CSA0961-JAVA

JF 7_1 PRACTISE

1.Create a simple class Shape that will represent a 2-dimensional shape with line segments for edges. It should have the following instance variables: numSides (int), regular (boolean). Create at least two constructors and getter and setter methods.

```
package shapeclass;

public class Shape {

        // Instance variables

        private int numSides;

        private boolean regular;


        // Default constructor

        public Shape() {

            this.numSides = 0; // Default to 0 sides

            this.regular = false; // Default to irregular

        }


        // Parameterized constructor

        public Shape(int numSides, boolean regular) {

            this.numSides = numSides;

            this.regular = regular;

        }


        // Getter for numSides

        public int getNumSides() {

            return numSides;

        }


        // Setter for numSides

        public void setNumSides(int numSides) {

            this.numSides = numSides;

        }
```

```
    // Getter for regular
    public boolean isRegular() {
        return regular;
    }

    // Setter for regular
    public void setRegular(boolean regular) {
        this.regular = regular;
    }

    // Example method to display the shape's properties
    public void displayShapeInfo() {
        System.out.println("Number of sides: " + numSides);
        System.out.println("Is regular: " + regular);
    }

    // Main method to test the class
    public static void main(String[] args) {
        // Using default constructor
        Shape shape1 = new Shape();
        shape1.displayShapeInfo();

        // Using parameterized constructor
        Shape shape2 = new Shape(4, true);
        shape2.displayShapeInfo();

        // Modifying the shape using setters
        shape1.setNumSides(3);
        shape1.setRegular(true);
        shape1.displayShapeInfo();
    }
}
```

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```java
package shapeclass;
public class Shape {
        // Instance variables
        private int numSides;
        private boolean regular;

        // Default constructor
        public Shape() {
            this.numSides = 0; // Default to 0 sides
            this.regular = false; // Default to irregular
        }

        // Parameterized constructor
        public Shape(int numSides, boolean regular) {
            this.numSides = numSides;
            this.regular = regular;
        }

        // Getter for numSides
        public int getNumSides() {
            return numSides;
        }

        // Setter for numSides
        public void setNumSides(int numSides) {
            this.numSides = numSides;
        }

        // Getter for regular
```

```
<terminated> Shape [Java Application] C:\Users\maddi\.p2\pool\p
Number of sides: 0
Is regular: false
Number of sides: 4
Is regular: true
Number of sides: 3
Is regular: true
```

2. Identify the key parts of the Java Class below. Put asterisks next to all the instance variables. Place a box around each

constructor. Circle the signature of methods other than the constructor method. Place triangles around the parameters.

Underline the return types of methods.

public class Animal {

int weight, height;

double speed;

Animal() {

weight = 50;

height = 4;

speed = 2; //miles per hour

}

Animal(int w, int h, int s) {

```
weight = w;
h = height;
speed = s
}
public double getTime(double miles) { //gets the number of hours to go these
miles
return miles/speed;
}
public int getWeight() {
return weight;
}
public int getHeight() {
return height;
}
public double getSpeed() {
return speed;
}
}
```

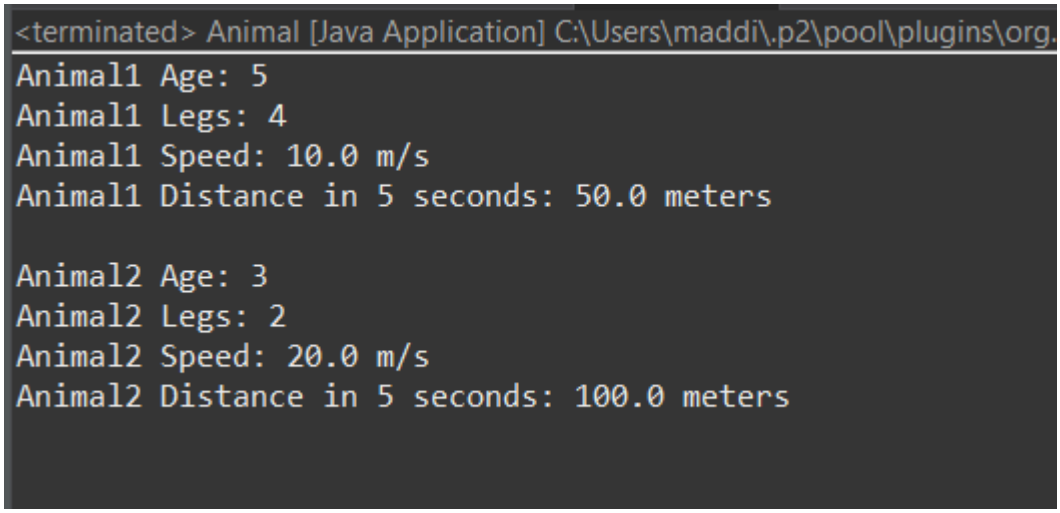
JAVA CODE:

```
package animal;

public class Animal {
        int age, legs;
        double speed;

        // Default constructor
        public Animal() {
            age = 5;
            legs = 4;
            speed = 10.0; // meters per second
        }
```

```
// Parameterized constructor
public Animal(int a, int l, double s) {
    age = a;
    legs = l;
    speed = s;
}

// Method to calculate distance
public double calculateDistance(double time) {
    return speed * time;
}

// Getter for age
public int getAge() {
    return age;
}

// Getter for legs
public int getLegs() {
    return legs;
}

// Getter for speed
public double getSpeed() {
    return speed;
}

// Main method to test the class
public static void main(String[] args) {
    // Creating an object using the default constructor
    Animal animal1 = new Animal();
    System.out.println("Animal1 Age: " + animal1.getAge());
```

```
        System.out.println("Animal1 Legs: " + animal1.getLegs());
        System.out.println("Animal1 Speed: " + animal1.getSpeed() + " m/s");
        System.out.println("Animal1 Distance in 5 seconds: " + animal1.calculateDistance(5) +
" meters");

        // Creating an object using the parameterized constructor
        Animal animal2 = new Animal(3, 2, 20.0);
        System.out.println("\nAnimal2 Age: " + animal2.getAge());
        System.out.println("Animal2 Legs: " + animal2.getLegs());
        System.out.println("Animal2 Speed: " + animal2.getSpeed() + " m/s");
        System.out.println("Animal2 Distance in 5 seconds: " + animal2.calculateDistance(5) +
" meters");
    }
}
```

```java
package animal;
public class Animal {
        int age, legs;
        double speed;

        // Default constructor
        public Animal() {
            age = 5;
            legs = 4;
            speed = 10.0; // meters per second
        }

        // Parameterized constructor
        public Animal(int a, int l, double s) {
            age = a;
            legs = l;
            speed = s;
        }

        // Method to calculate distance
        public double calculateDistance(double time) {
            return speed * time;
        }

        // Getter for age
        public int getAge() {
            return age;
        }

        // Getter for legs
        public int getLegs() {
            return legs;
        }
```



3. Write code to create two instances of the Animal class template listed in problem #2. Be sure to use each of the two constructors provided. Then add Java code that will print the following: a. Animal #1 has a speed of ___. b. Animal #2 has a speed of ___. Be sure that the blanks are automatically filled in with the actual speeds. Use the methods provided to access the speeds. package animalspeed;

```
public class Animal {
        int age, legs;
        double speed;

        // Default constructor
        public Animal() {
            age = 5;
            legs = 4;
            speed = 10.0; // meters per second
        }

        // Parameterized constructor
        public Animal(int a, int l, double s) {
            age = a;
            legs = l;
            speed = s;
        }

        // Getter for speed
        public double getSpeed() {
```

```
        return speed;
    }

    public static void main(String[] args) {
        // Creating the first instance using the default constructor
        Animal animal1 = new Animal();

        // Creating the second instance using the parameterized constructor
        Animal animal2 = new Animal(3, 2, 20.0);

        // Printing the speeds of both animals
        System.out.println("Animal #1 has a speed of " + animal1.getSpeed() + ".");
        System.out.println("Animal #2 has a speed of " + animal2.getSpeed() + ".");
    }
}
```

