In The Name Of God

The Most Compassionate And Merciful

Problem Set -Extra

First Half Of Semester

Sheet info :

- Problem Set Extra
- Due Date : Not Set
- Just upload scorable questions on HWS.
- File name format : "**studentNumber_PS_Extra.zip**"
- Do not hesitate to ask any question from your graders!

1- add commands to print the top elements of the stack without popping it , swap the top two elements , and clearing the whole stack .

1. print_top()
2. swap_two_top()
3. clear_stack()

2-write a simple calculator . the calculator should be able to apply precedence and read parentheses and make decision that which operation will be done first .

>>>(2*4) + (9 * 8) + 2-9*8

>>>Output : 10

the operators can be :

* , / , + , - , (,) , ^

^ = power function => 2^3 = 8

3- take a look at math.h library and see the available functions.

4- write a function that gets the output of question 5 and calculates the result .
float calculator (char sequence[]) ;

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// char seq[] = " 7 * 9 + ( 19 / 5 ) % 2 "
  printf("%f " , Calculator ( seq ) );
//output : 64
```

5- write a function that would take a set and writes it's subsets.
(Recursive)

Ex : set1 = { 1 , 2 , 3 }
Subset = { null , {1} , {2} , {3} , {1,2} , {1,3} , {2,3} ,{1,2,3} }

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6 - write the **fibonacci** and **factorial** functions **recursively** .
(Recursive)

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7 - Get scientific number
Using only the getchar () function for getting Input, then Write a function that gets a number in scientific notation and returns it as a double and print it using putchar function.

Prototype: double next_sc (char num[]); Examples:
next_sc (“12e-1”) --> next_sc (“12e9”) -->
next_sc (“0e+999”) -->
returns: 1.2
returns: 12000000000 returns: 0

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8 - Write a program to ask user 2 big numbers **a** and **b** (in string format) using getchar() function and compute **result = a + b** and print it using putchar function.
Note : the numbers can be **negative** too.
Sample output:
Enter the first number : 555555555
Enter the second number : 999999999
Sum is : 1555555554

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9 - in order to face more complexity , write **BigMul** function .

15 - تابعی بنویسید که از کاربر یه معادله درجه دو را گرفته و آنرا حل کند.
ورودی نمونه : x^2 + 4x + 4
خروجی : +2 و -2

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10 - Two words are anagram if they have same letters in same or different orders, write a function to determine whether two strings are anagram or not, then return 0 if they’re not and 1 otherwise. Declaration:
int isAnagram (char string1[], char string2[]) ;
Ex :

>> “ nima “ and “mina “ are anagram .

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11 - assume we have an array of integers , write a function that finds the subarray with maximum summation of elements .
(Recursive) & (Non-Recursive)

>> Ex : {13 , -3 , -25 , 20 , -3 , -16 , -23 , 18 , 20 , -7 , 12 , -5 , -22 , 15 , -4 , 7}

>> from index 7 through index 10 , we have the subarray with maximum summation which is 43 .

The output of this program should be 43
If you want to face more complexity , the output shall show :
>> from index **7** through index **10** we have max : **43**

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12 - binary search .

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13 - Write a function to sort strings in alphabetical order.
Input:
< **Ascending** & **Descending** >
Input :
Bhgerisa
Output:
Abeghirs

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14 - Write a program to get an integer “n” and finds all armstrong numbers less equal than n.< n must be large enough like n = 10000).(the cube of digits are equal to the number itself)
Input:153
Output:the number is armstrong(1*1*1+5*5*5+3*3*3=153)

Input: 354

Output : the number isn't armstrong(3*3*3+5*5*5+4*4*4 !=354)

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15 - برنامه ای بنویسید که از کاربر یک ورودی بگیرد تحت عنوان یک معادله دیفرانسیل و سپس **مشتق و انتگرال** آن عبارت را حساب کرده ، هرکدام را در آرایه ای جداگانه قرار دهد و سپس در main آنها را پرینت کند .
