EEE101 C Programming Report
Assignment 1

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1 Problem Statement

1.1 Introduction

Provide an interface through which user can input full name, telephone number, a 2-digit decimal number and a temperature in degrees Celsius. The limitations of the input data are as follows:

1. For the full name, users are allowed to input letters or spaces.
2. For the telephone number, users are able to input 11-digit number only.
3. For the 2-digit decimal number, users can input positive 2-digit number only.
4. For the temperature in degree Celsius, users are allowed to input positive integer or float.

1.2 Inputs

If an illegal input is detected, users have a certain number of attempts to re-enter the data again. The value of attempts is defined as ERR_ATTEMPTE in the program code (default is 3). If the attempts are all consumed, the function is running will be jump out, and then user will go to the next function automatically. Being illegal input may be defined as follows:

1. For the full name:
   (a) The input name is too long that out of the character limitation (defined as NAME_L ENGTH, default is 50).
   (b) The input name has character which is not letters or spaces.
   (c) The input name is not full name, which means only input part of the name, or there is no space between different parts of the name.
2. For the phone number:
   (a) The input phone number is shorter or longer than standard phone number length (defined as PHONE_LENGTH, default is 11).
   (b) The input phone number has character which is not digit.
3. For the 2-digit decimal number:

(a) The input number is shorter or longer than standard length (defined as NUMBER_LENGTH, default is 2).

(b) The input number has character which is not digit.

4. For the temperature:

(a) The input temperature is too long that out of the character limitation (defined as TEMPER_LENGTH, default is 10).

(b) The input temperature has character which is not digit or "." sign.

1.3 Outputs

Each program will display some information after user input data. The types of output details are as follows:

1. If the user input is correct:

(a) For the full name, output is the sum of character value of the name (without space in the name).

(b) For the phone number, output is the value of first 6 digits divide by the last 5 digits. (Ps. If the last 5 digits are all 0, a warning will appear to ask user whether to try again or continue running).

(c) For the 2-digit decimal number, output is the binary value of it.

(d) For the temperature, output is the value of temperature in degrees Celsius, degrees Fahrenheit and degrees Kelvin.

2. If the user input is incorrect, output is the reason of incorrect and a notification to ask user input again.

1.4 Exit

If the user input is incorrect, output is the reason of incorrect and a notification to ask user input again.

2 Analysis

2.1 On inputs

Firstly, a message needs to be printed on the screen to let the users know what data/action this program expects. Because the execution is not terminated immediately once an illegal input is detected, but need to ask users know the reason of error and give them a few attempts to re-enter the data, the program needs to do input legality verification when the attempts for users to re-enter data are not 0. Therefore, the program should accept all kinds of data which user input, so that it can check the legality of all data.

2.2 On outputs

Because the data input by user cannot be predicted before they enter, the outputs are need to be discussed in two types of result, which are correct output with legal input and incorrect output with illegal input. The details of the two types of outputs will be shown as follows:

1. The inputs are legal and outputs are correct:

   (a) For the full name, the sum of character values of name should be calculated correctly.

   (b) For the phone number, the value of first 6 digits divide by the last 5 digits should be calculated correctly.

   (c) For the 2-digit decimal number, the binary value of it should be calculated correctly.

   (d) For the temperature, the value of temperature in degrees Celsius, degrees Fahrenheit and degrees Kelvin should be calculated correctly.

   All of these outputs are needed to printed on the screen with clear text messages.

2. The inputs are illegal and outputs are incorrect:

   The reason of inputs illegal should be printed on screen, ask users to input again and the value of rest of attempts should be shown to the users.

2.3 Data structure

1. Structure:
   Define four types of structure type, record all data related to the type with the structure type, and store different types of data with structural members of different types in the structure type.

2. Array:
   Define array as one of members of the structure type, to organize and store several variables of the same type in an orderly fashion.

3. Some single data to save local variable data.

2.4 Algorithm

1. For the full name:
   Use addition to calculate the character value of name.

2. For the phone number:
   Use division to calculate the answer.

3. For the 2-digit decimal number:
   Use short division to calculate binary value.

4. For the temperature:
   Use two equation to calculate Fahrenheit and Kelvin by Celsius.

   (a) fahrenheit = 9/5 * Celsius + 32

   (b) Kelvin = Celsius + 273.15

3 Design

3.1 For the full name

1. Declare Name_Struct type with a variable name, and members to store data about full name.

full[256]	An array up to store full name as string.
length	The length of name.
sum	The sum of character values of the name.
err_reason	The reason of error occurs.
result	The run result of the name read function.

2. Print a message on the screen to ask the user to input the full name.
3. Read the full name and assign it to name.full.
4. Check if the value of name.full is legal.
5. Re-enter if the value is incorrect. If there is no attempt, jump out to the next function.
6. Calculate the sum of character value of the name.
7. Print the result on the screen and give clear text message, then go to the next function.

3.2 For the phone number

1. Declare Phone_Struct type with a variable phone, and members to store data about phone number.

number[256]	An array to store phone number as string.
length	The length of phone number.
numerator[7]	An array to store first 6 digits of the phone number.
denominator[6]	An array to store last 5 digits of the phone number.
value	The operate value.
err_reason	The reason of error occurs.
result	The run result of the phone read function.

2. Print a message on the screen to ask the user to input the phone number.
3. Read the phone number and assign it to phone.number.
4. Check if the value of phone.number is legal.

5. Re-enter if the value is incorrect. If there is no attempt, jump out to the next function.
6. Calculate the operate value of phone number.
7. Print the result on the screen and give clear text message, then go to the next function.

3.3 For the 2-digit decimal number

1. Declare Number_Struct type with a variable number, and members to store data about 2-digit decimal number.

decimal[256]	An array to store the 2 digit number as string.
length	The length of the number.
binary	The number in binary.
err_reason	The reason of error occurs.
result	The run result of the number read function.

2. Print a message on the screen to ask the user to input the 2-digit decimal number.
3. Read the 2-digit decimal number and assign it to number.decimal.
4. Check if the value of number.decimal is legal.
5. Re-enter if the value is incorrect. If there is no attempt, jump out to the next function.
6. Calculate the binary of the decimal number.
7. Print the result on the screen and give clear text message, then go to the next function.

3.4 For the temperature

1. Declare Temper_Struct type with a variable temper, and members to store data about temperature.

celsius[256]	An array to store temperature in degrees Celsius as string.
length	The length of the temperature in degrees Celsius.
fahrenheit	The temperature in degrees Fahrenheit.
kelvin	The temperature in degrees Kelvin.
err_reason	The reason of error occurs.
result	The run result of the temperature read function.

2. Print a message on the screen to ask the user to input the temperature.
3. Read the temperature and assign it to temper.celsius.
4. Check if the value of temper.celsius is legal.
5. Re-enter if the value is incorrect. If there is no attempt, jump out to the next function.
6. Calculate the Fahrenheit and Kelvin temperature.
7. Print the result on the screen and give clear text message, then exit the program.

4 Implementation

See the C code âĂIJ1718112_1.câĂİ with comments.

5 Testing

5.1 For the full name

Test 1:
Please input your full name:Ziqi Yang
The sum of the chapter values of Ziqi Yang is 812.

Test 2:
Please input your full name:David Yang
The sum of the chapter values of David Yang is 887.

Test 3:
Please input your full name:Ziqi123 Yang
There are illegal characters in the name.

You have 3 attempts to try again!Please input your full name:ziqi..
There are illegal characters in the name.

You have 2 attempts to try again!Please input your full name: Yang
The name is not full name.

You have 1 attempts to try again!Please input your full name:Ziqi Yang
The sum of the chapter values of Ziqi Yang is 812.

Test 4:
Please input your full name:Ziqi
The name is not full name.

You have 3 attempts to try again!Please input your full name:Ziqi 394
There are illegal characters in the name.

You have 2 attempts to try again!Please input your full name:ziqiasdfghjkl qqewqtreyrueiureroeirori-
weiwoieqofhsajfak
The name is too long.

You have 1 attempts to try again!Please input your full name:Ziqi Yang
The sum of the chapter values of Ziqi Yang is 812.

Test 5:
Please input your full name:Test Ziqi Yang123
There are illegal characters in the name.

You have 3 attempts to try again!Please input your full name:Ziqi
The name is not full name.

You have 2 attempts to try again!Please input your full name:ziqi yang333

There are illegal characters in the name.

You have 1 attempts to try again!Please input your full name:12 345
There are illegal characters in the name.

You have no attempts to try again, it will go to next function.

5.2 For the phone number

Test 1:
Please input your 11 digit phone number:12345678901
The value of 123456 / 78901 is 1.56

Test 2:
Please input your 11 digit phone number:10945629651
The value of 109456 / 29651 is 3.69

Test 3:
Please input your 11 digit phone number:12345275381aaaa
The phone number is too long.

