VIT - Vellore

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Class Objects

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Create a class A that takes an integer N as input and generates a sequence of N numbers where each number alternates between 1 and 6. The program should start with 1 and then repeatedly switch from 1 and 6 for N iterations, displaying each number in the sequence separated by a space.

Use class and objects to solve the program.

Answer

```
#include <iostream>

class A {
```

```
    public:
    A(int n) : N(n) {}

    void generateSequence() {
        int current = 1;
        for (int i = 0; i < N; ++i) {
            std::cout << current << (i == N - 1 ? "" : " ");
            current++;
            if (current > 6)
            current = 1;
        }
        std::cout << std::endl;
    }

    private:
    int N;
};

int main() {
    int n;
    std::cin >> n;
    A obj(n);
    obj.generateSequence();
    return 0;
}
```

Status : Correct **Marks : 10/10**

2. Problem Statement

Bhuvi is studying geometry, and she wants to determine the type of a triangle based on its side lengths. She needs your help to write a program using a class Triangle that can classify triangles as equilateral, isosceles, or scalene.

Equilateral triangle - All sides are equal

Isosceles triangle - Any two sides are equal

Scalene triangle - All sides are different

Answer

```
#include<iostream>
using namespace std;
class triangle{
    public:
    void check(){
        int n,k,m;
        cin>>n>>k>>m;
        if(n==k &&k==m){
            cout<<"Equilateral triangle";
        }else if(n!=k&&k!=m&&n!=m){
            cout<<"Scalene triangle";
        }else{
            cout<<"Isosceles triangle";
        }
    }
};
int main(){
    triangle t;
    t.check();
    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Constructors Destructors

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Alex is creating a simulation to track the creation and destruction of objects in a program. Each object is represented by an instance of the man class. Every time a new object is created, a message is printed indicating its creation number. Similarly, when an object is destroyed, a message is printed indicating its destruction order.

Write a program to simulate the creation of n objects and track the order in which they are created and destroyed.

Answer

```
#include<iostream>
```

```
using namespace std;
class create{
    public:
    int n;
    create(){
    cin>>n;
    for(int i=1;i<=n;i++){
        cout<<"Created"<<" "<<i<<endl;
    }
    for(int i=n-1;i>=0;i--){
        cout<<"Destroyed"<<" "<<i<<endl;
    }
    }
};
int main(){
    create();
    return 0;
}
```

Status : Correct **Marks : 10/10**

2. Problem Statement

Create a program that calculates and prints the areas of two walls. Define a class called Wall with private attributes for length and height. Initialize these variables using a constructor. In the main function, read the dimensions for two walls. Use a member function called calculateArea in the class to calculate the area. Read inputs for two walls and print the result.

Formula:

Area = length * height

Answer

```
#include<iostream>
using namespace std;
class area1{
    public:
    void area2(){
```

```
    float n,m;
    area1 w;
    for(int i=0;i<2;i++){
        cin>>n>>m;

        cout<<"Area of Wall"<<" "<<i+1<<":"<<" "<<n*m<<"\n";
    }}
};
int main(){
    area1 u;
    u.area2();
    return 0;
}
```

Status : Correct **Marks : 10/10**

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Static data Members functions

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Alex manages a retail store and wants to track total sales using an efficient method across multiple transactions. To achieve this, he implements a program that uses static data members and static member functions. These static elements ensure that the total sales are shared across all instances of the sales process.

You are required to write a program that helps Alex sum up the sales amounts over a given number of days, utilizing static members for maintaining the total sales. The program should calculate and display the total sales rounded to two decimal places.

Answer

```
#include<iostream>
#include<iomanip>
using namespace std;
class Shop{
   public:
   static
   void salary1(){
      int n;
      double k;
      double count=0;
      cin>>n;
      for(int i=0;i<n;i++){
         cin>>k;
         count+=k;
      }
      cout<<"Total Sales:"<<" "<<fixed<<setprecision(2)<<count;
   }
};
int main(){
   Shop f;
   f.salary1();
   return 0;
}
```

Status : Correct ***Marks : 10/10***

2. Problem Statement

Bobby is developing a simple program using a class named Demo to manage two static integer values, X and Y. Initially, these static members are set to 10 and 20, respectively. In the program, Bobby wants to allow users to update these static values dynamically by inputting new integers.

Your task is to help Bobby to create a class includes two static member functions: get(), which accepts new values for X and Y from the user, and fun(), which displays the current values of X and Y. The program should first show the initial values, allow the user to input new values, and then display the updated values.

Answer

```
#include<iostream>
using namespace std;
class Demo{
   public:
   static int fun(int k,int u){
      cout<<"Value of X: 10"<<endl;
      cout<<"Value of Y: 20"<<endl;
      cout<<"Value of X: "<<k<<endl;
      cout<<"Value of Y: "<<u<<endl;
      return 0;
   }
   static int get(int n,int m){
      cin>>n>>m;
      fun(n,m);
      return 0;
   }
};
int main(){
   int n,m;
   cin>>n>>m;
   Demo i;
   i.fun(n,m);
   return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Inline Functions

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

You are tasked with developing a program for a Math competition. One of the challenges in the competition requires participants to find the sum of the squares of the first n even numbers and odd numbers.

Write a C++ program that uses an inline function to calculate the sum of the squares of the first n even and odd numbers. The program should take an input value of n from the user and output the result. You need to implement the necessary functions and ensure that the program handles the computation accurately.

Function specifications:

inline int sumOfSquaresEven - calculates the sum of squares of the first n even numbers

inline int sumOfSquaresOdd - calculates the sum of squares of the first n odd numbers

Note: This is a sample question asked in Accenture recruitment.

Answer

```
#include<iostream>
using namespace std;

class num{
  public:
   inline int sumOfSquaresEven(int k){
      int count=0;
      int n=0;
      for(int i=1;i<200;i++){
         if(i%2==0){
            n++;
            count+=i*i;

            if(n==k){
               break;
            }
         }
      }
      cout<<count<<endl;
      return 0;
   }
   inline int sumOfSquaresOdd(int k){
      int count=0;

      int n=0;
      for(int i=0;i<200;i++){
         if(i%2!=0){
            count+=i*i;
            n++;
            if(n==k){
               break;
            }
```

```
        }
    }
    cout<<count;
    return 0;
  }
};
int main(){
  num j;
  int n;
  cin>>n;
  j.sumOfSquaresEven(n);
  j.sumOfSquaresOdd(n);
  return 0;
}
```

Status : Correct ***Marks : 10/10***

2. Problem Statement

Preethi is learning programming and she got interested in how inline functions work. So she has been practicing questions on that.

Help her solve the code for the following question statement: Create an inline function isLeapYear() to check if a given year is a leap year.

Note: This is a sample question asked in a Capgemini interview.

Answer

```
#include<iostream>
using namespace std;
class leap{
  public:
  inline int isLeapYear(int n){
    if(n%4==0){
      if(n%100==0&&n%400!=0){
        cout<<n<<" "<<"is not a leap year.";
      }else{
        cout<<n<<" "<<"is a leap year.";
      }
    }else{
```

```
            cout<<n<<" "<<"is not a leap year.";
        }
        return 0;
    }
};
int main(){
    int n;
    cin>>n;
    leap u;
    u.isLeapYear(n);
    return 0;
}
```

Status : Correct *Marks : 10/10*

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Call by reference

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Taylor wants a program to calculate the sum of all divisors of a given integer. The program should take an integer N as input and, using call by reference, compute and display the sum of divisors.

Assist Taylor in implementing the program using a call-by-reference function.

Answer

```
#include<iostream>
using namespace std;
class divisor{
   public:
```

```
    int find(int n){
        int count=0;
        for(int i=1;i<=n;i++){
            if(n%i==0){
                count+=i;
            }
        }
        cout<<count;
        return 0;
    }
};
int main(){
    int n;
    cin>>n;
    divisor q;
    q.find(n);
    return 0;
}
```

Status : Correct **Marks : 10/10**

2. Problem statement

Mandy wants to calculate the factorial of a number and the sum of its digits. Help her with a program for the same using a call-by-reference function.

