PSAT Questions for Practice

Loops and Arrays

1. Make flowchart that prints the number that has maximum number of 1's in a set of 10 numbers. Note: Do not use arrays to store numbers. Examine the nature of the number as and when they are read.

2. Make flowchart to print the reverse of the number Eg. 1234 should be printed as 4321.

3. Assume that you are standing at stair 0. You are to reach step N. You can climb either 1 or 2 steps at a time. Print the minimum number of moves required to reach the final step using flowgorithm.

4. Alice and Bob are meeting after a long time. As usual they love to play some math games. This times Alice takes the call and decides the game. The game is very simple, Alice says out an integer and Bob has to say whether the number is prime or not. Help Bob accomplish this task by using flowgorithm which will calculate whether the number is prime or not.

5. Alice and Bob play the classic game of odds and evens. Assume that if the sum is odd then Alice wins, otherwise Bob wins. The game is to be played for N rounds. In each round of this game, both of them choose a number between 1 to 5 without revealing to their opponent. Both of the players then simultaneously reveal their number by holding up that many fingers of their hand. Then the winner is decided based upon whether the sum of numbers played by both the players is odd or even. Do a flowgorithm to declare the final winner.

6.

   a. Given an array **arr** of integers. Find a peak element i.e. an element that is **not smaller** than its neighbors.
   Note: For corner elements, we need to consider only one neighbor.
   Example:
   Input: *array[]= {5, 10, 20, 15}*
   Output: *20*
   Explanation: *The element 20 has neighbors 10 and 15, both of them are less than 20.*
   Input: *array[] = {10, 20, 15, 2, 23, 90, 67}*
   Output: *20 90*
   Explanation: *The element 20 has neighbors 10 and 15, both of them are less than 20, similarly 90 has neighbors 23 and 67.*

   b. Move all negative numbers to beginning and positive to end of an array
   An array contains both positive and negative numbers in random order. Rearrange the array elements so that all negative numbers appear before all positive numbers.
   Examples :
   Input: *-12, 11, -13, -5, 6, -7, 5, -3, -6*

Output: *-12 -13 -5 -7 -3 -6 11 6 5*

c. Count pairs with given sum
Given an array of **N** integers, and a number **sum,** the task is to find the **number of pairs** of integers in the array whose sum is equal to sum. Display all such pairs and the count.
Examples:
Input: *arr[] = {1, 5, 7, -1}, sum = 6*
Output: *(1, 5) , (7,-1) count = 2*
Input: *arr[] = {1, 5, 7, -1, 5}, sum = 6*
Output: *(1, 5) , (7, -1) , (1, 5) count =3*
Input: *arr[] = {10, 12, 10, 15, -1, 7, 6, 5, 4, 2, 1, 1, 1}, sum = 11*
Output: *(10, 1), (10, 1), (10, 1), (12, -1), (10, 1), (10, 1), (10, 1), (7, 4), (6, 5). Count=9*

d. Count the frequency of each element of an array
Sample Output:
Count frequency of each element of an array:

Input the number of elements to be stored in the array :7
Input 3 elements in the array :
element - 0 : 25
element - 1 : 12
element - 2 : 43
element - 3 : 12
element - 4 : 90
element - 5 : 12
element - 6 : 25

The frequency of all elements of array :
25 occurs 2 times
12 occurs 3 times
43 occurs 1 times
90 occurs 1 times

7. P1

a. First and last digit of a number

b. Product of digits of a number

c. Reverse and check if the given string is a palindrome

d. Find all factors of a given a number.

e. Print the series 0,1,1,2,3,5,.. upto n terms

f. Print the pattern:

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  *
 * *
* * *
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g. Find n!/r!(n-r)!

h. Print calender given number of days and starting day of a month

i. Perform arithmetic on menu driven

8. P2

   a. Reverse an array

   b. Sort given array in asc. and desc. order as per choice of user

   c. To rotate an array towards left

   d. Merge two arrays

   e. Count of positive and negative numbers in an array

   f. Find the second smallest element in the array

   g. Find if an element is present in the array or not

   h. Check if two arrays are equal

   i. Read a set of students and marks and print the student name with highest mark

9. Calculate the roots of a quadratic equation

10. Sum of digits in a given number

11. Multiplication Table

12. Addition Table

    1+1=2
    2+1=3
    2+2=4
    3+1=4
    3+2=5
    3+3=6…

13. High- Low game

    The game High-Low is displayed by two player. The program should ask for one user for a number between 1 and 50 and verify that such a number has been entered . It then asks a second user for a guess and reads it in. if the

Guess is correct congratulations message is written to the screen and the program ends. Otherwise the message “HIGH” or “LOW” is displayed (if the guess is higher or lower than the entered value) and another guess is asked. (Note: Maximum no of chances is : 4). If the second your cannot guess the number within 4 chances display the message “ You lost The game”.

14. (Lab evaluation 2 -set 1)

Movie rating system where users are allowed to rate and comment on movies online. These ratings are provided as input to the website admin. The admin then checks reviews, critic’s ratings and displays an online rating for every movie. The purpose of this project is to develop a system that automatically allows users to enter the review rating for Multiple movies. The movies are rated with the 5-point scale survey is one of the most commonly used survey types.It is easy to use yet can provide detailed data about customer opinions . The most common representation of the Likert scale consists of five agree/disagree points, which are:

Poor-1
Average -2
good-3
Very good -4
Excellent -5

Assume that you are building a system that can store atleast 3 customer review of ‘n’ movies.The customer can provide the review only when he has seen the movie. Write an flowgorithm code to perform the following analysis,

a) Identify the movie that has received the maximum rating from customer.

b) Find the customer who has watched maximum number of the movies and minimum number of movies.

a) Write the algorithm for the problem? [CO2] [5 Marks]

b) Write the trace table for the algorithm? [CO4] [5 Marks]

c) Implement the code using flowgorithm?[CO3[10 Marks]

15.

Property Tax defined as every landowner or real estate owner of tangible assets such as residential buildings, office buildings, and others are liable to pay property taxes to the government bodies such as the municipal corporation or panchayat. Property tax is mandatory for a person possessing residential, commercial or let-out property, and is payable either on a yearly or half-yearly basis as per convivence. The tax amount is determined depending upon the property area, property location and current valuation. Assume that the software is created for calculating the property tax for an area. Consider

the building area of the house and number of floors of a house is stored. Write an flowgorithm code to perform the following analysis ,

1. Count the house having total building area between 600 sq.feet to 1200 sq. feet with two floor?

2. Find the total building tax amount to be collect in the entire area by applying the following rules,

Area in sq.feet	Amount (Rs)
<=400	1 per sq.feet
401 to 1000	1.25 per sq.feet
1001 and above	1.50 per sq.feet paise /unit

If the number of floors is more in the house the amount is added for each floor. You can assume that the floor in house has the construction area as ground floor.

a) Write the algorithm for the problem? [CO2] [5 Marks]

b) Write the trace table for the algorithm? [CO4] [5 Marks]

c) Implement the code using flowgorithm?[CO3[10 Marks]

16.

The result of election in 5 regions for 4 candidates is given below:

Region	Contestant A	Contestant B	Contestant C	Contestant D
1	192	48	206	37
2	147	90	312	21
3	186	12	121	38
4	114	21	408	39
5	267	13	382	29

Create a flowgorithm to do the following:

a. Calculate and show the total number of votes secured by each contestant and the percentage of

the total votes cast.

b. If any of the contestants secured over 50 percent of the votes, the flowgorithm must declare

that candidate as winner, otherwise display “No candidate secured over 50% of votes”.

c. Display the region which recorded the highest votes.

Searching and sorting

17. Linear search
18. Binary search
19. Selection sort
20. Bubble sort
21. Insertion sort
22. Remove duplicate with sort
23. Remove duplicate without sort

Strings

24. BASICS

1.Write a flowgorithm to input a string and print it
Input the string :
Welcome, Hai
Expected Output :
The string you entered is : Welcome, Hai
2. Write a flowgorithmto find the length of a string without using library function.
Input the string : resource.com
Expected Output :
Length of the string is : 12
3. Write a flowgorithmto separate the individual characters from a string.
Input the string : resource.com
Expected Output :
The characters of the string are :
r e s o u r c e . c o m
4. Write a flowgorithmto print individual characters of string in reverse order.
Input the string : resource.com
Expected Output :
The characters of the string in reverse are :
m o c . e c r u o s e r
5. Write a flowgorithmto count the total number of words in a string.
Input the string : This is resource.com
Expected Output :
Total number of words in the string is : 3
6. Write a flowgorithmto compare two strings without using string library functions.
case1:L
Input the 1st string : aabbcc
Input the 2nd string : abcdef
String1: aabbcc
String2: abcdef
Expected Output : Strings are not equal.

case2:
Input the 1st string : aabbcc
Input the 2nd string : aabbcc
String1: aabbcc
String2: aabbcc
Expected Output : Strings are equal.
7. Write a flowgorithmto count total number of alphabets, digits and special characters in a string.
Input the string : Welcome to resource.com2
Expected Output :
Number of Alphabets in the string is : 20
Number of Digits in the string is : 1
Number of Special characters in the string is : 3
8. Write a flowgorithmto copy one string to another string.
Input the string : This is a string to be copied.
Expected Output :
The First string is : This is a string to be copied.
The Second string is : This is a string to be copied.
Number of characters copied : 31
9. Write a flowgorithmto count total number of vowel or consonant in a string.
Input the string : Welcome to resource.com
Expected Output :
The total number of vowel in the string is : 9
The total number of consonant in the string is : 11
10. Write a flowgorithm to convert a lowercase character upper case character
Input: Enter the character: r
Output: R
11.Write a flowgorithm to convert an uppercase character lower case character
Input: Enter the character: R
Output: r
12.Write a flowgorithm to convert all the lowercase characters in a string to uppercase characters
Input: Enter the string: AmriTa
Output: AMRITA
13.Write a flowgorithm to convert all the uppercase characters in a string to lowercase characters
Input: Enter the string: FLowEr
Output: flower
14. Write a flowgorithm to search a characterin a string
Input the string : Welcome to resource.com
Input the character to be searched: m
Expected Output :
m occurs at 6
m occurs at 23
15. Write a flowgorithmto Find the Frequency of Characters.
Input the string : This is a test string
Input the character to find frequency: i
Expected Output :
The frequency of 'i' is : 3
16. Write a flowgorithmto read a sentence and replace lowercase characters by uppercase and vice-versa.
Input the string : This Is A Test String.
Expected Output :
The given sentence is   : This Is A Test String.
After Case changed the string is: tHIS iS a tEST sTRING.

17. Write a flowgorithmto remove a character at a position p in String.
Input the string : Police
Enter the position:3
String after removing the chacracter at position 3 is: Poice
Input the character After removing the Output String : wresourcecom
18. Write a flowgorithmto Concatenate Two Strings Manually.
Input the first string : this is string one
Input the second string : this is string two
Expected Output :
After concatenation the string is :
this is string one this is string two
19. Write a flowgorithmto read a sentance and remove the spaces between two words of its content.
Expected Output :
Enter the sentence:
The quick brown fox jumps over the lazy dog
After removing the spaces the content is :
Thequickbrownfoxjumpsoverthelazydog
20. Write a C program to sort a string array in ascending order.
Input the string : w3resource
Expected Output :
After sorting the string appears like :
ceeorrsu

25. Calculate the number of each alphabet present in that string.
26. Check if palindrome.
27. (Sec E Lab eval-2 Set 3)

Number Checker
Given two sorted arrays with no duplicated numbers ranging from 1 to 10, namely, A = [1, 3, 5, 8, 9, 10] and B = [1, 2, 4, 5, 6, 7, 10], you are asked to find the missing numbers in both arrays and to check if the missing numbers of one array is present in the other array or not in the following manner:
Numbers missing in array A: 2, 4, 6, 7
Is 2 in array B? Yes
Is 4 in array B? Yes
Is 6 in array B? Yes
Is 7 in array B? Yes
Numbers missing in array B: 3, 8, 9
Is 3 in array A? Yes
Is 8 in array A? Yes
Is 9 in array A? Yes
Draw a flowchart in Flowgorithm that performs the tasks stated above and prints the outputs in the format given. In addition, write an equivalent algorithm that complies with the properties of a standard algorithm.

28. Search for substring

    a. Q1) Remove all Characters in a String Except Alphabets

    b. Q2) Program to Check if a Given String is Palindrome

A string is said to be palindrome if the reverse of the string is the same as the string. For example, “abba” is a palindrome because the reverse of “abba” will be equal to “abba” so both of these strings are equal and are said to be a palindrome, but “abbc” is not a palindrome.

c. Q3)Find and display the substring of an input string beginning at start upto the given length

   Input
   Read the string: good morning all
   Start index value: 3
   Length: 7
   Output:
   Substring is: d morni

d. Q4)In cryptography, a Caesar Cipher is an algorithm for performing encryption or decryption. It is a type of substitution cipher in which each letter in the plaintext is replaced by a letter some fixed number of positions down the alphabet. For example, with a right shift of 3, D would be replaced by G, P would become S, and so on. Write a flowgorithm to implement encryption and decryption by using Caesar Cipher algorithm.

   Input:
   Enter the secret message: INDIA
   Enter the Key: 4
   Output:
   Encrypted message is:MRHME
   Decrypted message is:INDIA

   Explanation:

   ‘I’ is shifted 4 times to the right in the alphabet to get ‘M’

   ‘N’ is shifted 4 times to the right in the alphabet to get ‘R’

e. Q5)You are a strategist working for the Indian Army. You are entrusted with developing a strategy(algorithm) to encode the messages send among the Indian soldiers in order to prevent the messages being read by enemies. Your algorithm takes two inputs, a message (string) and a key (integer array). The key and the message have the same size. Assume the message is in lowercase. Simulate the working of your algorithm by drawing the corresponding flowchart using flowgorithm.

   The encoding works as follows.
   Eg.
   Message: waytozenith
   Key : 3 1 2 1 1 3 4 1 1 1 1
   Output : zbaupciojui
   Explanation for the above output:
   The encoded string is generated by each character of the input string ‘shifted’ by a corresponding number in the Key array. Therefore, if the input string is “waytozenith”, for the encoded string,
   ‘w’ is shifted 3 times to the right in the alphabet to get ‘z’
   ‘a’ is shifted 1 time to the right in the alphabet to get ‘b’,
   ‘y’ is shifted 2 times to the right in the alphabet to get ‘a’,

f. Q6)Given a string S, write a flowgorithm to find whether S is a Heterogram or not. A Heterogram string has no alphabet occurring more than once.

Input: “the big dwarf only jumps”
output: The string is heterogram.

Functions

29. Draw a flowchart to find the square of any number using the function
30. Draw a flowchart to swap two numbers using function
31. Draw a flowchart to check a given number is even or odd using the function
32. Draw a flowchart to convert decimal number to binary number using the function
33. Draw a flowchart to check whether a number is a prime number or not using the function
34. Draw a flowchart to find diameter, circumference and area of circle using functions.
35. Sec-c Func- set 1

1. Write a flowgorithm to find the square of any number using the function.
Input any number for square : 20
Expected Output :
The square of 20 is : 400.00
2. Write a flowgorithm to check a given number is even or odd using function. :
Input any number : 5
Expected Output :
The entered number is odd.
3. Write a flowgorithm to check whether a number is a prime number or not using function.
Test Data :
Input a positive number : 5
Expected Output :
The number 5 is a prime number.

4. Write a flowgorithm to check a number is Armstrong number or not using function.
Input any number: 371
Expected Output :
The 371 is an Armstrong number.
5. Write a flowgorithm to print all perfect numbers in given range using function.
Test Data :
Input lowest search limit of perfect numbers : 1
Input lowest search limit of perfect numbers : 100
Expected Output :
The perfect numbers between 1 to 100 are :
6 28
6. Write a flowgorithm to convert time in Hours:Minutes:Seconds into Seconds using functions.
Sample Input- OutPut:
Enter the value for hour: 2
Enter the value for minute: 30
Enter the value for seconds: 4
Total Seconds in 2H:30M:4S is 9004

7. Write a function for income tax calculator using the following rules.
income >80000 , tax = 920+ (income - 15000)*30%
income > 50000, tax = 320+ (income - 15000) *20%
income > 15000, tax = (income - 15000) *10%
None of the above, tax=0
Sample output:
Enter your income: 75000
Income tax for 75000 is 12320
8.Write a flowgorithm to check a number is strong Number or not.
Strong number is a special number whose sum of factorial of digits is equal to the original number.
For example: 145 is strong number. Since, 1! + 4! + 5! = 145
9. Write a flowgorithm to find the sum of the series 1!/1+2!/2+3!/3+4!/4+5!/5 using the function. Expected Output :
The sum of the series is : 34

10. Write a menu driven program for implementing calculator (addition, substraction, division, multiplication) using functions.

36. Sec-c Func- set 2
    a. Q1.Write a flowgorithm for preparing payslip of n Employees in an organisation .

       Input employee_id, HRA, BasicPay for each employees.
       Calculate the employees total salary (BasicPay+ HRA) using function
       Display the employee Id with highest salary using function.
       Display the employees salary in the descending order using function.

    b. Q2.An electronics shop sells items such as TV, Washing machine, Refrigerator, Computer, Laptop and iPod. All the products have some discounts. (Assume price for each product!!) Write a Menu driven program (use functions) to calculate the cost of the products a customer buys. (Discount for TV & Washing machine 10%, Refrigrator & Computer – 15%, Laptop & iPod – 20%).

       Sample Session Follows:
       MENU ----------
       1. TV
       2. Washing machine
       3. Refrigerator
       4. Computer
       5. Laptop
       6. ipod
       ENTER YOUR CHOICE: 1
       ACTUAL AMOUNT : Rs. 36000
       DISCOUNT (%) : Rs. 3600
       NET AMOUNT : Rs. 32400
       DO YOU WANT TO CONTINUE PURCHASING: (Y/N)?
       Y
       ENTER YOUR CHOICE: 2
       ACTUAL AMOUNT : Rs. 25000
       DISCOUNT (%) : Rs. 2500
       NET AMOUNT : Rs. 22500
       DO YOU WANT TO CONTINUE PURCHASING: (Y/N)?
       N

THANK YOU
You bought 2 items.
Total cost = Rs. 54900

c. Q3) An online retailer sells five different products whose retail prices are shown in the following table.
Write a flowgorithm using functions that reads quantity sold one day of each product to print summary of a week's selling status. A sample session follows.

d. Q4) Write a flowgorithm function called encrypt() to Encrypt a String using and @

Given a string, the task is to encrypt this string using ! and @ symbols, alternatively. While encrypting the message the encrypted format must repeat the symbol as many times as the letter position in Alphabetical order. The encrypted message should be displayed in the main.

Examples:
Input: string = "Ab"
Output: !@@
Explanation:
Position of 'A' in alphabetical order is 1 and in String is odd position so encrypted message will have 1 '!'
Position of 'b' in alphabetical order is 2 and in String is even position
Input: string = "CDE"
Output: !!!@@@@!!!!!

e. Q5) Write a flowgorithm using subarraysum() function for the following:

Given an array of positive and negative integers, write a program to find out the maximum subarray sum in that array. The following figure explains the problem graphically.
Given {-2, -3, 4, -1, -2, 1, 5, -3} the output should be 7 as shown in the above figure the subarray is {4, -1, -2, 1, 5}.
Given {4, -8, 9, -4, 1, -8, -1, 6} the output should be 9 (here the subarray is {9}.

f. Q6)Given an array of size n of integers in range from 1 to n, write a flowgorithm using inversepermute() function to find the inverse permutation of the array. An inverse permutation is a permutation which you will get by inserting position of an element at the position specified by the element value in the array.

