

C - LANGUAGE

CODE: TECH 121 to 135

STUDENT HANDOUT

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TECH 121 - INTRODUCTION TO C PROGRAMMING

THEORY CONCEPTS:

1. Introduction, Variables and Data types
2. Input & Output
3. Operators and Expressions

PROGRAM 1

Ramu and Somu are going on a picnic. Ramu packs m apples, n oranges. Somu packs $m1$ more apples than Ramu and $n1$ more oranges than Ramu. If Somu eats x of his apples and Ramu eats y of Somu's oranges, how many apples and oranges are left in total?

Input Format

Input consists of 6 integers $m, n, m1, n1, x, y$.

m - corresponds to the apples brought by Ramu.

n - corresponds to the oranges brought by Ramu.

$m1$ – Apples brought by Somu.

$n1$ – Oranges brought by Somu.

x - apples ate by Somu.

y – oranges ate by Ramu.

Output Format

Print two integers representing remaining apples and oranges.

Sample Input

4 3 2 8 3 2

Sample Output

7 12

PROGRAM 2

Pranav and Change

Pranav, an enthusiastic kid, visited the "Fun Fair 2017" along with his family. His father wanted him to purchase entry tickets from the counter for his family members. Being a little kid, he is just learning to understand units of money. Pranav has paid some amount of money for the tickets but he wants your help to give him back the change of Rs. N using the minimum number of rupee notes.

Consider a currency system in which there are notes of seven denominations, namely, Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 50, Rs. 100. If the change is given to Pranav Rs. N is input, write a program to compute the smallest number of notes that will combine to give Rs. N.

Input Format

The first line of the input is an integer N, the change to be given to Pranav.

Output Format

The output should display the smallest number of notes that will combine to give N.

Refer sample input and output for formatting specifications.

Constraints

Do not use any looping structures and conditional statements .

Sample Input

1200

Sample Input

242

Sample Output

12

Sample Output

7

PROGRAM 3

Wisconsin State Fair

Wisconsin State Fair is one of the largest midsummer celebrations in the Midwest Allis, showcasing the agriculture skills and prowess of the state. The Event organisers hired few part-time employees to work at the fair and the agreed salary paid to them are as given below:

Weekdays --- 80 / hour

Weekends --- 50 / hour

Justin is a part-time employee working at the fair. The number of hours Justin has worked in the weekdays is 10 more than the number of hours he had worked during weekends. If the total salary paid to him in this month is known, write a program to estimate the number of hours he had worked during weekdays and the number of hours he had worked during weekends.

Input Format

First line of the input is a double value that corresponds to the total salary paid to Justin.

Output Format

First line of the output should display the number of hours Justin has worked during the weekdays.

Second line of the output should display the number of hours Justin has worked during the weekends.

Refer sample input and output for formatting specifications.

Sample Input

2750

Sample Output

Number of weekday hours is 25

Number of weekend hours is 15

TECH 122 - CONDITIONAL STATEMENTS

THEORY CONCEPTS:

1. if, if-else, if-else-if, nested if, switch-case statement and
2. Switch case - fall through

PROGRAM 1

An automobile company manufactures both a two wheeler (TW) and a four wheeler (FW). A company manager wants to make the production of both types of vehicle according to the given data below:

1st data, Total number of vehicle (two-wheeler + four-wheeler)=v

2nd data, Total number of wheels = W

The task is to find how many two-wheelers as well as four-wheelers need to manufacture as per the given data.

Input format:

The candidate has to write the code to accept two positive numbers separated by a new line.

First Input line – Accept value of V.

Second Input line- Accept value for W.

Output format:

Written program code should generate two outputs, each separated by a single space character

Example :

Sample Input

200 -> Value of V

540 -> Value of W

Sample Output

TW =130 FW=70

Explanation:

$130+70 = 200$ vehicles

$$(70*4)+(130*2)= 540 \text{ wheels}$$

PROGRAM 2

Lucky Winner

It was the inaugural ceremony of "Fantasy Kingdom" Amusement park and the park Management has announced some lucky prizes for the visitors on the first day. Based on this, the visitors whose ticket number has the last digit as 3 or 8, are declared as lucky winners and attracting prizes are awaiting to be presented for them.

Write a program to find if the last digit of the ticket number of visitors is 3 or 8.

Input Format

First line of the input is an integer that corresponds to the ticket number.

Output Format

Output should display as "Lucky Winner" if the last digit of the ticket number is 3 or 8. Otherwise print "Not a Lucky Winner".

Sample Input

43

Sample Input

41

Sample Output

Lucky Winner

Sample Output

Not a Lucky Winner

PROGRAM 3

Triangle Game

The Westland Game Fair is the premier event of its kind for kids interested in some intellectual and cognitive brain games. Exciting games were organized for kids between the ages of 8 and 10. One such game was called the "Triangle game", where different number boards in the range 1 to 180 are available. Each kid needs to select three number boards, where the numbers on the boards correspond to the angles of a triangle.

