Trend.Nxt Core Java L1 Assignment

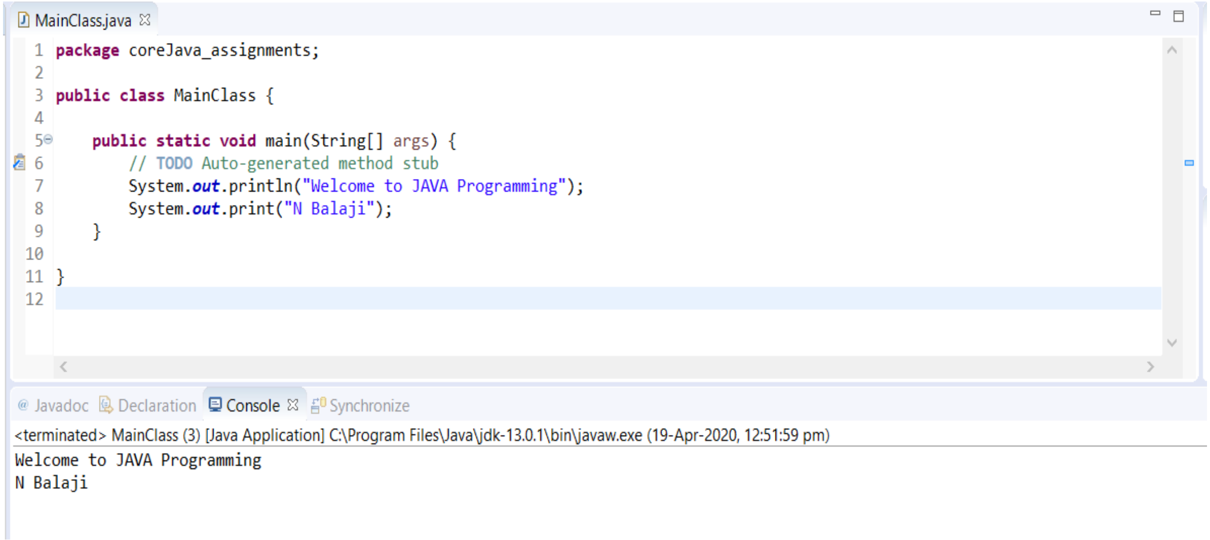
Topic 1: JVM Concepts and Language Basics

Assignment 1: Write a java program to display “Welcome to Java Programming” and then print your name on a separate line.

Program:

```
package coreJava_assignments;

public class MainClass {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		System.out.println("Welcome to JAVA Programming");
		System.out.print("N Balaji");
	}

}
```

Output:



```
package coreJava_assignments;

public class MainClass {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        System.out.println("Welcome to JAVA Programming");
        System.out.print("N Balaji");
    }

}

```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 12:51:59 pm)
Welcome to JAVA Programming
N Balaji
```

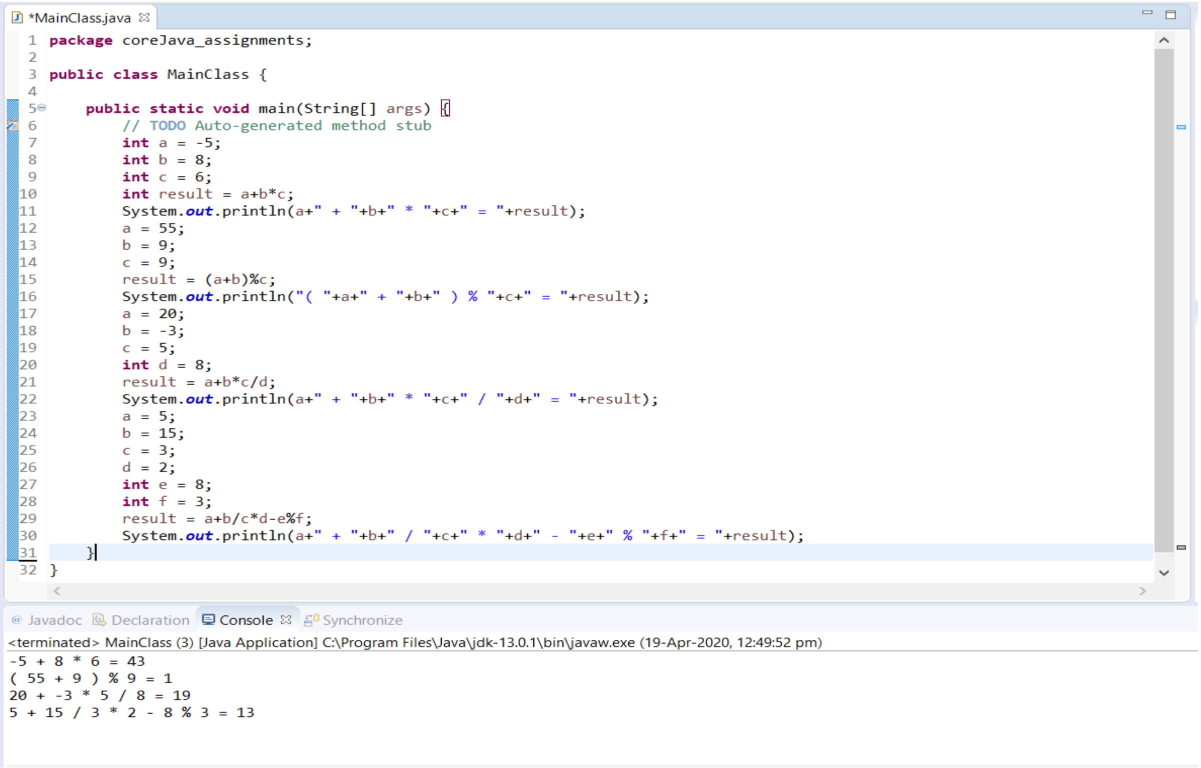
Assignment 2: Write a Java program to print the result of the following operations. Declare variables and initialize them with given values

a. -5 + 8 * 6
b. (55+9) % 9
c. 20 + -3*5 / 8
d. 5 + 15 / 3 * 2 - 8 % 3

Program:

```
package coreJava_assignments;

public class MainClass {

	public static void main(String[] args) {
        // TODO Auto-generated method stub
        int a = -5;
        int b = 8;
        int c = 6;
        int result = a+b*c;
        System.out.println(a+" + "+b+" * "+c+" = "+result);
        a = 55;
        b = 9;
        c = 9;
        result = (a+b)%c;
        System.out.println("( "+a+" + "+b+" ) % "+c+" = "+result);
        a = 20;
        b = -3;
        c = 5;
        int d = 8;
        result = a+b*c/d;
        System.out.println(a+" + "+b+" * "+c+" / "+d+" = "+result);
        a = 5;
        b = 15;
        c = 3;
        d = 2;
        int e = 8;
        int f = 3;
        result = a+b/c*d-e%f;
        System.out.println(a+" + "+b+" / "+c+" * "+d+" - "+e+" % "+f+" = 
"+result);
    }
}
```

Output:



```
package coreJava_assignments;

public class MainClass {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        int a = -5;
        int b = 8;
        int c = 6;
        int result = a+b*c;
        System.out.println(a+" + "+b+" * "+c+" = "+result);
        a = 55;
        b = 9;
        c = 9;
        result = (a+b)%c;
        System.out.println("( "+a+" + "+b+" ) % "+c+" = "+result);
        a = 20;
        b = -3;
        c = 5;
        int d = 8;
        result = a+b*c/d;
        System.out.println(a+" + "+b+" * "+c+" / "+d+" = "+result);
        a = 5;
        b = 15;
        c = 3;
        d = 2;
        int e = 8;
        int f = 3;
        result = a+b/c*d-e%f;
        System.out.println(a+" + "+b+" / "+c+" * "+d+" - "+e+" % "+f+" = "+result);
    }
}
```

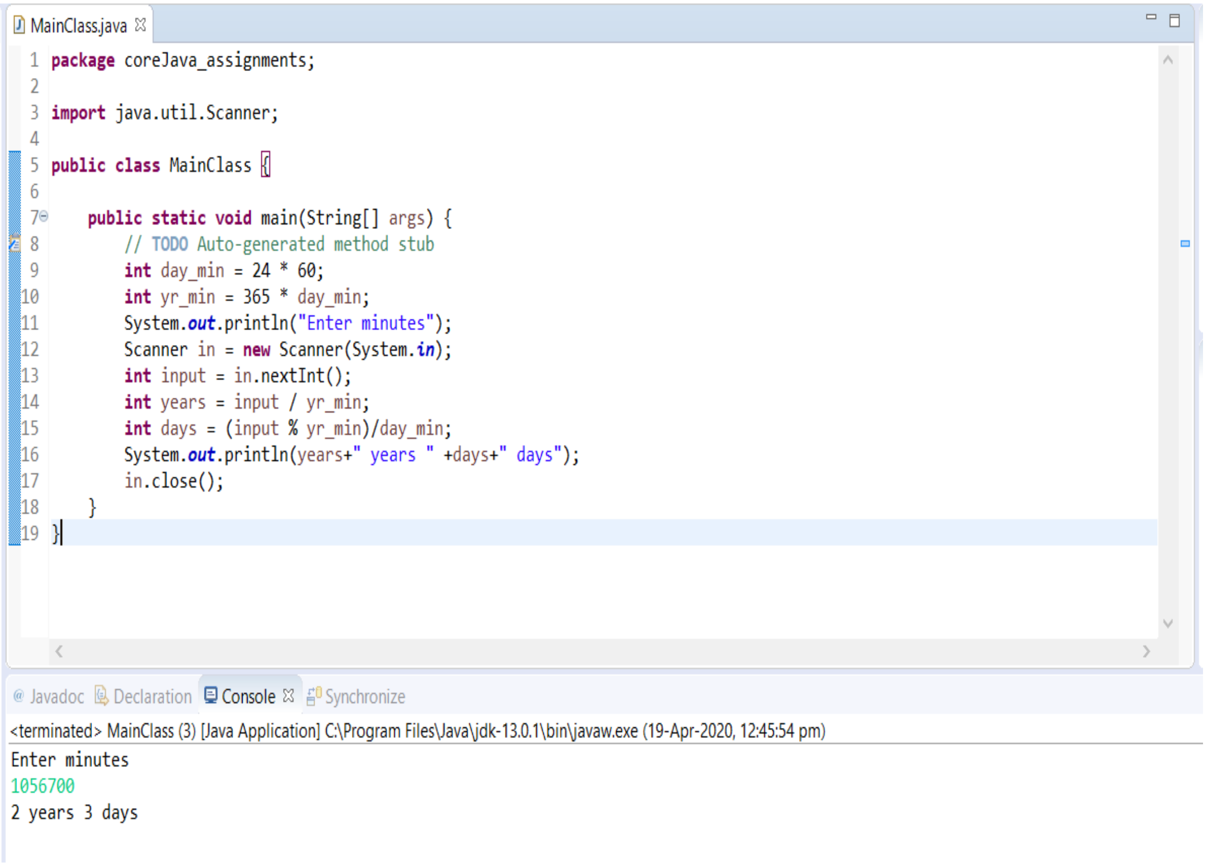
```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 12:49:52 pm)
-5 + 8 * 6 = 43
( 55 + 9 ) % 9 = 1
20 + -3 * 5 / 8 = 19
5 + 15 / 3 * 2 - 8 % 3 = 13
```

Assignment 3: Write a Java program to convert minutes into a number of years and days.

Program:

```java
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		int day_min = 24 * 60;
		int yr_min = 365 * day_min;
		System.out.println("Enter minutes");
		Scanner in = new Scanner(System.in);
		int input = in.nextInt();
		int years = input / yr_min;
		int days = (input % yr_min)/day_min;
		System.out.println(years+" years " +days+" days");
		in.close();
	}
}
```

Output:



```java
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		int day_min = 24 * 60;
		int yr_min = 365 * day_min;
		System.out.println("Enter minutes");
		Scanner in = new Scanner(System.in);
		int input = in.nextInt();
		int years = input / yr_min;
		int days = (input % yr_min)/day_min;
		System.out.println(years+" years " +days+" days");
		in.close();
	}
}
```

<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 12:45:54 pm)

