COURSE: **Programming Fundamentals**

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Question no. 1:

Define and explain the programming paradigms with the help of examples?

Answer:

Programming paradigms:

A programming paradigm refers to a style, way or classification of programming.

Example: java, Haskell, Prolog SQL

- **Types:**
  1. Imperative programming paradigm
  2. Declarative programming paradigm

Imperative programming paradigm:

It is programming style in which the program is written as a sequence of instructions that change the program's state step by step. It tells the computer hoe to perform tasks using commands, loops and conditionals.

Example: C, C++, Java, Python etc.

Subtypes:

1. Structured programming
2. Object-oriented programming

Declarative programming paradigm:

It is a programming style in which programmer specifies what result is required instead of giving step by step instructions. The focus is on describing the outcome, while the system decides how to achieve it.

Example: SQL, HTML Prolog etc.

Subtypes:

1. Functional programming

Question no. 2:

This question focuses on the types of errors

a) Write the java statements that can produce Syntax errors. Give three different examples and write the names of errors.

Answer:

- **Example 1: Missing semicolon**

```
public class Example 1{
  public static void main(String[] args){
    System.out.println(“Welcome to Comsats”)
  }
}
```

ERROR NAME: ‘:’ expected

- **Example 2: Mismatched braces:**

```
public class Example 2{
  public static void main(String[] args){
    System.out.println(“Welcome to Comsats”);
  }
```

ERROR NAME: reached end of file while parsing

- **Example 3: Misspelled Keyword:**

```
pubic class Example 3{
  public static void main(String[] args) {
    System.out.println(“Welcome to Comsats”);
  }
```

ERROR NAME: class, interface, or enum expected

b) Write the java statements that can produce logical errors. Give three different examples and briefly explain the reason.

- **Example 1: Wrong formula**

```
Int average = (10 + 20 + 30) /2
```

Reason: should divide by 3, not 2.

- **Example 2: Wrong condition**

```
If (marks > 60) {
   System.out.println(“Fail”);
}
```

Reason: the logic is reversed condition should print “pass” , not “fail”.

- **Example 3: Wrong operator**

```
Int sum= 5-3
```

Reason: used “-” instead of “+”.

c) Write the java statements that can produce run time errors. Give three different examples and briefly explain the reason.

- **Example 1: divided by zero**

```
int a = 12;
int b = 0;
int result = a/b;
```

Reason: division by zero program crashes

- **Example 2: String error**

```
String word = “java”
Char c = word.charAt(10);
```

Reason: position 10 is invalid

- **Example 3: input error**

```
Int num =

Integer.parseInt(“welcome”);
```

Reason: “welcome” is not a number

d) The following programs have have syntax errors. Write clearly the error and its correction(in tabular form). After you have corrected the syntax errors, show the output of this program.

First program

```
public class ErrorDemo {
 public static void main(String[] args) {
  int number;
  number = "ten";
  float pi = 3,1416;
  double result == 0;
   if (number = 5) {
   System.out.println("Number is 5");
   }
   System.out.println("Result is: " + result;
  }
}
```

Answer:

ERRORS	ERROR TYPE	PROBLEM	CORRECTION
Int number; Number = “ten”	Syntax error	Type mismatch(string is declared in integers datatype)	Int number; Number = 10;
Float = 3,1416	Syntax error	Wrong decimal separator(comma) and missing f	Float= 3.1416f
Double result ==0;	Syntax error	= here assignment operator shoud be used	Double result= 0
If (number=5)	Syntax error	==comparison operator should be used	If (number==0)
(“Result is:” +result;	Syntax error	Closing bracket is missing	(“Result is:” +result;)

Results:

Number is 5

Result is: 0.0

Second program

ERROR	TYPE	CORRECTION
count = 1;	Count variable is not declared	Int count = 1;
sum = count + PRIME;	PRIME is defined	Int PRIME = 5
x: = 25.67;	Wrong variable declaration	double x = 25.67
newNum = count * ONE + 2;	ONE undefined	Int ONE = 1;
sum + count = sum ;	Illegal assignment target	sum = sum + count
x = x + sum * COUNT;	COUNT wrong case	Count
… + Prime);	Case mismatch	Use PRIME consistently

Results

count = 1, sum = 7, PRIME = 5

newNum = 3, x = 32.67

Question no. 3:

This question focuses on the basic elements of JAVA language (comments , special words ,reserved words and identifiers)

```
/*This program will calculate product of three numbers */
public class Product{
 public static void main(String[] args){
  int num1 = 10; // first number
  int num2 = 20; // second number
  int num3 = 1;// third number
  int result; //product of numbers
  result = num1 * num2 * num3;
  System.out.println("Product of numbers: "+result);
 }
}
```

Answer:

Comments	**Single line comment:**//first number, //second number, etc. **Multiline comment:**/*this program will calculate product of three numbers
Special symbols	**a.** ;(semicolon) _ end statement **b.**{}(curly braces) _block start/end **c.**() (paratheses)_method and expression grouping

Reserve words	**a.** public **b.** class **c.** int
Identifiers	**Predefined** System, String, out **User- defined** Product, num1, num2, num3, result, main
Standard input Stream object	System.in
Standard output Stream object	System.out.println(…)

Question no. 4:

This question focuses on the basic elements of java language (primitive data types, expressions and assignments , arithmetic operators , order of precedence, augmented assignment operators, type convers. Write Java statements that accomplish the following.

1. Declare a String variable named name and assign it the value "Java".

2. Declare a boolean variable named is Passed and set it to true.

3. Multiply two int variables a and b, and store the result in an int variable product.

4. Declare a float variable temperature and initialize it with the value 36.6.

5. Assign the remainder when dividing num1 by num2 to an int variable remainder.

6. Suppose p and q are double variables. Output the contents of p, q, and the expression (p * q) / 2.

7. Declare a char variable symbol and assign it the value '#'.

8. Declare three int variables to store the marks of three subjects.

9. Copy the value of an int variable score into a double variable resultScore.

10. Suppose radius is a double. Write a statement to compute the area of a circle and store it in a double variable area.

Answer:

1. String name = “java”
2. Boolean isPassed = true;
3. int product = a * b;
4. float temperature = 36.6f;
5. int remainder = num1 % num2;
6. System.out.println(p+ “” + q +””+(p*q)/2):// if p and q are double
7. char symbol = ‘#’;
8. int marks1, marks2, marks3;
9. double resultScore = score;
10. double area = Math.PI * radius *radius

b. Suppose a, b and c ,d are int variables and a = 5, b = 6, c=7, d = 2. What value is assigned to each variable after each statement executes? If a variable is undefined at a particular statement, report UND (undefined)

Statements	a	b	c	D
a = (++b) * 2 + (c--);	21	7	6	2
c = (a++) - (--d) + b;	22	7	27	1
b = (d--) + (c++) * ++a;	23	622	28	0
d = (--a) + (b++) - (c--);	22	623	27	616

c. Suppose a, b, and sum are int variables and c is a double variable. What value is assigned to each variable after each statement executes? Suppose a = 3, b = 5 , and c = 14.1

Statements	a	b	c	sum
sum = a + b + (int) c;	3	5	14.1	22
c /= a;	3	5	4.7	22
b += (int) c - a;	3	6	4.7	22
a *= 2 * b + (int) c;	48	6	4.7	22

JAVA PROGRAMMING QUESTIONS

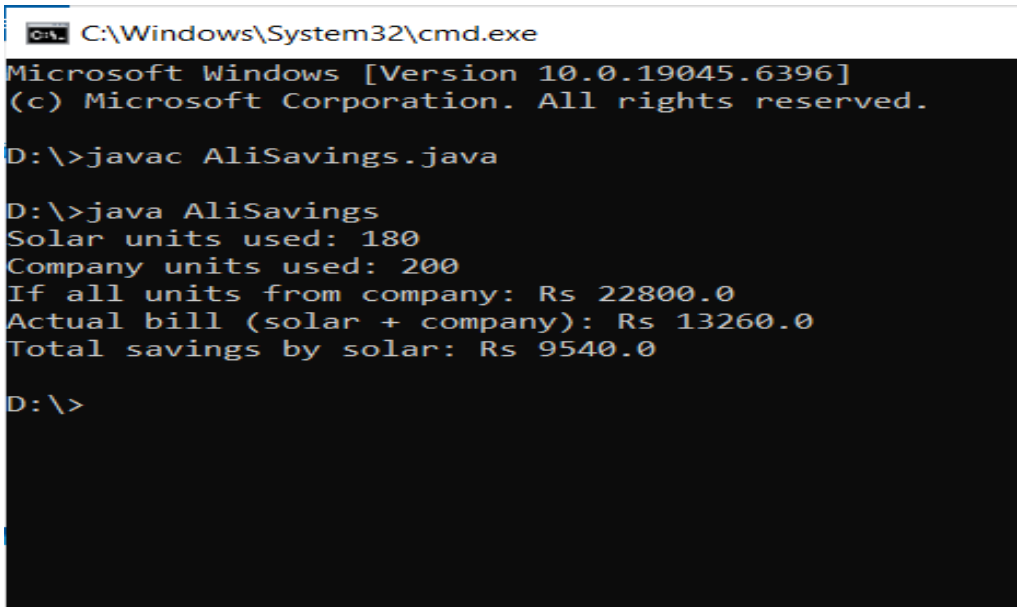
Question 5. Ali lives in a village where he uses both solar energy and electricity from the company. During the day, he consumes electricity generated from his solar system, which costs him only Rs. 7 per unit. After 5 PM, he uses electricity from the company, which charges Rs. 60 per unit. Ali wants to calculate how much money he is saving by using solar energy. Create a program that asks for the number of units consumed from the solar system and the number of units consumed from the electricity company. The program should then calculate the total bill if all units were taken from the company, the actual bill using both solar and company electricity, and the total savings Ali makes by using solar power.

Answer:

```
import java.util.Scanner;

public class AliSavings {

   public static void main(String[] args) {

      Scanner sc = new Scanner(System.in);

      System.out.print("Solar units used: ");

      double solar = sc.nextDouble();

      System.out.print("Company units used: ");

      double company = sc.nextDouble();


      double total = solar + company;

      double companyBill = total * 60.0;

      double actualBill = solar * 7.0 + company * 60.0;

      double savings = companyBill - actualBill;


      System.out.println("If all units from company: Rs " + companyOnlyBill);

      System.out.println("Actual bill (solar + company): Rs " + actualBill);
```

```
        System.out.println("Total savings by solar: Rs " + savings);
    }
}
```

Output:



Question no. 6:

Sara visits her doctor for a regular health check-up, and the doctor asks her to calculate her Body Mass Index (BMI) to monitor her fitness. Sara's weight is 62 kilograms, and her height is 1.68 meters. The formula for BMI is the weight divided by the square of the height. Create a program that calculates Sara's BMI and displays the result.

