
CSI33 Data Structures

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C++ loops

C++ has three types of loops
Pre-test loop or while loop

```
int j = 0;
while(j < 10){
    cout << j << endl;
    ++j;
}
```

Post-test loop – loop is executed, then the condition is tested

```
int j = 0;
do {
    cout << j << endl;
    ++j;
} while(j < 10);
```

C++ for loop or counted loop

```
for (j = 5; j < 12; ++j){  
    cout << 2*j + 1 << endl;  
}
```

(initialization; test; increment)

Variable can be declared in the initialization. It will be local to the block. Other increments are allowed – $j += 2$, for instance.

Arrays

C++ array declaration:

```
int a[100];
```

Array has storage for
100 integers, fixed size

Indexed from 0 to 99

New feature since
1999

Size of array can be
specified at run time
by assigning a value to
a variable, even from
input

Be careful with C++ arrays

You can use elements of an array without having assigned them values.

There is no index-range checking for C++ arrays, so you can access elements beyond the boundaries of an array.

C++ supports multidimensional arrays

```
double a[4][5][3];
int i, j, k;
for (i = 0; i < 4; ++i) {
    for (j = 0; j < 5; ++j) {
        for (k = 0; k < 3; ++k) {
            a[i][j][k] = i + 2*j + 5*k;
        }
    }
}
```

Arrays of characters

In C, strings are represented as arrays of characters - char
C++ has a string class.

Look at program `buffer.cpp` for a simple example of C strings in an array.

Print out the characters one at a time. Go past the end of the string.
`'\0'`

C++ functions

In C++ functions must be declared.

A declaration tells the compiler that a name exists, represents a variable of certain type, a class, or a function with parameters.

Technically statements like

```
int a;
```

are variable definitions, since memory is assigned.

Function declaration/prototype

```
double ctof(double celsius);
```

Gives name of function – ctof

Tells the return type of the function – The function ctof returns a double value

Says the function takes one parameter of type double, name is not necessary.

Ends with ;

Must appear before the function is called in the code.

Unnecessary unless other code calls the function.

In-class assignment - Write a C++ program.

Write a program that gets input of a temperature in Celsius, and prints out the equivalent temperature in Fahrenheit.

Use a function `ctof` to do the conversion.

Write a prototype for the function before the definition of the main method.

Write the definition of `ctof` after the main method.