

Tutorial Sheet : 2-D Array

Q1. Write a program in C++ to find transpose of a given matrix.

Sample Input :

```
3 3  
1 5 7  
2 4 6  
9 3 8  
Sample Output :  
1 2 9  
5 4 3  
7 6 8
```

Q2. Write a program in C++ to find whether given matrix is magic matrix or not.(Magic matrix is a square matrix of size n , which contains elements from 1 to n^2 . And sum of each row ,each column and both diagonals of matrix is equal.)

Sample Input :

```
3  
2 7 6  
9 5 1  
4 3 8
```

Sample Output :
Magic Matrix

Q3. Write a program in C++ to find the column that contains maximum number of 1s in a binary matrix (a matrix that contains either 0 or 1).

Sample Input :

```
3 3  
1 0 1  
1 1 0  
1 0 1
```

Sample Output :
1

Q4. Write a program in C++ to find the column having maximum sum in a matrix.

Sample Input :

```
3 3  
1 2 3  
4 5 6  
7 8 9
```

Sample Output :

3

Q5. Write a program in C++ to find largest element from each row and column.

Sample Input :

```
2 3  
1 2 5  
3 4 6
```

Sample Output :

```
5 6  
3 4 6
```

Output Description :

First line contains the largest elements from each row.

Second line contains the largest elements from each column.

Q6. Write a program in C++ to find largest group of 1's in a row of a matrix whose elements are either 0 or 1.

Sample Input :

```
3 3  
1 0 1  
1 1 0  
0 0 1
```

Sample Output :
2

Q7. Write a program in C++ to find the index of row representing the minimum and maximum number in binary form.

Sample Input :

```
3 3  
1 1 1  
1 0 1  
0 0 0
```

Sample Output :

```
2  
0
```

Output Description :

First line represent the index of row representing minimum value and second line represent the index of row representing maximum value.

Q8. Write a program in C++ to find the elements that are greater than the 4 neighbours in a matrix.

Sample Input :

```
4 4  
1 3 2 4  
3 5 6 2  
7 9 3 1  
2 1 2 3
```

Sample Output :

```
6  
9
```

Assumption:

Boundary elements of the matrix need not be considered as doesn't have 4 neighbours.

Q9. Write a program in C++ to find the sum of two square matrices entered by the user.

Sample Input :

```
3  
1 2 3  
4 5 6  
7 8 9  
9 8 7  
6 5 4  
3 2 1
```

Sample Output :

```
10 10 10  
10 10 10  
10 10 10
```

Q10. Write a program in C++ to find the product of two square matrices entered by the user.

Sample Input :

```
3 3  
1 2 3  
4 5 6  
7 8 9  
10 0  
0 1 0  
0 0 1
```

Sample Output :

```
1 2 3  
4 5 6  
7 8 9
```

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\begin{array}{c} \xrightarrow{\text{Diagram}} \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \\ \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \xrightarrow{\text{Diagram}} \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \end{array}$$

Q11. Write a program in C++ to find the k^{th} diagonal of a matrix

	4	5	6
3	1	4	3
2	5	6	7
1	4	7	9

For example the elements of 3-diagonal are : 1, 6, 9
And elements of 5-diagonal are: 3, 2

Sample Input :

```
3 3  
2  
1 2 3  
4 5 6  
7 8 9
```

Sample Output :

```
4 8
```

Q12. Study how to allocate a 2D array dynamically and try it.

Q13. Study about different methods of passing a 2D-array to a function and try them.

Tutorial Sheet : Nested Loop

Q1. Write a program in C++ to find whether there exist i,j such that $A[i]+A[j]=k$ in unsorted array.

Sample Input :

5
17
1 10 5 6 7

Sample Output :

Yes

Q2. Write a program in C++ to find frequency of element in an array.

Sample Input :

5
8 5 6 5 6

Sample Output :

5 : 2
6 : 2
8 : 1

Q3. Write a program in C++ to find element that has maximum frequency in an array.

Sample Input :

5
2 3 2 1 5

Sample Output :

2

Q4. Write a program in C++ to find the elements that occur 'k' times in an array.

Sample Input :

5
2
2 3 2 3 5

Sample Output :

2
3.

Q5. Write a program in C++ to convert an array of size 'n' into a matrix of size 'a x b' where n=ab (start filling elements row-wise).

