# Variables and Arithmetic - C1W2

**T1** Chapters **5-13**

## Defining Variables

* The syntax to define a variable has the following structure

Type Name = Value;

For example, int x = 4; defines an int variable containing the value 4. Similarly, float y = 3.14; defines a float variable containing the value 3.14.

* Variable can also be defined in two steps - **declaration** and **assignment**.
  + int c; // declaration
      
    c = 8; // assignment
* The first way of defining a variable is called **inline initialization** because the value of the variable is assigned to it at declaration time, while in the second case, this is made explicit by separating the declaration and assignment steps.
* Which approach one chooses is often a matter of personal preference. However, for the sake of readability and correctness, it is advisable to use the first approach whenever possible.

## Exercises

1. Define a variable containing the value 'c'. (E)
2. Define an unsigned variable containing the value 32768. (M)
3. Define a variable to hold the result of the arithmetic expression

* and display the value of the variable to the console. (H)

## Performing Arithmetic

There are five arithmetic operators.

* Addition +
* Subtraction -
* Multiplication \*
* Division /
* Modulus or Remainder %

These operators can be used to compute arithmetic expressions like the following,

int x = 4\*5;  
float y = 3.4/1.2;  
float c = sqrt(x\*x + y\*y); // length of hypotenuse

In the last example, sqrt is a function available in the math.h library to compute the square root.

## Exercises

1. \*\*Complete the following program to compute the volume of a cube.

* #include <stdio.h>  
    
  int main()  
  {  
   float h = 8;  
   float l = 12;  
   float w = 10;  
     
   float volume = <insert arithmetic expression here>;  
  }

1. \* Define a variable containing the area of a square with a side length of 3.14cm, and display the value of the variable.
2. \*\*\*Modify the following program to remove the weight variable by computing (volume + 165) / 166 within the last printf itself.
3. \*\*\* Explain why the result of the expression int r = 3 % 4 is 3. What happens when the expression is instead int r = 5 % 4, and why?

## scanf

* The scanf function can be seen as a complement to the printf function, in that, the former is used for user input while the latter is used for user output.
* In cases where some input from the user is required and this input has a predetermined structure, the scanf function can be used.
* For example, consider the simple program below -
* #include <stdio.h>  
    
  int main()  
  {  
   printf("Please enter two integers [separated by a space]: ");  
   int a, b;  
   scanf("%d %d", &a, &b);  
   printf("a = %d, b = %d\n", a, b);  
   return 0;  
  }
* Here, scanf requires that the user enter the input exactly as specified in the format string. In other words, the user must enter an input similar to 3 4 in order for the program to work correctly.

## Exercise

1. Compute the weight of a box from the input provided by the user.

* where w and v are the weight and volume of the box respectively. (M)

1. Convert temperature entered by a user in Celsius to Fahrenheit.

* where F and C are the Fahrenheit and Celsius temperatures respectively. (M)

## Homework

1. **T1** Chapters:
   1. **14-16**
   2. **20-23**
2. Write a program that computes the volume of a sphere using the radius obtained from the user. Display the result on the console.
3. Write a program that asks the user to enter a value for x and then displays the value of the following polynomial: