Lab Four

ID1303: Introduction to Programming

1. (a) Write a program to accept two integers m and n and display the perimeter of a $m \times n$ rectangle.

   Example run:

   Enter the value of m: 4

   Enter the value of n: 7

   ```
   * * * * * * *
   *           *
   *           *
   * * * * * * *
   ```

   (b) Implement the above as a function.

2. (a) Write a program that accepts a positive integer n and a sequence of n numbers from the user and prints their sum. (b) Implement the above as a function.

3. Write a program that accepts a string and a number k and prints the string left-rotated k times.

   Example runs:

   Enter the string: APPLE

   Enter the number of left-rotations: 1

   The rotated string is: PPLEA

   Enter the string: CHROME

   Enter the number of left-rotations: 4

   The rotated string is: MECHRO

4. (a) Write a **function** that accepts a positive integer n and a position k and checks if the kth bit of n (from right) is equal to 1.

   Example runs:

   Enter the number: 5

   Enter the position: 2

   The bit is zero.

Enter the number: 5

Enter the position: 3

The bit is one.

[Hint: Method 1: AND with 2^{k-1}; Method 2: Right-shift $k-1$ times.]

(b) Accept a string as input and print all subsets of the string (in any order). Hint: Let the length of the string be n. Map the subsets to numbers in $\{0, 1, \ldots, 2^n - 1\}$ as shown in class and for each of these numbers, print the characters in positions where the bit is one.

Example run:

Enter the string: CAT

T

A

TA

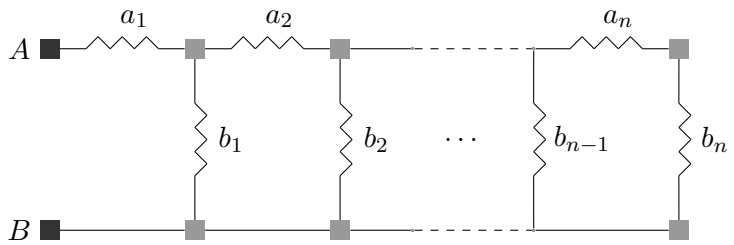
C

TC

AC

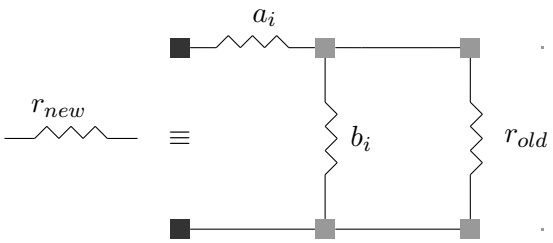
TAC

5. A **step-ladder** arrangement of resistors is shown below.



Write a program which accepts the the values of the resistances (a_is and b_is as in the picture) in two arrays, and prints the effective resistance between A and B. Assume that all values are in some common unit, eg: ohms.

Hint: Update the value of the effective resistance from right-to-left as shown below.



6. Test the functions in mymath.h and mymath.c.