**C++ PROGRAM**

1. Write a function in C++ to count the number of uppercase alphabets present in a text

Input:

AI={ “Artificial Intelligence is Intelligence demonstrated by machines, as opposed to the natural intelligence displayed by animals and humans.”}

output:3

Testcases:

CPP={"c++ is a Programming Language."}

JAVA={"Java is a Interpreteur Language."}

**(E) Function Ups, Function, easy),**

2,. Write a user defined function Reverse(int A[],int n) which accepts an integer array

and its size as arguments(parameters) and reverse the array.

Input :arr={10,20,30,40,50}

Output: {50,40,30,20,10}

Testcases:

{2,4,6,8,10}

{3,6,9,12,15}

{5,10,15,20,25}

**(E) Reverse', 'Function', 'easy')**

3. Write a user-defined function EXTRA\_ELE(int A[ ], int B[ ], int N) in C++

to find and display the extra element in Array A.

Array A contains all the elements of array B but one more element extra.

(Restriction: array elements are not in order)

Example If the elements of Array A is 14, 21, 5, 19, 8, 4, 23, 11

and the elements of Array B is 23, 8, 19, 4, 14, 11, 5

Then output will be 21

(**E) Extra', 'Array', 'easy')**

4. Write a user defined function in C++ to find the sum diagonal elements from a two dimensional array.

Input:

24 16 14

2 5 4

12 3 4

Output:33

Testcases

Case:1

2 6

2 5

12 3

Case 2:

4 16 1

2 15 4

1 31 14

**(E) Diagonal', 'Array', 'easy')**

5. Write a user-defined function AddEnd4(int A[][4],int R,int C)

in C++ to find and display the sum of all the values,

which are ending with 4 (i.e., unit place is 4).

For example if the content of 2D array ={{24,16,14}, {19, 5, 4}}

The output should be 42

Testcases:

input 1: {{24,16,14}, {19, 5, 46}}, Input 2:6

input 1: {{24,16,14,33}, {19, 53, 43,3}},Input 2:3

**(E) AddEnd4', 'Array', 'easy')**

6. Given an array arr[] of length N and Q queries of 3 types (1, 2, 3) whose operations are as follows:

Type 1: query has input as 1 and the task is to reverse the array.

Type 2: query has input as (2 x) and the task to find the index of x in the result array.

Type 3: query has input as (3 x y) and the task is to swap the elements at index x and y in the array.

The task is to print the result for the query of type 2.

Examples:

Input: N = 5, arr[] = {3, 7, 8, 1, 33}, Q = 4, Queries[][] = {{1}, {2, 8}, {3, 2, 4},

{2, 1}

Output: 2 1

Explanation:

Process query wise,

first is 1 so reverse the list [33, 1, 8, 7, 3],

Second query 2 8 so find index of element 8 which is 2,

third query is 3 2 4 so swap 2nd and 4th index new array=[33, 1, 3, 7, 8]

now the last query is 2 1 so find index of element 1 which is 1 so output 2 1.

**(E) Query', 'Array', 'easy')**

7. Given an array A[] of n numbers and another number x, the task is to check whether \nor not there exist two elements in A[] whose sum is exactly x.

Input:

arr[] = {0, -1, 2, -3, 1}

x= -2

Output: Yes ( -3 + 1 = -2 )

Testcases:

{4,6,7,2,4},x=3

{-3,-4,45,2,3},x=-1

**(E) Two Elements', 'Array', 'easy')**

8. Given an unsorted array and an element x, search x in the given array.Write recursive C++ code for this.

If the element is not present, return -1.

Input:

arr[] = {12, 34, 54, 2, 3}

x=11

Output: Element 11 is present at index2

Testcases:

{1,6,2,4,8},6

{23,56,84,5,-3},2

{78,56,4},0

**(E) Search', 'Array', 'easy')**

9. Write a program in C++ to convert decimal number to binary number.

Input any decimal number : 65

Output :

The Binary value is : 1000001

Testcases:

1. 111

2. 15.2

3. 0

4. B12

5. 1A.2

**(E) D to B', 'Numbers', 'easy')**

10. Write a program to generate Multiplication table.

Sample Input: 2

Output :

1 \* 2 = 2

2 \* 2 = 4

3 \* 2 = 6

4 \* 2 = 8

Testcases:

5

-2

6

16

**(E) Table', 'Loops', 'easy')**

11. Write a program to count the number of vowels and consonants in a string.

Input: string

Output:

Number of vowels : 1

Number of constant : 5

Testcases:

1. HYPOTHECATION

2. MATRICULATION

3. MANIPULATION

4. SEDIMENTATION

5. EXPERIMENTATION

**(E) Vow\'s & Con\'s', 'Strings', 'easy')**

12. Write a C++ program to check whether a given number is palindrome or not.

Input:123321

Output: It is a palindrome

Testcases:121

-900

008

@333

**(E) Palindrome', 'Numbers', 'easy')**

13. Write a C++ program to find whether the person is eligible for vote or not.

And if that particular person is not eligible, then print how many years are

left to be eligible.

Input :

Enter your age: 7

Output: You are allowed to vote after 11 years

Testcases:-12

34

0

9

**(E) Vote', 'Control', 'easy')**

14. Write a C++ program to take two arrays as input and merge or concatenate two arrays and store the result in third array.

Sample Input:

Enter number of Element in array A: 7

Enter elements: 1 2 3 4 5 6 7

Enter number of Element in array B: 5

22 33 44 55

Output:

Merged in array C

1 2 3 4 5 6 7 11 22 33 44 55

**(E) Merge', 'Array', 'easy')**

15. You are given with an array consisting of Celsius values you are asked to convert

it into Fahrenheit.

Input: 4.4,10,12.7,70

Output: 39.92,50,54.86,158

Testcases:

-5

-0

0

**(E) Conversion', 'Numbers', 'easy')**

16. Write a program to find the sum of the series 1!/1+2!/2+3!/3+4!/4+5!/5

Sample Input: 5

Sample Output: 34

Testcases:- 6

6

K

42

**(E) Series', 'Numbers', 'easy')**

17. Find the Mth maximum number and Nth minimum number in an array and find the sum and difference of it.

Sample Input:

Array of elements = {14, 16, 87, 36, 25, 89, 34}

M = 1

N = 3

Sample Output:

1st Maximum Number = 89

3rd Minimum Number = 25

Sum = 114

Difference = 64

Testcases:

1. {16, 16, 16, 16, 16}, M = 0, N = 1

2. {0, 0, 0, 0}, M = 1, N = 2

3. {-12, -78, -35, -42, -85}, M = 3, N = 3

4. {15, 19, 34, 56, 12}, M = 6, N = 3

5. {85, 45, 65, 75, 95}, M = 5, N = 7

**(E) Max-Min', 'Array', 'medium'),**

18. Write a program to convert a string into upper case and lower case and find the

reverse of it.

Sample Input:

Good morning all

Sample Output:

GOOD MORNING ALL

good morning all

lla gninrom doog

Testcases:

1. She is Good

2. 1234tellme

3. 0000.000

4. OK!

**(E) String Convert', 'Strings', 'easy')**

19. Write a constructor in the Car class given below that initializes the brand

class field with the string “Ford”.

Call the getBrand() method in the main method of the Sample class and store the value of the brand in a variable, and print the value.

class Car {

String brand;

// Your constructor here

public Car() {

this.brand = "Ford";

}

public String getBrand() {

return brand;

}

}

**(M) Constructor', 'Constructor', 'medium')**

20. Write a program to print the names of students by creating a Student class. If no name is passed while creating an object of the Student class, then the name should be "Unknown", otherwise, the name should be equal to the String value passed while creating an object of the Student class. (Use Constructors)

**(E) Student', 'Class', 'easy')**

21. Define a class Ele\_Bill in C++ with the following descriptions:

Private members:

- Cname of type character array

- Pnumber of type long

- No\_of\_units of type integer

- Amount of type float.

Calc\_Amount() This member function should calculate the amount as No\_of\_units\*Cost.

Amount can be calculated according to the following conditions:

- First 50 units Free

- Next 100 units 0.80 @ unit

- Next 200 units 1.00 @ unit

- Remaining units 1.20 @ unit

Public members:

- A function Accept() which allows the user to enter Cname, Pnumber, No\_of\_units and invoke function Calc\_Amount().

- A function Display() to display the values of all the data members on the screen.

**(E) ‘Ele\_Bill', 'Class', 'easy’)**

22. Consider the following class State :

class State

{

protected :

int tp;

public :

State( )

{

tp=0;

}

void inctp( )

{

tp++;

};

int gettp();

{

return tp;

}

};

Write code in C++ to publicly derive another class ‘District’ with the following additional members derived in the public visibility mode.

Data Members:

Dname string

Distance float

Population long int

Member functions:

DINPUT(): To enter Dname, Distance, and population

DOUTPUT(): To display the data members on the screen.

**(M) State', 'Inheritance', 'medium')**

**23. Write a program in C++ to find the sum of the series using constructor overloading.**

**Input: 9+99+999+9999+99999**

**Output: 111105**

**(M) Sum Series', 'Constructor', 'medium')**

**24. Write a C++ program to convert a binary number to octal using a constructor.**

**Input: 1100**

**Output: 14**

**(E) B to O', 'Numbers', 'easy')**

25. Write a C++ program to find the number and sum of all integers between 100 and 200 which are divisible by 9 using constructor and destructor.

Sample Output:

Numbers between 100 and 200, divisible by 9:

108 117 126 135 144 153 162 171 180 189 198

The sum: 1683

**(E) Div by 9', 'Loops', 'easy')**

26. Create a class named 'Programming'. While creating an object of the class, if nothing is passed to it, then the message "I love programming languages" should be printed. If some String is passed to it, then in place of "programming languages" the name of that String variable should be printed.

For example, while creating the object if we pass "cpp", then "I love cpp" should be printed.

**(M) Programming', 'Class', 'medium')**

**27. Create a class to print an integer and a character using two functions having the same name but a different sequence of the integer and the character parameters.**

**For example, if the parameters of the first function are of the form (int n, char c), then that of the second function will be of the form (char c, int n).**

**(M) Fun. Overload', 'Overloading', 'medium')**

**28. a program to print the area and perimeter of a triangle having sides of 3, 4, and 5 units by creating a class named 'Triangle' with a function to print the area and perimeter.**

**(E) Triangle', 'Function', 'easy')**

**29. Create a class 'Student' with three data members which are name, age, and address. The constructor of the class assigns default values to name as "unknown", age as '0', and address as "not available".**

**It has two functions with the same name 'setInfo'. The first function has two parameters for name and age and assigns the same whereas the second function takes three parameters which are assigned to name, age, and address respectively.**

**Print the name, age, and address of 10 students.**

**Hint - Use an array of objects.**

**(M) Student', 'Constructor', 'medium')**

**30. Create a class 'Degree' having a function 'getDegree' that prints "I got a degree".**

**It has two subclasses namely 'Undergraduate' and 'Postgraduate' each having a function with the same name that prints "I am an Undergraduate" and "I am a Postgraduate" respectively. Call the function by creating an object of each of the three classes.**

**(E) Degree', 'Class', 'easy')**

31. A boy has his money deposited Rs 10000, Rs 15000, and Rs 20000 in banks - Bank A, Bank B, and Bank C respectively. We have to print the money deposited by him in a particular bank.

Create a class 'Bank' with a function 'getBalance' which returns 0. Make its three subclasses named 'BankA', 'BankB', and 'BankC' with a function with the same name 'getBalance' which returns the amount deposited in that particular bank. Call the function 'getBalance' by the object of each of the three banks.

**(E) Bank', 'Class', 'easy')**

**32. All the banks operating in India are controlled by RBI. RBI has set a well-defined guideline (e.g. minimum interest rate, minimum balance allowed, maximum withdrawal limit, etc.) which all banks must follow. For example, suppose RBI has set the minimum interest rate applicable to a saving bank account to be 4% annually; however, banks are free to use 4% interest rate or to set any rates above it.**

**Write a program to implement bank functionality in the above scenario. Note: Create the classes namely Customer, Account, RBI (Base Class), and few derived classes (SBI, ICICI, PNB, etc.). Assume and implement required member variables and functions in each class.**

**(E) Bank', 'Class', 'easy')**

**33. Write a C++ code to find the area of a square and a circle using an abstract class and pure virtual function.**

**Input:**

**Enter radius of the circle: 5**

**Enter the length of the square: 4**

**Output:**

**Area of square: 16**

**Area of circle: 78.5**

**Testcases:**

**Enter radius of the circle: 4**

**Enter the length of the square: 6**

**Enter radius of the circle: 6**

**Enter the length of the square: 3**

**(E) Abstract', 'Class', 'easy')**

**34. In C++ programming, 'this' is a keyword that refers to the current instance of the class. Create a class called Employee with attributes: int empid, char(20), float salary. Use the 'this' pointer to refer to the current instance and display the employee details.**

**(E) Employee', 'Class', 'easy')**

**35. C++ Program to display the address of each element of an array.**

**Output:**

**Displaying address using arrays:**

**&arr[0] = 0x61fef0**

**&arr[1] = 0x61fef4**

**&arr[2] = 0x61fef8**

**Displaying address using pointers:**

**ptr + 0 = 0x61fef0**

**ptr + 1 = 0x61fef4**

**ptr + 2 = 0x61fef8**

**(E) Address', 'Array', 'easy')**

**36. Write a CPP program to find the square root and cube root of a number.**

**Square Root Input: 1296**

**Cube Root Input: 27**

**Output:**

**36**

**3**

**(E) Sqrt-Cube', 'Numbers', 'easy')**

37. Write a C++ program to check whether a number is perfect or not.

Input: 6

Output: Perfect number

Testcases:

1. 28

2. 8

3. 128

4. 486

**(E) Perfect Number', 'Numbers', 'easy')**

38. Write a C++ program to find the smallest element missing in a sorted array of natural numbers.

Input: {0, 1, 2, 3, 5, 6, 7}

Output: 4

Testcases:

1. {56, 57, 59, 60}

2. {11, 13, 14, 16}

**(E) Min', 'Array', 'easy')**

39. Write a program to find the Nth Fibonacci Number.

Input: 8

Output: 21

**(E) Fibonacci ', 'Numbers', 'easy')**

40. Write a program to count the number of words in a paragraph.

Input:

“Machine learning (ML) is a kind of AI (artificial intelligence) that lets software applications become more precise at anticipating results without being specifically programmed to do so. Machine learning algorithms utilize historical data as input to anticipate/predict the latest output values.”

Output:

No. of words = 41

**(E) Words', 'Strings', 'easy')**

41. Write a C++ program that reads an integer and prints the least significant digit and the next least significant digit.

Example:

Input:

Enter an integer number: 7235

Output:

The least significant digit is 5

The next least significant digit is 3

**(E) LSD', 'Numbers', 'easy')**

42. Declare a class `Box`, with length (Public variable) and width (Private variable). Use `setWidth()` and `getWidth()` functions to set and display width and length.

Input:

Enter the Length of box: 6

Enter the Width of box: 9

Output:

Length of box: 6

Width of box: 9

**(M) Box', 'Class', 'medium')**

43. Write a program to print the prime numbers between the range from M to N.

Sample Input:

M = 1

N = 10

Sample Output:

2, 3, 5, 7

Testcases:

1. M = 15, N = 5

2. M = 25, N = 50

3. M = 15, N = 100

4. M = 0, N = 0

5. M = 200, N = 200

**(E) Prime', 'Numbers', 'easy')**

44. Write a program to print the following pattern.

Sample Input:

Number of rows: 5

Sample output:

2

4 4

16 16 16

256 256 256 256

65536 65536 65536 65536 65536

Testcases:

0

-1

4.5

6

5

**(E) RT-Pattern', 'Loops', 'easy')**

45. Define a class Employee with Emp\_name, Emp\_id, Address, Mail\_id, Mobile\_no as members. Inherit the classes Programmer, Assistant Professor, Associate Professor, and Professor from the Employee class. Add Basic Pay (BP) as the member of all the inherited classes and set 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

Input:

Enter Name of the Employee: Suresh

Enter Address of the Employee: Vetri Nagar

Enter ID of the Employee: 7001

Enter Mobile Number: 9898989898

Enter E-Mail ID of the Employee: aff@gmail.com

ENTER THE BASIC PAY OF THE PROGRAMMER => 80000

Output:

======================

PROGRAMMER PAYMENT SLIP

=======================

BASIC PAY => 80000

DEARNESS ALLOWANCE => 77600

HOUSE RENT ALLOWANCE => 8000

PROVIDENT FUND => 9600

CLUB FUND => 800

GROSS PAY => 175200

NET PAY => 164800

**(M) Employee', 'Class', 'medium')**

46. Write a program to enter the marks of a student in five subjects. Then calculate the total and aggregate, display the grade obtained by the student.

If the student scores an aggregate greater than 75%, then the grade is Distinction.

If the aggregate is between 60 and 75 (inclusive), then the grade is First Division.

If the aggregate is between 50 and 60 (inclusive), then the grade is Second Division.

If the aggregate is between 40 and 50 (inclusive), then the grade is Third Division.

Else the grade is Fail.

Perform the above for 10 students [Use array of objects].

Input:

Please Enter the marks of five subjects:

50 50 50 50 50

Output:

Total Marks = 250

Average Marks = 50

Grade Third Division

**(M) Students Grade', 'Array', 'medium')**

47. Write a program in C++ to calculate income tax for the employee based on the following conditions:

- If taxable income is less than or equal to 60000, tax = 0;

- If taxable income is greater than 60000 and less than or equal to 150000, tax = taxable income \* 0.05;

- If taxable income is greater than 150000 and less than or equal to 500000, tax = taxable income \* 0.1;

- Else tax = taxable income \* 0.15.

Input:

Enter your Income: 800000

Output:

Your income tax is: 1,20,000

**(M) Tax', 'Control', 'medium')**

48. Write a C++ program to add all the numbers from 1 to a given number.

Input:

Add 1 to 4

Output:

10

Input:

Add 1 to 100

Output:

5050

**(E) Sum of 1st N', 'Loops', 'easy')**

49. C++ has a logical operator &&, which can also be written as "and" . The && operator is very useful, it takes in two values. For example, a && b works like:

Return true if a and b are true and false otherwise.

The && operator is equivalent to perform the above function

Make a function using &&.

**(M) Logical AND', 'Control', 'medium')**

50. Create a function that takes the number of wins, draws, and losses and calculates the number of points a football team has obtained so far.

- Wins get 3 points

- Draws get 1 point

- Losses get 0 points

Examples:

footballPoints(3, 4, 2) ➞ 13

footballPoints(5, 0, 2) ➞ 15

footballPoints(0, 0, 1) ➞ 0

```

**(M) Win-Lose', 'Function', 'medium')**

51. Write a function that returns true if the given array is empty, and false otherwise.

Examples:

isEmpty({}) ➞ true

isEmpty({1, 2, 3}) ➞ false

**(M) isEmpty', 'Function', 'medium')**

52. Create a class to print the area of a square and a rectangle. The class has two functions with the same name but different numbers of parameters. The function for printing the area of a rectangle has two parameters which are its length and breadth respectively, while the other function for printing the area of a square has one parameter which is the side of the square.

Input:

7

7,8

Output:

49

56

**(M) Area', 'Class', 'medium')**

**53. Create a class called `Add` for adding two numbers using operator overloading.**

**Input:**

**10**

**5**

**Output:**

**15**

**(M) Add', 'Overloading', 'medium')**

54. In this challenge, a farmer is asking you to tell him how many legs can be counted among all his animals. The farmer breeds three species:

- chickens = 2 legs

- cows = 4 legs

- pigs = 4 legs

The farmer has counted his animals and he gives you a subtotal for each species. You have to implement a function that returns the total number of legs of all the animals.

Input & Output:

animals(2, 3, 5) ➞ 36

animals(1, 2, 3) ➞ 22

animals(5, 2, 8) ➞ 50

**(M) Farmer', 'Control', 'medium')**

55. To find the area of a Circle, Rectangle, and Triangle using constructor overloading:

Input:

a) Radius of Circle: 3

b) Length and Breadth of Rectangle: 6, 7

c) Base and Height of Triangle: 2, 3

Output:

28.26 (Area of Circle)

42 (Area of Rectangle)

3 (Area of Triangle)

**(M) Area Circle', 'Overloading', 'medium')**

56. Write a program in C++ to print Floyd’s Triangle by using constructor and destructor.

Print the Floyd's Triangle:

Input number of rows: 5

1

01

101

0101

10101

**(M) Floyd’s Triangle', 'Loops', 'medium')**

57. Create a class named 'Rectangle' with two data members: length and breadth, and a function to calculate the area, which is 'length \* breadth'. The class has three constructors which are:

1. No parameter - values of both length and breadth are assigned zero.

2. Two parameters - two values are assigned as length and breadth respectively.

3. One parameter - both length and breadth with the same value.

Create objects of 'Rectangle' class having none, one, and two parameters and print its area.

Input:

3, 3 or 3

Output:

Area: 0, 9, 9

**(M) Rectangle', 'Constructor', 'medium')**

58. Create two classes named `Mammals` and `MarineAnimals`. Create another class named `BlueWhale` which inherits both the `Mammals` and `MarineAnimals` classes. Now, create a function in each of these classes which prints "I am mammal", "I am a marine animal", and "I belong to both the categories: Mammals as well as Marine Animals" respectively.

Now, create an object for each of the above classes and try calling:

1. Function of `Mammals` by the object of `Mammals`

2. Function of `MarineAnimals` by the object of `MarineAnimals`

3. Function of `BlueWhale` by the object of `BlueWhale`

4. Function of each of its parents by the object of `BlueWhale`

**(M) Mammals', 'Inheritance', 'medium')**

59. Make a class named `Fruit` with a data member to calculate the number of fruits in a basket.

Create two other classes named `Apples` and `Mangoes` to calculate the number of apples and mangoes in the basket.

Print the number of fruits of each type and the total number of fruits in the basket.

**(M) Fruit', 'Class', 'medium')**

60. We want to calculate the total marks of each student of a class in Physics, Chemistry, and Mathematics and the average marks of the class.

The number of students in the class is entered by the user. Create a class named `Marks` with data members for roll number, name, and marks. Create three other classes inheriting the `Marks` class, namely `Physics`, `Chemistry`, and `Mathematics`, which are used to define marks in the individual subject of each student. Roll numbers of each student will be generated automatically.

**(M) Student Marks', 'Class', 'medium')**

61.We want to store the information of different vehicles. Create a class named Vehicle with two data members named mileage and price. Create its two subclasses.

Car with data members to store ownership cost, warranty (by years), seating capacity, and fuel type (diesel or petrol).

Bike with data members to store the number of cylinders, number of gears, cooling type (air, liquid, or oil), wheel type (alloys or spokes), and fuel tank size (in inches).

Make another two subclasses Audi and Ford of Car, each having a data member to store the model type. Next, make two subclasses Bajaj and TVS, each having a data member to store the make-type.

Now, store and print the information of an Audi and a Ford car (i.e., model type, ownership cost, warranty, seating capacity, fuel type, mileage, and price.) Do the same for a Bajaj and a TVS bike.

**(M) Vehicle', 'Class', 'medium’)**

62.Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle".

Now, try calling the function by the object of each of these classes.

**(M) Shape', 'Class', 'medium')**

63.Create a Class called FLOAT containing one float data member. Overload all 4 arithmetic operators so that they operate on objects of FLOAT.

Input: F1=2.5, F2=1.2

Output: F1+F2=3.7

**(M) Overload', 'Overloading', 'medium')**

64. Define a class String. Write an overload function == to compare two strings.

