Assignments

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Introduction to Java

Sr. No.	Assignment Question
1.	**Tnamco** is the biggest chain of superstores situated in various cities of **United Kingdom** (UK). The company has more than 6,70,000 employees working in these superstores. Apart from UK, the company also operates in other countries and has recently decided to open their stores in the **United States**. Thus, the recruitment team of **Tnamco** published various job vacancies through their Web site and local newspapers. The recruitment process is of two types: internal and external. In the internal recruitment process, the list of current employees looking for a promotion are selected based on their expertise and accordingly a talent pool is created. Similarly, in the external recruitment process, the filled application forms are accepted through the Website. The selected applicants are then interviewed followed by an assessment in the final stage of the selection process. To automate the process of recruitment, the management has thought of developing a software application. You, as one of the team member of the development team have been asked to identify the following: i. Which of the following approach must be followed for developing such an application: structured or object-oriented approach? Justify your answer with proper explanation. ii. Identify various classes that will be created in the application. Also, identify various attributes and methods for the identified classes. iii. Explain the benefits of using Java programming language for developing the recruitment application.

Application Development in Java

Sr. No.	Assignment Question

1.	**Extrain Services** is a training firm located in **Chicago**, **Illinois**. The firm provides software trainings to corporate employees in various sectors. A new batch of junior software developers has joined for the training of Java programming language. At the end of each session, the instructor assigns assignments on the topics conducted in the training.
	Assume that you are one of the participants in the training and in this session, the instructor has covered compilation and execution of a Java program. To gain confidence on the topic learnt, the instructor has given you some assignments.
	Compile and execute the Java codes using the command-line interface. Before compilation, set the path for JDK on the system using environmental variables. Then, execute the following Java programs:
	
	a. `public Class PrintMessage {`
	`  public static void main(String[] args) {`
	`  System.out.println("Hello, world!");`
	`  System.out.println();`
	`  System.out.print('Hello, world!");`
	`  System.out.println("Hello,);`
	`  System.out.print(" ");  // Print a space`
	`  System.out.print("world!");`
	`  System.out.println("Hello, world!");`
	`  }`
	`}`
	Check, if the code compiles and executes correctly or if there are errors in the code. If, errors are displayed, then make appropriate changes to the code and execute them. Secondly, place appropriate comments for each line of the code to increase the readability of the code.
	
	b. `public class SumOfNumbers {`
	`  public static void main(String[] args) {`
	`  int number1 = 10;`
	`  int number2 = 20;`
	`  int number3 = 32;`
	`  int number4 = 47;`
	`  int number5 = 55;`
	`  int sum;  // Declare an int variable called sum to hold the sum`
	`  sum = number1 + number2 + number3 + number4 + number5;`
	`  System.out.print("The sum is ");`
	`  System.out.println(sum);  }`
	`}`
	
	Save this file as **fivenum.java** and try to compile and execute the code. If there are errors, find out the reasons. Also, check the directory in which the compiled code will be stored.

Variables and Operators

Sr. No.	Assignment Question
1.	**Atlantis Scientific Systems** is an advanced scientific computation lab in **Colorado**, **USA**. The staff of this lab gathers data on various elements and phenomena and performs vast amount of scientific calculations and research on the accumulated data. This will help them to reach specific conclusions with which they can publish in journals and papers across the world. Assume that you are one of the researchers at **Atlantis Scientific Systems** and have to gather and store the following data given as input: • Minimum Temperature of the locality • Maximum Temperature of the locality • Average Temperature of the locality • Population of the town • Population of the state • Whether the city is a metropolis or not (true/false data) • Average literacy percentage of the city • Average qualifications of the population (Graduate/Postgraduate and so on.) You decided to write a Java program that will help you to do this. Test the output by compiling the program and executing the same through NetBeans IDE.
2.	Write a program for a bank accountant that will calculate the interests, which customers will gain on investing any amount of money for any given period of time. (Hint: Keep the rate of interest as fixed.)
3.	Write a program to accept two numbers and then display the result of the following operations using the given bit-wise operators: • Number 1 & Number 2: • Number 1 | Number 2: • ~ Number 1: • Number 2: • (~ Number 1) & (~ Number 2): • (~ Number 1) | (~ Number 2): • Number 1 >> Number 2: • Number 1 << Number 2: • Number 2 >> Number 1: • Number 2 << Number 1:

Decision-Making Constructs

Sr. No.	Assignment Question
1.	**TRON EXPRESS** is a full-time courier and cargo dispatch agency for corporate companies around the world. It mainly deals with delivering and tracking the packages delivered. TRON EXPRESS has its annual budget session during the end of year. The company has more than 30,000 full-time employees, 5,00,000 customers per month, and an average of three million packages a day. The manner in which the company structures pay scales is different for permanent and temporary staff. Some of the criteria which the company uses to decide the pay are as follows: i. **Number of packages being delivered**: Permanent employees get $50 for every package they deliver, whereas temporary employees get $30 for every delivered package. ii. **The distance they travel**: Permanent employees get a daily allowance of $75 for their travel. Similarly, temporary employees get a daily allowance of $65 for their travel. iii. **Shifts**: People who work for the night shift get an additional pay of 10% over and above their regular pay. Depending on all these factors, the basic pay structure is decided. Now, the company wants to reward the employees with bonuses based on their grade as follows: (Assume that grade is provided as input.) Grade A1: 5% of basic pay Grade A2: 10% of basic pay Grade A3: 15% of basic pay With all the information provided, use all possible type of statements and expressions and design a Java program to help the management to calculate the net pay (basic added to bonus) for employees. Hint: Make use of if-else, switch case, and arithmetic operators. Test the output by compiling the program and executing the same through NetBeans IDE.

Looping Constructs

Sr. No.	Assignment Question

1.	**Howell University** is an accredited European university, which offers a range of courses to its students. It strives to provide students the very best in terms of education and course content.
	
	Now, the university management is introducing a new IQ testing system for its MBA students, which is an add-on to the traditional Examination System. The IQ test will test the students on four different subjects such as Aptitude, English, Mathematics, and General Knowledge.
	
	Consider yourself to be a part of the software development team that is supposed to design the application in Java. First, the application asks the student the number of attempt. If student responds with a value higher than 1, then the application terminates and displays a message.
	
	However, if the student is attempting the test for the first time, it displays the following menu:
	1. Aptitude
	2. English
	3. Math
	4. GK
	5. Exit
	
	On entering a value between 1 and 4, the application displays a corresponding question. Note that the student can attempt only once for every subject listed. For every correct answer the student gets a score of 10 points. Once the student appears the test for all the subjects, he/she can choose to exit the application. After selecting the **Exit** option, the student can obtain the total marks printed on the screen.
	Total score should be calculated by adding up the individual score in each subject. Next, the application displays the following based on the score:
	`Bonus points earned`
	`Total score out of 50`
	`Message on IQ level`
	The application displays the bonus points based on the following conditions:
	1. No bonus point is given, when the total score equals to 10.
	2. A bonus of 2 points is given, when the total score equals to 20.

3. A bonus of 5 points is given, when the total score equals to 30.
4. A bonus of 10 points is given, when the total score equals to 40.

The final score will be decided after adding the total score and bonus points. Based on the final score obtained, the following message will be displayed for IQ level:

1. If the final score is greater than or equal to 40, then a message stating "You are a genius" is displayed.
2. If the final score is greater than or equal to 30, then a message stating "You are intelligent" is displayed.
3. If the final score is greater than or equal to 20, then a message stating "Your IQ level is average" is displayed.
4. If the final score is greater than or equal to 10, then a message stating "Your IQ level is below average" is displayed.
5. Otherwise, a message stating "You need to re-appear the test" is displayed.