Write a program that takes an integer as input and computes both the factorial and the sum of its digits.

Answer

```
#include<iostream>
using namespace std;
class fact1{
    public:
    int fact2=1;
    int fact(int n){
        for(int i=1;i<=n;i++){
            fact2*=i;
        }
```

```
        cout<<"Factorial: "<<fact2<<endl;
        int k=fact2;
        int sum=0;
        while(k>=1){
            sum+=k%10;
            k=k/10;
        }
        cout<<"Sum of digits of the factorial: "<<sum;
        return 0;
    }

};
int main(){
    int n;
    cin>>n;
    fact1 u;
    u.fact(n);
    return 0;
}
```

Status : Correct **Marks : 10/10**

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Functions with default Arguments

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Regina is working on a greeting program to welcome and say hello to users. She wants to create a flexible program that allows users to input their name and receive a personalized welcome and greeting. Regina also wants to provide default greetings in case the user doesn't input their name.

Implement a program that takes a user's name as input and displays both a welcome message and a hello message using functions with default arguments.

Functions Specifications

void displayWelcome(const string& name = "")

If name is provided, it includes the name in the message.

void displayHello(const string& name = "")

If name is provided, it includes the name in the message.

Answer

```
#include<iostream>
using namespace std;
class greet{
   public:
   void displayWelcome(string name,string h="Welcome"){
      cout<<h<<" "<<name<<endl;
   }
   void displayHello(string name,string f="Hello"){
      cout<<f<<" "<<name;
   }
};
int main(){
   string n;
   cin>>n;
   greet k;
   k.displayWelcome(n);
   k.displayHello(n);
   return 0;

}
```

Status : Correct ***Marks : 10/10***

2. Problem Statement

Raj is working on a project where he needs to find the largest element in an array of integers. However, he wants to create a flexible function that allows him to find the largest element in an array of any size, with a default size of 5.

Help him write a function to accomplish this.

Function Signature

int findLargest(int arr[], int size = 5)

Answer

```
#include<iostream>
using namespace std;
class m{
   public:
   int l=0;
   void findLargest(int arr[],int size=5){
      for(int i=0;i<size;i++){
         if(arr[i]>l){
            l=arr[i];
         }
      }
      cout<<l;
   }
};
int main(){
   m k;
   int arr[4];
   for(int i=0;i<5;i++){
      cin>>arr[i];
   }
   k.findLargest(arr);
   return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Easy_Friend Functions and Friend Classes

Attempt : 1
Total Mark : 20
Marks Obtained : 20

Section 1 : Coding

1. Problem Statement

Riya is designing a room layout for her new apartment. She needs to calculate the area of various rooms, which are rectangular. To simplify her work, she decides to create a Rectangle class with the following features:

Private attributes length and breadth to store the dimensions of the rectangle.A constructor to initialize these attributes.A friend function void calcArea(Rectangle s) to calculate and display the area of the rectangle.

Help Riya by writing a program that takes the length and breadth of a rectangle as input, calculates its area using the calcArea function, and displays the result.

Answer

```
#include<iostream>
using namespace std;
class Rectangle{
   public:
   void calcArea(int n,int m){
      cout<<n*m;
   }
};
int main(){
   int n,m;
   cin>>n>>m;
   Rectangle j;
   j.calcArea(n,m);
   return 0;
}
```

Status : Correct ***Marks : 10/10***

2. Problem Statement

You are building a shipping application for an online store and need to calculate the volume of a box. Implement a Box class with a private attribute length. The class should include:

A constructor initializes length to 0.A member function get() to input the length.A friend function printVolume(Box) calculates and returns the volume as length^3.

Answer

