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# Practice Quiz 2

Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Gordon-CenSSIS)

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Name: _____

GEU111 Engineering Problem Solving with Computations
High-Tech Tools and Toys Lab
**PRACTICE QUIZ 2**

The hexadecimal (base-16) system is a way to label half-bytes (4 bits) with a single digit from 0 to 15. Numbers from 0 to 9 use normal numerals. Beyond 9, the following code is used: 10=A, 11=B, 12=C, 13=D, 14=E, and 15=F.

For example the decimal number 6 is represented by 6 in hexadecimal and 0110 in binary (1 in the 4's place plus 1 in the 2's place = 4 + 2 = 6). The decimal number 15 is represented by F in hexadecimal and 1111 in binary (1 in the 8's place plus 1 in the 4's place plus 1 in the 2's place plus 1 in the 1's place = 8 + 4 + 2 + 1 = 15 ).

*a.* In a project `Practice_Quiz_3_xy` – where where "`xy`" are your initials – write a function `char Dec_2_Hex_xy(int x)` that takes as an input a decimal number between 0 and 15 and returns a character representing that number in hexadecimal. You should write your own logic, using an if-else or switch structure to convert from decimal number to hexadecimal character. If input is a number that is not between 0 and 15, the program should return 'X'.

*b.* In the same `.cpp` file write a main program that prompts a user to enter a decimal integer between 1 and 15, uses your `Dec_2_Hex_xy` program to find the equivalent hexadecimal character, and prints out to the screen the hexadecimal equivalent. If the user enters a number above 15 the program should prompt the user to enter another number. If the user enters 99, the program should print out "Goodbye!" and end.

*c.* In the same `.cpp` file, write a function `void Dec_2_Bin_xy(int i_in, int& out8, int& out4, int& out2, int& out1)` that takes as input a decimal integer `i_in` and uses the bitwise AND operator to determine the digit (0 or 1) in the 8's place (`out8`), 4's place (`out4`) , 2's place (`out2`) , and 1's place (`out1`).

d. Modify your C++ main file to read integers from a file "input_data.txt" into an array num_in[20] until the end of the file or until the number of entries in the file exceeds 20. Then use a `for` loop to process the numbers, using `Dec_2_Hex_xy` and `Dec_2_Bin_xy`, and write to both the screen and to a file "output_data.txt" the number, the hexadecimal equivalent, and the binary equivalent with appropriate heading as below:

```
Number      Hexadecimal      Binary

13               D          1101
9                9          1001
23               -          ----
15               F          1111
3                3          0011
. . .
```

If the number from the file is negative or greater than 15, fill the Hexadecimal and Binary column with dashes as above.

*Submit your `Practice_Quiz_3_xy.cpp` file to Blackboard under the Practice Quiz 2 assignment. Use the back of this sheet to write out a draft of your program before starting to type. Turn this sheet in as well as submitting your C++ source code to the Blackboard..*