Classes and Objects

Sr. No.	Assignment Question
1.	**Alpha Airlines** is one of the oldest and largest airlines in U.S. The airline transports more than 90 percent of all U.S. airlines passenger and cargo traffic, thus flourishing the economic growth internationally. Currently, the airline operates only on the London route. The CEO of **Alpha Airlines** has now planned to expand the routes up to Singapore and Tokyo. Earlier automated software could book tickets only for London, but after the addition of two more destinations, that is, Singapore and Tokyo, the existing ticket booking software is required to be upgraded. To accomplish this, a team of experts have been chosen by the Airline company to provide a solution for the same. Consider yourself to be a part of the team that implements the solution for designing the application. Create an application using object-oriented features to implement the software. The application should perform the following: i. Design a class named **Booking** for booking the airline tickets. ii. Modify the class to store the following details: ➢ bookingID ➢ departureDate ➢ numberOfTickets ➢ price ➢ cabinType ➢ totalPrice ➢ destination iii. Add appropriate constructors in the class to instantiate an object of the Booking class. The constructor initializes the field bookingID, departure/date, numberOfTickets, price, destination, and cabinType respectively. iv. Apply encapsulation feature to achieve data hiding for the **Booking** class. v. Create a method named `totalPrice()` to compute the total price of tickets booked. vi. Create a method `ticketConformation()` to display all the information about the tickets booked. vii. Also, create a test class that creates the different instances of **Booking** class and initialize them with appropriate constructor. Finally, the respective method should be invoked to display the complete ticket information in proper format.

Methods and Access Specifiers

Sr. No.	
1	**TechDynamics Ltd.** is a software development company based in **Chicago**, **Illinois**. The company develops software on different technologies such as .NET, Java, PHP, and so on. Currently, the company is working on a security management project for Amigo Pvt. Ltd., a CA consultancy firm. You as a programmer have been assigned to develop the login module to authenticate the user trying to access his/her details. i. Create a class **Login.java**. ii. Create variables username, password, and designation with appropriate data types and access specifiers. iii. Provide accessor and mutator methods to access and modify the values of the variables. iv. Create a method **validate()** that accepts the username and password as parameters and validate the user. v. Based on the result of validation, appropriate message should be displayed to the user. vi. Generate javadoc for the class to view the details of the methods.

Arrays and Strings

Sr. No.	Assignment Question
1	**Fashionista** is a popular garment store in **Los Angeles**, **USA**. The store has multiple sections for men, women, and children for different types of garments such as trousers, suits, traditional wear, accessories, sports gear, and so on. Currently, the store maintains a manual register for recording the details of the garments such as type, price, stock, orderQty, sales, and so on. However, the owner of the store has decided to automate the tasks such as data entry, sales calculation, stock updation, and so on to save time and effort required in the tasks. You as a software developer have to accomplish the task as follows: i. Create a class named **Garments.java**. ii. Create variables **ID**, **type**, **stock**, **price**, **sales**, and **orderQty** with appropriate data types and access specifiers to restrict access from outside the class. iii. Create constructor to initialize the values of the variables according to the arguments specified by user at command-line. iv. Create method **addGarment()** that adds garment details to a collection. v. Create method **showDetails()** to display the details of the garment from the collection. vi. Create a method **setOrder()** to accept the **orderQty** for the current garment and calculate the **sales** value by multiplying the **price** with **orderQty**. Display the payable amount to the user.

Modifiers and Packages

Sr. No.	Assignment Question
1.	**MusicMania Gallery** is a popular music gallery located in **New Jersey**, **USA** that sells music and video CDs. The management has recently automated all the transactions such as sales, data entry, purchases, and so on. However, the software is not working as expected and takes long time for completing transactions. The management has decided to optimize the software for better performance. The CEO of the company and a team of experts have chosen your company to provide a solution for the same. After analysis of the software, the team has come to the conclusion that the reason of imperfect functioning is that all the classes are in the same package and vulnerable to external access. You, as part of the team, have been assigned the following tasks to improve the structure and function of the software: Create an application using different packages and access control specifiers to implement the **MusicMania Gallery** system. The application should consist of the following: i. A Java package named **cdpkg**. ii. A Java package named **orderpkg**. iii. A class named **CompactDisc** in the package **cdpkg** to add and display details of the CDs. iv. A class named **Order** to add display order details of customers. v. A Java main class named **BuyCD** inside the **orderpkg** package to access the **CompactDisc** and **Order** classes and to run the application. Each file has a specific purpose and functionality. The descriptions of each file are as follows: **CompactDisc.java** The **CompactDisc** class represents the music or video CD present in the **cdpkg** package. It stores the following details of a CD: ➢ **ID**: A String variable to store the ID of the CD ➢ **type**: A String variable to store the type of CD: music or video ➢ **artist**: A String variable to store the name of the artist ➢ **price**: A public static double variable to store the retail price of the album ➢ **discount**: A static final float variable with a fixed value that indicates the discount in percentage allowed on the total amount of purchase It consists of a constructor and methods to display CD details.

Order.java

The **Order** class is declared in the package named **orderpkg**. It stores the following details about the purchases made by a customer:

- **orderID**: A String variable to store the ID of purchase order
- **custID**: A String variable to store the ID of the customer
- **custName**: A String variable to store the name of the customer
- **quantity**: An integer variable to store the number of CDs purchased
- **payableAmt**: A private double variable to store the amount payable on a purchase

It consists of methods to calculate the **payable amount** by multiplying the **price** of the CD with the **quantity** and deducting the discount from the final amount. Also, display it along with the other order details.

BuyCD.java

This class creates instances of the **CompactDisc** and **Order** classes. It invokes the methods to add the details of CDs as well as method to calculate and display the payable amount with order details. The **BuyCD** class must import the **cdpkg** package to use the **CompactDisc** class. The details will be specified during runtime at command-line. The access specifiers of the variables can be modified according to programmer's discretion and the requirement of the code.

Create a **.jar** file of the application.

Inheritance and Polymorphism

Sr. No.	Assignment Question
1.	The **Australian** cricket team is the best team in the world. It has proved its potential over the years since 1999 by its consistent performance in all the matches. The **Australian Cricket Board** that handles the payment related issues of the players has decided to develop software that would automatically calculates the income of the players based on their grade, the number of matches each player plays, and their performance in the tournament. To accomplish this, the **Australian Cricket Board** has hired a team of developers. Consider yourself to be a part of the team. You have been assigned the following tasks for designing the software. Create an application using inheritance and polymorphism to implement the software. The application should consist of the following files: **1. Game.java** **2. TestMatch.java** **3. WorldCup.java** **4. Player.java** **5. PlayerTest.java** Each file has a specific purpose and functionality. Descriptions of each file are as follows: **Game.java** The **Game** class is an abstract base class that provides abstract method named **double calculateIncome(String numGames)** to calculate the income of the player and **double calculateBonus(String performance, String grade)** to calculate the bonus based on their performance in a match and the grade. The performance is rated as good, average, and best. **TestMatch.java** The **TestMatch** class inherits the **Game** class and overrides the abstract methods to calculate the income and grade based on the test matches played by the player. **WorldCup.java** The **WorldCup** class inherits the **Game** class and overrides the abstract methods to calculate the income and grade based on the number of world cup matches played by the player. **Player.java** The **Player** class contains an instance variables to stores the details of the player such as name, age, gender, and so on and a method **displayDetails(String**

match) to display the details of the player. The **displayDetails(String match)** method invokes the **calculateIncome()** and **calculateBonus()** methods of the **TestMatch** or **WorldCup** classes based on the type of match specified by the user, that is, Test Match or World Cup.

PlayerTest.java

The **PlayerTest** class creates an instance of the **Player** class and passes appropriate arguments to the constructor. Also, the class displays the details of the player such as personal details, income, and bonus by invoking the **displayDetails()** method using the **Player** class object.

