IS-FEE-10061S - INTRODUCTION TO PROGRAMMING IN C
TEST NO 2 (EXAMPLE)

Write a single computer program that includes all of the following points.

* Include your first name, last name, the current date, course code (IS-FEE-10061S), and the name of the IDE you are using (Code::Blocks) as comments on the first line of the program.

Points	2 pts.

* Declare a structure describing a **trapezoid** (with height **h** and bases **a** and **b**). *[2 pts.]*
  Declare a structure variable and input the values from the keyboard. *[2 pts.]*
  Using this variable, calculate and display the surface area of the trapezoid. *[2 pts.]*

Points	6 pts.

* Read the number **n** (of type **int**) from the keyboard. Dynamically allocate memory for an **n**-element vector of floating-point numbers. Check for correct memory allocation. *[4 pts.]*

* Write the values of the subsequent terms of the numerical series, described by the recursive formula below, into the vector. Display the vector elements. *[3 pts.]*

$$a_n = \begin{cases} 0.5 & \text{for} \quad n = 0 \\ 1.5 \cdot a_{n-1} + \sqrt{2} & \text{for} \quad n > 0 \end{cases}$$

* Use a recursive function to calculate the values of the terms. *[3 pts.]*

* Free the memory allocated to the vector. *[1 pt.]*

Points	11 pts.

* Write a function that calculates and returns the lateral area **M** of a cone with base radius **r** and height **h** (**r** and **h** are function parameters). *[5 pts.]*

$$M = \pi \cdot r \cdot \sqrt{r^2 + h^2}$$

* For π, use the constant from the **math.h** header file. *[1 pt.]*

* In the **main()** function: read the values of **r** and **h** from the keyboard, call the written function, and print the value returned by the function. *[3 pts.]*

Points	9 pts.

* The **tempC.txt** text file contains temperature measurement results from three sensors. For each measurement, the **sensor number** (an integer with the value **1**, **2**, or **3**) and the **temperature value in Celsius** (a floating-point number) are saved.

* Write a program that will read data from the text file and display on the screen for each measurement: the **sensor number**, the **temperature value in Celsius** with an accuracy of two digits after the decimal point, and the **temperature value in Fahrenheit** with an accuracy of two digits after the decimal point (**Tf=32+Tc·9/5**). The screen printout should have the following form: *[4 pts.]*

```
[3] --> 21.92 [C] --> 71.45 [F]
[2] --> 21.07 [C] --> 69.92 [F]
[1] --> 13.32 [C] --> 55.98 [F]
[3] --> 29.18 [C] --> 84.53 [F]
[3] --> 20.02 [C] --> 68.03 [F]
[2] --> 22.45 [C] --> 72.41 [F]
```

* Use a function to convert the temperature from Celsius to Fahrenheit. *[3 pts.]*

* Save the data displayed on the screen in the same form to the text file **tempCF.txt**. *[3 pts.]*

* Calculate and display the number of measurements for each sensor on the screen. *[2 pts.]*

Points	12 pts.

Notes: The maximum number of points is 40.

21 points are required to pass the test.