

- a. Given an integer, n, perform the following conditional actions:
 - If n is odd, print Weird
 - If n is even and in the inclusive range of 2 to 5, print Not Weird
 - If n is even and in the inclusive range of 6 to 20, print Weird
 - If n is even and greater than 20, print Not Weird
- b. Write a Java program that reads a positive integer from command line and count the number of digits the number (less than ten billion) has.
- c. Write a menu driven program using switch case to perform mathematical operations.
- d. We use the integers a, b, and n to create the following series:



$(a+2^0*b), (a+2^0*b+2^1*b), (a+2^0*b+2^1*b+.....+2^{n-1}*b)$
 corresponding to the given a,b and n values as a single line of n space-separated integers.

Eg: i/p:

0 2 10

5 3 5

O/P

2 6 14 30 62 126 254 510 1022 2046

8 14 26 50 98

e. WAP to display the following patterns:

```

1
2  1
1  2  3
4  3  2  1
1  2  3  4  5
6  5  4  3  2  1
1  2  3  4  5  6  7
  
```

```

A
CB
FED
JIHG
  
```

3. To implement Arrays

a. You have been given an array of positive integers A_1, A_2, \dots, A_n with length N and you have to print an array of same length (N) where the values in the new array are the sum of every number in the array, except the number at that index.

i/p 1 2 3 4

For the 0th index, the result will be $2+3+4=9$, similarly for the second, third and fourth index the corresponding results will be 8, 7 and 6 respectively.

i/p 4 5 6

o/p 11 10 9

b.

Write a program that queries a user for the no.: of rows and columns representing students and their marks.

Reads data row by row and displays the data in tabular form along with the row totals, column totals and grand total

Hint : For the data 1, 3, 6, 7, 9, 8 the output is

1	3	6		10
7	9	8		24
8	12	14		34



4. To implement Strings

- a. WAP to check if 2 strings are Meta strings or not. Meta strings are the strings which can be made equal by exactly one swap in any of the strings. Equal strings are not considered here as Meta strings.

Example: str1 = "geeks", str2 = "keegs"

By just swapping 'k' and 'g' in any of string, both will become same.

Example: str1 = "Converse", str2 = "Conserve"

By just swapping 'v' and 's' in any of string, both will become same.

Algorithm (if reqd):

1. Check if both strings are of equal length or not, if not return false.
 2. Otherwise, start comparing both strings and count number of unmatched characters and also store the index of unmatched characters.
 3. If unmatched characters are more than 2 then return false.
 4. Otherwise check if on swapping any of these two characters in any string would make the string equal or not.
 5. If yes then return true. Otherwise return false.
- b. Steve has a string of lowercase characters in range ascii['a'..'z']. He wants to reduce the string to its shortest length by doing a series of operations. In each operation he selects a pair of adjacent lowercase letters that match, and he deletes them. For instance, the string aab could be shortened to b in one operation.
Steve's task is to delete as many characters as possible using this method and print the resulting string. If the final string is empty, print Empty String

Sample Input 0

aaabccddd

Sample Output 0

abd

Explanation 0

Steve performs the following sequence of operations to get the final string:

aaabccddd → abccddd → abddd → abd

Sample Input 1

aa

Sample Output 1

Empty String

Explanation 1

aa → Empty String

Sample Input 2

baab

Sample Output 2

Empty String

Explanation 2

baab → bb → Empty String



5. To implement Array of Objects

- WOOP to arrange the names of students in descending order of their total marks, input data consists of students details such as names, ID.no, marks of maths, physics, chemistry. (Use array of objects)

6. To implement Functions, recursive functions and overloading

- We define super digit of an integer using the following rules:
Given an integer, we need to find the *super digit* of the integer using **recursion**.
 - If x has only digit, then its super digit is x .
 - Otherwise, the super digit of x is equal to the super digit of the sum of the digits of x .

For example, the super digit of 9875 will be calculated as:

super_digit(9875)	$9+8+7+5 = 29$
super_digit(29)	$2 + 9 = 11$
super_digit(11)	$1 + 1 = 2$
super_digit(2)	$= 2$

-

Each year, sleepy Hollow Elementary school holds a "Principal for a Day" lottery. A student can participate by entering his/her name and ID into a pool of candidates. The winner is selected randomly from all entries. Each student is allowed one entry. Implement a student class that encapsulates a student. Implement StudentLottery class with methods addStudents () and pickwinner () and main () Hint : Use Random class to pick winner.