(فرض کنید که ورودی شما عبارتی خطی هست بدون هرگونه پارامتر غیر خطی یا نمایی)

>> X^4 + 2X^3 + 5X
>> Integral :
>> (⅕)x^5 + (½)x^4 + (2.5) x^2
>> Differential :
>> 4X^3 + 6X^2 + 5

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16 - تابعی بنویسید که یک مجموعه را به عنوان پارامتر ورودی دریافت کند به همراه یک عدد صحیح K و زیر مجموعه های K تایی آنرا چاپ کند.

>>> K_subset (int k , char set[]) ;
If (set == { 1 , 2 , 3 }) and (K == 2):
The output would be :
{1 , 2 } , { 1 , 3 } , { 2 , 3 }

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17 - برنامه ای بنویسید که تابعی را بگیرد و مشخص کند که تابع زوج است یا فرد و یا هیچکدام از حالات فوق.

Mathematical Point :
Even Functions :
If (f(x) = y then f(-x) = y)
Odd Functions :
If (f(x) = y then f(-x) = -y)
Else :

The function is neither even nor odd.

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18 - write a program that gets 3 inputs from the user as edges of a triangle and determines if we can build a triangle with those edges .

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19. Write you own Power without using multiplication(*) and division(/) operators. Please note that numbers can be Real.

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20. There are 2 arrays A and B of size n and m. Write an algorithm to find the median of the array obtained after merging the above 2 arrays.

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21. You are given an array arr[], and a number x. Check if a sum pair in arr[] is x.

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22. Check if a given string has a palindrome substring or not. If not print palindrome permutations of the given string.

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23. U are given a string .consider all substrings in that word and return the minimum value of them.(value is measured by their ascii number).

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24 - write a module named “myMath.c” and create a headerfile out of it named “ myMath.h”.
In myMath.c you should write necessary functions for Complex numbers (z = x + iy)

درواقع باید برای **جمع ، ضرب ، تقسیم ، تفریق** دو عدد حقیقی از یکدیگر توابعی بنویسید .

A) Add_complexes (int z1[] , int z2[] , int result[]) ;

B) Subtract_complexes (int z1[] , int z2[] , int result[]);
C) Multiply_complexes (int z1[] , int z2[] , int result[]) ;
D) divide_complexes(int z1[] , int z2[] , int result[])
E) Int r_complex (int z1[]) ; // calculates R

Attention :
If z = x + iy then :

$$r = |z| = \sqrt{x^2 + y^2}.$$

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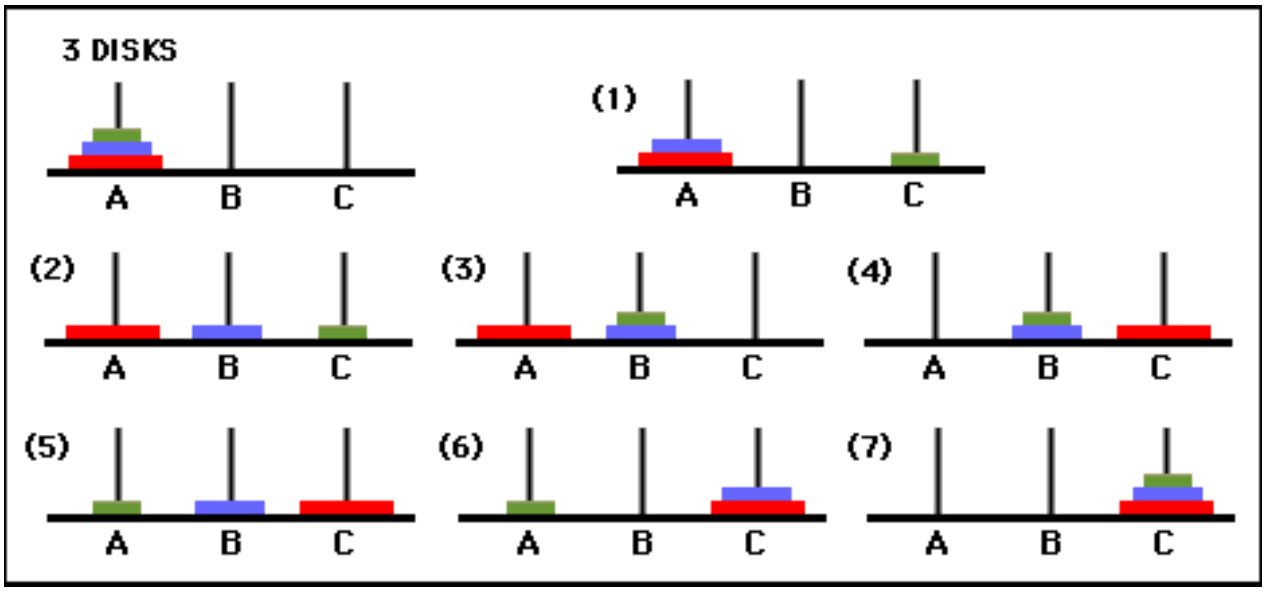
25 - Write a program that gets an input n from the user and prints the path we have to across to solve a hanoi problem with 3 bars and n rings.

(Hanoi Tower)
(Hint : See The belowExample)



26 - Write a piece of code to generate and print all the permutations of a given string s. the elements of the string can be distinct and the same.

Ex 1 :

input :

abc

output :

abc

acb

bac

bca

cab

cba

Ex2 :

Input :

abb

Output :

abb

bab

bba

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28 - برنامه ای بنویسید که از کاربر عددی را به عنوان ورودی دریافت کرده و در متغیری به نام n بریزد و مثلث خیام پاسکال را تا مرحله n ام بکشد.

29 - Write a recursive program to count the ways to express a function as sum of power Given two integers x and n, we need to find number of ways to express x as sum of n-th powers of **unique** natural numbers.
Example:

Input: x = 100
n = 2
Output: 3
Explanation: There are three ways to
express 100 as sum of natural numbers
raised to power 2.
100 = 10^2 = 8^2+6^2 = 1^2+3^2+4^2+5^2+7^2
Input: x = 100
n = 3
Output: 1
Explanation: The only combination is,
1^3 + 2^3 + 3^3 + 4^3

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30 - Write a function that gets a int number from user and print if it's palindrome or not. If not print the closet palindrome number to the given number.(use getchar and putchar functions only)

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31 - Write a program that generates moore & mealy state machine.
(HARD)