22TP104 BASIC CODING COMPETENCY

Hours Per Week :

L	T	P	C
0	1	3	2

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geeksforgeeks.org/
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geeksforgeeks-cp-
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PREREQUISITE KNOWLEDGE: Programming in C.

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed to impart knowledge on advanced concepts of C programming language and problem solving. At the end of this course, students will be able to design, implement, test and debug complex problems using features of C.

MODULE-1

UNIT-1   **0L+4T+12P=16 Hours**

NUMBER CRUNCHING :

PRACTICES:
Problems On Number Crunching

- Write a program to check if a given number is perfect or not.
- Write a program to check if a given number is deficient or not.
- Write a program to check if 2 given numbers are amicable or not.
- Write a program to check if 2 given numbers are betrothed or not.
- Write a program to check whether a given number is an Armstrong number or not.
- Write a program to print the series of prime numbers in the given range.
- Write a program to print all the perfect numbers in a given range.
- Write a program to generate all deficient numbers in a given range.
- Write a program to generate all the amicable numbers in a given range.
- Write a program to generate all the betrothed numbers in a given range.
- Write a program to find the largest prime factor of a given number.
- Write a program to check whether the given number is a palindrome or not.
- Write a program to calculate sum of the individual digits for the given number.
- Write a program to find the first number that has more than 'n' factors, excluding 1 and that number.
- Write a program to accept a number as input and print its factorial.
- Write a program to accept a number n, print first N Fibonacci numbers.
- Write a program to check if an input number is Armstrong number or not.
- Write a program that takes input a,b. Print a power b.
- Write a program that takes input a number n, check if it a perfect square or not.
- Print array in spiral format.
- Print sum of each row in a matrix.
- Print sum of each column in matrix.
- Print left->right and right->left diagonals in a matrix.
- Initially you are at (0,0) find the shortest path count to reach the (n, n) block in matrix.
- Remove all the elements present in row and column of unsafe elements. An element is called unsafe if it is equal to smallest or largest value. Count number of remaining elements.
- Write a program to check if the string contains all the letters of alphabet.

SKILLS:
- ✓ *Analysis of the problem to be solved.*
- ✓ *Application of various file operations effectively in solving real world problems.*
- ✓ *Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.*

- Check if a string is matching password requirements.
- Check if String A contains String B (String searching).
- Check if a number is harshad number or not.
- Write a program to get 3 numbers as input. The first is the number num1 and second is the digit that needs to be replaced. The third is the digit that is to replace the 2nd digit. Print the number after performing this operation.
- Write a program to accept a number and swap its alternate digits. Print the number generated.
- Write a program to accept a number and choice as input. If the choice is 0 rearrange the number such that the odd digits are ordered first followed by the even digits. If the choice is 1 rearrange the number such that the even digits are ordered first followed by the odd digits. Print the rearranged number. The order of occurrence of the digits is to be preserved.
- Write a program to determine that whether the given quadrilateral is cyclic or not. You are given the sizes of angles of a simple quadrilateral (in degrees) A, B, C and D, in some order along its perimeter.
  Note: A quadrilateral is cyclic if and only if the sum of opposite angles is 180^0.

- Chef is a very lazy person. Whatever work is supposed to be finished in x units of time, he finishes it in m*x units of time. But there is always a limit to laziness, so he delays the work by at max d units of time. Given x,m,d, find the maximum time taken by Chef to complete the work.
- Suppose Chef is stuck on an island and currently he has x units of food supply and y units of water supply in total that he could collect from the island. He needs xr units of food supply and yr units of water supply per day at the minimal to have sufficient energy to build a boat from the woods and also to live for another day. Assuming it takes exactly D days to build the boat and reach the shore, tell whether Chef has the sufficient amount of supplies to be able to reach the shore by building the boat? Read five integers x,y,xr,yr,D from the user and display "YES" if Chef can reach the shore by building the boat and "NO" if not (without quotes).
- There are 3 problems in a contest namely A,B,C respectively. Alice bets Bob that problem C is the hardest while Bob says that problem B will be the hardest.
  You are given three integers SA,SB,SC which denotes the number of successful submissions of the problems A,B,C respectively. It is guaranteed that each problem has a different number of submissions. Determine who wins the bet.

  1) If Alice wins the bet (i.e. problem C is the hardest), then output Alice.