- WAP to display area of square and rectangle using the concept of **overloaded functions**

7. To implement Constructors and constructor overloading

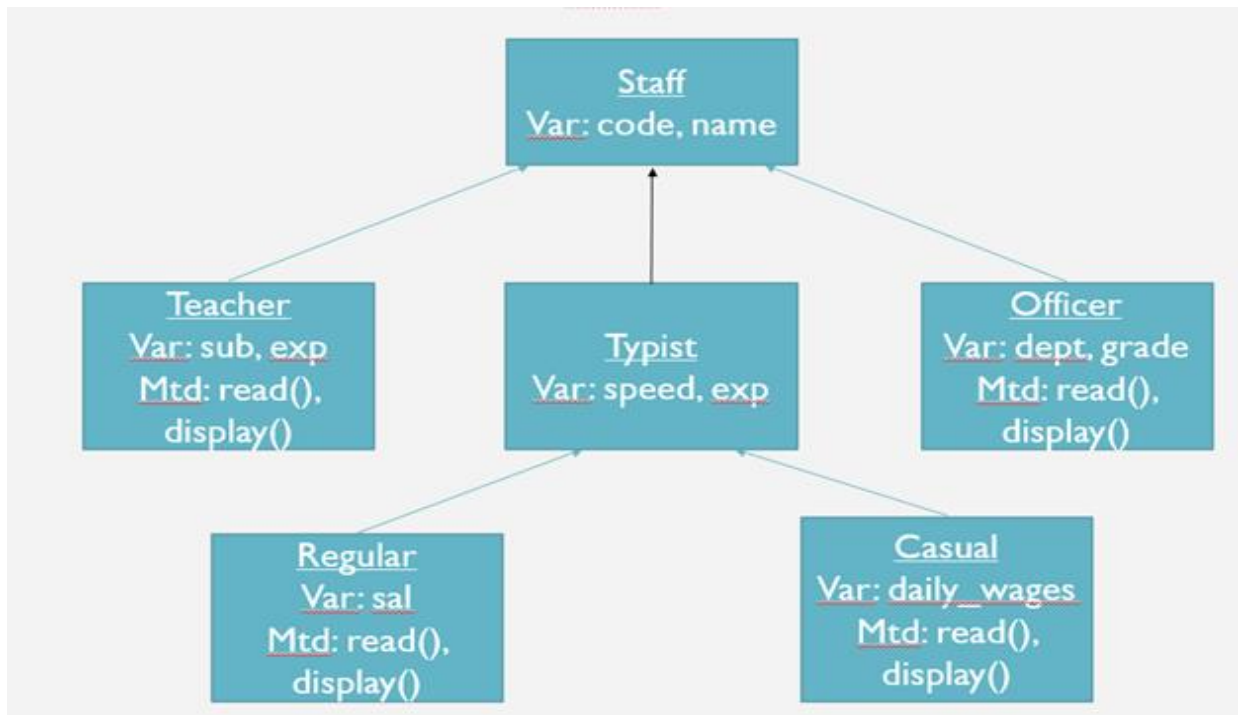
- WAOOP to count the no.of objects created of a class
-

Create Rectangle and Cube class that encapsulates the properties of a rectangle and cube i.e. Rectangle has default and parameterised constructor and area () method. Cube has default and parameterised constructor and volume () method. They share no ancestor other than Object.

Implement a class Size with size() method. This method accepts a single reference argument z . If z refers to a Rectangle then size (z) returns its area and if z is a reference to a Cube, then size (z) returns its volume. If z refers to an object of any other class, then size (z) returns - 1. Use main () method in Size class to call size (..) method.