```
Enter minutes
1056700
2 years 3 days
```

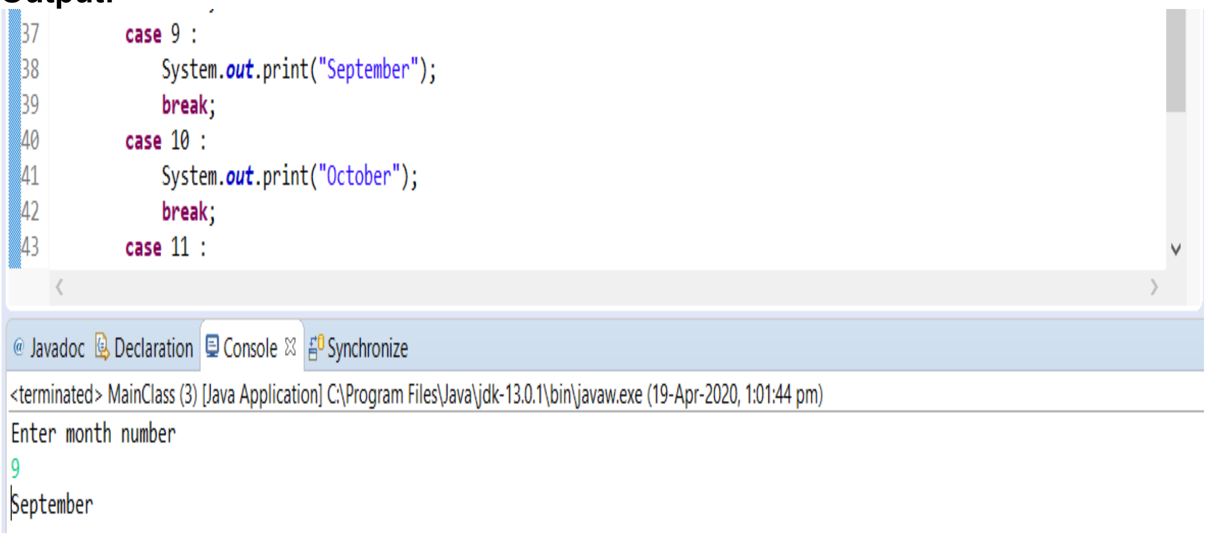
Assignment 4: Write a program to print month in words, based on input month in numbers. (using switch case)

Program:

```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {

        public static void main(String[] args) {
                // TODO Auto-generated method stub
                System.out.println("Enter month number");
                Scanner in = new Scanner(System.in);
                int input = in.nextInt();
                switch(input) {
                case 1 :
                        System.out.println("January");
                        break;
                case 2 :
                        System.out.print("February");
                        break;
                case 3 :
                        System.out.print("March");
                        break;
                case 4 :
                        System.out.print("April");
                        break;
                case 5 :
                        System.out.print("May");
                        break;
                case 6 :
                        System.out.print("June");
                        break;
                case 7 :
                        System.out.print("July");
                        break;
                case 8 :
                        System.out.print("August");
                        break;
                case 9 :
                        System.out.print("September");
                        break;
                case 10 :
                        System.out.print("October");
                        break;
                case 11 :
                        System.out.print("November");
                        break;
                case 12 :
```

```
            System.out.print("December");
            break;
        default :
            System.out.print("Invalid Month number");
        }
        in.close();
    }
}
```

Output:



```
        case 9 :
            System.out.print("September");
            break;
        case 10 :
            System.out.print("October");
            break;
        case 11 :
```

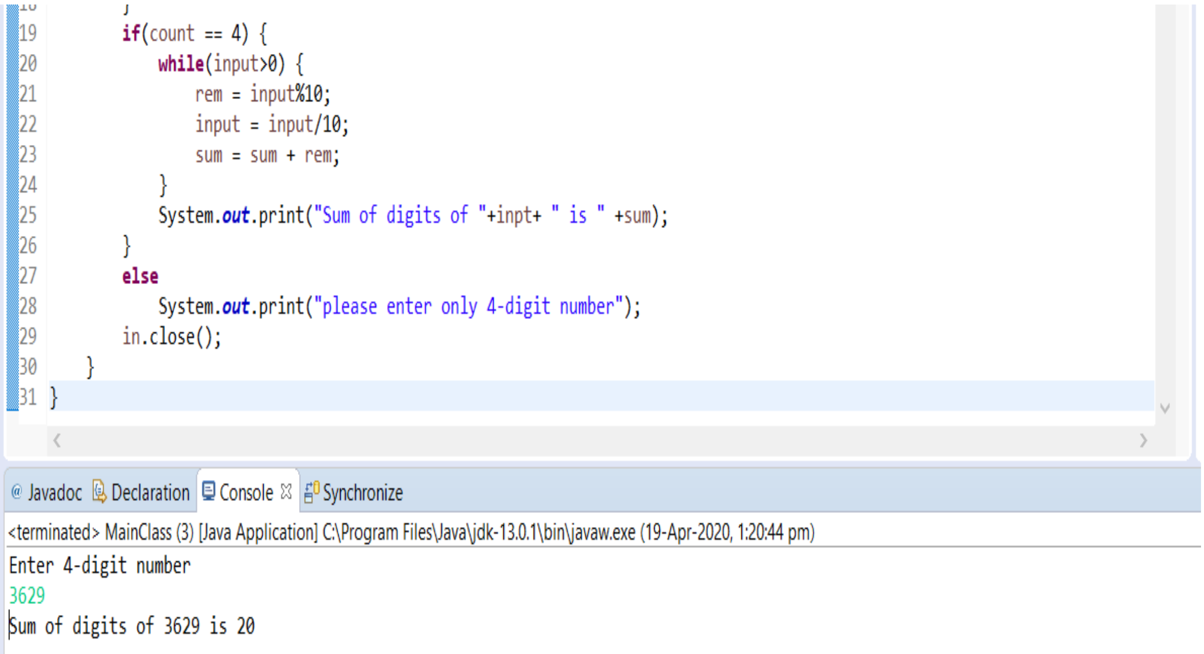
```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 1:01:44 pm)
Enter month number
9
September
```

Assignment 5: Write a program that will accept a 4-digit number (assume that the user enters only 4-digit nos.) and print the sum of all the 4 digits. For ex: If the number passed is 3629, the program should print “The sum of all the digits entered is 20”.

Program:

```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        System.out.println("Enter 4-digit number");
        Scanner in = new Scanner(System.in);
        int input = in.nextInt();
        int input_bkp = input;
        int inpt = input;
        int count = 0, sum = 0,rem;
        while(input_bkp > 0) {
            input_bkp=input_bkp/10;
            count++;
        }
        if(count == 4) {
            while(input>0) {
                rem = input%10;
                input = input/10;
                sum = sum + rem;
            }
            System.out.print("Sum of digits of "+inpt+ " is " +sum);
        }
        else
            System.out.print("please enter only 4-digit number");
        in.close();
    }
}
```

Output:



```
        if(count == 4) {
            while(input>0) {
                rem = input%10;
                input = input/10;
                sum = sum + rem;
            }
            System.out.print("Sum of digits of "+inpt+ " is " +sum);
        }
        else
            System.out.print("please enter only 4-digit number");
        in.close();
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 1:20:44 pm)
Enter 4-digit number
3629
Sum of digits of 3629 is 20
```

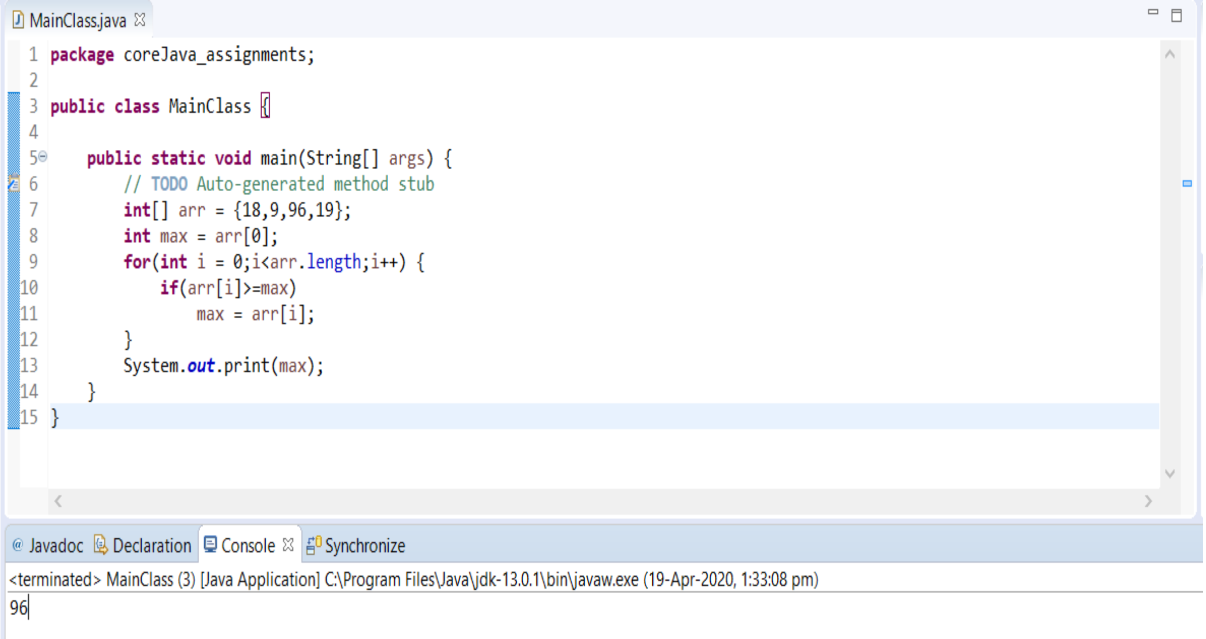
Assignment 6: Write a program to find greatest number in an array

Program:

```
package coreJava_assignments;

public class MainClass {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        int[] arr = {18,9,96,19};
        int max = arr[0];
        for(int i = 0;i<arr.length;i++) {
            if(arr[i]>=max)
                max = arr[i];
```

```
		}
		System.out.print(max);
	}
}
```

Output:



```
package coreJava_assignments;

public class MainClass {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        int[] arr = {18,9,96,19};
        int max = arr[0];
        for(int i = 0;i<arr.length;i++) {
            if(arr[i]>=max)
                max = arr[i];
        }
        System.out.print(max);
    }
}
```

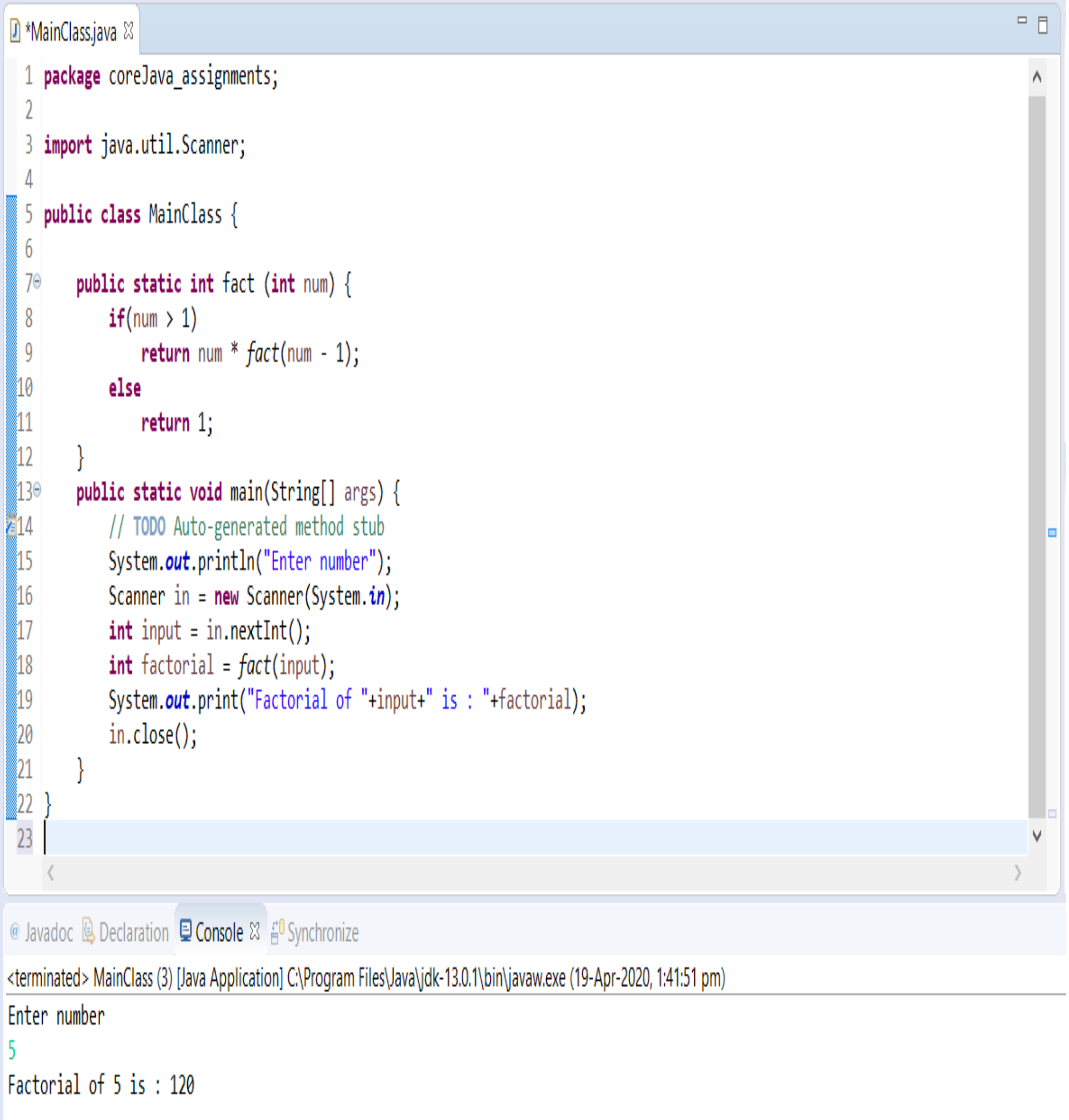
```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 1:33:08 pm)
96
```

Assignment 7: Write a Java program to calculate the factorial of a number without using any loop.

Program:

```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {

	public static int fact (int num) {
		if(num > 1)
			return num * fact(num - 1);
		else
			return 1;
	}
	public static void main(String[] args) {
		// TODO Auto-generated method stub
		System.out.println("Enter number");
		Scanner in = new Scanner(System.in);
		int input = in.nextInt();
		int factorial = fact(input);
		System.out.print("Factorial of "+input+" is : "+factorial);
		in.close();
	}
}
```

Output:



```java
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {

    public static int fact (int num) {
        if(num > 1)
            return num * fact(num - 1);
        else
            return 1;
    }
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        System.out.println("Enter number");
        Scanner in = new Scanner(System.in);
        int input = in.nextInt();
        int factorial = fact(input);
        System.out.print("Factorial of "+input+" is : "+factorial);
        in.close();
    }
}

```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 1:41:51 pm)
Enter number
5
Factorial of 5 is : 120
```

Topic 2: Object Oriented Concepts

Assignment 1: Write a program to create a class Book with the following
- attributes: -isbn, title, author, price
 - methods:
 i. Initialize the data members through parameterized constructor
 ii. displaydeta ils() to display the details of the book
 iii. discountedprice() : pass the discount percent, calculate the discount on price and find the amount to be paid after discount
 - task:
 Create an object book, initialize the book and display the details along with the discounted price

Program:

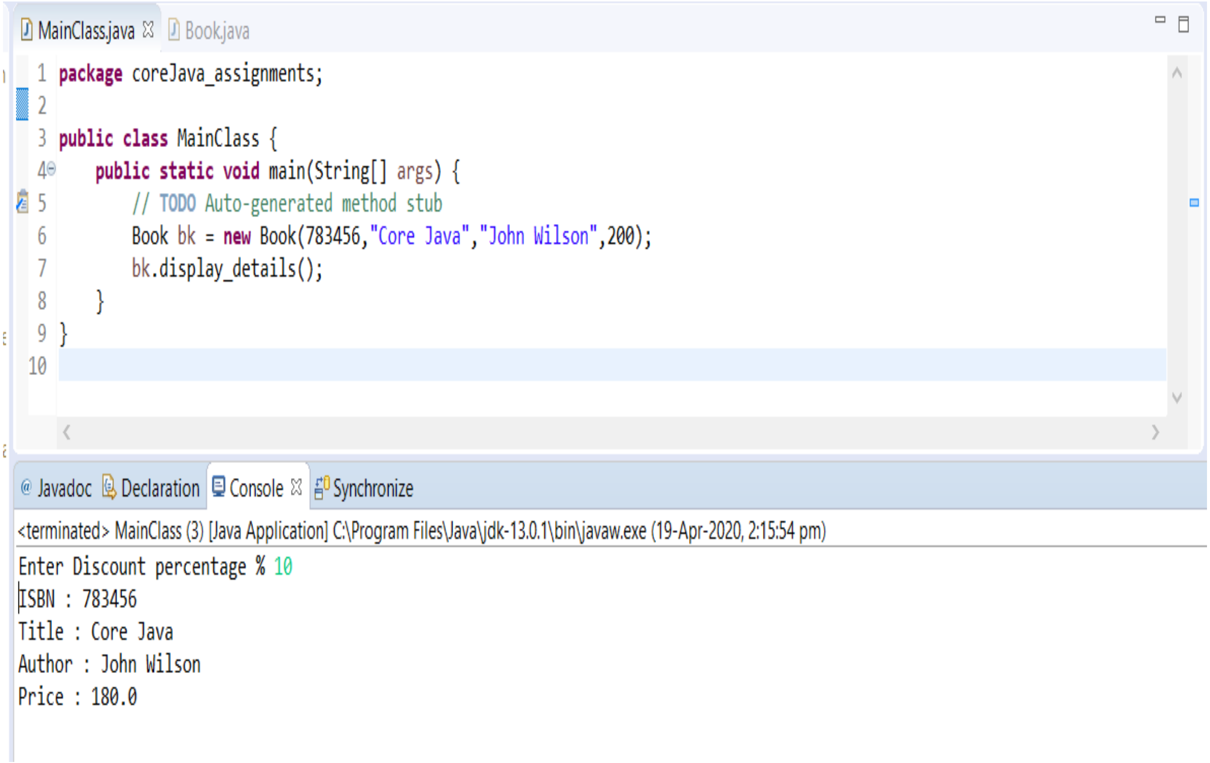
Book.java

```
package coreJava_assignments;

import java.util.Scanner;

public class Book {
        int isbn;
        String title,author;
        float price;
        /**
         * @param isbn
         * @param title
         * @param author
         * @param price
         */
        public Book(int isbn, String title, String author, float price) {
            this.isbn = isbn;
            this.title = title;
            this.author = author;
            this.price = price;
        }
        public void display_details() {
            this.price = discountedprice(price);
            System.out.println("ISBN : " +isbn);
            System.out.println("Title : " +title);
            System.out.println("Author : " +author);
            System.out.println("Price : " +price);
        }
        public float discountedprice(float price2) {
            // TODO Auto-generated method stub
            Scanner in = new Scanner(System.in);
            System.out.print("Enter Discount percentage %");
            float discnt = in.nextFloat();
            in.close();
            price2-=price2*(discnt/100);
            return price2;
        }
    }
```

MainClass.java

```
package coreJava_assignments;
public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Book bk = new Book(783456,"Core Java","John Wilson",200);
        bk.display_details();
    }
}
```

Output:



```
package coreJava_assignments;

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Book bk = new Book(783456,"Core Java","John Wilson",200);
        bk.display_details();
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 2:15:54 pm)
Enter Discount percentage % 10
ISBN : 783456
Title : Core Java
Author : John Wilson
Price : 180.0
```

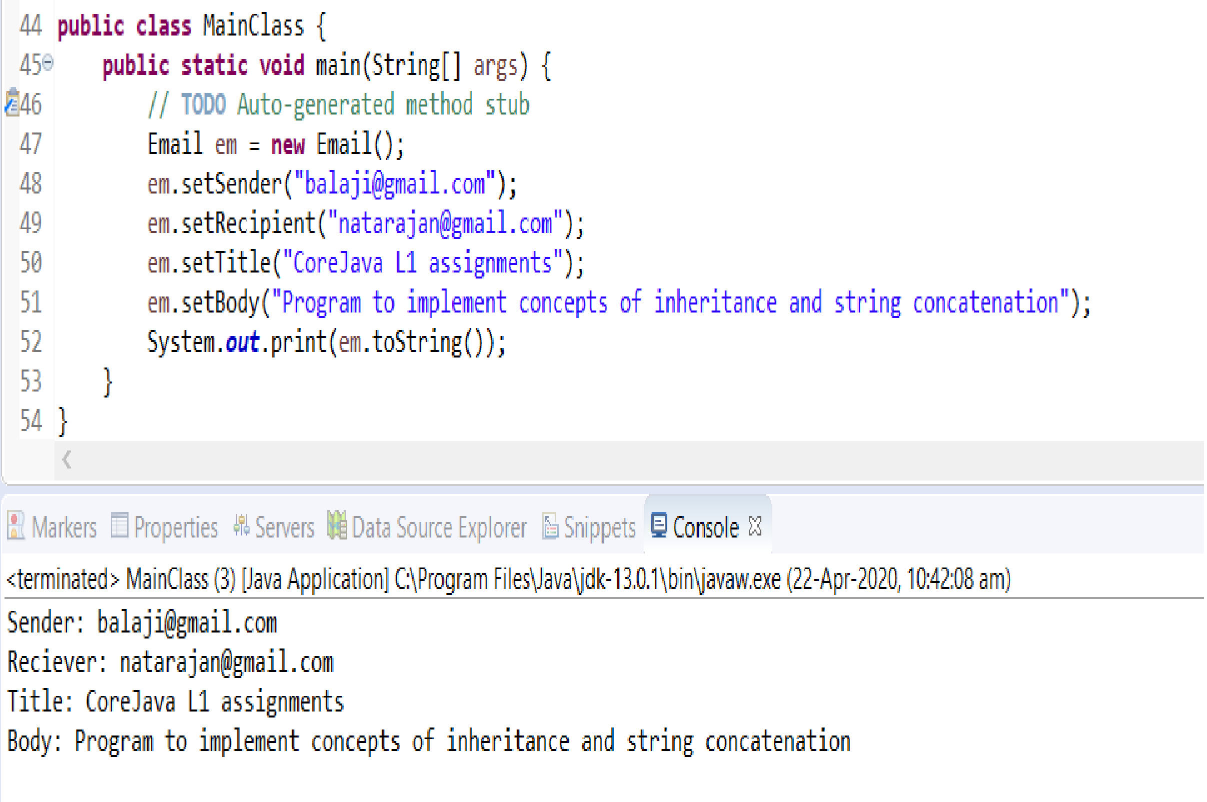
Assignment 2:
Define a class named Document that contains a member variable of type String named text that stores any textual content for the document. Create a method named toString that returns the text field and also include a method to set this value. Next, define a class for Email that is derived from Document and includes member variables for the sender, recipient, and title of an email message. Implement appropriate accessor and mutator methods. [An accessor is a member function that accesses the contents of an object but does not modify that object; eg: int getX(return x;)A mutator is a member function that can modify an object void setX(int x){this.x=x;}]The body of the email message should be stored in the inherited variable text. Redefine the toString method to concatenate all text fields

Program:

```
package coreJava_assignments;

class Document {
        String text;
        public String toString() {
                return text;
        }
        void setString(String str) {
                this.text=str;
        }
}
```

```
class Email extends Document {
        String sender,recipient,title,body;
        public String getSender() {
                return sender;
        }
        public void setSender(String sender) {
                this.sender = sender;
        }
        public String getRecipient() {
                return recipient;
        }
        public void setRecipient(String recipient) {
                this.recipient = recipient;
        }
        public String getTitle() {
                return title;
        }
        public void setTitle(String title) {
                this.title = title;
        }
        public String getBody() {
                return body;
        }
        public void setBody(String body) {
                setString(body);
        }
        public String toString() {
                return "Sender: "+getSender().concat("\nReciever: 
"+getRecipient()).concat("\nTitle: "+getTitle()).concat("\nBody: "+super.toString());
        }
}

public class MainClass {
        public static void main(String[] args) {
                // TODO Auto-generated method stub
                Email em = new Email();
                em.setSender("balaji@gmail.com");
                em.setRecipient("natarajan@gmail.com");
                em.setTitle("CoreJava L1 assignments");
                em.setBody("Program to implement concepts of inheritance and string 
concatenation");
                System.out.print(em.toString());
        }
}
```

Output:



```
public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Email em = new Email();
        em.setSender("balaji@gmail.com");
        em.setRecipient("natarajan@gmail.com");
        em.setTitle("CoreJava L1 assignments");
        em.setBody("Program to implement concepts of inheritance and string concatenation");
        System.out.print(em.toString());
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (22-Apr-2020, 10:42:08 am)
Sender: balaji@gmail.com
Reciever: natarajan@gmail.com
Title: CoreJava L1 assignments
Body: Program to implement concepts of inheritance and string concatenation
```

Assignment 3:
Write a program to create a class Book with the following data members: isbn, title and price. Inherit the class Book to two derived classes: Magazine and Novel with the following data members: Magazine: type Novel: author Populate the details using constructors. Create a magazine and Novel and display the details.

Program:
Book.java

```
package coreJava_assignments;

public class Book {
                int isbn;
                String title;
                int price;
                /**
                 * @param isbn
                 * @param title
                 * @param price
                 */
                public Book(int isbn, String title, int price) {
                        this.isbn = isbn;
                        this.title = title;
                        this.price = price;
                }
        }
```

Magazine.java

```
package coreJava_assignments;

public class Magazine extends Book {
    String type;
    public Magazine(int isbn, String title, String type, int price) {
        super(isbn, title, price);
        // TODO Auto-generated constructor stub
        this.type = type;
    }
    public void display() {
        System.out.println("ISBN : " +isbn);
        System.out.println("Title : " + title);
        System.out.println("Type : " +type);
        System.out.println("Price : " +price);
    }
}
```

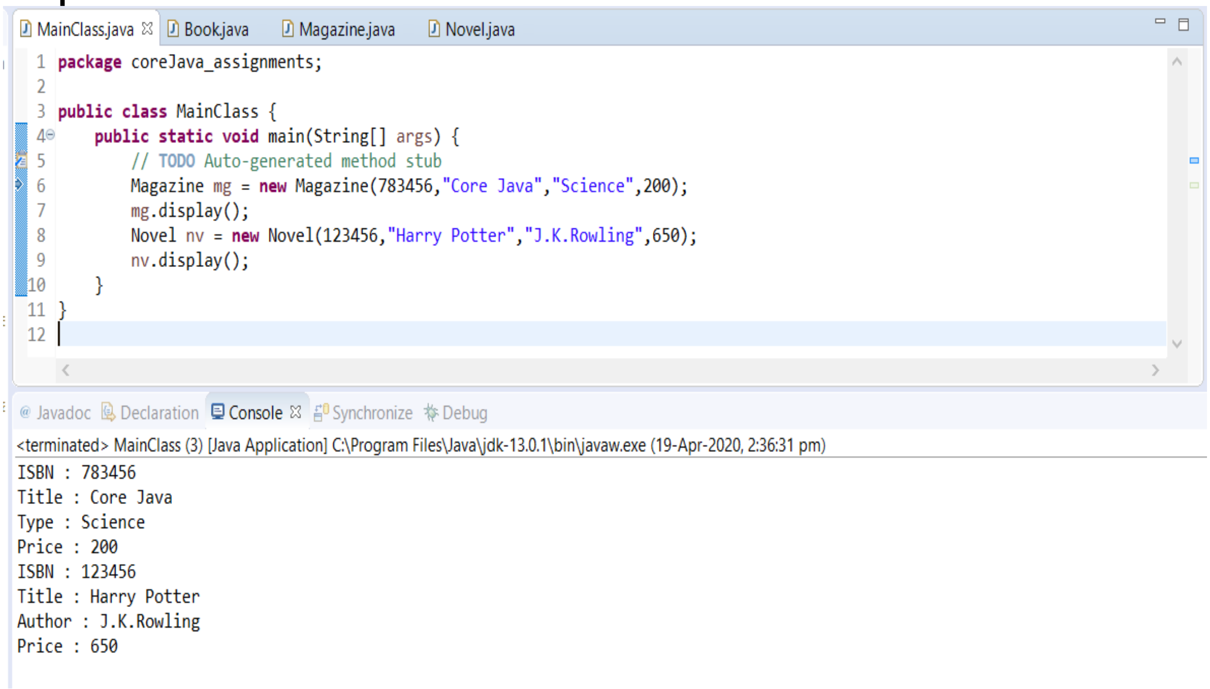
Novel.java

```
package coreJava_assignments;

public class Novel extends Book {
    String author;
    public Novel(int isbn, String title, String author, int price) {
        super(isbn, title, price);
        // TODO Auto-generated constructor stub
        this.author = author;
    }
    public void display() {
        System.out.println("ISBN : " +isbn);
        System.out.println("Title : " +title);
        System.out.println("Author : " +author);
        System.out.println("Price : " +price);
    }
}
```

MainClass.java

```
package coreJava_assignments;

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Magazine mg = new Magazine(783456,"Core Java","Science",200);
        mg.display();
        Novel nv = new Novel(123456,"Harry Potter","J.K.Rowling",650);
        nv.display();
    }
}
```

Output:



```
package coreJava_assignments;

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Magazine mg = new Magazine(783456,"Core Java","Science",200);
        mg.display();
        Novel nv = new Novel(123456,"Harry Potter","J.K.Rowling",650);
        nv.display();
    }
}

```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 2:36:31 pm)
ISBN : 783456
Title : Core Java
Type : Science
Price : 200
ISBN : 123456
Title : Harry Potter
Author : J.K.Rowling
Price : 650
```

Assignment 4:

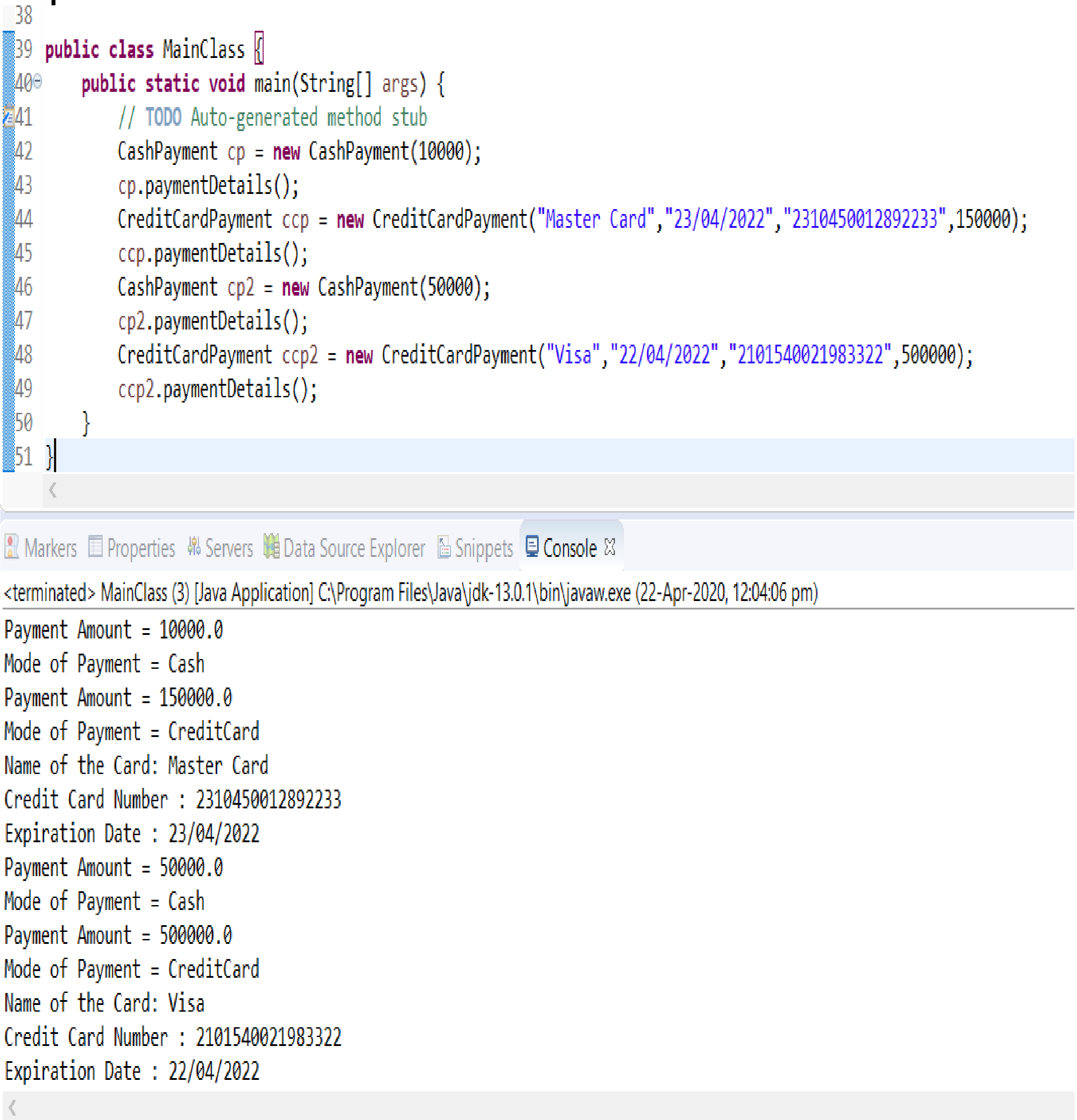
Define a class named Payment that contains a member variable of type double that stores the amount of the payment and appropriate accessor and mutator methods. Also create a method named paymentDetails that outputs an English sentence to describe the amount of the payment. Next, define a class named CashPayment that is derived from Payment. This class should redefine the paymentDetails method to indicate that the payment is in cash. Include appropriate constructor(s). Define a class named CreditCardPayment that is derived from Payment. This class should contain member variables for the name on the card, expiration date, and credit card number. Include appropriate constructor(s). Finally, redefine the paymentDetails method to include all credit card information in the printout. Create a main method that creates at least two CashPayment and two CreditCardPayment objects with different values and calls paymentDetails for each.

Program:

```
package coreJava_assignments;

class Payment {
        double amount;
        public double getAmount() {
                return amount;
        }
        void setAmount(double amount) {
                this.amount=amount;
        }
        void paymentDetails() {
                System.out.println("Payment Amount = "+getAmount());
        }
}
```

```
class CashPayment extends Payment {
    public CashPayment(double amount) {
        setAmount(amount);
    }
    void paymentDetails() {
        super.paymentDetails();
        System.out.println("Mode of Payment = Cash");
    }
}
class CreditCardPayment extends Payment {
    String name,expiration_date,credit_card_number;
    public CreditCardPayment(String name, String expiration_date, String
credit_card_number, double amount) {
        this.name = name;
        this.expiration_date = expiration_date;
        this.credit_card_number = credit_card_number;
        setAmount(amount);
    }
    void paymentDetails() {
        super.paymentDetails();
        System.out.println("Mode of Payment = CreditCard");
        System.out.println("Name of the Card: "+name+"\nCredit Card Number
: "+credit_card_number+"\nExpiration Date : "+expiration_date);
    }
}

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        CashPayment cp = new CashPayment(10000);
        cp.paymentDetails();
        CreditCardPayment ccp = new CreditCardPayment("Master
Card","23/04/2022","2310450012892233",150000);
        ccp.paymentDetails();
        CashPayment cp2 = new CashPayment(50000);
        cp2.paymentDetails();
        CreditCardPayment ccp2 = new
CreditCardPayment("Visa","22/04/2022","2101540021983322",500000);
        ccp2.paymentDetails();
    }
}
```

Output:



