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Course Code: MCA-109

Course Name: Java Programming Lab

Practice Questions (Practical)

UNIT - I

- Q 1. Construct a basic java application exploring Notepad++ and JDK Toolkit to print the count of odd and even no's entered.
- Q 2. Create a java code to convert the given temperature in Fahrenheit to Celsius using the following conversion formula
 $C = (F - 32) / 1.8$ and display the value in a tabular form.
- Q 3. Construct a java code using command line arguments to find the roots of a quadratic equation. Assign the values of a, b and c of the equations in the program itself.
- Q 4. Design a class 'MyNumber.java' that performs following operations on a variable 'num' of type double:
1. Finds the round value of 'num' and stores the result in a variable numRound of type double.
 2. Finds the ceil value of 'num' and stores the result in a variable numCeil of type double.
 3. Finds the floor value of 'num' and stores the result in a variable numFloor of type double
 4. Cast 'num' to type int and stores the result in a variable numInteger of type int.
- Q 5. Shown below is a Floyd's triangle

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

1. Create a program to print this triangle.
2. Modify the program to produce the following form of Floyd's triangle.

- Q 6. Construct a basic java application in the sequence 1 1 2 3 5 8 13 21 is called Fibonacci numbers. Write a program using a do...while loop to calculate and print the first m Fibonacci numbers.
- Q 7. Develop a java application to accept three digits (i.e. 0 - 9) and print all its possible combinations. (For example if the three digits are 1, 2, 3 than all possible combinations are: 123, 132,213, 231, 312, 321.)
- Q 8. Construct a Java Application to program called PrintDayInWord which prints "Sunday", "Monday", ... "Saturday" if the int variable "dayNumber" is 0, 1, ..., 6, respectively. Otherwise, it shall print "Not a valid day".
Use (a) a "nested-if" statement; (b) a "switch-case-default" statement.
Try dayNumber = 0, 1, 2, 3, 4, 5, 6, 7 and verify your results.
- Q 9. Create a Java Code called **SumAverageRunningInt** to produce the sum of 1, 2, 3, ..., to 100. Store 1 and 100 in variables lowerbound and upperbound, so that we can change their values easily. Also compute and display the average. The output shall look like:

```
The sum of 1 to 100 is 5050
```

```
The average is 50.5
```

- Q 10. Create a java code called **Product1ToN** to compute the product of integers from 1 to 10 (i.e., $1 \times 2 \times 3 \times \dots \times 10$), as an int. Take note that It is the same as factorial of N.
- Q 11. Create a java based application called **Fibonacci** to print the first 20 Fibonacci numbers $F(n)$, where $F(n)=F(n-1)+F(n-2)$ and $F(1)=F(2)=1$. Also compute their average.
- Q 12. Construct a java code called **ExtractDigits** to extract each digit from an int, in the reverse order. For example, if the int is 15423, the output shall be "3 2 4 5 1", with a space separating the digits.
- Q 13. A Simple Calculator that performs various arithmetic functions such as addition, subtraction, multiplication, division and modulus using the following constructs:
- Using if-else ladder
 - Using Switch case

NOTE- use minimum variables in code and the program should be menu driven that exits only when the user opts to.

- Q 14. The intersection method computes the intersection of two rectangles- that is, the rectangle that is formed by two overlapping rectangles:

You call this method as follows:

```
Rectangle r3 =r1.intersection(r2);
```

Create a program that constructs two rectangle objects, prints them, and then prints their intersection. What happens when the rectangles do not overlap?

- Q 15. Construct a Java program involving two classes: OddAndEven and TestOddAndEven. OddAndEven has the following:
1. Instance variables countOfOdd and countOfEven both of type int
 2. A method addNumber that takes a number as parameter and increments countOfOdd, if the number is odd, else increments countOfEven.
 3. A method toString that returns a string in the form: "Number of Odd: x, Number of Even : y", where x and y are the values of the instance variables.

The TestOddAndEven class first creates OddAndEven object, then in a loop, reads a number and uses it to call the addNumber method until the user enters Q. Finally, it prints the count of odd and even numbers entered.

- Q 16. In a small firm employee numbers are given in serial numerical order, that is 1, 2, 3 etc. write a menu driven program to perform following operations:
1. Create a file of employee data with following information: Employee No, Name, Sex, Gross Salary.
 2. Append the data of a new employee joining the firm.
 3. If a given employee leaves, delete his record.
 4. If gross salary of a given employee increases, update the gross salary.
 5. Display the record of (i) a given employee or (ii) all employees.

- Q 17. Design a class Circle and implement the following methods:
1. Define a circle method to compute its area
 2. Define a circle method to compute its perimeter
 3. Define a method that takes a given point represented by a pair of numbers and checks whether or not the point is inside the circle.

The circle class needs to have instance variables to store the radius of the circle, and the x and y coordinates of the center. Add main program to test the class Circle repeatedly, until user enters negative value for the radius of the circle.

- Q 18. The certain instructor assigns letter grade for his course based on the following table:

A class, Grader, which has an instance variable, score, an appropriate constructor and appropriate methods a method, letterGrade() that returns the letter grade as a String.

Now write a demo class to test the Grader class by reading a score from the user, using it to create a Grader object after validating that the value is not negative and is not greater than 100. Finally, call the letterGrade() method to get and print the grade.

Score	Grade
>= 90	A+
>= 85	A
>= 80	B+
>= 75	B
>= 65	C+
>= 60	C
>= 55	D+
>= 50	D
< 50	F

Q 19. A sales person is paid commission based on the sales he makes as shown by the following table:

A class, Commission, which has an instance variable, sales; an appropriate constructor; and a method, commission() that returns the commission.

Now write a demo class to test the Commission class by reading a sale from the user, using it to create a Commission object after validating that the value is not negative. Finally, call the commission() method to get and print the commission. If the sales are negative, your demo should print the message "Invalid Input".

SALES	COMMISSION
Under SR500	2 % of SALES
SR500 and under SR5000	5 % of SALES
SR5000 and over	8 % of SALES

Q 20. Develop a java application to make use of a parameterized method inside a class. Take the following case: Create a class Box and define a method in this class which will return the volume of the box. Initialize two objects for your class and print out the volumes respectively.

Q 21. Construct a program in Java that reads in text and prints as output the following:

1. The number of words in the text
2. The number of sentences in the text
3. The number of times the letter "e" occurs in the text
4. The number of times the letter "z" occurs in the text

(Note: Use StringTokenizer class)

- Q 22. A program called **CountVowelsDigits**, which prompts the user for a String, counts the number of vowels (a, e, i, o, u, A, E, I, O, U) and digits (0-9) contained in the string, and prints the counts and the percentages (rounded to 2 decimal places).
- Q 23. Caesar's Code is one of the simplest encryption techniques. Each letter in the plaintext is replaced by a letter some fixed number of position (n) down the alphabet cyclically. In this exercise, we shall pick n=3. That is, 'A' is replaced by 'D', 'B' by 'E', 'C' by 'F', ..., 'X' by 'A', ..., 'Z' by 'C'.
Construct a java program called CaesarCode to cipher the Caesar's code. The program shall prompt user for a plaintext string consisting of mix-case letters only; compute the ciphertext; and print the ciphertext in uppercase.
- Q 24. A program called **DecipherCaesarCode** to decipher the Caesar's code described in the previous exercise. The program shall prompts user for a ciphertext string consisting of mix-case letters only; compute the plaintext; and print the plaintext in uppercase.
- Q 25. A word that reads the same backward as forward is called a *palindrome*, e.g., "mom", "dad", "racecar", "madam", and "Radar" (case-insensitive). Create a program called **TestPalindromicWord**, that prompts user for a word and prints ""xxx" is | is not a palindrome".
- Q 26. The binary number system uses 2 symbols, 0 and 1. Create a java program called **CheckBinStr** to verify a binary string. The program shall prompt user for a binary string; and decide if the input string is a valid binary string.
- Q 27. The hexadecimal (hex) number system uses 16 symbols, 0-9 and A-F (or a-f). Write a program to verify a hex string. The program shall prompt user for a hex string; and decide if the input string is a valid hex string.
- Q 28. Construct a java based logic called Bin2Dec to convert an input binary string into its equivalent decimal number.
- Q 29. Construct a java based logic called **Hex2Dec** to convert an input hexadecimal string into its equivalent decimal number.
- Q 30. Construct a java based logic called **Oct2Dec** to convert an input Octal string into its equivalent decimal number.
- Q 31. Construct a java based logic called **RadixN2Dec** to convert an input string of any radix (≤ 16) into its equivalent decimal number.