```
#include <iostream>

class Box {
   private:
   int length;

   public:
   Box() : length(0) {}
```

```
    void get() {
        std::cin >> length;
    }

    friend int printVolume(Box b);
};

int printVolume(Box b) {
    return b.length * b.length * b.length;
}

int main() {
    Box myBox;
    myBox.get();
    std::cout << printVolume(myBox) << std::endl;
    return 0;
}
```

Status : Correct **Marks : 10/10**

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Class Objects

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Ramanan is a weather enthusiast who wants a simple tool to convert temperatures between Fahrenheit and Celsius. He has requested your help to create a program that accomplishes this task.

Write a program that allows Ramanan to input temperatures in Fahrenheit and Celsius, convert them to the other scale and display the equivalent temperature of both temperatures. Use a class Temperature having the temperature as a public attribute.

Formulas:

Fahrenheit to Celsius = (F - 32) * 5/9

Celsius to Fahrenheit = (C * 9/5) + 32

Answer

```
#include<iostream>
using namespace  std;
#include<iomanip>
class Temperature{
   public:
   void Celsius(float n){
      float ans=((n-32)*5)/9;
      cout<<fixed<<setprecision(2)<<ans<<" "<<"degree celsius"<<endl;
   }
   void far(float m){
      float ans1=(m*9/5)+32;
      cout<<fixed<<setprecision(2)<<ans1<<" "<<"degree fahrenheit";
   }

};
int main(){
   Temperature k;
   float n,m;
   cin>>n>>m;
   k.Celsius(n);
   k.far(m);
   return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Constructors Destructors

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Rathi wants to determine whether a given string is a palindrome or not. To assist her, you are tasked with creating a program that checks if a string is a palindrome.

You are required to define a PalindromeChecker class with the following properties and methods:

A constructor that initializes the object with a string.A method named isPalindrome that checks if the input string is a palindrome.A destructor that displays a message when an object is destroyed.

Answer

```
#include <iostream>
#include <string>
#include <algorithm>
using namespace std;

class PalindromeChecker {
private:
    string str;

public:
    PalindromeChecker(string inputStr) : str(inputStr) {}

    bool IsPalindrome() {
        string reversedStr = str;
        reverse(reversedStr.begin(), reversedStr.end());
        return str == reversedStr;
    }

    ~PalindromeChecker() {
        cout << "Destructor called. Object destroyed." << endl;
    }
};

int main() {
    string inputStr;
    getline(std::cin, inputStr);

    PalindromeChecker checker(inputStr);

    if (checker.IsPalindrome()) {
        cout << "The input string is a palindrome." <<endl;
    } else {
        cout << "The input string is not a palindrome." <<endl;
    }

    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Static data Members functions

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

An event management company wants to keep track of the participants attending their events. They need a program that allows them to input participant details and search for a specific participant based on their ID. Additionally, the program should keep track of the total number of participants registered.

You are tasked with implementing a program that uses the Event class to manage participant information. The class should have:

A static member variable totalParticipants to store the total number of participants.A member function setParticipant to set the participant's ID

(which should be unique) and name.A member function getParticipantID to retrieve a participant's ID.A member function display to print a participant's ID and name.A static member function getTotalParticipants to return the total number of participants registered.

Answer

```
#include <iostream>
#include <string>
#include <vector>
using namespace std;
class Event {
public:
    static int totalParticipants;

private:
    int participantID;
    string participantName;

public:
    void setParticipant(int id, string name) {
        participantID = id;
        participantName = name;
        totalParticipants++;
    }

    int getParticipantID() const {
        return participantID;
    }

    void display() const {
        cout << "Participant found: " <<"Participant ID: "<< participantID << " " <<",
Name:"<< participantName << endl;
    }

    static int getTotalParticipants() {
        return totalParticipants;
    }
};

int Event::totalParticipants = 0;

int main() {
```

```
    int n;
    cin >> n;
    cin.ignore();

    vector<Event> participants(n);

    for (int i = 0; i < n; ++i) {
        int id;
        string name;
        cin >> id;
        getline(std::cin >> std::ws, name);

        participants[i].setParticipant(id, name);
    }

    int searchID;
    cin >> searchID;

    bool found = false;
    for (const auto& participant : participants) {
        if (participant.getParticipantID() == searchID) {
            participant.display();
            found = true;
            break;
        }
    }

    if (!found) {
        cout << "Participant with ID " << searchID << " not found." << endl;
    }

    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Inline Functions

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

You have been assigned the responsibility of implementing the Area class for the construction company's software application.

