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	Faculty of Technology
	Department of Information and Communication Technology
Subject: DAA (01CT0512)	SHASHANK BAGDA
MID SEM - 1	Date: 05 / 09 / 2023	Enrolment No: 92100133020

// DAA - Mid Exam 1

// Shashank Bagda - 92100133020

// Question 1 : Write a cpp program to check the validity of a password using greedy approach


```cpp
#include <iostream>

#include <string>


using namespace std;


bool Validation(string password)

{

        bool length = false, hasUpper = false, hasLower = false, hasNumber = false, hasSpecial = false;


        // Validation of length of password

        if ( password.length() > 6 && password.length() < 16)

        {

                length = true;

        }


        // Check for at least one uppercase letter, one lowercase letter, one integer and special character
```

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```cpp
        for (int i = 0 ; i < password.length() ; i++)

        {

                if(isupper(password[i]) && islower(password[i]) &&
        isdigit(password[i]) && (password[i]) == '$' || password[i] == '#' || password[i]
        == '@')

                {

                        hasUpper = true;

                        hasLower = true;

                        hasNumber = true;

                        hasSpecial = true;


                        if(length == true)

                        {

                                return true;

                                break;

                        }

                }

        }

    }


    int main()

    {

        string password;

        cout << "Enter a password: ";
```
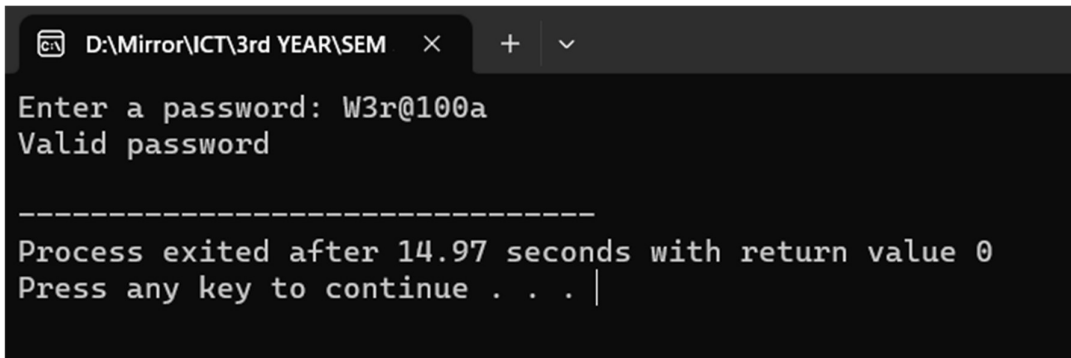
```
        cin >> password;


        if(Validation(password))

        {

                cout<<"Valid password"<<endl;

        }

        else

        {

                cout<<"Invalid password"<<endl;

        }


        return 0;

}
```

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// Question 2 : Write a cpp program to search for the character which is repeated odd number of times and display it

#include <iostream>

#include <string>

using namespace std;

int main()

{

        // Create a string to search

        string str = "HELLWORLD";

        // Create an array to store the character counts

        int charCounts[256] = {0};

         // Iterate over the string and count the characters

        for (int i = 0; i < str.length(); i++)

        {

                char c = str[i];

        charCounts[i]++;

```cpp
        }


        // Find the character that is repeated an odd number of times

        char oddChar;

        for (int i = 0; i < 256; i++)

        {

        if (charCounts[i] % 2 == 1)

                {

        oddChar = (char)i;

        break;

        }

        }


        // Print the character

        cout << oddChar << endl;


        return 0;

    }
```

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// Question 3 : take a user defined alphanumeric string of length N. arrange the characters in the format (Uppercase, Lowercase, Numbers).

// Write the cpp code for the same with time complexity O(N) and space complexity O(1)

#include <iostream>

#include <string>

#include <algorithm>

using namespace std;

int main()

{

        // Create a string to search

        string str;

        cout << "Enter the string : ";

        cin >> str;

        // Create three empty strings to store the uppercase, lowercase, and numeric characters

        string upper, lower, numbers;