Sample Input :

10
2 5
1 2 3 4 5 6 7 8 9 10

Sample Output :

1 2 3 4 5
6 7 8 9 10

Q6. Given a matrix. Create two arrays, one array will hold all odd values of matrix and other array will hold all even values of matrix.

Sample Input :

3 3
1 2 3
4 5 6
7 8 9

Sample Output :

2 4 6 8
1 3 5 7 9

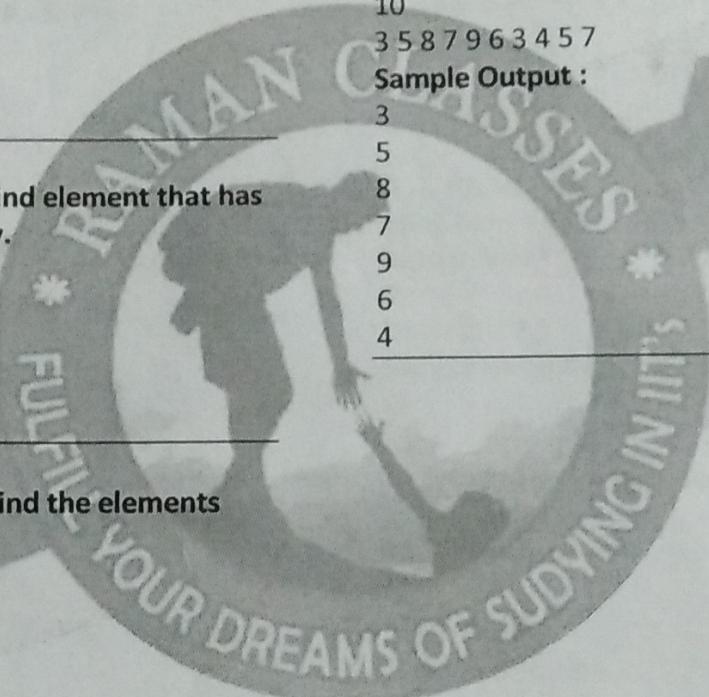
Q7. Write a program in C++ to find unique element in an array. List all the elements that exists in the array.

Sample Input :

10
3 5 8 7 9 6 3 4 5 7

Sample Output :

3
5
8
7
9
6
4



Tutorial Sheet : Recursion

Q1. Write a program to find the factorial of a number using recursion.

Sample Input :

5

Sample Output :

120

Q2. Write a program to check if the given number is palindrome or not.

Sample Input :

121

Sample Output :

Palindrome

Q3. Define a function mult(m, n) to find the product of two numbers using recursive addition.

Sample Input :

5

2

Sample Output :

10

Q4. Write a C++ program to compute a^b using recursion.

Sample Input :

4 2

Sample Output :

16

Q5. Write a C++ program to compute sum of digits of a number using recursion.

Sample Input :

1452

Sample Output :

12

Q6. Write a C++ program to reverse the digits of a number using recursion.

Sample Input :

1452

Sample Output :

2541

Q7. Write a program to find the nth number in fibonacci series using recursion.

Sample Input :

6

Sample Output :

5

Q8. Write a C++ program to compute GCD of two numbers using recursion.

Sample Input :

30 35

Sample Output :

5

Q9. Write a C++ program to compute Decimal equivalent of a Binary Number (represented as decimal integer).

Sample Input :

1010

Sample Output :

10

Q10. Write a C++ program to convert decimal number to binary number using recursion.

Sample Input :

10

Sample Output :

1010

Q11. Write a C++ program to find max of an array using recursion.

Sample Input :

5

10 20 25 12 3

Sample Output :

25

Q12. Write a C++ program to find sum of an array using recursion.

Sample Input :

5

1 2 3 4 5

Sample Output :

15

Q13. Write a program to reverse an array using recursion.

Sample Input :

5

1 2 3 4 5

Sample Output :

5 4 3 2 1

Tutorial Sheet : Strings

Q1. Write a program in C++ to convert the input string from lower case to upper case.

Sample Input :

12

RamanClasses

Sample Output :

RAMANCLASSES

Q2. Write a program to count the number of digits in a string.

Sample Input :

15

2Raman01Classes9

Sample Output :

4

Q3. Write a program in to count the number of words in the string.

Sample Input :

Raman Classes

Sample Output :

2

Q4. Write a program to print the character with maximum occurrence.

Sample Input :

raman

Sample Output :

A

Q5. Write a program to check if a string is palindrome or not.

