COMP 206: Homework 2

Due on Monday, February 18th, 2012 at 11:30am

How to finish this assignment?

There are 5 questions in this assignment. The corresponding files are named as q1.h q1.c – q5.h q5.c as attached. We use GNU make system (http://www.gnu.org/software/make/) to manage all source code files. An introduction of make will be given in C tutorials. In this assignment, you only need to type "make" under the directory where your source code files locate to compile your programs and "make clean" to delete object and executable files.

For each question, you have to complete the functions declared in its header file. The header file q1.h is for the first question, q2.h is for the second question, and etc. Please do not touch the given ".c" files, the grading script will overwrite those files when grade your submissions, so all your modifications will be lost. If any problem is found, please email nan.zhu@mail.mcgill.ca.

You have to test your program very carefully by **considering all cases of input data you can think out**. This document will give the format of input and output for each question as well as some example inputs and the expected outputs. *However*, the correctness of your program will be judged by a script which gives 10 test cases for each question, 2 points for each. The grade of each question is completely determined by how many test case you can pass.

NOTICE:

To enable the grading script identify you, you have to include a file, WHO, which contains your name and McGill ID. e.g.

$ cat WHO (don't include this line)

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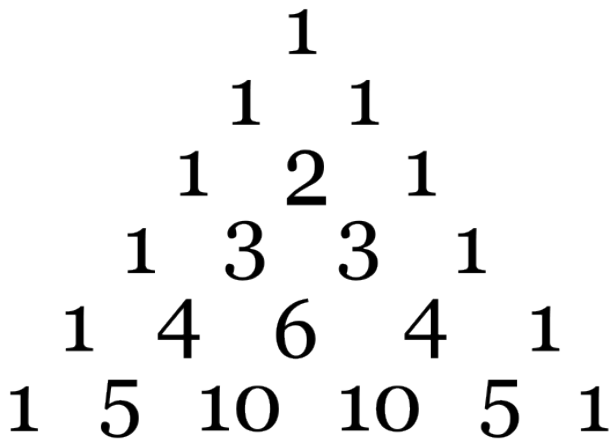
Questions:

1. Write a program to print out the element in a Pascal Triangle. An example of Pascal Triangle is shown in the following graph. "The rows of Pascal's triangle are conventionally enumerated starting with row n = 0 at the top. The entries in each row are numbered from the left beginning with k = 0 and are usually staggered relative to the numbers in the adjacent rows. A simple construction of the triangle proceeds in the following manner. On row 0, write only the number 1. Then, to construct the elements of following rows, add the number above and to the left with the number above and to the right to find the new value. If either the number to the right or left is not present, substitute a zero in its place. For example, the first number in the first row is 0 + 1 = 1, whereas the numbers 1 and 3 in the third row are added to produce the number 4 in the fourth row" (From Wikipedia).



More details about Pascal Triangle can be found in http://en.wikipedia.org/wiki/Pascal's_triangle.

Input & Output:

Input:

Line 1: n (Number of test cases)

Line 2 – Line n + 1： Each line contains two integers, which specify the row number and the index of the element to be printed

Output:

Contains n lines

Line i corresponds to the value of the element specified in test case i, if the element doesn't exist in that row, return -1.

Example:

Input:

3

2 1

2 100

4 2

Output:

2

-1

6

2. Convert the binary representation of an integer to its decimal value

Every value in computer is actually represented in binary format. In this question, you are supposed to convert the binary representation of an integer to its decimal format. The rule of convert binary to decimal is as following:

Suppose we have to convert 1001 to decimal.

Step 1: list the powers of two from right to left. Start with 2^0, evaluating with 1, and following are 2^1 * 0, 2^2* 0, 2^3 * 1

Step 2: sum them up, so the decimal value of 1001 is 9.

Input & Output:

Input:

Line 1: n (Number of test cases)

Line 2 – Line n + 1： Each line a string representing an integer with binary format

Output:

Contains n lines

Line i prints out the decimal integer specified in test case i

Example:

Input:

3

1001

1

101

Output:

9

1

5

3. Write a program to use recursive binarySearch function to perform the binary search of a sorted array. The function should receive an integer array, the starting subscript, the ending script and the search key as argument. If the search key is found, return the array subscript; otherwise, return -1.

Input & Output:

Input:

Line 1: n (Number of test cases)

Line 2 – Line n + 1： Each line a sequence of integers, the first integer indicates the length of sorted sequence, say L; the following L numbers are the integer sequence; and the last number is the element you want to search.

Output:

Contains n lines

Line i corresponds to the position of the element specified in test case i

Example:

Input:

2

5 1 6 8 9 10 11

7 1 6 8 9 10 29 78 9

Output:

-1

3

NOTICE: this assignment requires you to write a recursive binary search function. To check this, your program will be analyzed by some tool printing out function calling trace. If your function is not recursive, you cannot get credit for this question.

4. The Fibonacci series 0, 1, 1, 2, 3, 5, 8, 13, 21, …, begins with 0, and 1 and has the property that each succeeding term is the sum of the two preceding terms. Write a function that calculates the *n-th* Fibonacci number.

Input & Output:

Input:

Line 1: n (Number of test cases)

Line 2 – Line n + 1： Each line contains two integers, first is the length of Fibonacci series, the second is the index of value you want to print out

Output:

Contains n lines

Line i corresponds to the value of the integer specified in test case I, if the value doesn't exist, return -1

Example:

Input:

2

4

6

Output:

3

8

5. Write a program to reverse the order of words in a sentence. The main function is given as follows, and you will need to complete the code in function reverse(char*). If the given sentence is “This is a string to be reversed.”, the output will be “reversed. Be to string a is This”.

Input & Output:

Input:

Line 1: n (Number of test cases)

Line 2 – Line n + 1： Each line contains one sentence, ending with “.”

Output:

Contains n lines

Line i corresponds to reversed sentence in test case i

Example:

Input:

2

The course number of Software System is CS206.

This assignment contains 5 questions; don’t wait until the last day to start it!

Output:

CS206. is System Software of number course The

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