```
// Iterate over the string and add each character to the appropriate
string

for (int i = 0; i < str.length(); i++)

{

        char c = str[i];

if (isupper(c))

        {

        upper += c;

}

        else if (islower(c))

        {

        lower += c;

}

        else

        {

        numbers += c;

}

}


// Sort the three strings

sort(upper.begin(), upper.end());

sort(lower.begin(), lower.end());

sort(numbers.begin(), numbers.end());
```
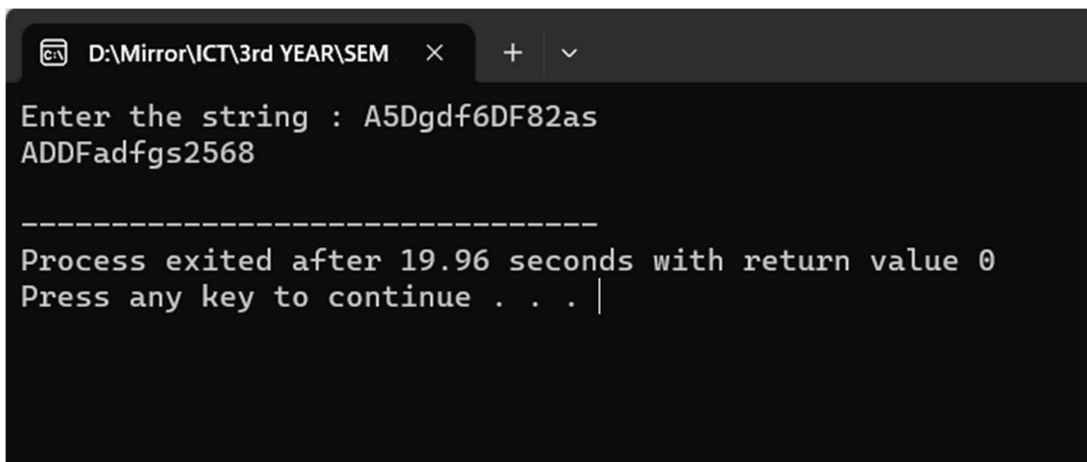
// Concatenate the three strings and print the result

string result = upper + lower + numbers;

cout << result << endl;

return 0;

}

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// Question 4 : Let the product of three variable be X. write a cpp program of time complexity O(N) (if possible) that calculates the summation of thse

// three variables such that the summation is maximum. Note that each character must have distinct values. If I*C*T = 2001, what will be the

// maximum value of I+C+T, such that all the characters have distinct values.

#include <iostream>

#include <algorithm>

using namespace std;

int main()

{

    // Declare the three variables

    int i, c, t;

    // Read the product of the three variables

    int x;

    cout << "Enter the product of three variable : ";

    cin >> x;

    // Find the maximum value of i + c + t such that all the characters have distinct values

    int maxSum = 0;

```
for (i = 1; i <= x; i++)

{

        for (c = 1; c <= x / i; c++)

        {

        t = x / (i * c);

        if (i != c && c != t && i != t)

                {

        maxSum = max(maxSum, i + c + t);

        }

    }

}

// Print the maximum value

cout << "The maximum sumation of I+C+T is : "<<maxSum << endl;

return 0;