Input:

First string: Apple

Second string: Orange

Output:

Both not equal

**(M) , 'Overloading', 'medium')**

65. Write a program to find out the greatest and the smallest among three numbers using pointers.

Input:

10, 34, -90

Output:

Smallest: -90, Biggest: 34

**(M) Pointer 3 Nums', 'Pointer', 'medium')**

66. Write a program to order the array of elements in non-decreasing order.

Input:

Arr={-45,78,23,89,-90}

Output:

{-90,-45,23,78,89}

**(E) Sort', 'Array', 'medium')**

67. Write a C++ program to demonstrate the use of try-catch blocks with the argument as an integer and string using multiple catch blocks.

**(M) Exception', 'Exception', 'medium')**

68. Write a program to illustrate array index out of bounds exceptions.

**(M) AIOB', 'Exception', 'medium')**

69Write a program in C++ to store n elements in an array, sort and print the elements using pointers.

Input:

Input the number of elements to store in the array: 5

5

7

2

9

8

Output:

2

5

7

8

9

**(M) Sort Pointer', 'Pointer', 'medium')**

70.Write a program in C++ to count the number of vowels and consonants in a string using a pointer.

Input: Input a string: string

Output:

Number of vowels: 1

Number of consonants: 5

**(M) Vows-Cons', 'Pointer', 'medium')**

71. Write a program in C++ to print a string in reverse using a pointer.

Input:

Hello

Output:

OlleH

**(M) Reverse', 'Pointer', 'medium')**

73. A person can have various roles and responsibilities at the same time. A woman plays multiple roles in her life such as a mother, wife, daughter, daughter-in-law, sister, etc. A man behaves as an employee in an office, son or husband at home, customer at a mall, etc. A mobile is one device but offers various features such as a camera, radio, etc.

Write a C++ program to implement one of the above scenarios using runtime polymorphism.

**(M) Person', 'Overloading', 'medium')**

74.Given N and an array (let's call it coins[]) that contains some numbers (representing coins in rupees). N represents a coin denomination, and the array contains various coins. The task is to make change for N using the coins from the array in such a way that the minimum number of coins are used.

For example:

Let's take an input array coins[] = {10, 25, 5}, total coins = 3.

Suppose N = 30.

The output is two because we can use one 25 rupee coin and one 5 rupee coin to make 30. (25 + 5 = 30)

Similarly, if coins[] = {1, 9, 6, 5}, total coins = 4.

Suppose N = 13.

The output is three because we need two 6 rupee coins and one 1 rupee coin. (6 + 6 + 1 = 13) **(M) Coins', 'Array', 'medium')**

75. Write a C++ program to demonstrate the working of a copy constructor.

Sample input & output (P1 & P2 are objects)

p1.x = 10, p1.y = 15

p2.x = 10, p2.y = 15

**(M) Copy', 'Constructor', 'medium')**

178. Given an array of distinct elements of size N, the task is to rearrange the elements of the array in a zig-zag fashion so that the converted array should be in the below form:

arr[0] < arr[1] > arr[2] < arr[3] > arr[4] < . . . . arr[n-2] < arr[n-1] > arr[n].

Input: N = 7, arr[] = {4, 3, 7, 8, 6, 2, 1}

Output: arr[] = {3, 7, 4, 8, 2, 6, 1}

Explanation: The given array is in a zig-zag pattern as we can see 3 < 7 > 4 < 8 > 2 < 6 > 1

Input: N = 4, arr[] = {1, 4, 3, 2}

Output: arr[] = {1, 4, 2, 3}

Explanation: The given array is in a zig-zag pattern as we can see 1 < 4 > 2 < 3

**(H) zig-zag', 'Array', 'hard')**

179. Minimum Jumps To Reach End of an Array:

Given an array of non-negative integers, A, of length N. You are initially positioned at the first index of the array. Each element in the array represents your maximum jump length at that position.

Return the minimum number of jumps required to reach the last index.

If it is not possible to reach the last index, return -1.

![Jump Example](images/CHQ2.png)

Input: arr[] = [1, 3, 5, 8, 9, 2, 6, 7, 6, 8, 9]

Output: 3

Explanation: Provided in the above image

Input: arr[] = [2, 3, 1, 1, 4]

Output: 2

Explanation: Travel from 2 -> 3 -> end.

**(H) Jumps', 'Array', 'hard')**

180. Given an integer array A[] consisting of N non-negative integers representing an elevation map, where the width of each bar is 1. The task is to compute the total volume of water that can be trapped after rain.

Examples:

Input: A[] = {0, 1, 0, 2, 1, 0, 1, 3, 2, 1, 2, 1}

Output: 6

Explanation:

[Rain Image](images/rain.jpg)

The rain water trapped is represented by the blue region.

Trap 1 unit of water between the first and third block.

Trap 4 units of water between the second and third blocks.

Therefore, the total volume of water is 1 + 4 + 1 = 6 units.

**(H) Rain', 'Array', 'hard')**

181. Given two integer arrays A1[] and A2[] of size N and M respectively. Sort the first array A1[] such that all the relative positions of the elements in the first array are the same as the elements in the second array A2[].

Input:

N = 11

M = 4

A1[] = {2, 1, 2, 5, 7, 1, 9, 3, 6, 8, 8}

A2[] = {2, 1, 8, 3}

Output:

2 2 1 1 8 8 3 5 6 7 9

Explanation:

Array elements of A1[] are sorted according to A2[]. So 2 comes first then 1 comes, then comes 8, then finally 3 comes, now we append remaining elements in sorted order.

**(H) 2 Array', 'Array', 'hard')**

183.Create three classes: Person, Professor, and Student. The class Person should have data members name and age. The classes Professor and Student should inherit from the class Person.

The class Professor should have two integer members: publications and cur\_id. There will be two member functions: getdata and putdata. The function getdata should get the input from the user: the name, age, and publications of the professor. The function putdata should print the name, age, publications, and the cur\_id of the professor.

The class Student should have two data members: marks, which is an array of size 6, and cur\_id. It has two member functions: getdata and putdata. The function getdata should get the input from the user: the name, age, and the marks of the student in 6 subjects. The function putdata should print the name, age, sum of the marks, and the cur\_id of the student.

For each object being created of the Professor or the Student class, sequential id's should be assigned to them starting from 1.

Solve this problem using virtual functions, constructors, and static variables. You can create more data members if you want.

**(H) Student-Teacher', 'Function', 'hard')**

184. You are given three classes A, B, and C. All three classes implement their own version of func.

In class A, func multiplies the value passed as a parameter by 2

In class B, func multiplies the value passed as a parameter by 3

In class C, func multiplies the value passed as a parameter by 5

Write a Class D which inherits from classes A, B, C

**(H) 3 Classes', 'Function', 'hard')**

185. A student signed up for workshops and wants to attend the maximum number of workshops where no two workshops overlap. You must do the following:

Implement 2 structures:

1. struct Workshop having the following members:

- The workshop's start time.

- The workshop's duration.

- The workshop's end time.

2. struct Available\_Workshops having the following members:

a. An integer, n (the number of workshops the student signed up for).

b. An array of type Workshop array having size n.

Implement 2 functions:

1. Available\_Workshops\* initialize(int start\_time[], int duration[], int n)

2. int CalculateMaxWorkshops(Available\_Workshops\* ptr)

**(H) Workshop', 'Function', 'hard')**

186.Write a program to illustrate division by zero exception. Get the two inputs from the user and use the function `divide(int, int)`.

Input: 5, 0

Output: divide by zero.

**(H) div by 0', 'Exception', 'hard')**

188. Write a C++ program to throw multiple exceptions and define multiple catch statements.

Input: int x = 0.00001

Output: The number is too small. Accept only positive integers.

**(H) Multi Exception', 'Exception', 'hard')**

189. You are given a class - Complex.

class Complex {

public:

int a, b;

};

Operators are overloaded by means of operator functions, which are regular functions with special names. Their name begins with the `operator` keyword followed by the operator sign that is overloaded. The syntax is:

type operator sign (parameters) { /\*... body ...\*/ }

You need to overload operators + and << for the Complex class.

The operator + should add complex numbers according to the rules of complex addition:

(a+ib) + (c+id) = (a+c) + i(b+d)

Overload the stream insertion operator << to add "a+ib" to the stream: `cout << c << endl;`

**(H) Complex', 'Overloading', 'hard')**

190. You are required to compute the area of a rectangle using classes.

Create two classes:

1. Rectangle

The Rectangle class should have two data fields: width and height of int types. The class should have a display() method to print the width and height of the rectangle separated by space.

2. RectangleArea

The RectangleArea class is derived from the Rectangle class, i.e., it is the subclass of Rectangle class. The class should have a read\_input() method to read the values of width and height of the rectangle. The RectangleArea class should also overload the display() method to print the area (width × height) of the rectangle.

**(H) Area', 'Class', 'hard')**

191. Write the code to implement the concept of inheritance for Vehicles. You are required to implement inheritance between classes. You have to write four classes in C++: one superclass, two subclasses, and one driver class. Vehicle is the superclass, whereas Bus and Truck are subclasses of the Vehicle class. Transport is a driver class which contains the main method.

Detailed description:

Detailed description of Vehicle (Super class):

The class Vehicle must have the following attributes:

1. Vehicle model

2. Registration number

3. Vehicle speed (km/hour)

4. Fuel capacity (liters)

5. Fuel consumption (kilometers/liter)

The Vehicle class must have the following methods:

1. Parameterized constructor that will initialize all the data members with the given values.

2. Getters and Setters for each data member that will get and set the values of data members of the class.

3. A method fuelNeeded() that will take distance (in kilometers) as an argument. It will calculate the amount of fuel needed for the given distance and will return the value of fuel needed for the given distance. You can use the attributes ‘Fuel consumption’ defined within the Vehicle class to determine the fuel needed for the given distance. You are required to implement this functionality by yourself.

4. A method distanceCovered() that will take time (in hours) as an argument. It will calculate the distance for the given time and speed and return the value of distance. The formula to calculate speed is given as speed = distance/time. You can use this formula to calculate the distance.

5. A display() method that will display all the information of a vehicle.

Derive 2 classes Bus and Truck from the Vehicle class.

**(H) Vehicle', 'Inheritance', 'hard')**