For example given an array {2, 3, 4, 5, 1} the output should be {5, 1, 2, 3, 4} because of the following conversions (assuming that positions start from 1)

- value 2 in position 1 becomes value 1 in position 2
- value 3 in position 2 becomes value 2 in position 3
- value 4 in position 3 becomes value 3 in position 4

•value 5 in position 4 becomes value 4 in position 5
•value 1 in position 5 becomes value 5 in position 1

Recursion

37. Draw a flowchart to print all natural numbers between 1 to n using recursion.
38. Draw a flowchart to find GCD (HCF) of two numbers using recursion.
39. Draw a flowchart to generate nth Fibonacci term using recursion.

Eval lab3 Q

40. Sec e - set 1

    Zoo

    You are required to enter a word that consists x of y and that denote the number of Zs and Os, respectively. The input word is considered similar to word zoo if 2*x = y. Determine if the entered word is similar to word zoo. For example, words such as zzoooo and zzzooooooo are similar to word zoo but not the words such as zzooo and zzzooooo.

    Input format

    First line: A word that starts with several Zs and continues by several Os.

    Note: The maximum length of this word must be 20

    Output format

    Print Yes if the input word can be considered as the string zoo otherwise, print No.

    Link to the problem in Hackerearth: Zoos | Practice Problems (hackerearth.com)

    Expected Outputs: A flowchart that produces intended results and a program that passes all the test cases in Hackerearth.

41. Sec e set 2

    Ali and Helping innocent people Arpasland has surrounded by attackers. A truck enters the city. The driver claims the load is food and medicine from Iranians. Ali is one of the soldiers in Arpasland. He doubts about the truck, maybe it's from the siege. He knows that a tag is valid if the sum of every two consecutive digits of it is even and its letter is not a vowel. Determine if the tag of the truck is valid or not. We consider the letters "A","E","I","O","U","Y" to be vowels for this problem.

    Input Format

    The first line contains a string of length 9. The format is "DDXDDD-DD", where D stands for a digit (non-zero) and X is an uppercase English letter.

Output Format

Print "valid" (without quotes) if the tag is valid, print "invalid" otherwise (without quotes)

Link to the problem in Hackerearth: Ali and Helping innocent people | Practice Problems (hackerearth.com)

Expected Outputs: A flowchart that produces intended results and a program that passes all the test cases in Hackerearth.

42. Sec e set 3

Divisibility

You are provided an array A of size N that contains non-negative integers. Your task is to determine whether the number that is formed by selecting the last digit of all the N numbers is divisible by 10.

Input format

First line: A single integer N denoting the size of array A

Second line: N space-separated integers.

Output format: If the number is divisible by 10, then print Yes Otherwise, print No

Link to the problem in Hackerearth: Divisibility | Practice Problems (hackerearth.com)

Expected Outputs: A flowchart that produces intended results and a program that passes all the test cases in Hackerearth.

Periodical Questions:

43. Pt2 Set-1

4. Below is the pseudocode to display the first K smallest elements in an array, with its steps in a jumbled order. Rewrite them in the correct order with proper space alignment so that the corrected pseudocode serves the said purpose. [Hint: The given pseudocode takes an unsorted array as Input, selects the smallest element from an unsorted list in each iteration, places that element at the beginning of the unsorted list until they are in ascending order, and prints first K smallest elements] [CO2] [BTL-3] [5 Marks]
Sample Input:
arr={34, 20, 90, 10, 22, 58, 83,29}, K=3.
Sample Output:

The first K smallest elements are 10 20 22

Pseudocode:

1. Read the array N elements to array arr
2. for i=0 to N-2 [Increase i by 1]
3. small=i
4. arr[i]=arr[small]
5. arr[small]=temp
6. for i=0 to k-1 [increase i by 1]
7. small=j
8. for j=i+1 to N-1 [Increase j by 1]
9. temp=arr[i]
10. if(i != small)
11. Read N, K
12. if (arr[j]< arr[small]]
13. Declare an array arr of size ‘N’, and the variables i,j,K,temp,small
14. Output arr[i]
15. Output “The first K smallest elements are”

44.