```java
public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        CashPayment cp = new CashPayment(10000);
        cp.paymentDetails();
        CreditCardPayment ccp = new CreditCardPayment("Master Card","23/04/2022","2310450012892233",150000);
        ccp.paymentDetails();
        CashPayment cp2 = new CashPayment(50000);
        cp2.paymentDetails();
        CreditCardPayment ccp2 = new CreditCardPayment("Visa","22/04/2022","2101540021983322",500000);
        ccp2.paymentDetails();
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (22-Apr-2020, 12:04:06 pm)
Payment Amount = 10000.0
Mode of Payment = Cash
Payment Amount = 150000.0
Mode of Payment = CreditCard
Name of the Card: Master Card
Credit Card Number : 2310450012892233
Expiration Date : 23/04/2022
Payment Amount = 50000.0
Mode of Payment = Cash
Payment Amount = 500000.0
Mode of Payment = CreditCard
Name of the Card: Visa
Credit Card Number : 2101540021983322
Expiration Date : 22/04/2022
```

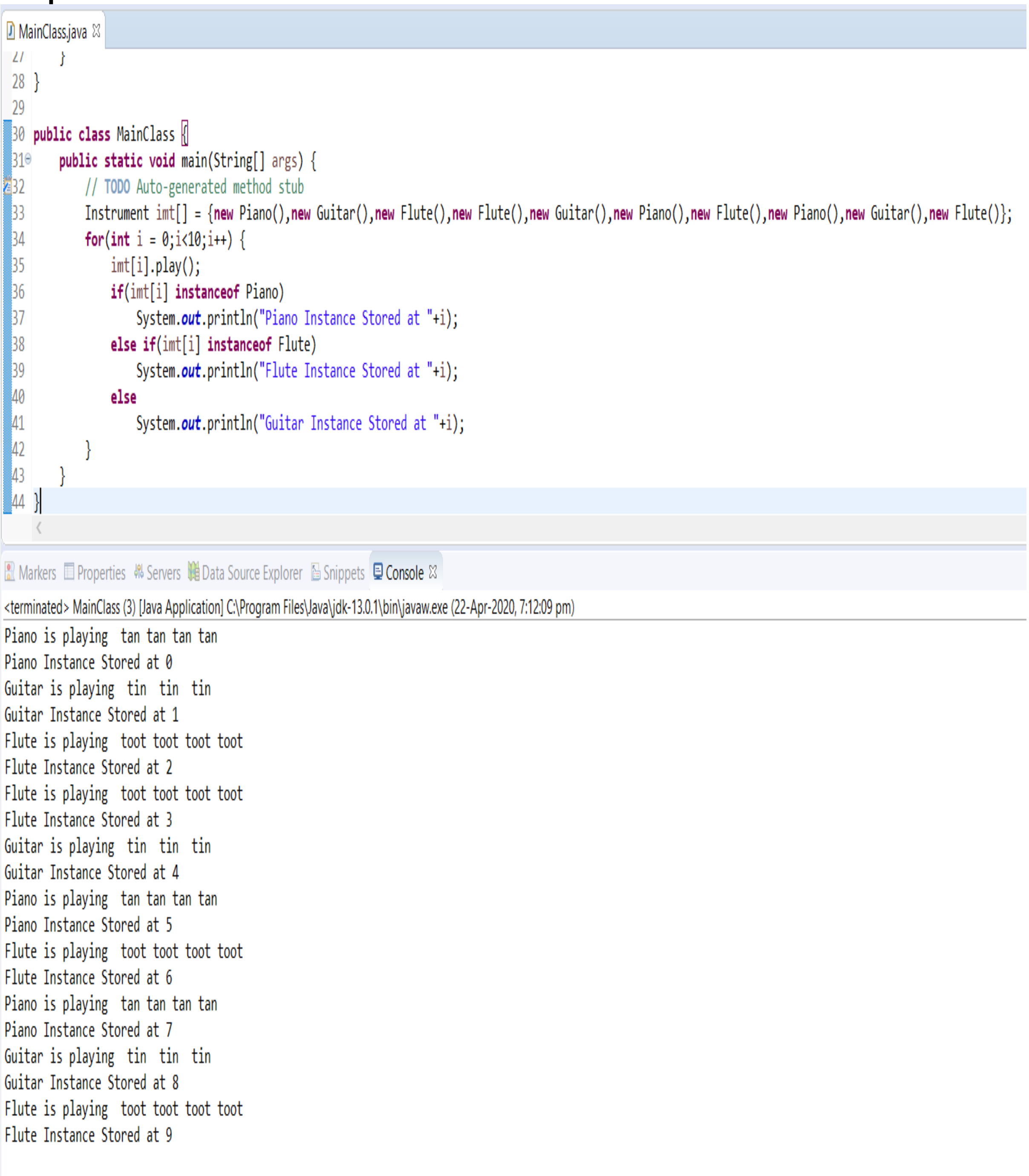
Assignment 5:

Create an abstract class Instrument which is having the abstract function play.
Create three more sub classes from Instrument which is Piano, Flute, Guitar.
Override the play method inside all three classes printing a message
“Piano is playing tan tan tan tan ” for Piano class “Flute is playing toot toot toot toot” for Flute class “Guitar is playing tin tin tin ” for Guitar class
You must not allow the user to declare an object of Instrument class.
Create an array of 10 Instruments.
Assign different type of instrument to Instrument reference.
Check for the polymorphic behavior of play method.
Use the instanceof operator to print that which object stored at which index of instrument array

Program:

```
package coreJava_assignments;

abstract class Instrument {
	abstract void play();
}
class Piano extends Instrument {

	@Override
	void play() {
		// TODO Auto-generated method stub
		System.out.println("Piano is playing  tan tan tan tan ");
	}

}
class Flute extends Instrument {
	@Override
	void play() {
		// TODO Auto-generated method stub
		System.out.println("Flute is playing  toot toot toot toot");
	}
}
class Guitar extends Instrument {
	@Override
	void play() {
		// TODO Auto-generated method stub
		System.out.println("Guitar is playing  tin  tin  tin" );
	}
}

public class MainClass {
	public static void main(String[] args) {
		// TODO Auto-generated method stub
		Instrument imt[] = {new Piano(),new Guitar(),new Flute(),new
Flute(),new Guitar(),new Piano(),new Flute(),new Piano(),new Guitar(),new Flute()};
		for(int i = 0;i<10;i++) {
			imt[i].play();
			if(imt[i] instanceof Piano)
				System.out.println("Piano Instance Stored at "+i);
			else if(imt[i] instanceof Flute)
				System.out.println("Flute Instance Stored at "+i);
			else
				System.out.println("Guitar Instance Stored at "+i);
		}
	}
}
```

Output:



```
    }
}

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Instrument imt[] = {new Piano(),new Guitar(),new Flute(),new Flute(),new Guitar(),new Piano(),new Flute(),new Piano(),new Guitar(),new Flute()};
        for(int i = 0;i<10;i++) {
            imt[i].play();
            if(imt[i] instanceof Piano)
                System.out.println("Piano Instance Stored at "+i);
            else if(imt[i] instanceof Flute)
                System.out.println("Flute Instance Stored at "+i);
            else
                System.out.println("Guitar Instance Stored at "+i);
        }
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (22-Apr-2020, 7:12:09 pm)
Piano is playing  tan tan tan tan
Piano Instance Stored at 0
Guitar is playing  tin  tin  tin
Guitar Instance Stored at 1
Flute is playing  toot toot toot toot
Flute Instance Stored at 2
Flute is playing  toot toot toot toot
Flute Instance Stored at 3
Guitar is playing  tin  tin  tin
Guitar Instance Stored at 4
Piano is playing  tan tan tan tan
Piano Instance Stored at 5
Flute is playing  toot toot toot toot
Flute Instance Stored at 6
Piano is playing  tan tan tan tan
Piano Instance Stored at 7
Guitar is playing  tin  tin  tin
Guitar Instance Stored at 8
Flute is playing  toot toot toot toot
Flute Instance Stored at 9
```

Assignment 6:

Write an interface called Playable, with a method void play(); Let this interface be placed in a package called music. Write a class called Veena which implements Playable interface. Let this class be placed in a package music.string Write a class called Saxophone which implements Playable interface. Let this class be placed in a package music.wind

Write another class Test in a package called live. Then,

a. Create an instance of Veena and call play() method

b. Create an instance of Saxophone and call play() method

c. Place the above instances in a variable of type Playable and then call play()

Program:

Playable.java

```
package music;

public interface Playable {
	 void play();
}
```

Veena.java

```
package music.string;

import music.Playable;

public class Veena implements Playable {

	public Veena() {
		// TODO Auto-generated constructor stub
	}

	public void play() {
		System.out.println("Veena");
	}
}
```

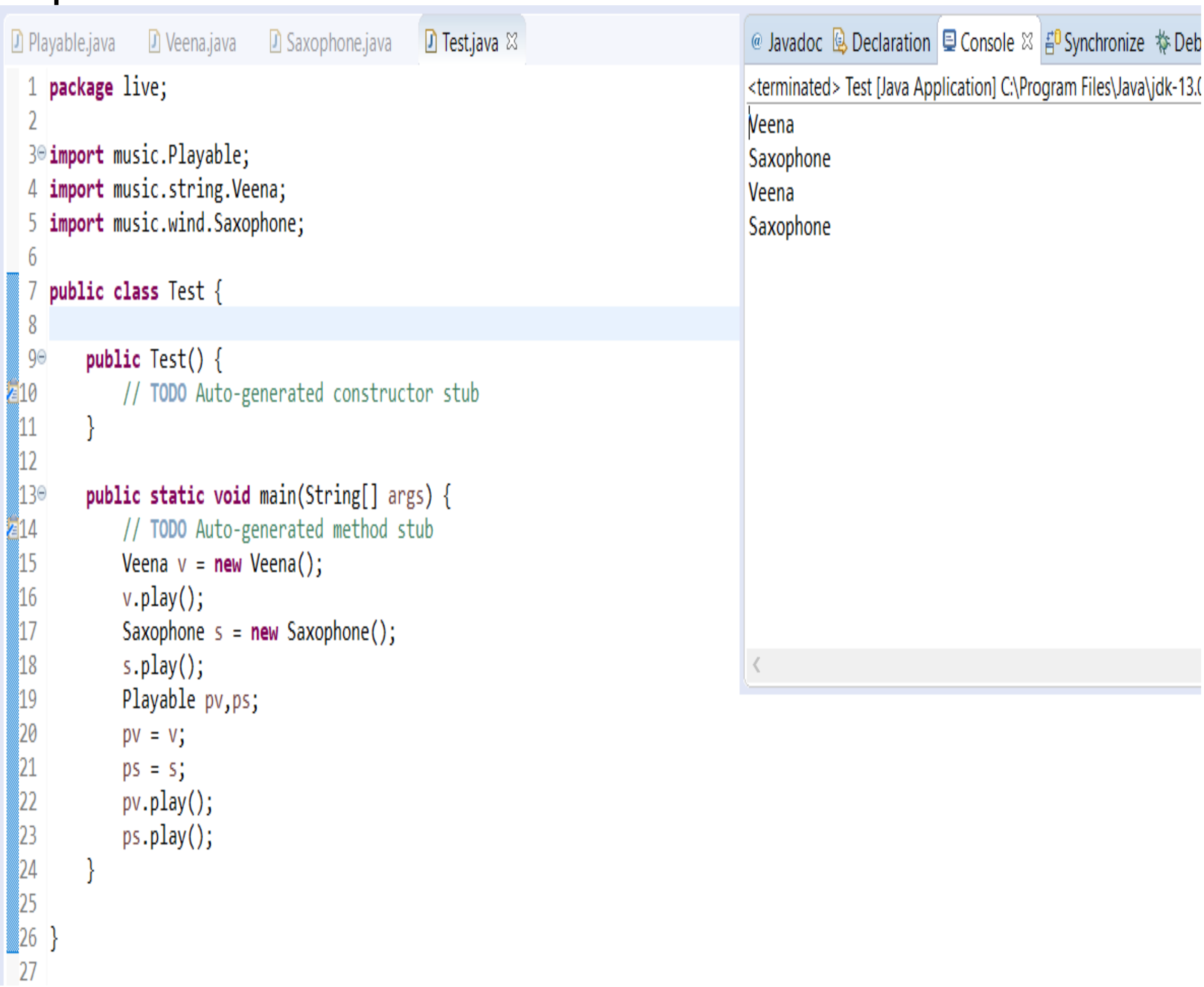
Saxophone.java

```
package music.wind;

import music.Playable;

public class Saxophone implements Playable {

	public Saxophone() {
		// TODO Auto-generated constructor stub
	}

	public void play() {
		// TODO Auto-generated method stub
	System.out.println("Saxophone");
	}
}
```

Test.java