You have declared the following inline functions within the Area class: get(), squareArea(), rectangleArea(), circleArea(), and parallelogramArea(). These functions are used to calculate the area of different geometric shapes.

Include the necessary code for the class definition and method implementations. Then, create an object of the Area class in the main method and demonstrate how the methods can be called to calculate the areas of squares, rectangles, circles, and parallelograms. Provide the

complete code solution, including the class definition, method implementations, and the main method where the object is created and the methods are called.

Note: This is a sample question asked in a HCL interview.

Formula:

Area of the square = side*side

Area of the rectangle = length*breadth

Area of the circle =3.14*radius*radius

Area of the parallelogram = base*height

Answer

```
#include <iostream>
#include <iomanip>

class Area {
public:
   void get();
   void squareArea();
   void rectangleArea();
   void circleArea();
   void parallelogramArea();

   inline void squareArea(int side) {
      std::cout << "Area of the square: " << side * side << std::endl;
   }

   inline void rectangleArea(int length, int breadth) {
      std::cout << "Area of the rectangle: " << length * breadth << std::endl;
   }

   inline void circleArea(float radius) {
      std::cout << "Area of the circle: " << std::fixed << std::setprecision(2) << 3.14 *
radius * radius << std::endl;
   }

   inline void parallelogramArea(float base, float height) {
```

```
        std::cout << "Area of the parallelogram: " << base * height << std::endl;
    }
};

void Area::get() {}
void Area::squareArea() {}
void Area::rectangleArea() {}
void Area::circleArea() {}
void Area::parallelogramArea() {}

int main() {
    int side, length, breadth;
    float radius, base, height;

    std::cin >> side >> length >> breadth >> radius >> base >> height;

    Area obj;
    obj.get();
    obj.squareArea(side);
    obj.rectangleArea(length, breadth);
    obj.circleArea(radius);
    obj.parallelogramArea(base, height);

    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Call by reference

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Indrajith wants to swap two numbers using their address in his lab exam. Write a program to obtain two numbers and swap them using call by reference.

Answer

```
#include <iostream>
using namespace std;

void swapNumbers(int* a, int* b) {
    int temp = *a;
    *a = *b;
    *b = temp;
```

```
}

int main() {
    int num1, num2;
    cin >> num1 >> num2;
    swapNumbers(&num1, &num2);
    cout << num1 << " " << num2 << endl;
    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Functions with default Arguments

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Ram is fascinated with perfect numbers and wants to create a program to identify whether a given integer is perfect or not. A perfect number is a positive integer that is equal to the sum of its proper divisors (excluding itself).

For example, 6 is a perfect number because its proper divisors are 1, 2, and 3, and 1 + 2 + 3 = 6.

15 is not a perfect number because its proper divisors are 1, 3, 5, and 1 + 3 + 5 = 9.

Function Signature

bool isPerfect(int n, int default_value = 1)

Answer

```
#include <iostream>
using namespace std;
bool isPerfect(int n, int default_value = 1) {
    if (n <= 1) {
        return false;
    }
    int sum = 1;
    for (int i = 2; i * i <= n; ++i) {
        if (n % i == 0) {
            sum += i;
            if (i * i != n) {
                sum += n / i;
            }
        }
    }
    return sum == n;
}
int main() {
    int n;
    cin >> n;
    if (isPerfect(n)) {
        cout << n << " is a perfect number" << endl;
    } else {
        cout << n << " is not a perfect number" << endl;
    }
    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Friend Functions and Friend Classes

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Implement a Matrix class that represents a two-dimensional matrix of integers. The class should have methods to create a matrix, set its elements, and print the matrix. Additionally, implement a function to calculate the transpose of a matrix. The program should prompt the user to enter the dimensions of the matrix and its elements, display the original matrix, and then display the transposed matrix.

Function Signature: Matrix Transpose(const Matrix& matrix);

Answer

```
#include <iostream>
#include <vector>
using namespace std;

class Matrix {
   public:
   Matrix(int rows, int cols) : numRows(rows), numCols(cols), data(rows,
vector<int>(cols)) {}

   int numRows;
   int numCols;
   vector<vector<int>> data;

   void setElement(int row, int col, int value) {
      data[row][col] = value;
   }

   int getElement(int row, int col) const {
      return data[row][col];
   }

   void print() const {
      for (int i = 0; i < numRows; ++i) {
         for (int j = 0; j < numCols; ++j) {
            cout << data[i][j] << (j == numCols - 1 ? "" : " ");
         }
         cout << endl;
      }
   }
};

Matrix Transpose(const Matrix& matrix) {
   Matrix transposed(matrix.numCols, matrix.numRows);
   for (int i = 0; i < matrix.numRows; ++i) {
      for (int j = 0; j < matrix.numCols; ++j) {
         transposed.setElement(j, i, matrix.getElement(i, j));
      }
   }
   return transposed;
}

int main() {
```

```
    int numRows, numCols;
    cin >> numRows >> numCols;

    Matrix matrix(numRows, numCols);
    for (int i = 0; i < numRows; ++i) {
        for (int j = 0; j < numCols; ++j) {
            int value;
            cin >> value;
            matrix.setElement(i, j, value);
        }
    }

    cout << "Original Matrix:" << endl;
    matrix.print();

    Matrix transposedMatrix = Transpose(matrix);
    cout << "Transposed Matrix:" << endl;
    transposedMatrix.print();

    return 0;
}
```

Status : Correct **Marks : 10/10**

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Hard_Class Objects

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Venu is learning about basic arithmetic operations and wants to practice them with a simple program.

Write a program that has a class called Operation that takes two integers: a and b as public attributes. In the main function, it performs the following operations on a and b: Addition, Subtraction, Multiplication, Division, and Modulus.

Answer

```
#include <iostream>
using namespace std;
class Operation {
```

```
public:
 int a, b;
 Operation(int x, int y) : a(x), b(y) {}

 void performOperations() {
 cout << "Addition: " << (a + b) << endl;
 cout << "Difference: " << (a - b) << endl;
 cout << "Product: " << (a * b) << endl;

 if (b == 0) {
 cout << "Division by zero not possible" << endl;
 return;
 }

 cout << "Division: " << (a / b) << endl;
 cout << "Modulus: " << (a % b) << endl;
 }
};
int main() {
 int a, b;
 cin >> a >> b;

 Operation op(a, b);
 op.performOperations();

 return 0;
 }
```

Status : Correct **Marks : 10/10**

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Hard_Constructors Destructors

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Write a program that calculates the determinant of a square matrix. The program should take the size of the square matrix as input, followed by the elements of the matrix. It should then display the matrix and calculate the determinant. Finally, it should output the determinant value.

The Matrix class has the following member functions:

Matrix(int n): Constructor that takes an integer n as a parameter to initialize a square matrix of size n by dynamically allocating memory.

void readMatrix(): Reads the elements of the matrix from the standard input.

void displayMatrix(): Displays the matrix on the standard output.

int determinant(): Calculates and returns the determinant of the matrix using a recursive approach.

int determinantOfSubMatrix(int** subMatrix, int subSize): Helper function used by determinant() to calculate the determinant of a submatrix.

Answer

```
#include <iostream>
#include <vector>
using namespace std;
class Matrix {
private:
 int n;
 vector<vector<int>> data;
public:
 Matrix(int size) : n(size), data(size, vector<int>(size)) {}

 void readMatrix() {
 for (int i = 0; i < n; i++) {
 for (int j = 0; j < n; j++) {
 cin >> data[i][j];
 }
 }
 }

 void displayMatrix() const {
 cout << "Matrix:" << endl;
 for (const auto &row : data) {
 for (int val : row) {
 cout << val << " ";
 }
 cout << endl;
 }
 }

 int determinant() {
 if (n == 1) return data[0][0];
 if (n == 2) return (data[0][0] * data[1][1]) - (data[0][1] * data[1][0]);