```java
package animalspeed;
public class Animal {
        int age, legs;
        double speed;

        // Default constructor
        public Animal() {
            age = 5;
            legs = 4;
            speed = 10.0; // meters per second
        }

        // Parameterized constructor
        public Animal(int a, int l, double s) {
            age = a;
            legs = l;
            speed = s;
        }

        // Getter for speed
        public double getSpeed() {
            return speed;
        }

        public static void main(String[] args) {
            // Creating the first instance using the default constructor
            Animal animal1 = new Animal();
```

```
<terminated> Animal (1) [Java Application] C:\Users\mac
Animal #1 has a speed of 10.0.
Animal #2 has a speed of 20.0.
```

4. Write a class Student. It should have the following instance variables for the name, credits, grade point average (GPA), and quality Points. Create a constructor method. Create two other methods as follows: a. A method that will return the current grade point average which will be the quality points divided by the credits. b. A method that will take in the credits for a class or semester along with the quality points. It should update the credits, the quality points, and the GPA.

```
package student;

public class Student {

    // Instance variables

    private String name;

    private int credits;

    private double gpa;

    private double qualityPoints;


    // Constructor

    public Student(String name, int credits, double qualityPoints) {
```

```
    this.name = name;
    this.credits = credits;
    this.qualityPoints = qualityPoints;
    this.gpa = calculateGPA();
}

// Method to calculate the GPA
public double calculateGPA() {
    if (credits == 0) {
        return 0.0; // To avoid division by zero
    }
    return qualityPoints / credits;
}

// Method to update credits, quality points, and GPA
public void updateRecord(int newCredits, double newQualityPoints) {
    credits += newCredits;
    qualityPoints += newQualityPoints;
    gpa = calculateGPA(); // Recalculate GPA after updating
}

// Method to return the current GPA
public double getGPA() {
    return gpa;
}

// Getter methods for other instance variables (optional)
public String getName() {
    return name;
}

public int getCredits() {
```

```
        return credits;
    }

    public double getQualityPoints() {
        return qualityPoints;
    }

    // Main method to test the class
    public static void main(String[] args) {
        // Create a Student object
        Student student = new Student("John Doe", 30, 120.0);

        // Print initial GPA
        System.out.println("Initial GPA: " + student.getGPA());

        // Update the student's record with new credits and quality points
        student.updateRecord(15, 45.0);

        // Print updated GPA
        System.out.println("Updated GPA: " + student.getGPA());
    }
}
```

```java
package student;
public class Student {
    // Instance variables
    private String name;
    private int credits;
    private double gpa;
    private double qualityPoints;

    // Constructor
    public Student(String name, int credits, double qualityPoints) {
        this.name = name;
        this.credits = credits;
        this.qualityPoints = qualityPoints;
        this.gpa = calculateGPA();
    }

    // Method to calculate the GPA
    public double calculateGPA() {
        if (credits == 0) {
            return 0.0; // To avoid division by zero
        }
        return qualityPoints / credits;
    }

    // Method to update credits, quality points, and GPA
    public void updateRecord(int newCredits, double newQualityPoints) {
        credits += newCredits;
        qualityPoints += newQualityPoints;
        gpa = calculateGPA(); // Recalculate GPA after updating
    }

    // Method to return the current GPA
    public double getGPA() {
        return gpa;
    }

    // Getter methods for other instance variables (optional)
    public String getName() {
```

```
<terminated> Student [Java Application] C:\Users\maddi\.p2\pool\pl
Initial GPA: 4.0
Updated GPA: 3.6666666666666665
```

5. Using the class you created in #4, create three instances of the Student Class from the table below: Name Credits Quality Points Mary Jones 14 46 John Stiner 60 173 Ari Samala 31 69.

package studentgpa;

public class Student {

// Instance variables

private String name;

private int credits;

private double gpa;

private double qualityPoints;

// Constructor

```
public Student(String name, int credits, double qualityPoints) {
    this.name = name;
    this.credits = credits;
    this.qualityPoints = qualityPoints;
    this.gpa = calculateGPA();
}