If the angles selected by a kid forms a triangle, he/she would receive Prize 1. If the angles selected by a kid forms a right triangle, he/she would receive Prize 2. If the angles selected by the kids form an equilateral triangle, he/she would receive Prize 3. If the angles selected by a kid do not form even a triangle, then he/she will not receive any prizes. Write a program for the organizers to fetch the result based on the number boards selected by the kids.

Input Format

There are 3 lines in the input, each of which corresponds to the numbers on the boards that the kids select.

Output Format

Output should display "Prize 1" or "Prize 2" or "Prize 3" or "No Prize" based on the conditions given.

Sample Input

60

50

70

Sample Output

Prize 1

Sample Input

60

60

70

Sample Output

No prize

PROGRAM 4

The Parking Lot

In a busy city, a parking lot charges different fees based on the type of vehicle. The manager wants an automated system where customers enter the vehicle type, and the system calculates the fee.

For Car: \$20

For Bike: \$10

For Bus: \$30

The system asks the customer to choose their vehicle type from a list and then displays the parking fee.

Sample Input : Enter vehicle type (1 for Car, 2 for Bike, 3 for Bus): 1

Sample Output: Parking Fee: \$20

Write a program that uses a switch statement to determine the parking fee based on the vehicle type.

ADDITIONAL QUESTION:

PROGRAM 5

Card Game

The Westland Game Fair is the premier event of its kind for kids interested in some intellectual and cognitive brain games. Alan, a middle school boy, is visiting the fair where he is very much drawn by the Card game.

The game's rules are: A player needs to pick 3 cards from a big lot of cards. There are 4 types of Cards namely Spade(S), Heart(H), Club(C) and Diamond (D). If all the 3 cards that the player picks are of the same type and same number, they get a Double Bonanza. If all the 3 cards are of the same type or if they all have the same number, they get a Bonanza. Otherwise they do not get a Bonanza. Alan has now picked 3 cards and is awaiting to know if he has got a bonanza. Please help him to know if he has won the Bonanza or not.

Input Format

There are 3 lines of input.

Each of the lines consists of character and integer input, which corresponds to the type of the card and the number in it that Alan picked. The type of card and the number are separated by a single space

Output Format

Output should display "Double Bonanza" or "Bonanza" or "No Bonanza" based on the conditions given.

Input

H 5

C 3

D 3

Input

H 5

H 4

H 7

Input

D 8

D 8

D 8

Output

No Bonanza

Output

Bonanza

Output

Double Bonanza

TECH 123 - CONTROL STATEMENTS

THEORY CONCEPTS:

1. Looping / Iterative Statements:

- A. for loop
- B. while loop
- C. do-while loop
- D. Nested loops

2. Jump Statements:

- A. break
- B. continue statements

PROGRAM 1

Candy Game

Mona set off with great zeal to the "Fun Fair 2017". There were numerous activities in the fair, though Mona liked the Candy game. Delicious candies were wrapped in colourful foiled sheets with some random numbers on each of the candies. The game coordinators then formed many groups of a few candies together, such that each candy group makes an integer and hides them all around the room. The objective of the game is that the players should look for the occurrences of number four anywhere in the integers (candy groups) placed in the room.

Mona started off with the game where there are many such integers, for each of them she should calculate the number of occurrences of the digit 4 in the decimal representation. Can you please help her in succeeding in the game?

Input Format

The only line of input contains a single integer from the candy group.

Output Format

Output should contain the number of occurrences of the digit 4 in the respective integer from the candy groups that Mona gets.

Sample Input

447474

Sample Output

4

Sample Input

12

Sample Output

0

PROGRAM 2

The online math course provided 'MathAtTip' has designed a course for children called Learning Number Recognition and Counting. The assessment part of the course has a question where the student is given a number and a digit. The student needs to find out the total count of the digits present in the number excluding the given digit.

Write an algorithm to help the student find out the count of the total number of digits present in the number excluding the given digit.

Example**Input**

5644456 5

Output

5

PROGRAM 3**Exploring Special Numbers**

In a maths club, students are exploring interesting properties of numbers. One student comes across a unique class of numbers known as special numbers. A two-digit number is classified as a special number if the sum of its digits and the product of its digits equals the number itself.

To make this exploration interactive, the teacher gives the students a challenge:

Task:

Write a program to identify all special numbers between two specified limits, m and n (both inclusive), where m and n are two-digit numbers.

Sample Input: 34 59

Sample output : 59

PROGRAM 4

A company is conducting a survey to gather feedback about its services. The survey is conducted across multiple cities, and in each city, responses are collected from multiple participants. Write a C program to input and display the feedback ratings from participants in each city.

The program should:

1. Take the number of cities and the number of participants in each city as input.
2. Collect feedback ratings (1 to 5) for each participant in each city.
3. Display the feedback ratings city-wise.

Sample Input:

Enter the number of cities: 2

Enter the number of participants in city 1: 3

Enter feedback ratings (1 to 5) for 3 participants:

Participant 1: 4

Participant 2: 5

Participant 3: 3

Enter the number of participants in city 2: 2

Enter feedback ratings (1 to 5) for 2 participants:

Participant 1: 2

Participant 2: 3

Sample Output:

Feedback Ratings:

City 1:

Participant 1: 4

Participant 2: 5

Participant 3: 3

City 2:

Participant 1: 2

Participant 2: 3

ADDITIONAL QUESTIONS

PROGRAM 5

A transportation company is analyzing ticket numbers to check for palindromes. A ticket number is considered a **palindrome** if it reads the same backward as forward. Write a C program to:

1. Take the number of ticket numbers as input.
2. Check each ticket number to see if it is a palindrome.
3. Display which ticket numbers are palindromes.

