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: Celsius = 10 * depth + 20
- Celsius to Fahrenheit conversion formula: Fahrenheit = 1.8 * Celsius + 32

Model Answer - Software Development Process

Problem statement:

To ask user to input a real number representing the depth (in kilometers) and then compute and display the temperature at the given depth in degrees Celsius and Fahrenheit respectively (according to two provided conversion formulas).

Analysis

Inputs:

- A real number representing the depth (in kilometers).

Outputs:

- to print/display the temperature at the given depth in degrees Celsius and Fahrenheit (printing messages).

additional requirements or constraints:

- none (assuming that the user only input valid data, i.e. only real numbers as inputs)

Design:

1. Declare three variables of the type of float namely 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.
3. Read the input real number and store the value of such a real number into depth.
4. Compute the temperature at the given depth in degrees Celsius according to the provided formula.
5. Compute the temperature at the given depth in degrees Fahrenheit according to the provided formula.
6. Display the Celsius temperature at the given depth.
7. Display the Fahrenheit temperature at the given depth.

Implementation:

see the C code in file sample.c 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.

C code

```
/*
Name: Simple Program for Depth, Degree 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 (as input data) in degree Celsius and degree Fahrenheit
*/

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

main(){          /*define a function named main*/

float depth, Celsius, Fahrenheit; /* declare three variables of the 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 such a real number into variable depth depth using the scanf function */

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

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

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

printf("Fahrenheit temperature at depth %f in km is %f.\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.