UNIT - II

- Q 32. Implement a Student class with the following fields, constructors and methods :
- Fields:**
name;
totalScore;
numberOfQuizzes;
- Constructors:**
public Student(String name, double score) public Student(double score, String name) public Student(String name) {
- Methods:**
public String getName()

```

public double getAverage() //this should return zero if no quiz has been taken.
public double getTotalScore()
public void addQuiz(double score)
public void printStudent() //this should print the student's name and average
score
public String toString()

```

Create a java application TestStudent that reads a student name and use the Student class to create a Student object. Then read the scores of the student in three quizzes and add each to the totalScore of the student using addQuiz() method and print the student object.

(Note: Make use of this key word wherever it can be used).

- Q 33. A java application called PrintArray which prompts user for the number of items in an array (a non-negative integer), and saves it in an int variable called numItems. It then prompts user for the values of all the items and saves them in an int array called items. The program shall then print the contents of the array in the form of [x1, x2, ...,xn].
- Q 34. A java application called **printArrayInStars** which prompts user for the number of items in an array (a non-negative integer), and saves it in an int variable called numItems. It then prompts user for the values of all the items (non-negative integers) and saves them in an int array called items. The program shall then print the contents of the array in a graphical form, with the array index and values represented by number of stars.
- Q 35. A java based program which prompts user for the number of students in a class (a non-negative integer), and saves it in an int variable called numStudents. It then prompts user for the grade of each of the students (integer between 0 to 100) and saves them in an int array called grades. The program shall then compute and print the average (in double rounded to 2 decimal places) and minimum/maximum (in int).
- Q 36. A method called exponent(int base, intexp) that returns an int value of base raises to the power of exp. The signature of the method is:

```
public static int exponent(int base, intexp);
```

Assume that exp is a non-negative integer and base is an integer. Do not use any Math library functions.

Also write the main() method that prompts user for the base and exp; and prints the result.

- Q 37. A boolean method called isOdd() in a class called OddEvenTest, which takes an int as input and returns true if the it is odd. The signature of the method is as follows:

```
public static booleanisOdd(int number);
```

Also write the main() method that prompts user for a number, and prints "ODD" or "EVEN". You should test for negative input.

- Q 38. A boolean method called hasEight(), which takes an int as input and returns true if the number contains the digit 8 (e.g., 18, 168, 1288). The signature

of the method is as follows:

```
public static boolean hasEight(int number);
```

Create a java program called MagicSum, which prompts user for integers (or -1 to end), and produce the sum of numbers containing the digit 8. Your program should use the above methods.

Q 39. Design a Banking Application in java to represent a bank account. Include the following members.

Data members

- Name of depositor
- Account Number
- Type of account
- Balance account in the account

Methods

- To assign initial values
- To deposit an account
- To withdraw an account after checking balance.
- To display the name and balance

Q 40. An exception handler java application calls a method that throws an exception of type ArithmeticException at a random iteration in a for loop. Catch the exception in the method and pass the iteration count when the exception occurred to the calling method by using an object of an exception class you define.

Q 41. Create a Leader Finder Java application. The application prints all the LEADERS in the array.

Note: An element is leader if it is greater than all the elements to its right side.

Q 42. Demonstrate the working of Method Local Inner Class in any utility of your project.

Q 43. Explore the concept of 2D arrays with int values the first element should be an array containing 32. The second array should be an array containing 500 and 300. The third element should be an array containing 39.45 and 600. Declare, allocate and initialize the array display its length and elements.