Interfaces and Nested Classes

Sr. No.	Assignment Question
1.	**Smart Toys** is a famous toy manufacturing company located in **New York**, **USA**. The company manufactures and sells different types of automated toys. With the increasing number and types of automated toys, the company is finding it difficult to keep track of the demand and supply of the toys. For this purpose, the management has decided to automate the following tasks in the company: ➢ Adding and retrieving toy information ➢ Testing the product ➢ Order management You, as a developer, have been assigned the task to provide the solution for the same. Create an application to accomplish the task. The application should consist of the following classes and interfaces: **Interfaces** **Testing.java**: This interface should declare methods to test the product such as **moveObject()**, **stopObject()**, **startObject()**, **turnObject()**, and so on. The **Toy** class should implement this interface and define the methods for the toys. **Classes** **Toy.java**: This class should store the basic information about a toy such as Id, name, price, color, and type. It should consist of a method to display toy details. **Order.java**: This class should store the order information such as order Id, quantity, and payable amount. It should consist of a method to display order details. **Stock.java**: This class should be nested within the **Order** class. It should have a method **int getStock(String toyId)** that accepts the toy id as a parameter and returns the available stock value of the toy. **TestToy.java**: This class should contain the **main()** method for execution of the program. It should create an instance of the **Toy** and **Order** classes with appropriate arguments. Next, the class should invoke various methods to display the toy details, order details, and methods to test the toy.

Exceptions

Sr. No.	Assignment Question
1.	The management of the **Elvis Bank** is looking at automation as a means to save time and effort required to carry out various banking transactions. In order to achieve this, the management has planned to computerize the following transactions: ➢ Creating a new account ➢ Withdrawing money from an account ➢ Depositing money in an account The CEO of the company has hired a team of experts to provide a solution for the same. Consider yourself to be a part of the team that implements the solution for designing the application. Create an application using exceptions to implement the transactions. The application should consist of the following classes: ➢ **Account.java** ➢ **Bank.java** ➢ **BankTest.java** Each class has a specific purpose and functionality. The descriptions of each class are as follows: **Account.java** The **Account** class represents an actual bank account. It stores the following details of a bank account such as **customerName**, **accountNumber**, and **balance**. The instance variables are initialized in the constructor of the class. The **Account** class will be used by the **Bank** class to create bank accounts. **Bank.java** The **Bank** class stores the bank details of the customer's account such as **bankId**, **bankName**, and **branch**. The instance variables are initialized in the constructor of the class. The **Bank** class implements the following methods: ➢ **void displayAccountDetails(Account)**: This method displays the bank and account details of the account object passed as an argument to the method. ➢ **void createAccount(String username, double balance)**: This method accepts the user name and the opening balance from the user to create a new instance of the **Account** class. ➢ **void withdraw(String accountNumber, double amount)**: This method is used to withdraw money from an account. The method consists of a

try-catch block to throw an exception if the withdrawal amount is greater than the balance.

- **void deposit(String accountNumber, double amount)**: This method is used to deposit money in an account. The account number and the amount to be deposited in the account are accepted from the user.

BankTest.java

The **BankTest** class is the main Java class used to test the **Bank** class. It creates an instance of the **Bank** class and accepts the bank and account details from the user. The required method is invoked on the instance of the **Bank** class based on user's selected transaction. The class consists of a try-catch block to check for the format of balance or amount passed by the user to raise the **NumberFormatException** if the amount is specified as a string. Also, the try-catch block checks for the **IllegalArgumentException** if the argument supplied to the method is incorrect and the **ArrayIndexOutOfBoundsException** if the number of command line arguments exceed the required limit.

New Date and Time API

Assignment Question
1. **Francis** is an insurance agent with Insurance Europe. Over the years, he has built a good rapport with his customers. He helps policyholders to settle claims and handle policy renewals. He maintains a manual register that consists of the complete record of his customers such as customer name, customer age, policy type, policy start date, policy maturity date, premium amount, and so on. One of his customer suggests him to automate the tasks so that he can concentrate more on his business. As a software developer, you have to perform following tasks to implement customer profiling: i. Create a class named **DemoDateTime.java** and set the variables **cname**, **dob**, **policytype**, and **policystart** with appropriate data type. ii. Use the **of()** method to set the date of birth of the customer as 9th December, 1960. iii. Calculate the age of the customer using the appropriate class of Date and Time API and the **now()** method. iv. Use a **LocalDateTime** class to set the login user details and display the logged in user details. v. Use the **now()** method to get the difference of current date and policy start date taken as 12th April, 2005.