Sample Input :

5

madam

Sample Output :

Palindrome

Q6. Write a program to reverse a string.

Sample Input :

12

RamanClasses

Sample Output :

sessalcnamaR

Q7. Write a program to find if the given string represents a valid floating point number or not.

Sample Input :

12.34e-2

Sample Output :

Valid

Q8. Write a program to print the longest numeric substring.

Sample Input :

This345is78a1num12string.

Sample Output :

345

Tutorial: Linked List
13th June 2019

1. Create new linked list from two given linked list with greater element at each node
Given two linked list of the same size, the task is to create a new linked list using those linked lists.
The condition is that the greater node among both linked list will be added to the new liked list.

Examples:

Input: list1 = 5->2->3->8
list2 = 1->7->4->5
Output: New list = 5->7->4->8

Input: list1 = 2->8->9->3
list2 = 5->3->6->4
Output: New list = 5->8->9->4

2. Sum of nodes in a linked list which are greater than next node
Given a linked list, the task is to find the sum of all the nodes which are greater than the node next to them. Note that for the last node of the linked list which doesn't have any node next to it, it must be greater than the first node in order for it to contribute to the sum.

Examples:

Input: 9 -> 2 -> 3 -> 5 -> 4 -> 6 -> 8
Output: 14
 $9 + 5 = 14$

Input: 2 -> 1 -> 5 -> 7
Output: 9
 $2 + 7 = 9$

3. Delete linked list nodes which have a greater value on left side
Given a singly linked list, the task is to remove all the nodes which have a greater value on left side.

Examples:

Input: 12->15->10->11->5->6->2->3
Output: Modified Linked List = 12 15

4. Delete alternate nodes of a Linked List
Given a Singly Linked List, starting from the second node delete all alternate nodes of it. For example, if the given linked list is 1->2->3->4->5 then your function should convert it to 1->3->5, and if the given linked list is 1->2->3->4 then convert it to 1->3.

5. Finding Median in a Sorted Linked List
Given A sorted linked list of N elements. The task is to find the median in the given Sorted Linked List.

We know that median in a sorted array is the middle element.

6. Convert singly linked list into circular linked list

1. Sum of two large numbers

Given two numbers as strings. The numbers may be very large (may not fit in long long int), the task is to find sum of these two numbers.

Examples:

Input : str1 = "3333311111111111",
str2 = "4442222221111"

Output : 337773333332222

2. Number of substrings divisible by 6 in a string of integers

Given a string consisting of integers 0 to 9. The task is to count the number of substrings which when convert into integer are divisible by 6. Substring does not contain leading zeroes.

Examples:

Input : s = "606".

Output : 5

Substrings "6", "0", "6", "60", "606"
are divisible by 6.

3. Find the smallest window in a string containing all characters of another string

Given two strings string1 and string2, the task is to find the smallest substring in string1 containing all characters of string2 efficiently.

Examples:

Input: string = "this is a test string", pattern = "tist"

Output: Minimum window is "t stri"

Explanation: "t stri" contains all the characters of pattern.

4. Count number of substrings with exactly k distinct characters

Given a string of lowercase alphabets, count all possible substrings (not necessarily distinct) that has exactly k distinct characters.

Examples:

Input: abc, k = 2

Output: 2

Possible substrings are {"ab", "bc"}

Input: aba, k = 2

Output: 3

Possible substrings are {"ab", "ba", "aba"}

5. Program to find Smallest and Largest Word in a String

Given a string, find the minimum and the maximum length words in it.

Examples:

Input : "This is a test string"

Output : Minimum length word: is

Maximum length word: string

6. Program to remove vowels from a String

Given a string, remove the vowels from the string and print the string without vowels.

Examples:

Input : what is your name ?

Output : wht s yr nm ?

7. Check if frequency of all characters can become same by one removal

Given a string which contains lower alphabetic characters, we need to remove at most one character from this string in such a way that frequency of each distinct character becomes same in the string.

Examples:

Input : str = "xxyz"

Output : Yes

We can remove character 'y' from above string to make the frequency of each character same.

8. Number of subsequences in a string divisible by n

Given a string consisting of digits 0-9, count the number of subsequences in it divisible by m.

Examples:

Input : str = "1234", n = 4

Output : 4

The subsequences 4, 12, 24 and 124 are divisible by 4.

Input : str = "330", n = 6

Output : 4

The subsequences 30, 30, 330 and 0 are divisible by n.