Q 44. Extract the source code of the class Math from the JDK source code (JDK Installed Directory ⇒ "lib" ⇒ "src.zip" ⇒ "java.base" ⇒ "java" ⇒ "lang" ⇒ "Math.java"). Study how constants such as E and PI are defined. Also study how methods such as abs(), max(), min(), toDegree(), etc, are written. Also study the "Integer.java", "String.java".

Q 45. A method called print(), which takes an int array and print its contents in the form of [a1, a2, ..., an]. Take note that there is no comma after the last element. The method's signature is as follows:

```
public static void print(int[] array);
```

Also write a test driver to test this method (you should test on empty array, one-element array, and n-element array).

Q 46. A method called arrayToString(), which takes an int array and return a String in the form of [a1, a2, ..., an]. Take note that this method returns a String, the previous exercise returns void but prints the output. The method's signature is as

follows:

```
public static String arrayToString(int[] array);
```

Also write a test driver to test this method (you should test on empty array, one-element array, and n-element array).

- Q 47. A method called `swap()`, which takes two arrays of `int` and swap their contents if they have the same length. It shall return `true` if the contents are successfully swapped. The method's signature is as follows:

```
public static boolean swap(int[] array1, int[] array2)
```

Also write a test driver to test this method.

- Q 48. A boolean method called `copyOf()`, which takes an `int Array` and returns a copy of the given array. The method's signature is as follows:

```
public static int[] copyOf(int[] array)
```

Also write a test driver to test this method.

- Q 49. A program called `GradesStatistics`, which reads in `n` grades (of `int` between 0 and 100, inclusive) and displays the average, minimum, maximum, median and standard deviation. Display the floating-point values upto 2 decimal places. Your output shall look like:

```
Enter the number of students: 4
Enter the grade for student 1: 50
Enter the grade for student 2: 51
Enter the grade for student 3: 56
Enter the grade for student 4: 53
The grades are: [50, 51, 56, 53]
The average is: 52.50
The median is: 52.00
The minimum is: 50
The maximum is: 56
The standard deviation is: 2.29
```

The formula for calculating standard deviation is:

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=0}^{n-1} x_i^2 - \mu^2}, \text{ where } \mu \text{ is the mean}$$

- Q 50. Create a client server application that has the following responsibilities:

- Client: Accept the name of a text file as a string from the user.
- Server: Open the file and write its contents back to the client stream.
- Client: Display the received contents.

You are supposed to use connection-oriented communication

- Q 51. Construct a java code to maintain file using `DataInputStream` / `DataOutputStream` built on top of respective file streams. The file is to store

objects of the class Course containing the following members:

CourseID: String (Key)

CourseName: String

Duration: int

Fee: float

Implement menu driven program with following. Options

- 1) Append
- 2) Searching of Course using CourseID

UNIT - III

- Q 52. Use awt / swings to develop a GUI application that maintains a simple list of contacts. You may store data in a file or DB as per your choice. Options to be provided are store and search.
- Q 53. An application maintains information regarding teams and players of a particular sport. Identify and implement the relation between team and player. Create a program that provides the following options:
1. Enter TeamID
 2. Enter PlayerID

When the user enters a valid

1. TeamID the details of the players belonging to that team should be displayed
2. PlayerID the details of the team to which the player belongs should be displayed

There can be multiple players associated with a country

- Q 54. Create the classes Employee, PermanentEmployee, TemporaryEmployee such that the class Employee acts as the base class for the other two classes. Add appropriate data members & functions to the base class. The base class should contain an abstract function to calculate net salary.

The class PermanentEmployee should

1. Contain data members for storing BasicSalary, HRAPercent, DAPercent, PFPercent
2. Provide body for the abstract function, contained in the base class, to calculate net salary on basis of the data given above.

The class TemporaryEmployee should

1. Contain data members for storing HourlyWages, HoursWorked
2. Provide body for the abstract function, contained in the base class, to calculate wages on basis of the data given above.

Test the above classes and demonstrate dynamic binding. Your application should provide options to:

1. Add data for permanent employee
2. Add data for temporary employee
3. Calculate salary of an employee given his/her empno.