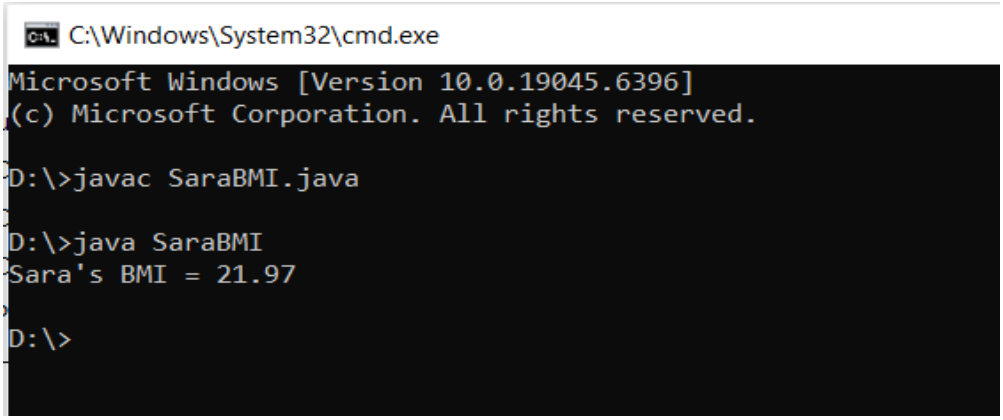
Answers:

Code

```
public class SaraBMI {
    public static void main(String[] args) {
        double weight = 62.0;
        double height = 1.68;
```

```
        double bmi = weight / (height * height);
        System.out.printf("Sara's BMI = %.2f%n", bmi);
    }
}
```

Output:



Question no.7:

Ahmed works in a private company and earns Rs. 50,000 each month. His monthly expenses, however, are Rs. 37,500. Ahmed plans to purchase a new laptop that costs Rs. 100,000. He wants to calculate how long it will take to save enough money. Create a program that calculates Ahmed's monthly savings and determines how many months are required for him to save enough money to buy the laptop.

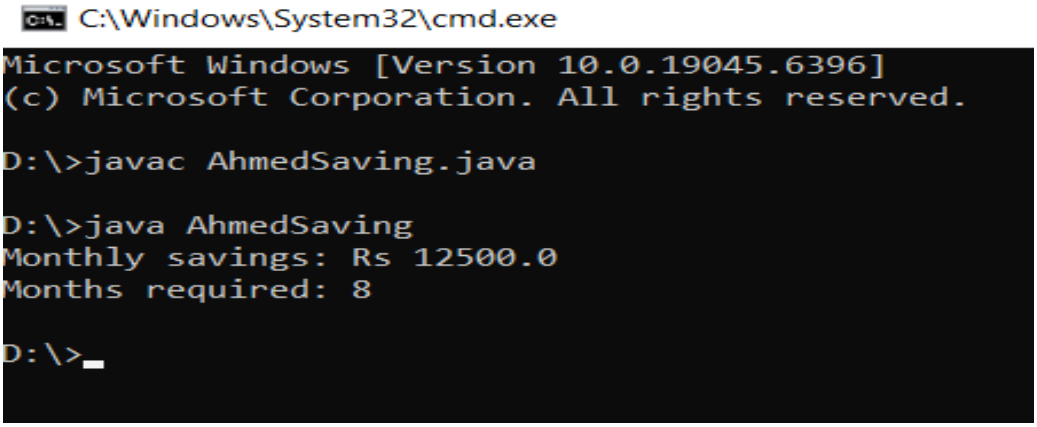
Answer:

Code

```
public class AhmedSaving {
    public static void main(String[] args) {
        double salary = 50000;
        double expenses = 37500;
        double laptopCost = 100000;
        double monthlySavings = salary - expenses;
```

```
        int months = (int) Math.ceil(laptopCost / monthlySavings);
        System.out.println("Monthly savings: Rs " + monthlySavings);
        System.out.println("Months required: " + months);
    }
}
```

Result:



Question no. 8:

The weather station in Lahore has reported today's temperature as 32 degrees Celsius. For preparing an international weather report, the same temperature also needs to be expressed in Fahrenheit and Kelvin. The formulas to use are Fahrenheit = (9/5 × Celsius) + 32 and Kelvin = Celsius + 273.15. Create a program that converts 32 degrees Celsius into Fahrenheit and Kelvin and displays the converted values.