Sample Input:

Enter the number of ticket numbers: 5

Enter the ticket numbers:

Ticket 1: 12321

Ticket 2: 46654

Ticket 3: 78987

Ticket 4: 12345

Ticket 5: 11211

Sample Output:

Palindrome Ticket Numbers:

Ticket 1: 12321 is a palindrome.

Ticket 3: 78987 is a palindrome.

Ticket 5: 11211 is a palindrome.

TECH 124 - PATTERN PRINTING

THEORY CONCEPTS:

1. Star Patterns
2. Number Patterns
3. Advanced Shape Patterns

PROGRAM 1

A passionate mountain climber, Alex, is preparing to scale the highest peak in the region. Alex has mapped out the path, which involves climbing up a series of steps, each progressively higher than the last. The journey begins with the first step, and with each new step, the height increases by one unit.

Write a C program to help Alex track how many steps are climbed each day. The program should:

1. Take the number of days Alex will be climbing.
2. Print the number of steps Alex climbs each day (forming a right-angled triangle pattern), where on Day 1 Alex climbs 1 step, on Day 2, 2 steps, and so on.
3. Display the climbing progress day by day.

Sample Input:

Enter the number of days Alex will be climbing: 6

Sample Output:

Alex's Climbing Progress:

```
*
**
***
****
*****
*****
```

PROGRAM 2

Harinarayan has reached the base camp of the mountain and is getting ready to climb further. To motivate himself, he decides to print a hollow square pattern of stars (*). This pattern will represent the base camp's boundary, which will remind him of the structure and goal of his journey. The hollow square pattern is such that the outer border is filled with stars, but the inside is empty (spaces).

Write a C program to print a hollow square star pattern, where:

- The size of the square is defined by the user.
- The outer boundary of the square is filled with stars, and the inner part of the square is filled with spaces.

Sample Input:

Enter the size of the square: 5

Sample Output:

```
* * * * *
*       *
*       *
*       *
*       *
* * * * *
```

PROGRAM 3

A space agency is preparing for the launch of a rocket. The mission is critical, and every team member is closely monitoring the countdown. To visualize the countdown, the team leader, Sarah, decides to print the countdown in a pattern of numbers, forming an inverted right-angled triangle. The first row will display the highest countdown number, and each subsequent row will decrease the number of digits printed until the countdown reaches one.

Write a C program to print the countdown in an inverted right-angled triangle pattern.

Sample Input:

Enter the countdown starting number: 5

Sample Output:

```
5 4 3 2 1
```


4 3 2 1

3 2 1

2 1

1

PROGRAM 4

Gagana, after successfully completing the base camp trek, now wants to set up a flag near the hill to mark his achievement. To symbolize his triumph, she decides to create a tower of stars (*). The tower should have a pyramid-like shape, with the first row consisting of one star, the second row consisting of two stars, and so on. The number of rows is determined by the user, and the pyramid is centered at the top.

Sample Input:

Enter the number of rows for the pyramid: 5

Sample Output:

```
      *
    ***
  *****
*****
*****
```

ADDITIONAL QUESTION

PROGRAM 5

Kethan is solving a puzzle that involves arranging numbers in a reverse sequence. The challenge is to start with a sequence of numbers in a line, and each subsequent line should have one fewer number, arranged in a pattern where the numbers decrease by one as the rows progress.

Sample Input:

4

Sample Output:

7*8*9*10

4*5*6

2*3

1

TECH 125 - FUNCTIONS

THEORY CONCEPTS:

1. Defining and calling functions, Function prototypes and declarations, Passing arguments to functions: pass by value, pass by reference
2. math.h Library

PROGRAM 1

In a computer science class, a teacher named Sachin is conducting a workshop focused on the principles of modular programming. To reinforce these concepts, she assigns her students to create a simple calculator program using a single user-defined function to perform arithmetic operations.

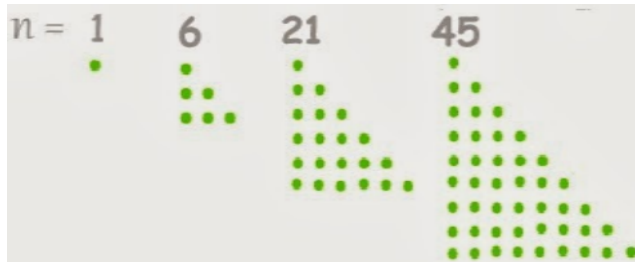
During the workshop, Sachin instructs the students to write a program that allows users to perform basic arithmetic operations (addition, subtraction, multiplication, and division) by calling a single user-defined function that takes two numbers and an operator as input.

Input: num1 = 10, num2 = 5, op = +

Output: res = 15.00

PROGRAM 2

Right Triangle of Dots The much-awaited event in the entertainment industry every year is the "Screen Awards". This year the event is going to be organized on December 25 to honor the Artists for their professional excellence in Cinema. The Organizers of the event, J&R Events, decided to design the logo of the Screen Awards as a digitized image and display it on the LED panel boards for the show promotions all across the venue. The Event team wanted to border the logo with right triangles which will describe it better. For this purpose, the Event development team is in the task to find if N dots can make a right triangle or not (all N dots must be used). Given N dots, we can make it look like a Right Triangle (45-45-90 triangle) exactly with N dots. Rearrange the given N dots, like this:



Your task is to help the team write a program using functions to find if N dots can make a right triangle or not.

Function Specifications: Use the function name, return type, and the argument type as: **int find(int)** The function must return 1 if you can make a right triangle using N dots, else return 0;

Input Format : The first line of the input consists of an integer N.

Output Format: Output "Yes" (without quotes) if you can make a right triangle using N dots, otherwise "No"(without quotes). Refer sample input and output for formatting specifications.

Sample Input

6

Sample Output

We can create Right Triangle of dots with 6 dots

Sample Input

4

Sample Output

We can't create Right Triangle of dots with 4 dots

PROGRAM 3

You are given the lengths of two sides of a right-angled triangle (base and height). Write a C program that calculates and prints the length of the hypotenuse using the Pythagorean theorem.

Functions to use: sqrt(), pow()

Input Format:

- Two integers, base and height, representing the lengths of the two sides.

Output Format:

- The length of the hypotenuse as a floating-point number.

Sample Input:

3 4

Sample Output:

Hypotenuse: 5.000000

TECH 126 RECURSION

THEORY CONCEPTS:

- Introduction to Recursion
- Recursion vs Iteration

PROGRAM 1

A renowned scientist named Dr. Arya is researching the properties of recursive algorithms. She recently learned how recursion can help solve problems that would typically require loops. Dr. Arya is particularly interested in how recursion can be applied to print a sequence of numbers in reverse order. As part of her experiment, she wants to print numbers from a given value **N** down to 1 without using loops. Can you help her achieve this using recursion?

Write a recursive program that takes a number **N** as input and prints the numbers from **N** down to 1, each on a new line.

Input Format:

- A single integer **N** ($1 \leq N \leq 100$).

Output Format:

- Print the numbers from **N** down to 1, each on a new line.

Sample Input:

5

Sample output:

5 4 3 2 1

PROGRAM 2

In a high school computer science class, the students are tasked with exploring the mathematical concept of the Fibonacci sequence and its connection to the Golden Ratio. Their teacher, Mrs. Carter, encourages them to think critically about recursion and its applications in problem-solving.

Mrs. Carter assigns the students to write a program that calculates the Fibonacci sequence using recursion.

Input: Enter a positive integer (n): 7

Output: The 7th Fibonacci number is 13.

PROGRAM 3

Alice is a software engineer at a tech company that specializes in building smart applications. One of the applications she is working on involves handling user-generated content, specifically user messages. The company wants to implement a feature that allows users to view their messages in reverse order for fun. Alice has been tasked with developing a function that takes a user message and returns the message in reverse, but she needs to do it using recursion.

Can you help Alice by writing a recursive function that takes a string and returns its reverse?

Input Format:

- A single string S ($1 \leq \text{length of } s \leq 100$) representing the message.

Output Format:

- The reversed string.

Sample input:

Recursion

Sample output:

noisruceR

PROGRAM 4

In a futuristic city, the local government collects daily temperatures from multiple sensors scattered across the city. These sensors report temperature values as an array of integers. The city's data analytics team is developing a tool to calculate the average temperature for a given day, but they want to implement the calculation using recursion. The team is looking for a

solution that can compute the mean of the temperatures from the data collected across various sensors.

Can you help them by writing a recursive function to calculate the mean (average) of the temperatures in the given array?

Input Format:

- A single integer n ($1 \leq n \leq 1000$), representing the number of sensors, followed by an array of n integers `arr[1]`, `arr[2]`, ..., `arr[n]` where each element represents the temperature recorded by a sensor.

Output Format:

- The mean (average) of the temperature readings, which is a floating-point number rounded to two decimal places.

Sample Input:

5

10 20 30 40 50

Sample Output:

30.00

TECH 127 - ARRAYS

THEORY CONCEPTS:

1. Arrays: declaration, initialization, accessing elements
2. Multi-dimensional arrays, Arrays as function arguments

PROGRAM 1

A party has been organised on cruise. The party is organised for a limited time(T). The number of guests entering (E[i]) and leaving (L[i]) the party at every hour is represented as elements of the array. The task is to find the maximum number of guests present on the cruise at any given instance within T hours.

Example

Input :

5 -> Value of T

[7,0,5,1,3] -> E[], Element of E[0] to E[N-1], where input each element is separated by new line

[1,2,1,3,4] -> L[], Element of L[0] to L[N-1], while input each element is separated by a new line.

Output :

8 -> Maximum number of guests on cruise at an instance.

