Lab 2
C programming basics (2)

Topics

1. Basic control and looping statements.

2. Type Casting.

3. Operators

4. Bit Masking

Prelab Assignment

- Complete Reading Chapters 2 and 3 (Kernighan & Ritchie)

Problems:

1. Write a menu driven program using a **switch statement** with the following options:

    a. Factorial of a number: The input data type should be unsigned short. The output data type should be unsigned long. The input should be restricted so that the output value is smaller than the maximum possible value of the type unsigned long.

      Hint: Check the examples shown in class to determine what the maximum possible value for the required type is.

    b. Leap year or not: The input type should be unsigned int. The output should be a message stating if the year entered is leap or not (If you don't know already, investigate how you can determine which years are leap). Example: 2016 is a leap year!

      Hint: use the modulus operator (%).

    c. Maximum: Use the "?:" operator to determine the maximum number among two input numbers (type float).

    d. Division of two numbers: Data type of the input numbers should be int and the data type to return the division result should be float.

      Hint: use typecasting to convert from int to float.

    e. Exit

    Once a menu item is selected (user input type char), the appropriate action should be taken and once this action is finished, the menu should reappear. This will continue unless the user selects the 'Exit' option.

    Hint: Use an infinite while loop.

2. Binary representation. Write a program that takes in a decimal number (type unsigned short) and displays its binary representation. Example: the decimal number 170 has a binary representation of 10101010. You should achieve this in two different ways (ask the user to select which way should be used):

    a. Using arithmetic operations: +, -, *, /, %

    b. Using bitwise operations: &, |, ^, <<, >>, ~

    Hint: review example L2_Ex2_float discussed in class, particularly the part used to determine the sign of the number. Remember the concept of "Bit Masking".

    Make sure that you get the same output using both approaches. Try many cases, including well known cases (e.g. 0 = 00000000, 255 = 11111111), to verify that your algorithms are correct. Since you are using type unsigned short, make sure to display ALL bits (not necessarily only 8, as shown in the examples above). How many bits is that? Finally, try entering the maximum possible value of type unsigned short. What is that value? What binary representation do you expect?

Deliverables (due at the beginning of the following week's lab)

1. Lab Report:

    The lab report should include

    1) The objective of the lab (written in your own words)

    2) Discussion: Discuss your results. Describe any problems that you may have encountered while coding the lab. How did you fix them? Talk about what you learned, interesting/unexpected things that you observed, problems/limitations that your current approach may have, alternative solutions/approaches, etc.

    3) Any other relevant comments related to the lab (e.g. something was unclear).

    4) Append your source code to the end of you report with proper comments.

2. Demonstration:

    Demonstrate your solutions to the TA.

Grading:

Problem 1 Demo:	20	Report:	30
Problem 2 Demo:	20	Code:	30 (proper indentation / comments)