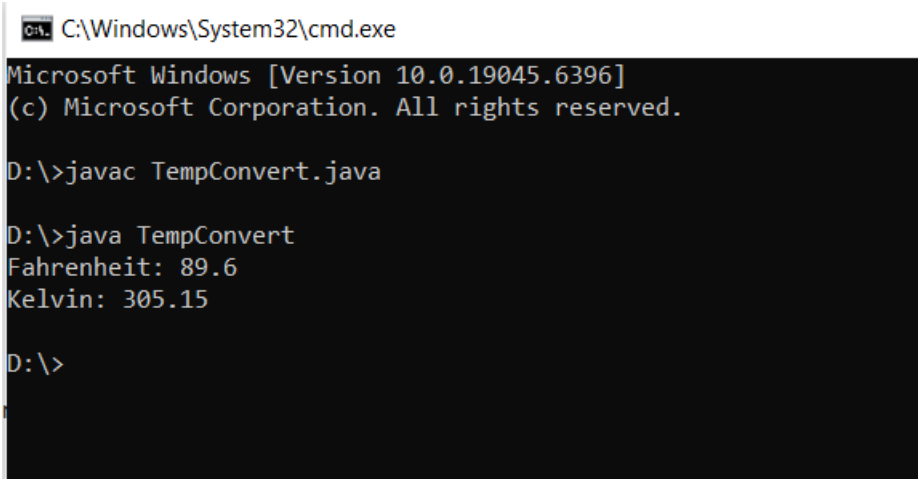
Answers:

Code

```
public class TempConvert {
    public static void main(String[] args) {
        double c = 32;
        double f = (9.0 / 5.0) * c + 32;
```

```
        double k = c + 273.15;
        System.out.println("Fahrenheit: " + f);
        System.out.println("Kelvin: " + k);
    }
}
```

Output:



Question no. 9:

Hassan has purchased a car by taking a loan of Rs. 1,200,000 from the bank. The loan is to be repaid in 5 years with an annual interest rate of 12%. Hassan wants to know his monthly installment amount so he can plan his expenses. The formula for calculating the monthly installment is Payment = (P × r) / (1 – (1 + r)^(-n)), where P is the loan amount, r is the monthly interest rate (annual rate divided by 12), and n is the total number of months. Create a program that calculates Hassan's monthly car loan installment.

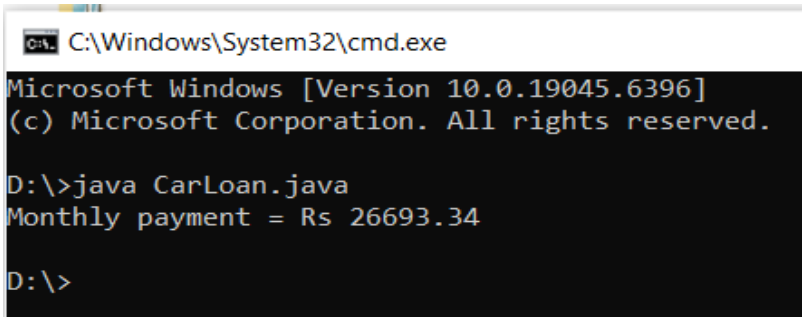
Answers:

Code

```
public class CarLoan {
    public static void main(String[] args) {
        double P = 1_200_000;
```

```
        double annualRate = 0.12;
        double r = annualRate / 12.0;
        int n = 5 * 12;
        double payment = (P * r) / (1 - Math.pow(1 + r, -n));
        System.out.printf("Monthly payment = Rs %.2f%n", payment);
    }
}
```

Output :



Question no. 10:

Research several car-pooling websites. Create an application that calculates your daily driving cost, so that you can estimate how much money could be saved by carpooling, which also has other advantages such as reducing carbon emissions and reducing traffic congestion. The application should input the following information and display the user's cost per day of driving to work: a) Total miles driven per day. b) Cost per gallon of gasoline. c) Average miles per gallon. d) Parking fees per day. e) Tolls per day.