Q 55. Identify and implement the relation between Job applicant and Job application. Create a program that provides the following options:

1. Create record of Job applicant
2. Create Record of Job Application for an Applicant

When the user enters a valid

1. ApplicantID the details of his / her applications should be displayed
2. ApplicationID the details of the applicant should be displayed

An applicant may post multiple applications.

Q 56. Create a Java Frame that allows free hand drawing as user drags the left mouse button. The color of the drawing should be controlled using three command line parameters for RGB values respectively.

Q 57. Create a panel that simulates MessageRotator component. The panel should use multithreading to pick up messages from an ArrayList and display the messages one by one. The messages are set in the constructor.

Q 58. Create a frame that can be used to perform simple drawing operations. The frame should have following menu options:

Shape	Style	Color
Line	Fill	Red
Rectangle	Draw	Blue
Oval		Green

The point where the user clicks the left mouse button should be treated as the top-left corner of the shape and the point where the user releases the left mouse button should be treated as the bottom-right corner of the shape.

Q 59. Create a java based application called **IncomeTaxCalculator** that reads the taxable income (in int). The program shall calculate the income tax payable (in double); and print the result rounded to 2 decimal places.

Taxable Income	Rate (%)
First \$20,000	0
Next \$20,000	10
Next \$20,000	20
The remaining	30

- Q 60. Create a java based application called **PensionContributionCalculator** that reads the monthly salary and age (in int) of an employee. Your program shall calculate the employee's, employer's and total contributions (in double); and print the results rounded to 2 decimal places.

Employee's Age	Employee Rate (%)	Employer Rate (%)
55 and below	20	17
above 55 to 60	13	13
above 60 to 65	7.5	9
above 65	5	7.5

- Q 61. Based on the previous PensionContributionCalculator, write a program called PensionContributionCalculatorWithSentinel which shall repeat the calculations until user enter -1 for the salary.
- Q 62. Create an **Employee Finder** app to maintain data in a Database table. The data is related to the class Employee derived from class Person.

The application should have options to:

1. Add a record
2. Modify an existing record

Define appropriate table structures to hold the data.

- Q 63. Create a frame that displays a pie chart based upon a set of numerical-values entered by the user as command line argument.
- Q 64. Create a Java Bean that displays the system time (HH:MM:SS) in the font and color as set by the properties of the bean. The time should be updated every second.
- Q 65. Create a frame that displays a bar chart based upon a set of numerical values entered by the user as command line argument.
- Q 66. Create a java bean to preview image files. The bean should have properties: file name, width and height for generating the preview. The bean should use these properties to generate the preview of the image file.
- Q 67. Use swing component JTable, to display all the records contained in a database table person where name follows a pattern entered in a textbox.
- Q 68. Create a frame that displays a line graph based upon a set of numerical-values entered by the user as command line argument.

UNIT - IV

Q 69. A Java application that uses **JDBC to connect to a database** containing table that holds data for employees of an organization. The application should allow the user to:

1. Add a record
2. Search for a record
3. Modify an existing record

Make use of Prepared Statement.

Q 70. A Java application that uses **JDBC to connect to a database** containing table that holds data for employees of an organization. The application should allow the user to:

1. Add a new record
2. Search for a record on basis of name (duplicates possible, use appropriate collection to hold returned values).

Q 71. Construct a database application that calls a backend procedure/function. The procedure should take roll number and class as input parameters and return marks secured by the student in that class.

Q 72. Create a java program to maintain data in a Database table. The data is related to the class **Student** derived from class **Person**.

The application should have options to:

1. Add a record
2. Modify an existing record

Define appropriate table structures to hold the data.

Q 73. Design a Java Shredder. The application shreds a given file where filename and the size of shredded file are given as command line arguments. Test that the file was shredded properly using the DOS command:

Java Copy a b c ... dest

Where a, b, cetc are the source files and dest is the destination file

Also, write a java program to combine the files generated above into a single file.

Q 74. Create a Java Bean to implement a simple Calendar Control. Identify and implement appropriate properties. Demonstrate the usage.

Q 75. Create a Java Bean to create an up-down (spinner) control. Identify and implement appropriate properties. Demonstrate the usage

***** **Wish you luck!** *****