You have 3 attempts to try again!Please input your 11 digit phone number:1234527
The phone number is too short.

You have 2 attempts to try again!Please input your 11 digit phone number:1234567wsd1
There are illegal characters in the phone number.

You have 1 attempts to try again!Please input your 11 digit phone number:12345678901
The value of 123456 / 78901 is 1.56

Test 4:
Please input your 11 digit phone number:123,356,yu2
There are illegal characters in the phone number.

You have 3 attempts to try again!Please input your 11 digit phone number:12378452974

The value of 123784 / 52974 is 2.34

Test 5:
Please input your 11 digit phone number:1234567 897
There are illegal characters in the phone number.

You have 3 attempts to try again!Please input your 11 digit phone number:12398
The phone number is too short.

You have 2 attempts to try again!Please input your 11 digit phone number:12346098653332234
The phone number is too long.

You have 1 attempts to try again!Please input your 11 digit phone number:1237chdsijda
The phone number is too long.

You have no attempts to try again, it will go to next function.

5.3 For the 2-digit decimal number

Test 1:
Please input a 2 digit decimal number:16
The binary of 16 is 10000.

Test 2:
Please input a 2 digit decimal number:59
The binary of 59 is 111011.

Test 3:
Please input a 2 digit decimal number:2
The number is too short.

You have 3 attempts to try again!Please input a 2 digit decimal number:2222
The number is too long.

You have 2 attempts to try again!Please input a 2 digit decimal number:1a

There are illegal characters in the number.

You have 1 attempts to try again!Please input a 2 digit decimal number:23
The binary of 23 is 10111.

Test 4:
Please input a 2 digit decimal number:2
There are illegal characters in the number.

You have 3 attempts to try again!Please input a 2 digit decimal number:,;
There are illegal characters in the number.

You have 2 attempts to try again!Please input a 2 digit decimal number:-o
There are illegal characters in the number.

You have 1 attempts to try again!Please input a 2 digit decimal number:63
The binary of 63 is 111111.

Test 5:
Please input a 2 digit decimal number:we
There are illegal characters in the number.

You have 3 attempts to try again!Please input a 2 digit decimal number:2
The number is too short.

You have 2 attempts to try again!Please input a 2 digit decimal number:34657656
The number is too long.

You have 1 attempts to try again!Please input a 2 digit decimal number:j-0sa
The number is too long.

You have no attempts to try again, it will go to next function.

5.4 For the temperature

Test 1:
Please input a temperature in degrees Celsius:12
The temperture in degrees Celsius is 12°C.
The temperture in degrees Fahrenheit is 44°F.
The temperture in degrees Kelvin is 285 K.

Test 2:
Please input a temperature in degrees Celsius:12.64
The temperture in degrees Celsius is 13°C.
The temperture in degrees Fahrenheit is 45°F.
The temperture in degrees Kelvin is 286 K.

Test 3:
Please input a temperature in degrees Celsius:1a
There are illegal characters in the temperature.

You have 3 attempts to try again!Please input a temperature in degrees Celsius:12.5.6
There are illegal characters in the temperature.

You have 2 attempts to try again!Please input a temperature in degrees Celsius:36
The temperture in degrees Celsius is 36°C.
The temperture in degrees Fahrenheit is 68°F.
The temperture in degrees Kelvin is 309 K.

Test 4:
Please input a temperature in degrees Celsius:98.75.a
There are illegal characters in the temperature.

You have 3 attempts to try again!Please input a temperature in degrees Celsius:111111.1111111111111111111
The temperature is too long.

You have 2 attempts to try again!Please input a temperature in degrees Celsius:12.25a
There are illegal characters in the temperature.

You have 1 attempts to try again!Please input a temperature in degrees Celsius:12.4
The temperture in degrees Celsius is 12°C.
The temperture in degrees Fahrenheit is 44°F.
The temperture in degrees Kelvin is 286 K.

Test 5:
Please input a temperature in degrees Celsius:12.a
There are illegal characters in the temperature.

You have 3 attempts to try again!Please input a temperature in degrees Celsius:asdf
There are illegal characters in the temperature.

You have 2 attempts to try again!Please input a temperature in degrees Celsius:12.8.0
There are illegal characters in the temperature.

You have 1 attempts to try again!Please input a temperature in degrees Celsius:12 45.=
There are illegal characters in the temperature.

You have no attempts to try again, the programme will exit.