// Method to calculate the GPA
public double calculateGPA() {
    if (credits == 0) {
        return 0.0; // To avoid division by zero
    }
    return qualityPoints / credits;
}

// Method to update credits, quality points, and GPA
public void updateRecord(int newCredits, double newQualityPoints) {
    credits += newCredits;
    qualityPoints += newQualityPoints;
    gpa = calculateGPA(); // Recalculate GPA after updating
}

// Method to return the current GPA
public double getGPA() {
    return gpa;
}

// Getter methods for other instance variables
public String getName() {
    return name;
}
```

```
    public int getCredits() {
        return credits;
    }

    public double getQualityPoints() {
        return qualityPoints;
    }

    // Main method to test the class
    public static void main(String[] args) {
        // Create three instances of the Student class
        Student student1 = new Student("Mary Jones", 14, 46.0);
        Student student2 = new Student("John Stiner", 60, 173.0);
        Student student3 = new Student("Ari Samala", 31, 69.0);

        // Print the details of each student
        System.out.println(student1.getName() + " has a GPA of " + student1.getGPA());
        System.out.println(student2.getName() + " has a GPA of " + student2.getGPA());
        System.out.println(student3.getName() + " has a GPA of " + student3.getGPA());
    }
}
```

```java
package studentgpa;
public class Student {
        // Instance variables
        private String name;
        private int credits;
        private double gpa;
        private double qualityPoints;

        // Constructor
        public Student(String name, int credits, double qualityPoints) {
            this.name = name;
            this.credits = credits;
            this.qualityPoints = qualityPoints;
            this.gpa = calculateGPA();
        }

        // Method to calculate the GPA
        public double calculateGPA() {
            if (credits == 0) {
                return 0.0; // To avoid division by zero
            }
            return qualityPoints / credits;
        }

        // Method to update credits, quality points, and GPA
        public void updateRecord(int newCredits, double newQualityPoints) {
            credits += newCredits;
            qualityPoints += newQualityPoints;
            gpa = calculateGPA(); // Recalculate GPA after updating
        }

        // Method to return the current GPA
        public double getGPA() {
            return gpa;
        }

        // Getter methods for other instance variables
        public String getName() {
```

```
<terminated> Student (1) [Java Application] C:\Users\maddi\.p2\pool\plug
Mary Jones has a GPA of 3.2857142857142856
John Stiner has a GPA of 2.8833333333333333
Ari Samala has a GPA of 2.225806451612903
```

6. Using the instance variables created in #5, add 13 credits and 52 quality points to the student “Ari Samala”.

```
package gpa;

public class Student {

        // Instance variables

        private String name;

        private int credits;
```

```
private double gpa;
private double qualityPoints;

// Constructor
public Student(String name, int credits, double qualityPoints) {
    this.name = name;
    this.credits = credits;
    this.qualityPoints = qualityPoints;
    this.gpa = calculateGPA();
}

// Method to calculate the GPA
public double calculateGPA() {
    if (credits == 0) {
        return 0.0; // To avoid division by zero
    }
    return qualityPoints / credits;
}

// Method to update credits, quality points, and GPA
public void updateRecord(int newCredits, double newQualityPoints) {
    credits += newCredits;
    qualityPoints += newQualityPoints;
    gpa = calculateGPA(); // Recalculate GPA after updating
}

// Method to return the current GPA
public double getGPA() {
    return gpa;
}

// Getter methods for other instance variables
```

```
    public String getName() {
        return name;
    }

    public int getCredits() {
        return credits;
    }

    public double getQualityPoints() {
        return qualityPoints;
    }

    // Main method to test the class
    public static void main(String[] args) {
        // Create three instances of the Student class
        Student student1 = new Student("Mary Jones", 14, 46.0);
        Student student2 = new Student("John Stiner", 60, 173.0);
        Student student3 = new Student("Ari Samala", 31, 69.0);

        // Print the initial GPA of Ari Samala
        System.out.println("Initial GPA of " + student3.getName() + ": " + student3.getGPA());

