 1;  
cout << "Shifted: " << abc << endl;
```

Output

[string]
stringrangeset:

Shifted: bcd

Review quiz 1

True or false?

- '0' is a valid value for a char variable
- "0" is a valid value for a char variable
- "0" is a valid value for a string variable
- 'a'+'b' is a valid value for a char variable

Exercise 2

The oldest method of writing secret messages is the *Caesar cypher*. You would take an integer s and rotate every character of the text over that many positions:

$$s \equiv 3: \text{"acdZ"} \Rightarrow \text{"dfgc"}.$$

Write a program that accepts an integer and a string, and display the original string rotated over that many positions.

More vector methods

Other methods for the vector class apply: `insert`, `empty`, `erase`, `push_back`, et cetera.

Methods only for `string`: `find` and such.

http://en.cppreference.com/w/cpp/string/basic_string

Exercise 3

Write a function to print out the digits of a number: 156 should print `one five six`. You need to convert a digit to a string first; can you think of more than one way to do that?

Start by writing a program that reads a single digit and prints its name.

For the full program it is easiest to generate the digits last-to-first. Then figure out how to print them reversed.

Exercise 4

Write a function to convert an integer to a string: the input 215 should give two hundred fifteen, et cetera.