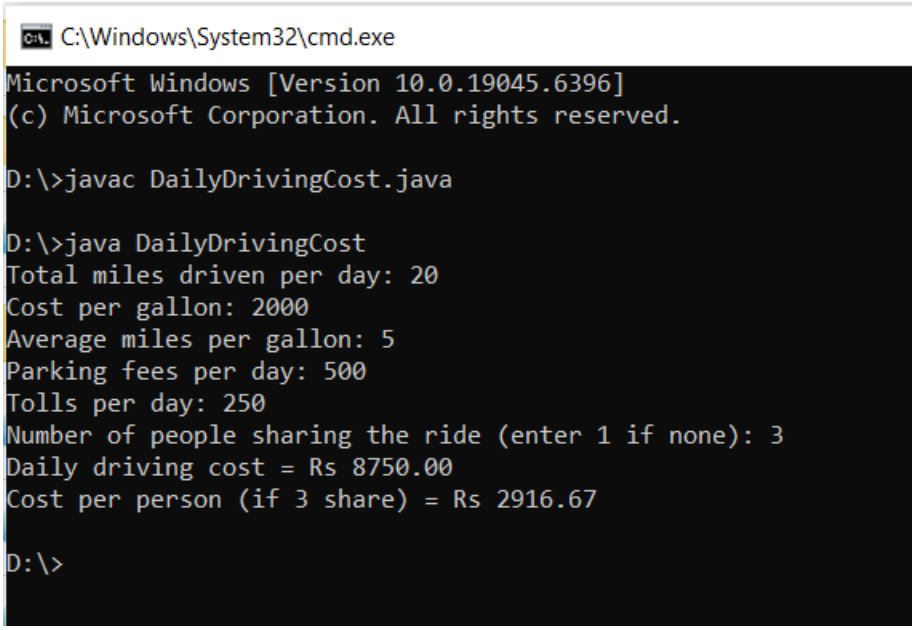
Answer:

Code

```
import java.util.Scanner;
public class DailyDrivingCost {
    public static void main(String[] args) {
```

```
        Scanner sc = new Scanner(System.in);
        System.out.print("Total miles driven per day: ");
        double miles = sc.nextDouble();
        System.out.print("Cost per gallon: ");
        double costPerGallon = sc.nextDouble();
        System.out.print("Average miles per gallon: ");
        double mpg = sc.nextDouble();
        System.out.print("Parking fees per day: ");
        double parking = sc.nextDouble();
        System.out.print("Tolls per day: ");
        double tolls = sc.nextDouble();
        System.out.print("Number of people sharing the ride (enter 1 if none): ");
        int people = sc.nextInt();

        double gallons = miles / mpg;
        double fuelCost = gallons * costPerGallon;
        double dailyCost = fuelCost + parking + tolls;
        double perPerson = dailyCost / people;

        System.out.printf("Daily driving cost = Rs %.2f%n", dailyCost);
        System.out.printf("Cost per person (if %d share) = Rs %.2f%n", people, perPerson);
    }
}
```

Results:



Question no.11:

Write an application that inputs one number consisting of five digits from the user and show the number in reverse order. Note the reverse order must also be a number. E.g. 93324 The reverse order number: 4 2 3 3 9

Answers:

Code

```
import java.util.Scanner;

public class ReverseFiveDigit {

   public static void main(String[] args) {

      Scanner sc = new Scanner(System.in);

      System.out.print("Enter a 5-digit number: ");

      int n = sc.nextInt();

      int original = n;


      int d1 = n % 10; n /= 10;

      int d2 = n % 10; n /= 10;
```

```
        int d3 = n % 10; n /= 10;
        int d4 = n % 10; n /= 10;
        int d5 = n % 10;

        int reversed = d1*10000 + d2*1000 + d3*100 + d4*10 + d5;

        System.out.println("Original: " + original);
        System.out.println("Reversed number: " + reversed);
    }
}
```

Result: