

# **EE101 C programming and SW engineering 1 Example**

## **Application of Software Development Process**

The following sets out an example of how to follow the Software Development Process (SDP). This is a simple example designed to show you the types of things that you should be aiming to achieve when undertaking program design and how the SDP is applied. Note: This is by no means a perfect example of an implementation, it is only meant to provide you with ideas.

### **Question**

Write a C program to take the depth in kilometers inside the earth as input data. The program should use this information to compute and display the temperature at this depth in degrees Celsius and degrees Fahrenheit. The relevant formulas are:

- Celsius temperature at depth in kilometer formula:  $\text{Celsius} = 10 * \text{depth} + 20$
- Celsius to Fahrenheit conversion formula:  $\text{Fahrenheit} = 1.8 * \text{Celsius} + 32$

### **Model Answer - Software Development Process**

#### **Problem statement:**

To ask user to input a real number using the keyboard. The number can be a real number and should represent a depth in kilometers. The program must compute the temperature at the input depth in degrees Celsius and degrees Fahrenheit using the conversion formulas provided. The computed temperatures should be output on the screen rounded to 2 decimal places

#### **Analysis**

##### **Inputs:**

- A real number representing depth in kilometers.

##### **Outputs:**

- Display the temperature at the given depth in degrees Celsius and Fahrenheit by printing messages on the screen.
- additional requirements or constraints:
- assume that the user only inputs valid data, (i.e. only real numbers as inputs)
- round the displayed values to 2 decimal places

**Design:**

1. Declare three variables of the type of float and name them appropriately e.g. depth, Celsius and Fahrenheit, intuitively:  
Depth - represents the input depth in kilometers.  
Celsius - represents degrees Celsius.  
Fahrenheit - represents degrees Fahrenheit.
2. Ask the user to input a real number representing the depth in kilometers.
3. Read the input real number and store the value of into variable named depth.
4. Compute the temperature at the given depth in degrees Celsius according to the provided formula and store the value in variable Celsius.
5. Compute the temperature at the given depth in degrees Fahrenheit according to the provided formula and store the value in variable Fahrenheit.
6. Display the Celsius temperature at the given depth rounded to two decimal places on the screen.
7. Display the Fahrenheit temperature at the given depth rounded to two decimal places on the screen.

**Implementation:**

see the C code “sample.c” (next page) with comments.

**Testing:**

The C program was tested by carrying out a set of experiments; and the C program output was verified successfully. For instance,

Please enter the depth in kilometers inside the earth as input data. 100

Celsius temperature at depth 100.000000 km is 1020.000000.

Fahrenheit temperature at depth 100.000000 km is 1868.000000.

Please enter the depth (in kilometers) inside the earth as input data. 250

Celsius temperature at depth 250.000000 km is 2520.000000. Fahrenheit temperature at depth 250.000000 km is 4568.000000.

Please enter the depth in kilometers inside the earth as input data. 5000

Celsius temperature at depth 5000.000000 in km is 50020.000000.

Fahrenheit temperature at depth 5000.000000 in km is 90068.000000.

Note: testing should be more extensive, other none valid inputs should also be attempted. Try to make your program fail.

## C code

/\*

**Name: Simple Program for Depth, Degrees Celsius and Degree Fahrenheit**

**Conversion File Name: sample.c**

**Copyright: Free**

**Author: Anonymous Author**

**Description: Compute and display the temperature at a given depth inside the earth in degrees Celsius and degrees Fahrenheit**

\*/

**#include <stdio.h>     /\* include information about standard library stdio.h \*/**

**int main(void){         /\* define a function named main \*/**

**float depth, Celsius, Fahrenheit;     /\* declare three variables of type of float namely depth, Celsius and Fahrenheit \*/**

**printf("Please enter the depth in kilometers inside the earth as input data.\n");**  
**/\* ask user to input a real number representing the variable depth in kilometers**  
**\*/**

**scanf("%f", &depth);             /\* store the value of the input real number into variable depth using the scanf function \*/**

**Celsius = 10\*depth + 20;         /\* compute the temperature at the given depth in degrees Celsius according to the formula provided \*/**

**Fahrenheit = 1.8\*Celsius + 32;         /\* compute the temperature at the given depth in degrees Fahrenheit according to the formula provided \*/**

**printf("Celsius temperature at depth %f in km is %0.2f.\n", depth, Celsius);**  
**/\* display the Celsius temperature at the given depth \*/**

**printf("Fahrenheit temperature at depth %f in km is %0.2f.\n", depth, Fahrenheit);**  
**/\* display the Fahrenheit temperature at the given depth \*/**  
**}**

## Notes

The solution of this exercise demonstrates solving practical problems in C using the Software Development Process. Students are expected to present their works using the similar approach as presented above.