}
```
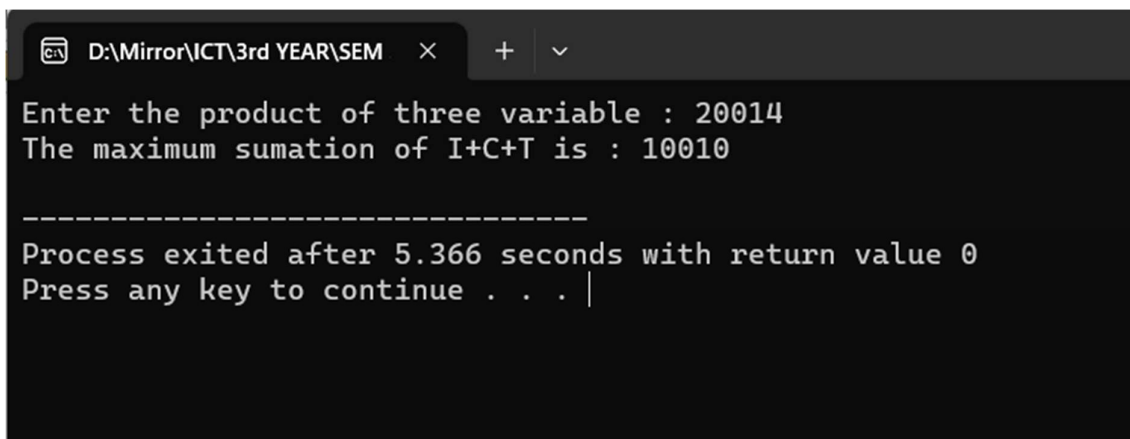
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// Question 5 : Given teo integers 'n' and 'm', find all the stepping numbers in range [n, m]. A number is called steeping number if all adjacent digits

// have an absolute difference of 1. 321 is a stepping number while 421 s not. For example input : 10, 15 [Here value of n is 10 and m is 15] Output : 10, 12

```
#include <iostream>

#include <vector>


using namespace std;


// Function to check if a number is a stepping number


bool isSteppingNumber(int n)

{

        // Convert the number to a string

        string s = tostring(n);


        // Iterate over the string and check if the adjacent digits have an
absolute difference of 1

        for (int i = 1; i < s.length(); i++)

        {
```

```
if (abs(s[i] - s[i - 1]) != 1)

    {

    return false;

  }

}


    // If all the adjacent digits have an absolute difference of 1, then the
number is a stepping number

    return true;

}


// Function to find all the stepping numbers in a range

vector<int> findSteppingNumbers(int n, int m)

{

    // Create a vector to store the stepping numbers

    vector<int> steppingNumbers;


    // Iterate over the range and add all the stepping numbers to the vector

    for (int i = n; i <= m; i++)

    {

    if (isSteppingNumber(i))

        {

        steppingNumbers.push_back(i);
```

```cpp
        }
    }


    // Return the vector of stepping numbers
    return steppingNumbers;
}


int main()
{
    // Get the input
    int n, m;
    cout << "Enter value of n : ";
    cin >> n;
    cout << "Enter value of m : ";
    cin >> m;


    // Find all the stepping numbers in the range
    vector<int> steppingNumbers = findSteppingNumbers(n, m);


    // Print the stepping numbers
    for (int i = 0; i < steppingNumbers.size(); i++)
    {
            cout << steppingNumbers[i] << " ";
```

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```
        }


        cout << endl;


        return 0;
    }
```

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// Question 6 : given an infinite array in which the first n cells contains integers in sorted order and the rest of the cells are filled

// with some special symbol (assume @). Assume we do not know the n value. Give an algorithm that takes an integer K as input and finds

// a position in the array containing K, if such a position exists in O(logn) time.


```cpp
#include <iostream>

#include <vector>


using namespace std;


int main() {

  // Initialize the sorted array

  std::vector<int> arr = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};


  // Initialize the low and high indices

  int low = 0;

  int high = arr.size() - 1;


  // Initialize the target value

  int K = 5;
```

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```
// Search for the element

while (low <= high) {

 // Compute the mid index

 int mid = (low + high) / 2;


 // Check if the element is found

 if (arr[mid] == K) {

  // Return the mid index

  return mid;

 } else if (arr[mid] < K) {

  // Set low to mid + 1

  low = mid + 1;

 } else {

  // Set high to mid - 1

  high = mid - 1;

 }

}


// Return -1 if the element is not found

return -1;

}
```