9. Reverse individual words

Given a string str, we need to print reverse of individual words.

Examples:

Input : Hello World

Output : olleH dlroW

10. Convert to a string that is repetition of a substring of k length

Given a string, find if it is possible to convert it to a string that is repetition of substring with k characters. To convert, we can replace one substring of length k with k characters.

Examples:

Input: str = "bdac", k = 2

Output: True

We can either replace "bd" with "ac" or "ac" with "bd".

Input: str = "abcbedabcabc", k = 3

Output: True

Replace "bed" with "abc" so that the whole string becomes repetition of "abc".

Competitive Coding – Patterns & Series – Level 1

1. *
**

2. 1
2 3
4 5 6
7 8 9 10

3. 0
1 0
1 0 1
0 1 0 1

4. 1
3 2
4 5 6
10 9 8 7

5. 1
3 2
6 5 4
10 9 8 7

6. 1
-2 -3
4 5 6
-7 -8 -9 -10

7. 1
-2 3
4 -5 6
-7 8 -9 10

8. *

9. -- *
-* *
* *
-* *
-- *

10. *

*

-- ->
-- >
->
>

11.

WAP in C++ to find $\sin x (x - (x^3/3!) + (x^5/5!) - (x^7/7!) + \dots)$

Input :

90

1000

Output :

1

Input Description :

An integer x , denoting angle in degree .

An integer n , denoting the number of iteration.

12.

Write a program in C++ to print and find sum of first $2k$ terms of series 2,10,6,20,18,40,54,80.

Input :

5

Output :

2,10,6,20,18,40,54,80,162,160.

Sum=552

Input Description :

An integer k .

13. Write a program in C++ to print next 10 terms of series AZ, CY, EX, GW, IV

14. Write a program in C++ to find e^x using series $1 + (x/1!) + (x^2/2!) + (x^3/3!) + \dots$

15. Write a program in C++ to find n th term of geometric progression

2,4,8,16,32,...

16. Write a program in C++ to find sum till n th term of geometric progression

2,4,8,16,32,...

17.

Write a program in C++ to find the sum and n terms of arithmetic series given the first three terms of series.

Input :

5

2 3

Output :

1 2 3 4 5

15

Input Description :

First line denotes the number of terms in Arithmetic series. Next line contains the first three term of Arithmetic series.

Output Description :

First line denotes the n terms of the given Arithmetic series.

Second line input the sum of n terms of given series.

Competitive Coding – Patterns & Series – Level 2

1. WAP to print following pattern

* * * *

* * * *

* * * *

* * * *

2. WAP to print following pattern

Input: rows = 5, cols = 8

Output:

* * * * * * *

* *

* *

* *

* * * * * * *

3. WAP to print the trapezoid pattern

If N = 2

1*2*5*6

3*4

If N = 4

1*2*3*4*17*18*19*20

5*6*7*14*15*16

8*9*12*13

10*11

8e 20 - 2^{x+11}
- 2 31 - 6

Input: N = 5

Output:

12345

4

3

2

12345

7. WAP to print given N pattern

$\rightarrow (2n-1)$ spaces

1 1

22 2

* - *

N N

8. Given an integer N as input, the task is to print the Magical Pattern as given below

N..32123..N

• • • • • • • • •

33332123333

22222122222

1111111111

222222122222

2 2 2 2 2 1 2 2 2 2

N 32123 N

$i=0$	4	3	2	1
$i=1$	3	3	2	1
$i=2$	2	2	2	1
$i=3$	1	1	1	1

321 23
221 22
111 11
221 22
321 23

Competitive Coding –Loops– Level 1

1. Write a program in C++ to find sum of factorial of digits of a number.

Ex: Input – 146, output – 745 (1+24+720)

2. Write a program in C++ to print sum of digits.

3. Write a program in C++ to convert binary number to decimal number using loops.

4. Write a program in C++ to find maximum of given numbers. Stop when user enters 0 or any negative number.

5. Write a program in C++ to print integer cube root of a number.

(Integer cube root of a number n is the largest number x such that $x*x*x \leq n$)

6. Write a program in C++ to print integer square root of a number.

(Integer cube root of a number n is the largest number x such that $x*x \leq n$)

7. Write a C++ program to check whether two numbers are Twin Primes or not.

(Ex: 5 7. Output yes)

8. Write a C++ program to check whether two numbers are Semi Primes or not.

(Ex: A number is said to be a Semi Prime if it is a product of two prime numbers

Example : 10 (2x5)

9. Write a program in C++ to print all factors of a number in increasing order.

10. Write a program to check whether two numbers are co-prime or not.

Tutorial Sheet : 1-D Array

Q1. Write a program in C++ to find the index of the element in an array.