```
package live;

import music.Playable;
import music.string.Veena;
import music.wind.Saxophone;

public class Test {
	public Test() {
		// TODO Auto-generated constructor stub
	}

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		Veena v = new Veena();
		v.play();
		Saxophone s = new Saxophone();
		s.play();
		Playable pv,ps;
		pv = v;
		ps = s;
		pv.play();
		ps.play();
	}

}
```

Output:



```
package live;

import music.Playable;
import music.string.Veena;
import music.wind.Saxophone;

public class Test {

    public Test() {
        // TODO Auto-generated constructor stub
    }

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Veena v = new Veena();
        v.play();
        Saxophone s = new Saxophone();
        s.play();
        Playable pv,ps;
        pv = v;
        ps = s;
        pv.play();
        ps.play();
    }

}
```

```
<terminated> Test [Java Application] C:\Program Files\Java\jdk-13.(
Veena
Saxophone
Veena
Saxophone
```

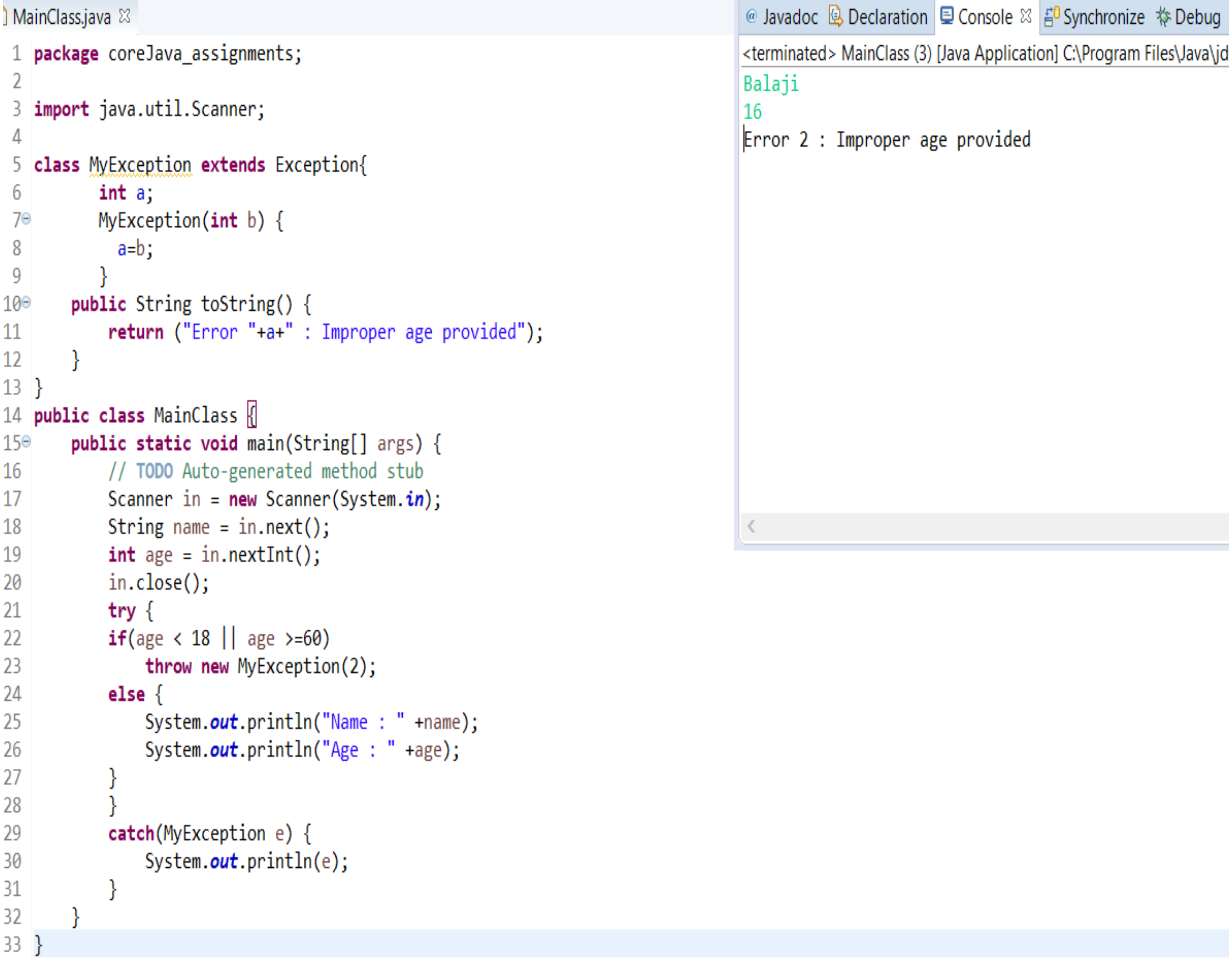
Topic 3: Exceptions, String Concepts

Assignment 1:
Write a program to accept name and age of a person from the command prompt(passed as arguments when you execute the class) and ensure that the age entered is >=18 and < 60. Display proper error messages. The program must exit gracefully after displaying the error message in case the arguments passed are not proper. (Hint : Create a user defined exception class for handling errors.)

Program:

```
package coreJava_assignments;

import java.util.Scanner;

class MyException extends Exception{
     int a;
     MyException(int b) {
      a=b;
     }
    public String toString() {
        return ("Error "+a+" : Improper age provided");
    }
}
public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Scanner in = new Scanner(System.in);
        String name = in.next();
        int age = in.nextInt();
        in.close();
        try {
        if(age < 18 || age >=60)
            throw new MyException(2);
        else {
            System.out.println("Name : " +name);
            System.out.println("Age : " +age);
        }
        }
        catch(MyException e) {
            System.out.println(e);
        }
    }
}
```

Output:



```
package coreJava_assignments;

import java.util.Scanner;

class MyException extends Exception{
        int a;
        MyException(int b) {
          a=b;
        }
    public String toString() {
        return ("Error "+a+" : Improper age provided");
    }
}
public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Scanner in = new Scanner(System.in);
        String name = in.next();
        int age = in.nextInt();
        in.close();
        try {
        if(age < 18 || age >=60)
            throw new MyException(2);
        else {
            System.out.println("Name : " +name);
            System.out.println("Age : " +age);
        }
        }
        catch(MyException e) {
            System.out.println(e);
        }
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jd
Balaji
16
Error 2 : Improper age provided
```

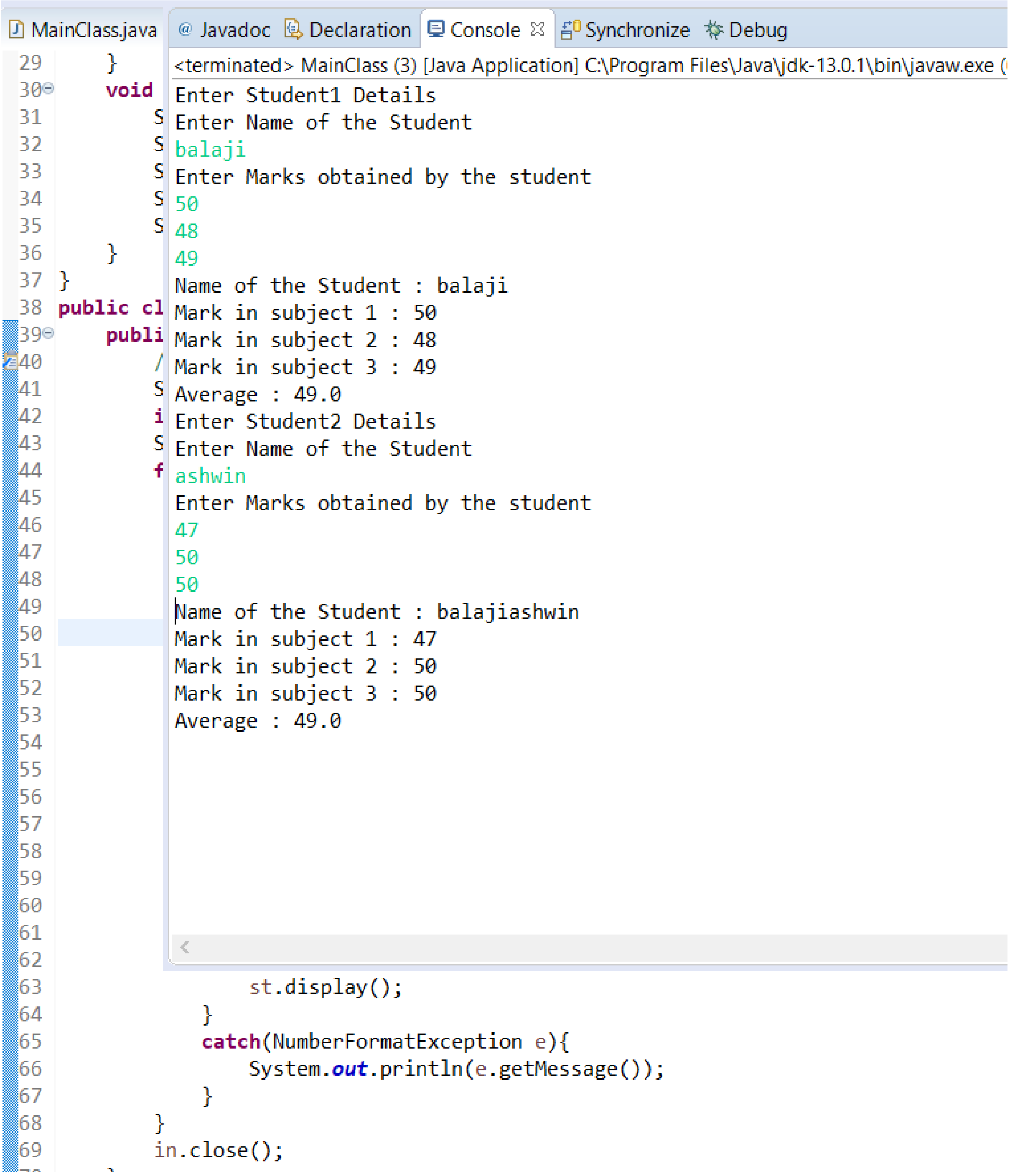
Assignment 2:
Write a Program to take care of Number Format Exception if user enters values other that integer for calculating average marks of 2 students. The name of the students and marks in 3 subjects are passed as arguments while executing the program.

Program:

```
package coreJava_assignments;

import java.util.Scanner;

class Student {
        StringBuilder name;
        int m1,m2,m3;
        float avg;
        public Student(StringBuilder name,int m1,int m2,int m3) {
                setName(name);
                setM1(m1);
                setM2(m2);
                setM3(m3);
        }
```