Annotations and Base 64 Encoding

Assignment Question
1. **AVR Interiors** has got the contract to renovate a park and the concerned government authorities have laid one of the requirements as having the flower gardens to represent different geometrical structures. The design team of AVR Interiors approaches a software firm to automate the designing process to plan and visualize the layout of the park. As a software developer, you have been entitled with the following tasks using Java 8: i. Create an interface called **Geoobject** with two abstract methods: getTotsides and getMargin. ii. Add a class **Triangle** that implements the interface and has **getTotSides** return the value 3 and **getmargin** return an instance variable set by the constructor. iii. Add a class **Rectangle** that implements the interface, has **getTotSides** return the value 4 and **getmargin** return an instance variable set by the constructor. iv. Add a static **totalSides** method that given a **Geoobject[]** returns the sum of the number of sides of the entire elements and then, add two default methods: **getPerimeter** and **getArea**.

Functional Programming in Java

Assignment Question
1. The **Welfare Association of Paradise Housing Society** has requested children living in the society to start a lending library with unused books at home. The innovative idea had an overwhelming response from children leading to piling of hundreds of books at society's office. Hence, the secretary of the society wanted to automate the task of managing the library. As a Software developer, you take up the initiative of developing an application using Java 8 for the same and do the following tasks: i. Create an interface called **Books** having two abstract methods: **getAuthor** and **getTitle**. Show the title of the books using the method, **display()**. ii. Include an arraylist for book titles. Titles can be set as Think and Grow Rich, Global Economy, The Intelligent Investor, You Can Win, The Art of War, Habit Makes Perfect, Gulliver's Travel, The Black Sheep, War and Peace, The Odyssey. Add **Predicate** interface to filter title of book that starts with the letter T. iii. Create another interface called **Publishers** having methods: **getName()** and g**etAddress()**. Use the method **display()** to show the name of the publisher. iv. Add a class called **BookInfo** that implements **interfaces**, **Books** and **Publishers** and overrides the **display()** method of the interface.

Stream API

Assignment Question
1. You have started to develop a Java 8 application for managing the books piled up at the office of the **Welfare Association of Paradise Society**. You need to do the following: i. Generate a stream from the class **Book** with list instance booklist as an array consisting of Think and Grow Rich, Global Economy, The Intelligent Investor, You Can Win, The Art of War, Habit Makes Perfect, Gulliver's Travel, War and Peace, and The Odyssey. Get the count of book titles that starts with the letter T from the array list. ii. Display the book titles that are more than eight characters in length and eliminate all empty strings. iii. Get an array list of number of books and find the highest number from the list. iv. Use **reduce** function to return the sum of all the books in the collection. v. Convert all the book titles that start with letter G to uppercase.

More on Functional Programming

Assignment Question
1. Write a **recursive** method in Java 8 to move a string by n characters to the left. For example, moveleft("CRYBABY",2) must give the output as "YBABYCR" and to convert a string representing a decimal number to its binary equivalent. 2. Write a program using Java 8 functional programming features to demonstrate the use of **CompleteableFuture** class to print the multiples of the number 10 until 20.

Additional Features of Java 8

Assignment Question
1. **Count Statistics Firm** has been performing data analysis for various clients spanning worldwide. Having grown to new heights, the company wants to develop software with advanced data modeling tool for its customers. As a software engineer, using the new features of Java 8, you must perform the following tasks: i. Create a class **DemoMath.java** and include methods for calculating the exponential, logarithmic, floor, ceil, and absolute value for a given integer. ii. Create a class **DemoTrigMath.java** and include methods for calculating the arcsine, arccosine, and arctangent value of a given integer. iii. In the **DemoTrigMath.java** class, include the method that returns the equivalent value in degrees for the value specified in radians as method argument and vice versa.

--- End of Assignments ---