Sample Input :

5
10 5 7 18 6

5

Sample Output :

1

Q2. Write a program in C++ to find the elements in the array which are greater than its neighbours.

Sample Input :

5
10 5 7 18 6

Sample Output :

18

Q3. Write a program in C++ to find the no of elements which are greater than mean of the array .

Sample Input :

5
2 4 6 8 10

Sample Output :

2

Q4. Write a program in C++ to find the no. of elements within a given range.

Sample Input :

5
10 5 7 18 6
2
7

Sample Output :

3

Q5. Write a program in C++ to find maximum element in an array.

Sample Input :

5
10 5 7 18 6

Sample Output :

18

Q6. Write a program in C++ to find the elements which are present in first array and not in second array.

Sample Input :

5
10 5 7 18 6
5 7 8 4 6

Sample Output :

10 18

Q7. Write a program in C++ to find reverse of an array.

Sample Input :

5
10 5 7 18 6

Sample Output :

6 18 7 5 10

Q8. Write a program in C++ to find hamming distance between two binary numbers.

Sample Input :

5
1 1 0 1 0
1 1 1 0 1

Sample Output :

3

Q9. Write a program in C++ to find out he highest strike rate of the batsman.

Sample Input :

5
10 5 7 18 6
4 2 3 17 2

Sample Output :

300

Input Description :

First line denotes an integer N, the number of elements in the array .

Second line denotes the runs scored by each batsman.

Third line denotes the balls faced by each batsman.

Q10. Write a program in C++ to find xor of two binary numbers.

Sample Input :

4
1 0 1 1
1 1 1 1

Sample Output :

0 1 0 0

Q11. Write a program in C++ to find all the leaders in an array .(A leader is an element which is greater than all the elements present towards its right.)

Sample Input :

5
10 5 7 18 6

Sample Output :

18 6

Q12. Write a program in C++ to merge two sorted array.

Sample Input :

2
10 12
11 13

Sample Output :

10 11 12 13

Q13. Write a program in C++ to modify the array as per the following rules .

- If both the elements of the array is even, then modifies the element of the first array by the sum of element of both the array.
- If both the element of the array is odd, then it modifies the element of the first array by the product of element of both the array.
- Otherwise do nothing.

Sample Input :

5
10 5 7 18 6
2 3 4 5 8

Sample Output :

12 15 7 18 14

Q14. Write a program in C++ to find whether an array is palindrome or not.

Sample Input :

5
1 2 3 2 1

Sample Output :

Palindrome

Q15. Write a program in C++ to modify the array such that all negative no. are followed by positive no.

Sample Input :

5
-10 5 -7 18 6

Sample Output :

-10 -7 5 18 6

Q16. Write a program in C++ to perform subtraction of two binary numbers stored in an array.

Sample Input :

4 4
1 0 1 0
1 0 0 0

Sample Output :

2

Q17. Write a program in C++ to find decimal equivalent of a given binary array.

Sample Input :

5
1 0 0 0 0

Sample Output :

16

Q18. Write a program in C++ to convert a decimal number to its binary equivalent (store the bits in array).

Sample Input :

5

Sample Output :

1 0 1

Q19. Write a program in C++ to delete second largest from an array. Assume duplicate elements are not allowed in array.

Sample Input :

5
1 2 3 7 8

Sample Output :

1 2 3 8

Q20. Write a program in C++ to delete the kth index of the array .

Sample Input :

5
10 5 7 18 6
2

Sample Output :

10 5 18 6

Q21. Write a program in C++ to find parity bits of given set of binary numbers by even parity method.

Sample Input :

5
1 0 0 1 0

Sample Output :

0

Q22. Write a program in C++ to left rotate an array by 1

Sample Input :

5
10 5 7 18 6

Sample Output :

5 7 18 6 10

Q23. Write a program in C++ to shift the 0's at even position and 1's at odd position in a binary array. If there are more 0's than 1's or vice versa put them at the end of array.

Sample Input :

5
1 0 0 0 1

Sample Output :

0 1 0 1 0

Q 24. Study how to allocate an array dynamically and try it.

Q 25. Study about different methods of passing an array to a function and try them.