PROGRAM 2

Airport security officials have confiscated several items of the passenger at the security checkpoint. All the items have been dumped into a huge box(array). Each item possessed a certain amount of risk(0,1,2). Here is the risk severity of the item representing an array[] of N number of integer values. The risk here is to sort the item based on their level of risk values range from 0 to 2.

Example 1:**Input:**

7 ----- Value of N

[1,0,2,0,1,0,2] -> Element of arr[0] to arr[N-1], while input each element is separated by new line

Output:

0 0 0 1 1 2 2

PROGRAM 3**Mid Aged**

The Pan Am 73 flight from Bombay to New York en route Karachi and Frankfurt was hijacked by a few Palestinian terrorists at the Karachi International Airport. The senior flight purser Neerja Banhot withered her fear and helped evacuate the passengers on board.

Neerja very well knew that she would not be able to evacuate all passengers dodging the hijackers. So she wanted to hand over the responsibility of evacuating the senior citizens(above 60 years of age) and children(below 18 years of age) in the flight to the mid-aged passengers seated in the diagonals. Given n the number of rows of seats and the number of seats in a row and the ages of passengers in each seat can you find the number of mid-aged passengers seated in the main diagonals?

Input Format

The first line of input consists of an integer n, corresponding to the number of rows of seats and the number of seats in the aircraft. The next n lines of input consist of n integers that correspond to the ages of passengers.

Output Format

The output consists of an integer corresponding to the number of mid-aged passengers seated in the diagonals.

Sample Input

3

21 3 44

78 25 19

50 23 6

Sample Output

2

PROGRAM 4

A common problem in statistics is that of generating frequency distribution of the given data. Assuming that the data consists of n positive integers in the range 1 to 25, write a program that prints the number of times each integer occurs in the data.

Input Format

The first line of the input consists of the value of n.

The next n inputs are the array elements.

Output Format

The output prints the frequency of each data.

Sample Input

8

10 20 20 10 10 20 5 20

Sample Output

10 3

20 4

5 1

TECH 128 - POINTERS

THEORY CONCEPTS:

1. Introduction to Pointers, Pointer Arithmetic, Pointers and Arrays, Array of Pointers, Pointers as Function Arguments, Function Returning pointers

PROGRAM 1

Sarah is a young and ambitious investor who has been closely tracking the stock prices of a particular company. She knows that if she can buy the stock when the price is low and sell it when the price goes high, she can make a significant profit. However, she must ensure that the stock price she buys at comes **before** the price she sells at.

Sarah has recorded the stock prices for the past few days. Now, she needs to figure out the **maximum profit** she could have made during this period. She has a list of the prices for each day and wants to calculate the **largest difference** between any two prices, where the higher price comes after the lower one.

Input Format :

The first line of the input consists of the value of n.

The next n inputs are the array elements.

Output Format

The output prints the maximum difference in the array.

Sample Input

5

1 10 12 15 30

Sample Output

29

PROGRAM 2

In a faraway futuristic city, **Technoville**, there are two enormous supercomputers, **Alpha** and **Omega**, that control the city's defense systems. To ensure that the city remains safe, the two supercomputers need to run the same program without any differences in their code execution. Each line of code is represented by a sequence of unique codes, and these codes need to match between both supercomputers.

You, the lead engineer, have been tasked with comparing the program sequences from **Alpha** and **Omega** to make sure they are identical. If all codes match, the city's defense systems will remain fully operational. However, if there is even a single mismatch in the codes, the defense systems will shut down, leaving the city vulnerable to attacks from cybercriminals.

Problem Statement:

Write a program that compares two arrays using **pointers** to check if they contain the same elements at the same index positions.

Input Format:

- The first integer corresponds to n , which is the number of program lines in each supercomputer (maximum value of n is 15).
- The next n integers correspond to the codes of the program running in **Alpha** (the first array).
- The next n integers correspond to the codes of the program running in **Omega** (the second array).

Output Format:

- Print **"yes"** if the two arrays (programs) are the same.
- Print **"no"** if the arrays (programs) are different.

Sample Input 1:

4

45 67 89 23

45 67 89 23

Sample Output 1:

Yes

Sample Input 2:

3

100 200 300

100 250 300

Sample Output 2:

No

PROGRAM 3

A group of friends has recorded their scores in a game, and they need to sort the scores in ascending order. You are required to write a C program that uses pointers and Bubble Sort technique to sort the scores in ascending order.

Input Format:

1. The first line contains an integer n ($1 \leq n \leq 100$), the number of friends in the group.
2. The second line contains n integers, where each integer represents the score of a friend.

Output Format:

- Print the scores in ascending order after sorting.

Sample Input:

5

85 92 71 78 88

Sample Output:

71 78 85 88 92

TECH 129 - STRINGS

THEORY CONCEPTS:

1. Introduction to strings in C, String input and output, String manipulation functions, Handling strings using pointers

PROGRAM 1

The MNC 'Softcomp' had a security breach recently and company officials have decided to change the system password. The system password is in string format tagged a-z or A-Z. To change the password the officials will simply convert the lowercase characters of the old password to uppercase, and uppercase characters of the old password to lowercase.

Write an algorithm to display the new password. If no such password is possible display null.

Example

Input: bowANDarrow

Output : BOWandARROW

Explanation

The lowercase characters are converted into uppercase characters and vice-versa.

Sample Input

bowANDarrow

Sample Output

BOWandARROW

PROGRAM 2

An event management company has come up with a unique idea of printing their event tickets. Based on the ticket number combination (str1), the visitor is directed towards a particular class of audience. The task is to create a program/application to fetch the ticket number based on the following conditions:

Any occurrences of digits EF, 56 and G, & should be deleted

The characters EF should be in the same format.

Example 1**Input:**

4523EF58G -> Value of STR1

Output:

452358 -> After removal of characters
'EF' and 'G'

Example 2:**Input:**

E12F35G58 -> Value of STR1

Output:

E12F3558 -> After removal of character 'G'

ADDITIONAL QUESTION**PROGRAM 3**

Given a string S(input) consisting of * and #. The length of the string is variable. The task is to find the minimum number of * and # required to make it a valid string. The string is considered valid if the number of * and # are equal. The * and # can be at any position in the string.

Note: The output will be a positive or negative integer based on number of * and # in the input string.

(* > #) : Positive integer

(# > *) : Negative integer

(# = *) : 0

Example 1:**Input**

###*** → Value of S

Output

0 ---> number of * and # are equal

Example 2:

Input

###**# → Value of S

Output

-1 ---> number of # is more than *

TECH 130 - STRUCTURES AND UNION

THEORY CONCEPTS:

1. Structs: definition, declaration, initialization, accessing members, Nested structure, Structures with Functions, Arrays of Structures, Pointers to Structures.
2. Unions: definition, declaration, accessing members.
3. Differences between structs and unions.

PROGRAM 1

In an online grocery shop, customers want to purchase multiple items. Create a structure to store the Item code, Brand name, Item Name, Quantity, Price of the product. Generate the Billnumber, Display the purchased product, name, amount and quantity, and the total bill amount.

- a. Write a function MESSAGE() to alert the customer with the product name if the rate of a product is more than Rs.1000.
- b. Write a function VOUCHER() to generate the voucher for Rs.200 if the bill amount is greater than Rs.10000.

Input Format:

The first line of the input consists of the value of n.

Next n inputs consist of the item code, brand name, item name, quantity, and price of the product(per item).

Output Format:

The output prints a message if the final amount of the product is greater than 1000.

The next line prints the bill amount (Rounded off to two decimal places).

The last line prints whether the customer gets a voucher or not.

Refer sample input and output for formatting specifications.

Sample Input:

2

101 philsbury flour 10 55

102 dettol soap 50 25

soap costs more than 1000

Sample Output:

1800

No voucher

ADDITIONAL QUESTION

PROGRAM 2

Five workers from an organization want to join in a Sukanya Samriddhi Yojana scheme in the post office. Create a structure to store the details of the employees like Policyholder name, Policy number, Mobile number, Child Name, Child Age, Maturity period (Minimum Maturity Period of 5 Years), and Monthly deposit amount(Fixed amount). Every month they have to pay a fixed amount in that account. Based on the policy number a worker wants to check the amount accumulated after 2.5 yrs. Display the details of the Policyholder, Scheme started month and Year, Maturity Period and the Total amount accumulated.

Input Format:

The first line of the input consists of the value of n.

Next n inputs consist of the policy holder's name, policy number, mobile number, child name, child age, maturity period, and deposit amount.

The last line consists of the policy number to be searched.

Output Format:

The output prints the policy holder's details and accumulated amount else not found.

Refer sample input and output for formatting specification

Sample Input:

2

Alice 123456 9876543210 sam 3 3 5000

Bob 235689 8569745825 zara 4 4 6000

123456

Sample Output:

Alice 123456 9876543210 sam 3 3 5000

Amount accumulated after 2.5 years: 150000

TECH 131 MEMORY MANAGEMENT

THEORY CONCEPTS:

1. Storage classes
2. Memory Allocation (Static vs Dynamic)
3. malloc(), calloc(), realloc(), free

PROGRAM 1

A group of friends is planning a trip and wants to allocate a certain amount of money for each activity. Create a program that dynamically allocates memory for the expenses of various activities during the trip. The program should prompt the user to enter the number of activities and the cost for each activity. After all inputs are provided, display the total expenses for the trip.

Input Format:

The first line of input consists of the value of n, the number of activities.

The next n inputs consist of the costs for each activity.

Output Format:

Print the total expenses for the trip.

Sample Input:

```
3
500
200
300
```

Sample output:

Total expenses: 1000

PROGRAM 2

Implement a student attendance system using dynamic memory allocation. Create a structure for students that includes their ID, name, and attendance percentage. Allow the user to enter details for a dynamic number of students and display those with attendance below a certain threshold.

Input Format:

The first line consists of an integer n, the number of students.

The next n lines consist of the student ID, name, and attendance percentage.

Output Format:

Print the details of students with attendance below 75%.

