CSc10300 - Assignment 2

Branches/Loops - Fall 2021

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Write a C++ program that converts numbers from and to different number systems(bases). For this end your program:

(a) displays a menu to the user and asks the user to choose the source number system from the menu by inputting an **integer value**. The source number system is a member of set $R = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 16\}$. If the user input value is a member of R, an inner menu (blue box shown in section **c**) will be displayed. Otherwise, the program displays a message that shows the user decided to quit the program and ask for confirmation (Y/N). Here is how the main menu of the program looks like:

The main menu of the program

```
=====================================
Number System Conversion=====================
=====================================
CHOOSE YOUR SOURCE NUMBER SYSTEM:
(2) BINARY
(3) TERNARY
(4) QUATERNARY
(5) QUINARY
(6) SENARY
(7) SEPTENARY
(8) OCTAL
(9) NONARY
(10) DECIMAL
(16) HEXADECIMAL
INPUT ANY OTHER VALUE TO EXIT THE PROGRAM.
=====================================
```

(b) when the user input value is NOT a member of R, the following menu will be displayed.

When the user chooses Y, the program outputs "BYE!" and terminates. Otherwise, the user will be returned to the main menu after displaying this message "You will be returned to the main menu".

(c) when user inputs 2, 3, 4, 5, 6, 7, 8, or 9, a second menu(blue box) displays and asks the user to choose the target number system. For instance, when the user inputs 8, the following menu displays: (you should represent the source number system at the top of this menu as shown)
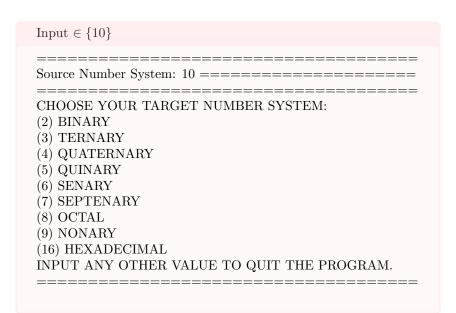
Input ∈ {2, 3, 4, 5, 6, 7, 8, 9}

==
Source Number System : 8 =======================
==
CHOOSE YOUR TARGET NUMBER SYSTEM:
(10) DECIMAL
INPUT ANY OTHER VALUE TO QUIT THE PROGRAM.
==

In this step, if the user inputs 10, the program

 (i) reads the user input number as **a string** (also print the source number system),

 (ii) converts the number to decimal,

(iii) outputs the result,

(iv) displays the "You will be returned to the main menu" message,

 (v) and returns to the main menu.

If the user inputs any other value, the program displays the red box in section **c** to confirm that the user wants to exit, etc.

Conversion Menu

==
Source Number System : 8, Target Number System: 10 ======
==
INPUT YOUR NUMBER IN SOURCE NUMBER SYSTEM:
OCTAL: 234
DECIMAL: 156
YOU WILL BE RETURNED TO THE MAIN MENU.
==

(d) when the user inputs 10, the program displays the following menu and asks the user to choose a target number system.
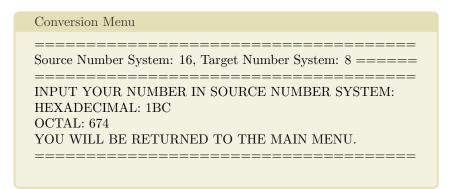
In this step, if the user inputs a valid value, the program

(i) reads the user input number as **a string**,

(ii) outputs its equivalent in the target number system,

(iii) and finally returns to the main menu.

If the user inputs any other value, the program displays the red box in section **c** to confirm that the user wants to exit, etc.

(e) when user inputs 16, the program displays the following menu and asks the user to choose the target number system.

In this step, if the user inputs 8 or 10, the program

(i) reads the user input number as **a string**,

(ii) and validates the input using an **input validation loop**. As a result, if the user-input number is not a valid hexadecimal number the program asks for another input. The program gives the user 5 chances, if the user inputs 5 invalid hexadecimal numbers the program returns to the main menu with the following message.

When the user inputs a valid hexadecimal number, the program outputs its octal or decimal equivalent based on the chosen target number system. Finally, it displays the main menu again. If the user inputs any other value, the program displays the red box in section **c** to confirm that the user wants to exit, etc.

```
Conversion Menu

====================================

Source Number System: 16, Target Number System: 8 ======

====================================

INPUT YOUR NUMBER IN SOURCE NUMBER SYSTEM:
HEXADECIMAL: 1BC
OCTAL: 674
YOU WILL BE RETURNED TO THE MAIN MENU.

====================================
```

INSTRUCTIONS

1. The best approach would be to implement this code incrementally. Otherwise debugging the code could get very hard. Implement a small step at a time, test your code for yourself to make sure it works correctly, and then go to the next step.

2. Implement the main menu branches with **switch**, NOT if-else.

3. The **hexadecimal to octal conversion** should be through base 2 as explained in **this video**. You won't get any point for converting to 10 and then 8. If you use any reference for this part of the problem, do not forget to cite them. As I mentioned before, you should NOT search for the code but you can search for the algorithm to see how this conversion is supposed to be done. Your reference should match your implementation.

4. Make your program as concise as possible. Generalize the base conversions similar to what I showed in the Binary to Decimal Conversion demo and just set the base based on the user inputs.

5. For **input validation loop**, check the cctype library functions and choose the most relevant one. You won't get any point for writing an if-statement with logical or of 16 conditions.

6. For submission, you should try all the possible different scenarios to see different menus of your program, try with different input values and get screenshots.

7. If you are unsure about any part of the problem, do NOT make assumptions, ask instead.