        // Add 13 credits and 52 quality points to Ari Samala's record
        student3.updateRecord(13, 52.0);

        // Print the updated GPA of Ari Samala
        System.out.println("Updated GPA of " + student3.getName() + ": " +
student3.getGPA());
    }
}
```

```java
package gpa;
public class Student {
        // Instance variables
        private String name;
        private int credits;
        private double gpa;
        private double qualityPoints;

        // Constructor
        public Student(String name, int credits, double qualityPoints) {
            this.name = name;
            this.credits = credits;
            this.qualityPoints = qualityPoints;
            this.gpa = calculateGPA();
        }

        // Method to calculate the GPA
        public double calculateGPA() {
            if (credits == 0) {
                return 0.0; // To avoid division by zero
            }
            return qualityPoints / credits;
        }

        // Method to update credits, quality points, and GPA
        public void updateRecord(int newCredits, double newQualityPoints) {
            credits += newCredits;
            qualityPoints += newQualityPoints;
            gpa = calculateGPA(); // Recalculate GPA after updating
        }

        // Method to return the current GPA
        public double getGPA() {
            return gpa;
        }

        // Getter methods for other instance variables
        public String getName() {
```

```
<terminated> Student (2) [Java Application] C:\Users\maddi\.p2\pool\plugins\org
Initial GPA of Ari Samala: 2.225806451612903
Updated GPA of Ari Samala: 2.75
```

7. Using the Card class from the slides and test the program to make sure it works. Add a second random Card. Code is

included below:

public class Card{

String suit,name;

int points;

Card(int n1, int n2){

suit = getSuit(n1);

name = getName(n2);

points = getPoints(name);

```
}
public String toString(){
 return "The " + name + " of " + suit;
}
public String getName(int i){
if(i == 1) return "Ace";
if(i == 2) return "Two";
if(i == 3) return "Three";
if(i == 4) return "Four";
if(i == 5) return "Five";
if(i == 6) return "Six";
if(i == 7) return "Seven";
if(i == 8) return "Eight";
if(i == 9) return "Nine";
if(i == 10) return "Ten";
if(i == 11) return "Jack";
```



```
if(i == 12) return "Queen";
if(i == 13) return "King";
return "error";
}
public int getPoints(String n){
if(n == "Jack" ||n == "Queen" ||n == "King"||n == "Ten")
 return 10;
if(n == "Two")
 return 2;
if(n == "Three")
 return 3;
if(n == "Four")
 return 4;
if(n == "Five")
 return 5;
```

```
if(n == "Six")
 return 6;
if(n == "Seven")
 return 7;
if(n == "Eight")
 return 8;
if(n == "Nine")
 return 9;
if(n == "Ace")
 return 1;
return -1;
}
public String getSuit(int i){
if(i == 1) return "Diamonds";
if(i == 2) return "Clubs";
if(i == 3) return "Spades";
if(i == 4) return "Hearts";
return "error";
}
}
public class Main {
public static void main(String args[]){
 int suitNumber = (int)(Math.random()*4.0+1);
 int faceNumber = (int)(Math.random()*13.0+1);
 Card newCard = new Card(suitNumber,faceNumber);
 System.out.println(newCard);
 }
}
```

JAVA CODE:

```
package card;

public class Card {
```

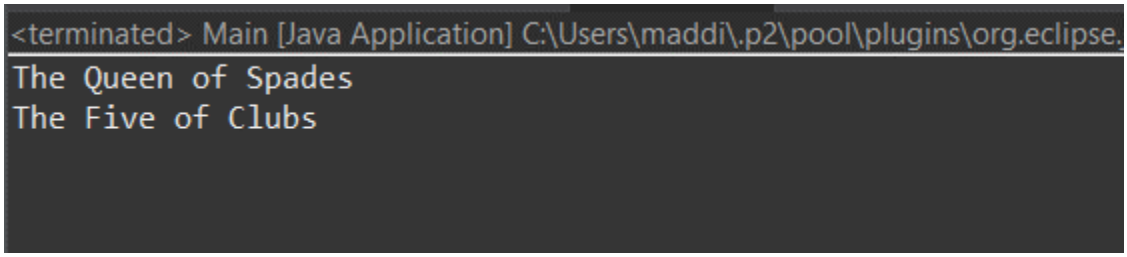
```
String suit, name;
int points;

// Constructor
public Card(int suitNumber, int faceNumber) {
    suit = getSuit(suitNumber);
    name = getName(faceNumber);
    points = getPoints(name);
}

// Method to get the string representation of the card
@Override
public String toString() {
    return "The " + name + " of " + suit;
}

// Method to get the name of the card based on face number
private String getName(int i) {
    switch (i) {
        case 1: return "Ace";
        case 2: return "Two";
        case 3: return "Three";
        case 4: return "Four";
        case 5: return "Five";
        case 6: return "Six";
        case 7: return "Seven";
        case 8: return "Eight";
        case 9: return "Nine";
        case 10: return "Ten";
        case 11: return "Jack";
        case 12: return "Queen";
        case 13: return "King";
```

```
        default: return "error";
    }
}

// Method to get the points of the card based on name
private int getPoints(String n) {
    switch (n) {
        case "Jack":
        case "Queen":
        case "King":
        case "Ten": return 10;
        case "Two": return 2;
        case "Three": return 3;
        case "Four": return 4;
        case "Five": return 5;
        case "Six": return 6;
        case "Seven": return 7;
        case "Eight": return 8;
        case "Nine": return 9;
        case "Ace": return 1;
        default: return -1;
    }
}

// Method to get the suit of the card based on suit number
private String getSuit(int i) {
    switch (i) {
        case 1: return "Diamonds";
        case 2: return "Clubs";
        case 3: return "Spades";
        case 4: return "Hearts";
        default: return "error";
```

```
        }
    }
}
package card;

public class Main {
    public static void main(String[] args) {
        // Generate random suit and face numbers
        int suitNumber1 = (int) (Math.random() * 4) + 1; // Values between 1 and 4
        int faceNumber1 = (int) (Math.random() * 13) + 1; // Values between 1 and 13
        int suitNumber2 = (int) (Math.random() * 4) + 1; // Values between 1 and 4
        int faceNumber2 = (int) (Math.random() * 13) + 1; // Values between 1 and 13

        // Create two random Card instances
        Card card1 = new Card(suitNumber1, faceNumber1);
        Card card2 = new Card(suitNumber2, faceNumber2);

        // Print the details of both cards
        System.out.println(card1);
        System.out.println(card2);
    }
}
```

```java
package card;
public class Card {
        String suit, name;
        int points;

        // Constructor
        public Card(int suitNumber, int faceNumber) {
            suit = getSuit(suitNumber);
            name = getName(faceNumber);
            points = getPoints(name);
        }

        // Method to get the string representation of the card
        @Override
        public String toString() {
            return "The " + name + " of " + suit;
        }

        // Method to get the name of the card based on face number
        private String getName(int i) {
            switch (i) {
                case 1: return "Ace";
                case 2: return "Two";
                case 3: return "Three";
                case 4: return "Four";
                case 5: return "Five";
                case 6: return "Six";
                case 7: return "Seven";
                case 8: return "Eight";
                case 9: return "Nine";
                case 10: return "Ten";
                case 11: return "Jack";
                case 12: return "Queen";
                case 13: return "King";
                default: return "error";
            }
        }

```

```java
package card;

public class Main {
        public static void main(String[] args) {
            // Generate random suit and face numbers
            int suitNumber1 = (int) (Math.random() * 4) + 1; // Values between 1 and 4
            int faceNumber1 = (int) (Math.random() * 13) + 1; // Values between 1 and 13
            int suitNumber2 = (int) (Math.random() * 4) + 1; // Values between 1 and 4
            int faceNumber2 = (int) (Math.random() * 13) + 1; // Values between 1 and 13

            // Create two random Card instances
            Card card1 = new Card(suitNumber1, faceNumber1);
            Card card2 = new Card(suitNumber2, faceNumber2);

            // Print the details of both cards
            System.out.println(card1);
            System.out.println(card2);
        }
    }
```



9. Add code to the Main class in exercise #7 to the following: a. Display the total point value for the two random cards. b. Ask the user if they would like another card. If they say yes display the new card and the points for all 3 cards in their "Hand". c. Loop to allow the user to continue to add cards to the hand until the number of points goes over 21 or the user decides not to add any more cards or the total number of cards is 5.

JAVA CODE:

```
package card;

import java.util.ArrayList;

import java.util.Scanner;

public class Main1 {

        public static void main(String[] args) {

            Scanner scanner = new Scanner(System.in);

            ArrayList<Card> hand = new ArrayList<>();

            int totalPoints = 0;

            final int MAX_CARDS = 5;


            // Add two random cards to the hand

            for (int i = 0; i < 2; i++) {

                int suitNumber = (int) (Math.random() * 4) + 1; // Values between 1 and 4

                int faceNumber = (int) (Math.random() * 13) + 1; // Values between 1 and 13

                Card card = new Card(suitNumber, faceNumber);

                hand.add(card);

                totalPoints += card.points;

            }


            // Display the initial hand

            System.out.println("Initial hand:");

            displayHand(hand);

            System.out.println("Total points: " + totalPoints);
```

```
    // Loop to add more cards until the conditions are met
    while (totalPoints <= 21 && hand.size() < MAX_CARDS) {
        System.out.println("Would you like another card? (yes/no)");
        String response = scanner.nextLine();

        if (response.equalsIgnoreCase("yes")) {
            int suitNumber = (int) (Math.random() * 4) + 1; // Values between 1 and 4
            int faceNumber = (int) (Math.random() * 13) + 1; // Values between 1 and 13
            Card card = new Card(suitNumber, faceNumber);
            hand.add(card);
            totalPoints += card.points;

            // Display the updated hand
            System.out.println("New card:");
            System.out.println(card);
            System.out.println("Updated hand:");
            displayHand(hand);
            System.out.println("Total points: " + totalPoints);

            if (totalPoints > 21) {
                System.out.println("You have gone over 21 points!");
                break;
            }
        } else {
            break;
        }
    }

    // Close the scanner
    scanner.close();
}
```

```
    // Method to display all cards in the hand
    private static void displayHand(ArrayList<Card> hand) {
        for (Card card : hand) {
            System.out.println(card);
        }
    }
}
```

```java
package card;
import java.util.ArrayList;
import java.util.Scanner;
public class Main1 {
        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            ArrayList<Card> hand = new ArrayList<>();
            int totalPoints = 0;
            final int MAX_CARDS = 5;

            // Add two random cards to the hand
            for (int i = 0; i < 2; i++) {
                int suitNumber = (int) (Math.random() * 4) + 1; // Values between 1 and 4
                int faceNumber = (int) (Math.random() * 13) + 1; // Values between 1 and 13
                Card card = new Card(suitNumber, faceNumber);
                hand.add(card);
                totalPoints += card.points;
            }

            // Display the initial hand
            System.out.println("Initial hand:");
            displayHand(hand);
            System.out.println("Total points: " + totalPoints);

            // Loop to add more cards until the conditions are met
            while (totalPoints <= 21 && hand.size() < MAX_CARDS) {
                System.out.println("Would you like another card? (yes/no)");
                String response = scanner.nextLine();

                if (response.equalsIgnoreCase("yes")) {
                    int suitNumber = (int) (Math.random() * 4) + 1; // Values between 1 and 4
                    int faceNumber = (int) (Math.random() * 13) + 1; // Values between 1 and 13
                    Card card = new Card(suitNumber, faceNumber);
                    hand.add(card);
                    totalPoints += card.points;

                    // Display the updated hand
                    System.out.println("New card:");
```

```
Problems  Javadoc  Declaration  Console
Main1 [Java Application] C:\Users\maddi\.p2\pool\plugins\org.ec
Initial hand:
The Three of Clubs
The Jack of Diamonds
Total points: 13
Would you like another card? (yes/no)
```