Sample Input

5

101 John 80.5

102 Alice 72.0

103 Bob 65.5

104 Emma 78.0

105 David 50.0

Sample output:

Students with attendance below 75%:

ID: 102, Name: Alice, Attendance: 72.0%

ID: 103, Name: Bob, Attendance: 65.5%

ID: 105, Name: David, Attendance: 50.0%

ADDITIONAL QUESTION

PROGRAM 3

Write a program that dynamically allocates two matrices and performs their addition. Create a function to display the resulting matrix.

Input Format:

The first line consists of two integers m and n, the number of rows and columns.

The next m lines consist of n integers for the first matrix followed by m lines for the second matrix.

Output Format:

Print the resulting matrix after addition

Sample Input:

```
2 3
1 2 3
4 5 6
7 8 9
10 11 12
```

Sample Output:

Resulting matrix after addition:

```
8 9 10
14 16 18
```

TECH 132 - FILE HANDLING IN C

THEORY CONCEPTS:

1. File Operations: fopen, fclose, fread, fwrite
2. Text Files vs Binary Files
3. File Input/Output
4. Reading and Writing to Files
5. Error Handling in File Operations

PROGRAM 1

Jaganath is working on a project where he needs to create a log file that records his actions. He decides to write a simple message into the file. He uses fopen() to open the file and fclose() to close it once the operation is complete.

Sample Input:

File name: log.txt

Message: "John's action logged successfully."

Sample Output:

The content of log.txt will contain the message:

John's action logged successfully.

PROGRAM 2

Sara is tasked with reading data from a file to analyze some user inputs. She opens the file and prints its content to the screen. Help Sara to perform the action by typing the C - code.

Sample Input:

File name: user_data.txt

Sample Output:

Sara, here's the data from the file:

Alice, 25

Bob, 30

PROGRAM 3

Michael wants to store a large amount of data for his analysis in binary format. He decides to write an integer value to a binary file to save memory space.

Sample Input:

Number: 5678

Sample Output:

A binary file data.bin will be created containing the binary representation of the integer 5678.

PROGRAM 4

Emma has a task where she needs to retrieve data stored in a binary file for further processing. She reads the binary file and outputs the stored integer value.

Sample Input:

Binary file: data.bin (containing the integer 5678)

Sample Output:

Emma, the number from the file is: 5678

ADDITIONAL QUESTIONS

PROGRAM 5

Udha is working on a program that needs to access a file. He tries to open a non-existent file, so he includes error handling to display an appropriate error message when the file cannot be opened.

Sample Input:

File name: nonexistent.txt (a file that does not exist)

Sample Output:

Error opening file: nonexistent.txt

PROGRAM 6

Nayana has been asked to copy content from one file to another. She opens both files, reads the content from the source file, writes it to the destination file, and handles potential errors during the process.

Sample Input:

File name: source.txt (with some content)

Output file name: destination.txt

Sample Output:

destination.txt will contain the same content as source.txt.

TECH 133 - PREPROCESSING TOOLS

THEORY CONCEPTS:

1. Preprocessor directives, Types of Preprocessor Directives, #include, #define, #if, #else, #elif, #endif, #undef, #ifdef, #ifndef
2. Macros -Types of Macros, Pros and Cons:
3. typedef

PROGRAM 1

Gahana is writing a program that calculates the area of a circle. To avoid hardcoding the value of π , she uses the #define a preprocessor directive to create a constant for π .

Sample Input:

Radius of the circle: 5

Sample Output:

The area of the circle with radius 5 is: 78.50

PROGRAM 2

Bob needs a program that calculates the square of a number. Instead of writing a function, he uses a macro to calculate the square.

Sample Input:

Number: 6

Sample Output:

The square of 6 is: 36

PROGRAM 3

Charlie is debugging his code and wants to include debugging information only if a macro DEBUG is defined.

Sample Input:

Compilation flag: Define DEBUG

Sample Output:

Debugging mode enabled.

Variable x = 5

PROGRAM 4

Diana wants to create an alias for unsigned int to make her code more readable when dealing with large numbers.

Sample Input:

Two numbers: 3000 and 2000

Sample Output:

Sum of the numbers: 5000

ADDITIONAL QUESTIONS**PROGRAM 5**

Ella is creating a program to store and display information about a student. She uses typedef to simplify the declaration of a structure.

Sample Input:

Name: John

Age: 21

Marks: 85

Sample Output:

Student Details:

Name: John

Age: 21

Marks: 85

PROGRAM 6

Sophia needs to calculate the perimeter and area of a rectangle multiple times in her program. She decides to use macros for these repetitive calculations.

Sample Input:

Length: 10

Width: 5

Sample Output:

Perimeter of the rectangle: 30

Area of the rectangle: 50

TECH 134 - PROBLEM SOLVING

PROGRAM 1

Raj is a software developer working on a project with daily productivity scores recorded in an array. Some days he works efficiently, while other days he is less productive. He needs to determine the maximum amount of productive work he can achieve in any consecutive days' span.

To solve this, Raj uses Kadane's Algorithm to find the maximum sum of any contiguous subarray of productivity scores. This will help him identify the longest streak of productive days and maximize his output.