  2) If Bob wins the bet (i.e. problem B is the hardest), then output Bob.

  3) If no one wins the bet (i.e. problem A is the hardest), then output Draw.

  Note: The hardest problem is the problem with the least number of successful submissions.

  Input Format
  - The first line of input contains a single integer T denoting the number of test cases. The description of T test cases follows.
  - The first and only line of each test case contains three space-separated integers SA,SB,SC, denoting the number of successful submissions of problems A,B,C respectively.

  Output Format

  For each test case, output the winner of the bet or print Draw in case no one wins the bet.

  Sample Input 1

  3

  1 4 2

  16 8 10

  14 15 9

  Sample Output 1

  Draw

  Bob

  Alice

- In a season, each player has three statistics: runs, wickets, and catches. Given the season stats of two players A and B, denoted by R, W, and C respectively, the person who is better than the other in the most statistics is regarded as the better overall player. Tell who is better amongst A and B. It is known that in each statistic, the players have different values.

  Input

  The first line contains an integer T, the number of test cases. Then the test cases follow.

  Each test case contains two lines of input.

  The first line contains three integers R1, W1, C1, the stats for player A.

  The second line contains three integers R2, W2, C2, the stats for player B.

  Output

  For each test case, output in a single line "A" (without quotes) if player A is better than player B and "B" (without quotes) otherwise.

- Write a program to find the direction.

  Chef is currently facing the north direction. Each second he rotates exactly 90 degrees in clockwise direction. Find the direction in which Chef is facing after exactly X seconds.

  Note: There are only 4 directions: North, East, South, West (in clockwise order). Initially chef is at 0th second i.e., facing North direction.

  Input Format

  - First line will contain T, number of testcases. Then the testcases follow.
  - Each testcase contains of a single integer X.

  Output Format

  For each testcase, output the direction in which Chef is facing after exactly X seconds.

  Sample Input 1

  3

  1

  3

  6

  Sample Output 1

  East

  West

  South

- Chef is playing in a T20 cricket match. In a match, Team A plays for 20 overs. In a single over, the team gets to play 6 times, and in each of these 6 tries, they can score a maximum of 6 runs. After Team A's 20 overs are finished, Team B similarly plays for 20 overs and tries to get a higher total score than the first team. The team with the higher total score at the end wins the match.

  Chef is in Team B. Team A has already played their 20 overs, and have gotten a score of R. Chef's Team B has started playing, and have already scored C runs in the first O overs. In the remaining 20−O overs, find whether it is possible for Chef's Team B to get a score high enough to win the game. That is, can their final score be strictly larger than R?

  Input: There is a single line of input, with three integers, R, O, C.

  Output: Output in a single line, the answer, which should be "YES" if it's possible for Chef's Team B to win the match and "NO" if not.

- Make Array Zeros using pointers

  You are given an array A of length N (size should be created using Dynamic memory allocation) and can perform the following operation on the array:

  Select a subarray from array A having the same value of elements and decrease the value of all the elements in that subarray by any positive integer x.

  Find the least possible number of operations required to make all the elements of array A equal to zero.

The first line contains an integer N denoting the number of elements in the array.

The next line contains space-separated integers denoting the elements of array A.

Print the least possible number of operations required to make all the elements of array A equal to zero.

Sample Test case

Input:

5

2 2 1 3 1

Output:

4

UNIT-2   **0L+4T+12P=16 Hours**

PATTERNS

PRACTICES:

Problems on Number Patterns

- Write a program to generate Floyd triangle. Sample input N= 4.

  1

  2 3

  4 5 6

  7 8 9 10

- Write a program to generate the following pattern. Sample input N=5.

  13579

  3579

  579

  79

  9

- Write a program to generate the following pattern. Sample input N=4.

  1111111

  222222

  33333

  4444

  333

  22

  1

- Write a program to generate the following pattern. Sample input N=5.

  5432*

  543*1

  54*21

  5*321

  *4321

- Write a program to generate the following pattern. Sample input N=5.

  12   21

  123   321

  1234 4321

  123454321

- Write a program to generate the following pattern. Sample input N=5.

  1

  2*2

  3*3*3

  4*4*4*4

  4*4*4*4

  3*3*3

  2*2

  1

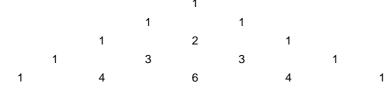- Write a program to generate the following pattern. Sample input N=4.

  1

  212

  32123

  4321234

- Write a program to generate the following pattern. Sample input N=5.

  *

  * *

  * * * *

  * *

  *

- Write a program to print Pascal triangle for the given number of rows. Sample input N=5.

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

- Write a program to generate the following pattern. Sample input N=4.

  1234

  2341

  3421

  4321

- Print Hollow Diamond pattern.
- Print pascals triangle.
- Print Floyds triangle.
- Print Butterfly Pattern.
- Print palindromic pattern.
- Print full inverted number triangle.
- Check if a number is prime or not (Efficient Approach).
- Find sum of all the digits of the number.
- Print transpose of given matrix.
- Rotate a two dimensional matrix by 90, 180, 270 degrees.

MODULE-2

UNIT-1   **0L+4T+12P=16 Hours**

ARRAYS:

PRACTICES:
Problems On Arrays

- Given an unsorted array of size N, and the array elements are in the range of 1 to N. There are no duplicates, and the array is not sorted. One of the integers is missing. Write a program to find the missing number.
- Given an array consisting of only 0s and 1s in random order rearrange the array such that all the 0s are to the left of the array and 1s to the right.
- Give an array consisting of odd and even numbers in random order, rearrange the array such that all the odd numbers are to the left of the array and even numbers are to the right of the array.
- Write a program to find all the unique elements in an array.
- Write a program to merge two arrays of the same size sorted in descending order.
- Write a program to count the frequency of each element in an array of integers.
- Write a program to find the second largest element in an array.
- Write a program to find the second smallest element in an array.
- Write a program to find that one element in array that occurs odd number of times, where every other element appears even number of times.
- Create a jagged array (adjacency list representation of a graph) with no of rows and no of columns in each row as specified by the user.
  Hint: Use Dynamic memory allocation (malloc() or calloc())

  Input:
  Enter no of rows: 3
  Enter no of columns Row in 1: 3
  Enter no of columns Row in 2: 5
  Enter no of columns Row in 3: 2
  Enter the elements row wise:
  8 6 5
  8 4 6 9 7
  9 2

  Output:
  8 6 5
  8 4 6 9 7
  9 2

- Write a program to find second largest number in the array.
- Write a program to find first repeating element in the array.
- Write a program to left rotate the array.
- Write a program to right rotate the array.
- Write a program to find the largest continuous sum.
- Write a program to print the sum of 2nd largest and 2nd smallest elements.
- Write a program to find the maximum product of two numbers multiplies in array (same index should not be used twice).
- Rearrange an array consisting of 1s and 0s such that they are alternatively arranged. Print minimum number of moves required.
- In a given array, find two numbers whose sum equal k.
- Find the difference between positive and negative elements in the array.
- Implement sorting algorithms (Insertion, selection, bubble).

UNIT-2   **0L+4T+12P=16 Hours**

STRINGS:

PRACTICES:

Problems on Strings:

- Write a program to reverse a given string word by word.
- Write a program to find the first occurrence of non-repeating character in the given string.
- Write a program to compress the string as provided in the example.
- Write a program to expand a string as provided in the example.
- Write a program to reverse those words of a string whose length is odd.
- Write a program to check if a given matrix is symmetric or not.
- Write a program to convert all the cases of letter (Lower case -> Upper Case, Upper Case-> Lower Case).
- Write a program to reverse all the words (Not the entire sentence but individual words).
- Find the longest palindrome in a given string.
- Check if two strings are anagrams or not.
- Find minimum number of changes to be done to make a string palindrome.
- Convert Excel sheet name to number (A-1, B-2, Z-26, AA-27).
- Find number of possible palindromes present in a string.
- Write a C program to read a string s, and determine the number of words in s.

  Example : s=oneTwoThree

  There are 3 words in the string: 'one', 'Two', 'Three'.
- Write a C program that reads a string S and remove all duplicates characters from the given string S.

  NOTE: 1) Order of characters in output string should be same as given in input string.

  2) String S contains only lowercase characters ['a'-'z'].

  Example: S = Vignanuniversity

  The program should generate the output as: Vignauersty
- Today Ron is reading the book. Due to some reason, he started hating the word 'are' (without quotes). So he decided to replace the substring 'are' with 'R'. Write a C program that reads a line of message 's' and replace the substring 'are' with 'R'. Example: s= Howareyou.

  The program should generate the output as: HowRyou
- Write a program to concatenate the characters of the two given strings alternatively.
- Given a string S consisting of uppercase and lowercase letters, change the case of each alphabet in this string. That is, all the uppercase letters should be converted to lowercase and all the lowercase letters should be converted to uppercase.

  Input: Vignan University

  Output: vIGNAN uNIVERSITY
- Write a program to insert a given character at the beginning and end of the given string.
- Given two Strings A and B. They are said to be friends if ASCII sum of the each individual string is divisible by 4 else they are not friends. You need to find whether given two strings are friends or not.

  Sample Test case:

  Input:

  man nam

  vignan university

  Output:

  YES

  NO

- Write a program to find the frequency of each digit in the given string.

  Input Format

  The first line contains a string, which is the given number.

  Output Format

  Print ten space-separated integers in a single line denoting the frequency of each digit, indicate that the integers are from 0 to 9.

  Sample Input 0

  a11472o5t6

  Sample Output 0

  0 2 1 0 1 1 1 1 0 0

  Explanation 0

  In the given string:

  - · 1 occurs two times.
  - · 2,4,5,6 and 7 occur one time each.
  - · The remaining digits and don't occur at all.

- Sherlock considers a string to be valid if all characters in the given string appear the same number of times. It is also valid if he can remove just 1 character at 1 index in the string, and the remaining characters will occur the same number of times.

  Write a C program that reads a string s and determine whether it is valid or not. If valid, return YES, otherwise return NO.

  Example: S=abc
  This is a valid string because frequencies are {a:1,b:1,c:1}
  S=abcc
  This is a valid string because we can remove one c and have 1 of each character in the remaining string.
  S=abccc
  This string is not valid as we can only remove 1 occurrence of c. That leaves character frequencies of {a:1,b:1,c:2}

- Read a string containing characters A and B only. Your task is to change it into a string such that there are no matching adjacent characters. To do this, you are allowed to delete zero or more characters in the string.

  Write a C program that finds the minimum number of deletions required.

  Example: S=AABAAB

  Remove A at positions 0 and 3 to make S=ABABA in 2 deletions.

  Input Format

  The first line contains an integer (the number of queries).

  The next q lines each contain a string s to analyze.

  Sample Input:

  5

  AAAA

  BBBBB

  ABABABAB

  BABABA

  AAABBB

  Sample Output:

  3

  4

  0

  0

  4

- Write a C program that reads a string 's' and it is said to be complete if it contains all the characters from a to z.

  Input Format

  First line of the input contains the number of strings N. It is followed by N lines each contains a single string.

  Output Format

  For each test case print "YES" if the string is complete, else print "NO"

  Constraints 1 <= N <= 10

  The length of the string is at max 100 & the string contains only the characters a to z.

- Write a C program that reads two strings and determine whether they share a common substring or not. A substring may be as small as one character.

  Example;

  S1=and

  S2=art

  The common substring in these two strings: a.

  Sample Input

  2

  hello

  world

  hi

  world

  Sample Output

  YES

  NO

COURSE OUTCOMES:

Upon successful completion of the course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Mod- ule No.	Mapping with POs
1	Write simple, but complete, C programs.	Apply	1,2	1
2	Identify suitable data type for operands and design of expressions having right precedence.	Apply	1,2	1
3	Apply decision making and iterative features of C Programming language effectively.	Apply	1,2	1
4	Select problem specific data structures and suitable accessing methods.	Analyze	1,2	1,2
5	Design and develop non- recursive and recursive functions and their usage to build large modular programs and also able to design string manipulation functions.	Create	1,2	3
6	Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.	Create	1,2	3,4

TEXT BOOKS:

1. Behrouz A. Forouzan, Richard F.Gilberg, "Programming for Problem Solving", 1st edition, Cengage publications, 2019.
2. Ajay Mittal, "Programming in C - A Practical Approach", 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Reema Thareja, "Computer Fundamentals and Programming in C", 1st edition, Oxford University Press, India, 2013.
2. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata McGraw-Hill, 2017.
3. Byron S Gottfried, "Programming with C", 4th edition, Tata McGraw-Hill, 2018.