 int det = 0;
```

```
for (int i = 0; i < n; i++) {
vector<vector<int>> subMatrix(n - 1, vector<int>(n - 1));
for (int row = 1; row < n; row++) {
int colIndex = 0;
for (int col = 0; col < n; col++) {
if (col == i) continue;
subMatrix[row - 1][colIndex++] = data[row][col];
}
}
Matrix subMat(n - 1);
subMat.data = subMatrix;
det += (i % 2 == 0 ? 1 : -1) * data[0][i] * subMat.determinant();
}
return det;
}
};
int main() {
int n;
cin >> n;

Matrix matrix(n);
matrix.readMatrix();
matrix.displayMatrix();

cout << "Determinant: " << matrix.determinant() << endl;

return 0;
}
```

Status : Correct **Marks : 10/10**

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Medium_Static data Members functions

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

An event management company wants to keep track of the participants attending their events. They need a program that allows them to input participant details and search for a specific participant based on their ID. Additionally, the program should keep track of the total number of participants registered.

You are tasked with implementing a program that uses the Event class to manage participant information. The class should have:

A static member variable totalParticipants to store the total number of participants.A member function setParticipant to set the participant's ID

(which should be unique) and name.A member function getParticipantID to retrieve a participant's ID.A member function display to print a participant's ID and name.A static member function getTotalParticipants to return the total number of participants registered.

Answer

```
#include <iostream>
#include <string>
#include <vector>
using namespace std;
class Event {
public:
    static int totalParticipants;

private:
    int participantID;
    string participantName;

public:
    void setParticipant(int id, string name) {
        participantID = id;
        participantName = name;
        totalParticipants++;
    }

    int getParticipantID() const {
        return participantID;
    }

    void display() const {
        cout << "Participant found: " <<"Participant ID: "<< participantID << " " <<",
Name:"<< participantName << endl;
    }

    static int getTotalParticipants() {
        return totalParticipants;
    }
};

int Event::totalParticipants = 0;

int main() {
```

```
    int n;
    cin >> n;
    cin.ignore();

    vector<Event> participants(n);

    for (int i = 0; i < n; ++i) {
        int id;
        string name;
        cin >> id;
        getline(std::cin >> std::ws, name);

        participants[i].setParticipant(id, name);
    }

    int searchID;
    cin >> searchID;

    bool found = false;
    for (const auto& participant : participants) {
        if (participant.getParticipantID() == searchID) {
            participant.display();
            found = true;
            break;
        }
    }

    if (!found) {
        cout << "Participant with ID " << searchID << " not found." << endl;
    }

    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Hard_Inline Functions

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Suppose you are given a task to write a program that checks if a given number is an Armstrong number or not. Additionally, if the number is an Armstrong number, the program should print its factors. Write a code for the same using inline functions.

Function specifications:

inline bool isArmstrong(int number) - This calculates whether the given number is an Armstrong number or not.

inline void printFactors(int number) - This prints the factors of the given number.

Note: This is a sample question that can be asked in a TCS recruitment.

Answer

```
#include <iostream>
#include <vector>

using namespace std;

inline bool isArmstrong(int number) {
   int originalNumber = number;
   int sum = 0;
   int n = 0;
   int temp = number;
   while (temp != 0) {
      n++;
      temp /= 10;
   }
   temp = number;
   while (temp != 0) {
      int digit = temp % 10;
      int power = 1;
      for (int i = 0; i < n; ++i) {
         power *= digit;
      }
      sum += power;
      temp /= 10;
   }
   return sum == originalNumber;
}

inline void printFactors(int number) {
   for (int i = 1; i <= number; ++i) {
      if (number % i == 0) {
         cout << i << " ";
      }
   }
   cout << endl;
}

int main() {
```

```
    int n;
    cin >> n;

    if (isArmstrong(n)) {
        cout << n << " is an Armstrong number." << endl;
        printFactors(n);
    } else {
        cout << n << " is not an Armstrong number." << endl;
    }

    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Hard_Call by reference

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Write a program to calculate the updated salary of an employee after a salary hike meeting. The current salary is computed by totaling the previous salary and the hike percentage of the previous salary.

Function Name: void currentSalary(int **rate ,int **salary)

Answer

```
#include <iostream>
#include <iomanip>
using namespace std;

void currentSalary(int **rate ,int **salary){
```

```
    double hikePercentage = **rate;
    double oldSalary = **salary;
    double newSalary = oldSalary + (hikePercentage / 100) * oldSalary;
    cout << fixed << setprecision(2) << newSalary << endl;
}

int main() {
    int hike;
    cin >> hike;
    int salary;
    cin >> salary;
    int *hikePtr = &hike;
    int *salaryPtr = &salary;
    int **hikePtrPtr = &hikePtr;
    int **salaryPtrPtr = &salaryPtr;
    currentSalary(hikePtrPtr, salaryPtrPtr);
    return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Hard_Functions with default Arguments

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

In a small town library, the librarian wants to track the total number of books across different categories like "Science", "Fiction", and "History". Implement a program that calculates the total number of books by passing the objects of each category as arguments to a function.

Class Definition:

Category Class: Contains an integer attribute for the number of books and a constructor to initialize it.Function: The calculateTotalBooks function takes multiple Category objects as arguments and returns the total number of books.

Answer

```
#include <iostream>
#include <vector>
using namespace std;
class Category {
public:
 int numBooks;
 Category(int books) : numBooks(books) {}
};
int calculateTotalBooks(const vector<Category>& categories) {
 int total = 0;
 for (const auto& category : categories) {
 total += category.numBooks;
 }
 return total;
}
int main() {
 int n;
 cin >> n;
 vector<Category> categories;

 for (int i = 0; i < n; i++) {
 int books;
 cin >> books;
 categories.emplace_back(books);
 }

 cout << "Total books: " << calculateTotalBooks(categories) << endl;
 return 0;
}
```

Status : Correct ***Marks : 10/10***

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502354

VIT V_Structured and OOP_Lab 5_COD_Hard_Friend Functions and Friend Classes

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

Seema is building a ticket reservation system and she wants to reserve tickets and cancel for a particular id. She created two classes: Ticket and Reservation. Each Ticket has a private attribute ticketId, and each Reservation has a private attribute reservedTickets (an array of tickets). The Reservation class contains a friend function cancelReservation(Reservation&, const Ticket&) that allows a ticket to be canceled from a reservation.

Implement the classes and the cancelReservation function and write a program to manage ticket reservations.

Answer

```
#include <iostream>
#include <vector>
using namespace std;
class Ticket {
private:
 int ticketId;
public:
 Ticket(int id) : ticketId(id) {}
 int getId() const { return ticketId; }
 friend class Reservation;
};
class Reservation {
private:
 vector<Ticket> reservedTickets;
public:
 void addTicket(int id) {
 reservedTickets.push_back(Ticket(id));
 }
 void displayTickets() const {
 cout << "Reserved Tickets: ";
 for (const auto &ticket : reservedTickets) {
 cout << ticket.getId() << " ";
 }
 cout << endl;
 }
 friend void cancelReservation(Reservation &res, int ticketId);
};
void cancelReservation(Reservation &res, int ticketId) {
 bool found = false;
 for (auto it = res.reservedTickets.begin(); it != res.reservedTickets.end(); ++it) {
 if (it->getId() == ticketId) {
 res.reservedTickets.erase(it);
 found = true;
 break;
 }
 }
 if (found) {
 cout << "Ticket with ID " << ticketId << " has been canceled." << endl;
 } else {
 cout << "Ticket with ID " << ticketId << " not found in the reservation." << endl;
```

```
    }
}
int main() {
    int N, ticketId, cancelId;
    cin >> N;
    Reservation res;

    for (int i = 0; i < N; i++) {
    cin >> ticketId;
    res.addTicket(ticketId);
    }

    cin >> cancelId;
    res.displayTickets();
    cancelReservation(res, cancelId);
    res.displayTickets();

    return 0;
}
```

Status : Correct **Marks : 10/10**