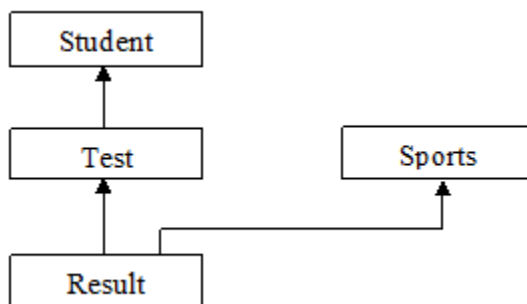


8. To implement Inheritance



9. To implement Inheritance, interfaces and method overriding

WAP to implement three classes namely Student, Test and Result. Student class has member as rollno, Test class has members as sem1_marks and sem2_marks and Result class has member as total. Create an interface named sports that has a member score (). Derive Test class from Student and Result class has multiple inheritances from Test and Sports. Total is formula based on sem1_marks, sem2_mark and score.



10. To implement Abstract classes

```
abstract class Book
{
    String title;
```



```
abstract void setTitle(String s);  
String getTitle()  
{  
    return title;  
}  
}
```

You have to create another class that extends the abstract class. Then you can create an instance of the new class. Notice that setTitle method is abstract too and has no body. That means you must implement the body of that method in the child class.

Sample Input

A tale of two cities

Sample Output

The title is: A tale of two cities

11. To implement exceptions in Java

- Write a Java Program to read input from user in an array using datainputstream and Find out total valid and in-valid integers. (Hint: use exception handling)
- Write a Java Program to Create a User Defined Exception class MarksOutOfBoundsException, If Entered marks of any subject is greater than 100 or less than 0, and then program should create a user defined Exception of type MarksOutOfBoundsException and must have a provision to handle it.

```
import java.util.*;  
/*WAP to implement exception handling  
  
a) default exceptions  
-NumberFormatException  
-ArithmeticException  
-ArrayIndexOutOfBoundsException  
  
b) user defined exceptions : when the input string is not equal to  
"India"  
-StringNotEqual  
  
*/
```

c.

12. To implement Multithreading

- Write a java program to print Table of Five, Seven and Thirteen using Multithreading (Use Thread class for the implementation).Also print the total time taken by each thread for the execution.
- Write a multithreaded program that outputs prime numbers. This program should work as follows: The user will run the program and will enter a number on the command line. The



program will then create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user.

- c. Write a multithreaded program that calculates various statistical values for a list of numbers. This program should read values in an array and will then create three separate worker threads. One thread will determine the average of the numbers, the second will determine the maximum value, and the third will determine the minimum value. For example, suppose your program is passed the integers
90 81 78 95 79 72 85
The program will report
The average value is 82
The minimum value is 72
The maximum value is 95
The variables representing the average, minimum, and maximum values will be stored globally. The worker threads will set these values, and the parent thread will output the values once the workers have exited
- d. The Fibonacci sequence is the series of numbers 0,1,1,2,3,5,8,Formally, it can be expressed as:
fib0=0
fib1=1
fibn=fibn-1+fibn-2
Write a multithreaded program that generates the Fibonacci sequence. This program should work as follows: On the command line (optional), the user will enter the number of Fibonacci numbers that the program is to generate. The program will then create a separate thread that will generate the Fibonacci numbers, placing the sequence in data that can be shared by the threads (an array is probably the most convenient data structure). When the thread finishes execution, the parent thread will output the sequence generated by the child thread. Because the parent thread cannot begin outputting the Fibonacci sequence until the child thread finishes, the parent thread will have to wait for the child thread to finish.

13. Collections

- WAP that accepts a shopping list of items and performs the following operations: Add an item at a specified location, delete an item in the list, and print the contents of the list.
- WJJP to find the max and min value from a linked list
- WJJP to check if a linked list is a palindrome or not

14. Generics

- WA generic program that determines the volume and surface of a sphere with radius specified in different types
- WA generic program that compares the objects of different classes for equality
- Write a simple generic version of method `isEqualTo` that compares its two arguments with the `equals` method and returns true if they're equal and false otherwise. Use this generic method in a program that calls `isEqualTo` with a variety of built-in types, such as `Object` or `Integer`. What result do you get when you attempt to run this program?



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- d. Write a generic method selectionSort based on the sort program. Write a test program that inputs, sorts and outputs an Integer array and a Float array. [Hint: Use > in the type-parameter section for method selectionSort, so that you can use method compareTo to compare the objects of the type that T represents.]

15. Project (Swings)