

# CS 1428

## Fall 2018

### Gentry Atkinson

#### Lab 1

### Introduction:

Like mathematical expressions, programs rely on variables. When using C++ you must declare variables as specific types determined by the value of the data you intend to store. These built-in data types are called “primitive”. Later on you will learn to define your own data types.

The primitives we will use are:

<b>int</b>	stores an integer value
<b>float</b>	stores a real number, which is called a “floating point” in programming
<b>char</b>	stores a single character
<b>bool</b>	stores a true or false value

In addition to variables, you need operators in order to write expressions. These operators are like functions that take some values and return one value. Operators are also built in but can be altered later. You’ve already learned how to define a function. Some of the built in operators are +, -, \*, /, and similar simple arithmetic signs.

### Directions:

1- Launch Code::Blocks and start a new file. Name it your\_last\_name\_lab1.cpp.

2- Include the standard header for this lab:

```
//Your Name
//CS1428 Fall 2018
//Lab 1
```

3- Include the iostream standard library and start your main function:

```
#include <iostream>

using namespace std;

int main() {
```

4- Declare your first integer type variable:

```
int myFirstInt;
```

This will create space in the computer's memory to store one integer value. However, you haven't given myFirstInt any value yet, so right now there might be a default value like 0 or there might be garbage that was left behind by an old program. It's never good practice to reference a variable that hasn't been given a value.

5- Assign values to some variables:

```
myFirstInt = 5;  
int mySecondInt = 7;
```

myFirstInt now has a value and is safe to use. Notice that for mySecondInt we chose to declare and assign the variable in the same statement, so mySecondInt is also safe to use. You can assign a variable with a fixed value (eg. myFirstInt = 5) or with another variable (eg. myFirstInt = mySecondInt).

6- We can use our new variable to create an expression and display the result with the code:

```
cout << "The sum of my variables is " << myFirstInt + mySecondInt << endl;
```

This one line of code will first compute the sum of the two integers and will then print the text followed by the sum.

7- Practice declaring and assigning variables by doing the following:

1. Create an integer called myAge and assign it the value of your age.
2. Create an integer called thisYear and assign it the value of this year.
3. Create a floating point number called pi and give it the value of Pi as accurately as you can remember.
4. Create a floating point number called myFirstFloat and give it the value of myFirstInt.
5. Create a boolean variable called myFirstBool and give it the value false.
6. Create a boolean variable called mySecondBool and give it the value true.

8- Write code to evaluate the following expressions and then output each answer to a separate line using **cout** statements:

1. The product of myFirstInt and mySecondInt.
2. Use thisYear and myAge to roughly calculate your birth year.
3. Use your pi variable to calculate the circumference of a circle with radius 4.
4. Divide myFirstInt by 3.
5. Divide myFirstInt int by 3.0.
6. One fifth of the square of myFirstFloat.

7. The sum of myFirstInt and mySecondBool.
8.  $(3 * \text{myFirstFloat} + \text{mySecondInt}) / 4 * (\text{mySecondInt} * \text{mySecondInt})$
9. The volume of a sphere is  $\frac{4}{3}$  pi times the cube of the radius. Use the pi variable to compute the volume of a sphere with radius 2.
10. The “modulus” operator is written with the % character and returns the remainder when two integers are divided. Use the thisYear variable and the modulus operator to calculate the number of years since the last leap year.
11. Assign myFirstInt a value between 100 and 999. Use the % and / operators to print the three digits of myFirstInt separately.

There are two things that you should notice about this block of questions. The first is that questions 4 and 5 will return different values. This is because integer and floating point division are different in C++. The second is that question 7 will return an answer even though  $5 + \text{true}$  doesn't mean anything mathematically. This is because C++ stores the values true and false as integers “under the hood”. Good naming conventions will help prevent you from accidentally using variables in ways that will give you garbage results.

9- Save your work. **Build and Run.** Correct any errors. You should see something like this:

```
C:\Users\gma23\Desktop\website\CS1428-Honors-Lab\atkinson_lab1.exe
The sum of my variables is 12
myFirstInt * mySecondInt = 35
My birth year = 1984
Circumference = 25.1327
myFirstInt / 3 = 1
myFirstInt / 3.0 = 1.66667
One fifth of the square of myFirstFloat = 5
myFirstInt + mySecondBool = 6
(3 * myFirstFloat + mySecondInt) / 4 * (mySecondInt * mySecondInt) = 269.5
Volume of Sphere = 33.5103
Years since last leap year = 2
First digit: 3 Second digit: 5 Third digit: 7
Process returned 0 (0x0) execution time : 0.125 s
Press any key to continue.
```

10- Email your .cpp file to [gma23@txstate.edu](mailto:gma23@txstate.edu). You can leave when you're done.