Input:

Enter the number of days: 8

Enter the productivity scores for each day: -2 1 -3 4 -1 2 1 -5 4

Output:

The maximum productive streak is: 6

PROGRAM 2

Tharun has been working on an algorithm that simulates how water accumulates in a storage system. The system contains containers of varying heights, and when it rains, water collects in the valleys between the containers. Tharun needs to calculate how much water is trapped between these containers after a rainfall. Each container has a height, and the amount of water trapped depends on the difference between the container's height and the tallest container on either side.

To solve this problem, Tharun decides to use a **trapping rain water algorithm**, which calculates the total amount of water that can be trapped after the rain, given the heights of the containers.

Input:

Enter the number of containers: 6

Enter the heights of the containers: 3 0 0 2 0 4

Output:

The total amount of trapped rainwater is: 10 units

PROGRAM 3

Deepak has been tasked with distributing chocolates to a group of children. Each child has a different level of need for chocolates, represented by an array of integers, where each number corresponds to the number of chocolates needed by a child. Deepak has a certain number of chocolates available, and he needs to distribute them in such a way that the children with the most need get more chocolates than others. However, he wants to ensure that every child gets at least one chocolate.

The task is to determine the minimum number of chocolates Deepak must give to the children while making sure the distribution is fair, i.e., children with a higher need for chocolates must receive more than children with a lower need.

Input

Enter the number of children: 5

Enter the chocolate needs for each child: 1 2 2 3 1

Output

The minimum number of chocolates to distribute is: 7

PROGRAM 4

Jay is working on a project where he needs to find the median from a large dataset of sorted values. The data is stored in a matrix, where each row is sorted in ascending order. Jay needs to find the median of the entire matrix by treating all values as a single list of numbers, sorted in ascending order.

Since the matrix is large, Jay wants to avoid flattening it entirely and sorting it, as this could be inefficient. Instead, he needs a more optimized approach to find the median efficiently.

Input

Matrix:

```
1 3 8 9 15
7 11 16 20 25
2 6 13 17 30
```

Output

The median of the matrix is: 13

ADDITIONAL QUESTION

PROGRAM 5

Fahad is working on a project that involves image processing. He needs to rotate an image matrix by 90 degrees clockwise. The image is represented as a 2D matrix, where each element corresponds to a pixel in the image. Alex needs to rotate the image in such a way that the rows become columns, and the columns become rows, but in a clockwise direction. Write a C program that rotates the matrix by 90 degrees clockwise in place.

Input

Original Matrix:

```
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
```

Output

Matrix after 90 degrees rotation:

```
13 9 5 1
14 10 6 2
15 11 7 3
16 12 8 4
```

MODULE 15 – TECH 135 - PROBLEM SOLVING 2

PROGRAM 1

There is a sequence of words in CamelCase as a string of letters, `s`, having the following properties:

- It is a concatenation of one or more words consisting of English letters.
- All letters in the first word are lowercase.
- For each of the subsequent words, the first letter is uppercase and the rest of the letters are lowercase.

Given `s`, determine the number of words in `s`.

Example:

`s = oneTwoThree`

There are 3 words in the string: 'one', 'Two', 'Three'.

Input:

`saveChangesInTheEditor`

Output:

5

PROGRAM 2

You are given two strings `word1` and `word2`. Merge the strings by adding letters in alternating order, starting with `word1`. If a string is longer than the other, append the additional letters onto the end of the merged string.

Return the merged string.

Input: `word1 = "abc", word2 = "pqr"`

Output: "apbqcr"

PROGRAM 3

Louise joined a social networking site to stay in touch with her friends. The signup page required her to input a name and a password. However, the password must be strong. The website considers a password to be strong if it satisfies the following criteria:

- Its length is at least 6.
- It contains at least one digit.
- It contains at least one lowercase English character.
- It contains at least one uppercase English character.
- It contains at least one special character. The special characters are: !@#\$%^&*()-+

She typed a random string of length `n` in the password field but wasn't sure if it was strong. Given the string she typed, can you find the minimum number of characters she must add to make her password strong?

Sample Input:

3

Ab1

Sample Output:

3

PROGRAM 4

A space explorer's ship crashed on Mars! They send a series of SOS messages to Earth for help.



Letters in some of the SOS messages are altered by cosmic radiation during transmission. Given the signal received by Earth as a string, , determine how many letters of the SOS message have been changed by radiation.

Sample Input:

SOSSPSSQSSOR

Sample Output:

3

PROGRAM 5

A pangram is a string that contains every letter of the alphabet. Given a sentence, determine whether it is a pangram in the English alphabet. Ignore the case. Return either pangram or not pangram as appropriate.

Example:

“The quick brown fox jumps over the lazy dog”

The string contains all letters in the English alphabet, so return pangram.

Function Description:

Complete the function pangrams in the editor below. It should return the string pangram if the input string is a “pangram”. Otherwise, it should return “not pangram”.

pangrams has the following parameter(s):

string s: a string to test

Sample Input 0

We promptly judged antique ivory buckles for the next prize

Sample Output 0

pangram

Sample Explanation 0

All of the letters of the alphabet are present in the string.

Sample Input 1

We promptly judged antique ivory buckles for the prize

Sample Output 1

not pangram