```java
    void setName(StringBuilder name) {
        this.name = name;
    }
    void setM1(int m1) {
        this.m1 = m1;
    }
    void setM2(int m2) {
        this.m2 = m2;
    }
    void setM3(int m3) {
        this.m3 = m3;
    }
    float calc_avg(int m1,int m2,int m3) {
        return (m1+m2+m3)/3;
    }
    void display() {
        System.out.println("Name of the Student : "+name);
        System.out.println("Mark in subject 1 : "+m1);
        System.out.println("Mark in subject 2 : "+m2);
        System.out.println("Mark in subject 3 : "+m3);
        System.out.println("Average : "+calc_avg(m1,m2,m3));
    }
}
public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Scanner in = new Scanner(System.in);
        int m1,m2,m3;
        StringBuilder name = new StringBuilder();
        for( int i = 0; i<2; i++) {
            try {
                System.out.println("Enter Student" +(i+1)+" Details");
                System.out.println("Enter Name of the Student");
                name.append(in.next());
                System.out.println("Enter Marks obtained by the
student");
                if (in.hasNextInt())
                    m1 = in.nextInt();
                else
                    throw new NumberFormatException();
                if (in.hasNextInt())
                    m2 = in.nextInt();
                else
                    throw new NumberFormatException();
                if (in.hasNextInt())
                    m3 = in.nextInt();
                else
                    throw new NumberFormatException();
                Student st = new Student(name,m1,m2,m3);
                st.display();
            }
            catch(NumberFormatException e){
                System.out.println(e.getMessage());
                break;
            }
        }
        in.close();
    }
}
```

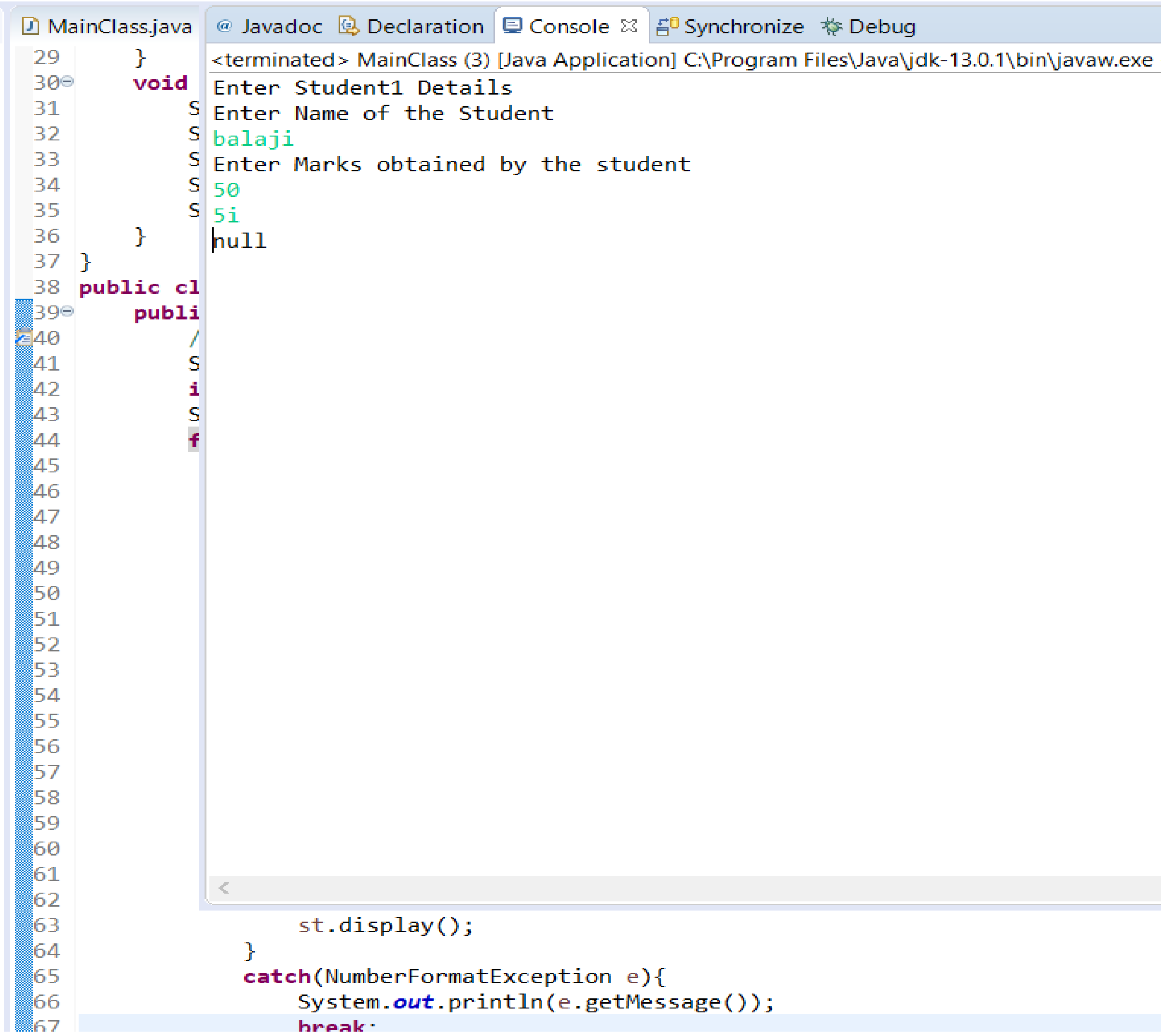
Output:



<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (

```
Enter Student1 Details
Enter Name of the Student
balaji
Enter Marks obtained by the student
50
48
49
Name of the Student : balaji
Mark in subject 1 : 50
Mark in subject 2 : 48
Mark in subject 3 : 49
Average : 49.0
Enter Student2 Details
Enter Name of the Student
ashwin
Enter Marks obtained by the student
47
50
50
Name of the Student : balajiashwin
Mark in subject 1 : 47
Mark in subject 2 : 50
Mark in subject 3 : 50
Average : 49.0
```

```
            st.display();
        }
        catch(NumberFormatException e){
            System.out.println(e.getMessage());
        }
    }
    in.close();
```



```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe
Enter Student1 Details
Enter Name of the Student
balaji
Enter Marks obtained by the student
50
5i
null
```

```
    }
    void
        S
        S
        S
        S
        S
    }
}
public cl
    publi
        /
        S
        i
        S
        f
```

```
            st.display();
        }
        catch(NumberFormatException e){
            System.out.println(e.getMessage());
            break;
```

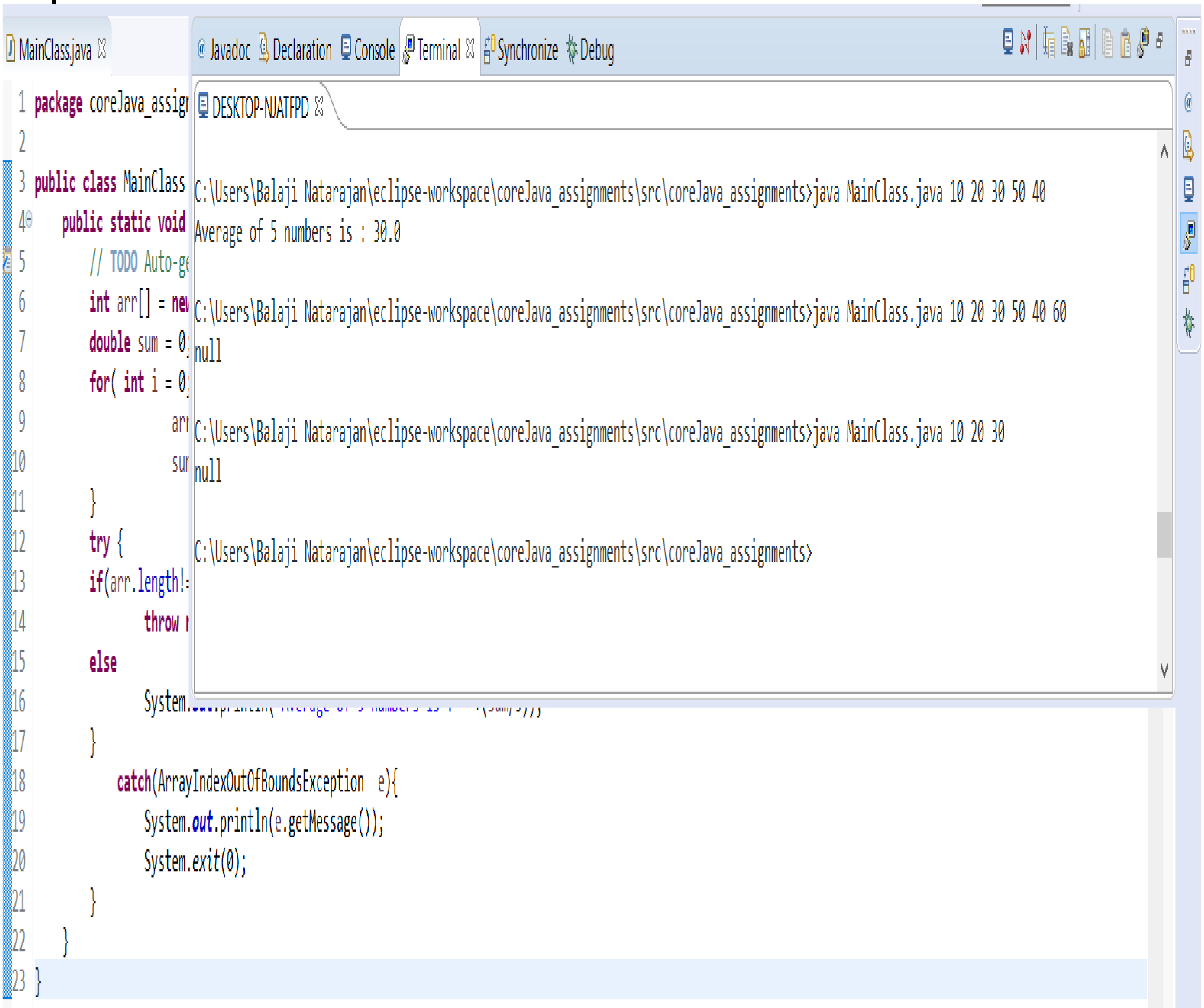
Assignment 3:
Write a program to accept 5 integers passed as arguments while executing the class. Find the average of these 5 nos. Use ArrayIndexOutofBounds exception to handle situation where the user might have entered less than 5 integers.

Program:

```
package coreJava_assignments;

public class MainClass {
	public static void main(String[] args) {
		// TODO Auto-generated method stub
		int arr[] = new int[args.length];
		double sum = 0;
		for( int i = 0; i<args.length; i++) {
					arr[i] = Integer.parseInt(args[i]);
					sum+=arr[i];
		}
```

```
                try {
                if(arr.length!=5)
                                throw new ArrayIndexOutOfBoundsException();
                else
                                System.out.println("Average of 5 numbers is : "
+(sum/5));
                }
                        catch(ArrayIndexOutOfBoundsException  e){
                                System.out.println(e.getMessage());
                                System.exit(0);
                }
        }
}
```

Output:



```
C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>java MainClass.java 10 20 30 50 40
Average of 5 numbers is : 30.0

C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>java MainClass.java 10 20 30 50 40 60
null

C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>java MainClass.java 10 20 30
null

C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>
```

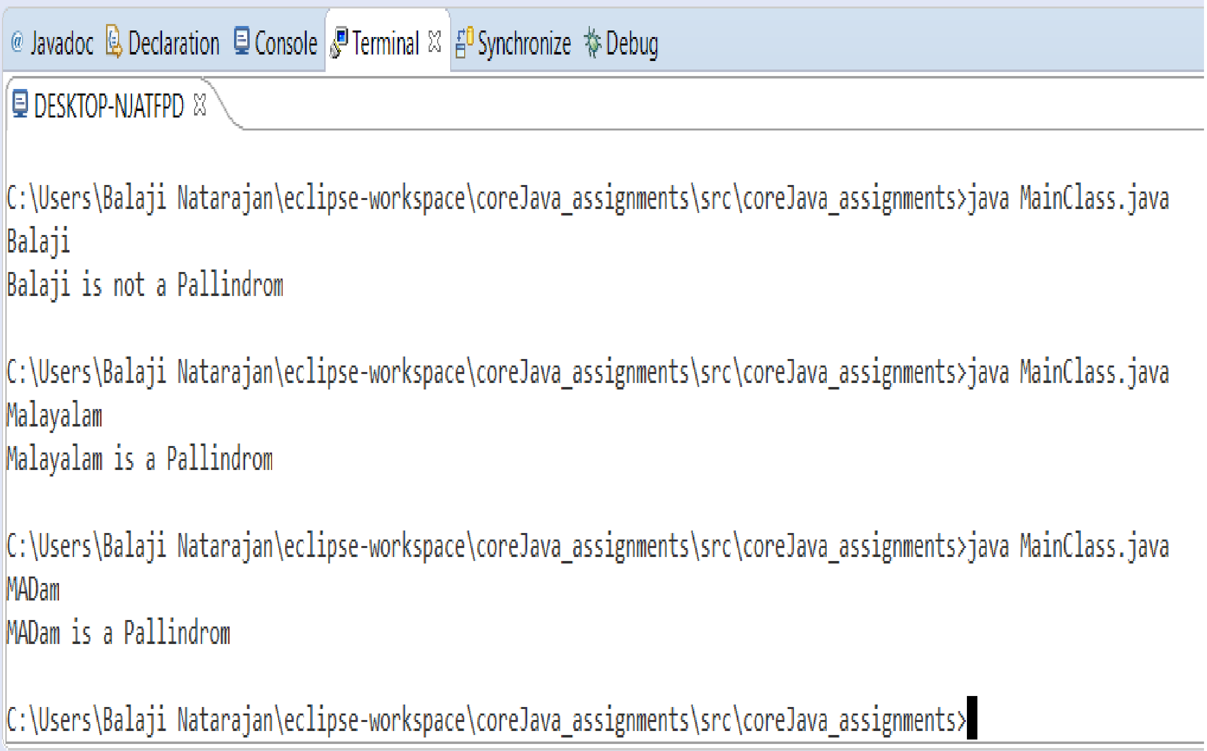
```
package coreJava_assig
public class MainClass
    public static void
        // TODO Auto-g
        int arr[] = ne
        double sum = 0
        for( int i = 0
                ar
                su
        }
        try {
        if(arr.length!=
                throw
        else
                System.
        }
            catch(ArrayIndexOutOfBoundsException  e){
                System.out.println(e.getMessage());
                System.exit(0);
        }
    }
}
```

Assignment 4:
Write a program to check whether the given string is a palindrome or not.

Program:

```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {
        public static void main(String[] args) {
                // TODO Auto-generated method stub
                Scanner in = new Scanner(System.in);
                String str1 = in.next();
                int l1 = str1.length();
                int flag=0;
                for (int i = 0; i<(l1-1); i++,l1-- ) {

        if(Character.toLowerCase(str1.charAt(i))!=Character.toLowerCase(str1.charAt
(l1-1)))
                                flag=1;
                }
                if(flag == 0 )
                        System.out.println(str1+" is a Pallindrom");
                else
                        System.out.println(str1+" is not a Pallindrom");
                in.close();
        }
}
```

Ouput:



```
C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>java MainClass.java
Balaji
Balaji is not a Pallindrom

C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>java MainClass.java
Malayalam
Malayalam is a Pallindrom

C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>java MainClass.java
MADam
MADam is a Pallindrom

C:\Users\Balaji Natarajan\eclipse-workspace\coreJava_assignments\src\coreJava_assignments>
```

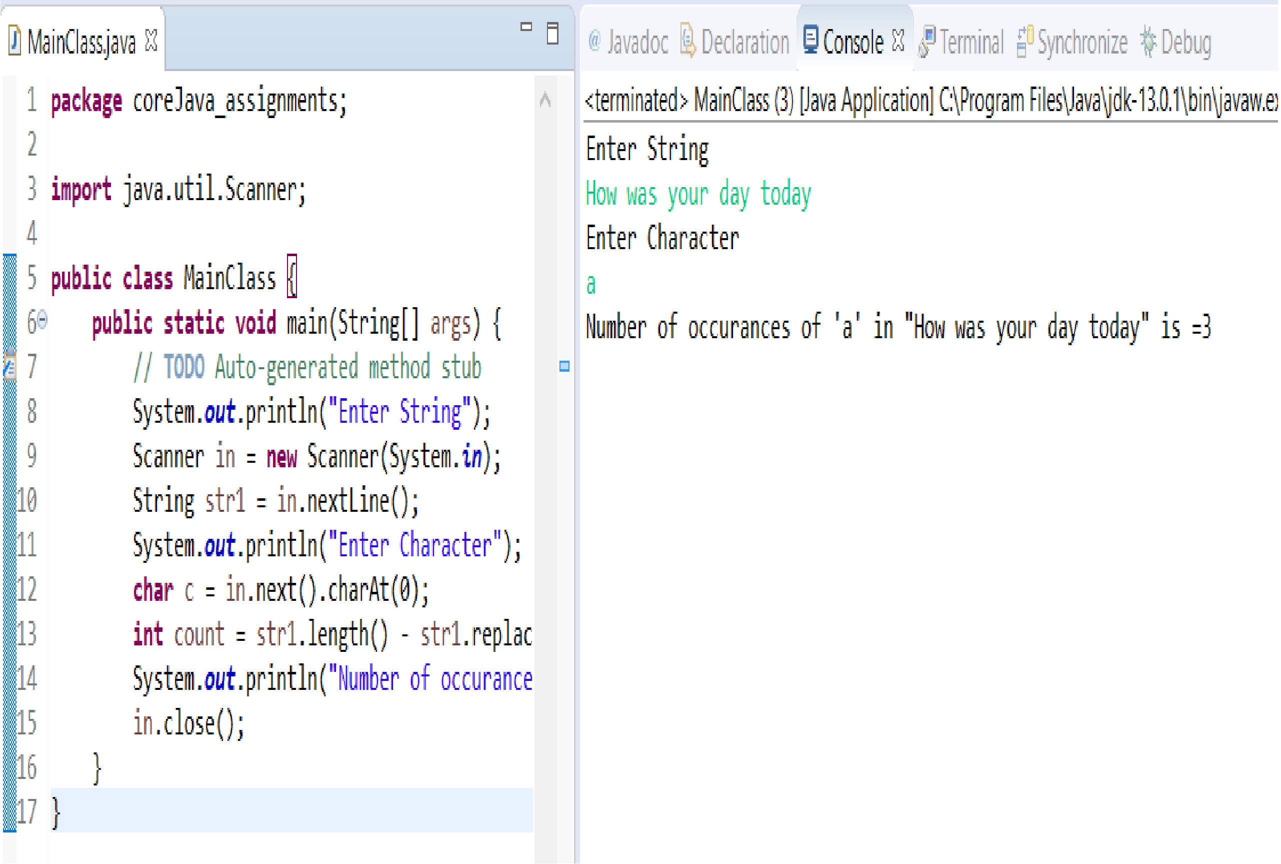
Assignment 5:

Write a program to check the no.of occurrences of a given character within the given string without using any loop. [Hint: String str=”How was your day today”; char c=’a’; no.of occurrences of a is=3]

Program:

```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {
        public static void main(String[] args) {
                // TODO Auto-generated method stub
                System.out.println("Enter String");
                Scanner in = new Scanner(System.in);
                String str1 = in.nextLine();
                System.out.println("Enter Character");
                char c = in.next().charAt(0);
                int count = str1.length() - str1.replace(Character.toString(c),"").length();
      System.out.println("Number of occurances of \'"+c+"\' in \""+str1+"\" is
="+count);
                in.close();
        }
}
```

Output:



```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        System.out.println("Enter String");
        Scanner in = new Scanner(System.in);
        String str1 = in.nextLine();
        System.out.println("Enter Character");
        char c = in.next().charAt(0);
        int count = str1.length() - str1.replac
        System.out.println("Number of occurance
        in.close();
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.e
Enter String
How was your day today
Enter Character
a
Number of occurances of 'a' in "How was your day today" is =3
```

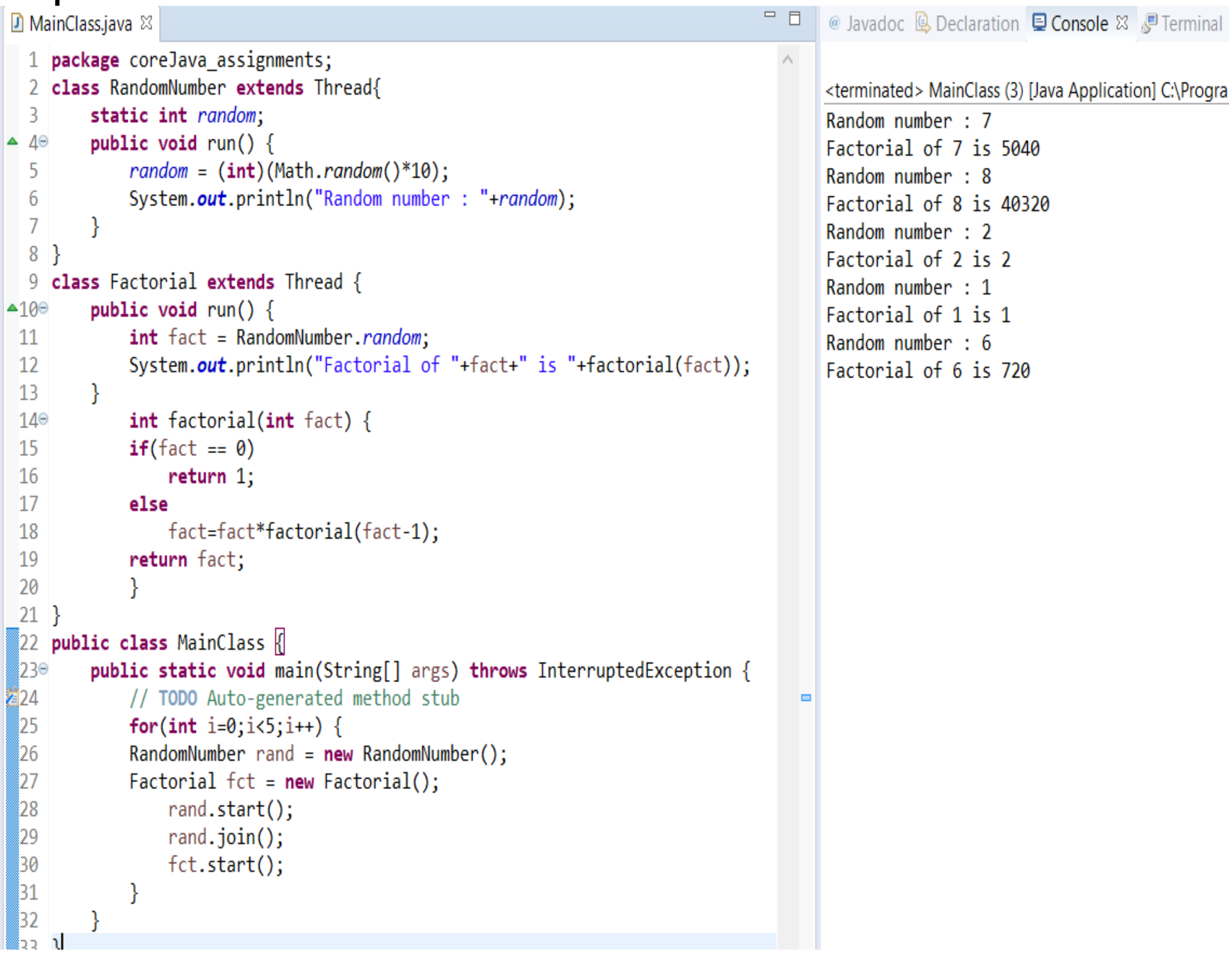
Topic 4: Threads, Collection Framework, Garbage Collection

Assignment 1:
Write a Java Program, where one thread prints a number (Generate a random number using Math.random) and another thread prints the factorial of that given number. Both the outputs should alternate each other. Eg: Number : 2 Factorial of 2 : 2 ; Number : 5 Factorial of 5 : 120 The program can quit after executing 5 times.

Program:

```
package coreJava_assignments;
class RandomNumber extends Thread{
	static int random;
	public void run() {
		random = (int)(Math.random()*10);
		System.out.println("Random number : "+random);
	}
}
class Factorial extends Thread {
	public void run() {
		int fact = RandomNumber.random;
		System.out.println("Factorial of "+fact+" is "+factorial(fact));
	}
		int factorial(int fact) {
		if(fact == 0)
			return 1;
		else
			fact=fact*factorial(fact-1);
		return fact;
		}
}
public class MainClass {
	public static void main(String[] args) throws InterruptedException {
		// TODO Auto-generated method stub
		for(int i=0;i<5;i++) {
		RandomNumber rand = new RandomNumber();
		Factorial fct = new Factorial();
			rand.start();
			rand.join();
			fct.start();
		}
	}
}
```

Output:



```
package coreJava_assignments;
class RandomNumber extends Thread{
    static int random;
    public void run() {
        random = (int)(Math.random()*10);
        System.out.println("Random number : "+random);
    }
}
class Factorial extends Thread {
    public void run() {
        int fact = RandomNumber.random;
        System.out.println("Factorial of "+fact+" is "+factorial(fact));
    }
        int factorial(int fact) {
        if(fact == 0)
            return 1;
        else
            fact=fact*factorial(fact-1);
        return fact;
        }
}
public class MainClass {
    public static void main(String[] args) throws InterruptedException {
        // TODO Auto-generated method stub
        for(int i=0;i<5;i++) {
        RandomNumber rand = new RandomNumber();
        Factorial fct = new Factorial();
            rand.start();
            rand.join();
            fct.start();
        }
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Progra
Random number : 7
Factorial of 7 is 5040
Random number : 8
Factorial of 8 is 40320
Random number : 2
Factorial of 2 is 2
Random number : 1
Factorial of 1 is 1
Random number : 6
Factorial of 6 is 720
```

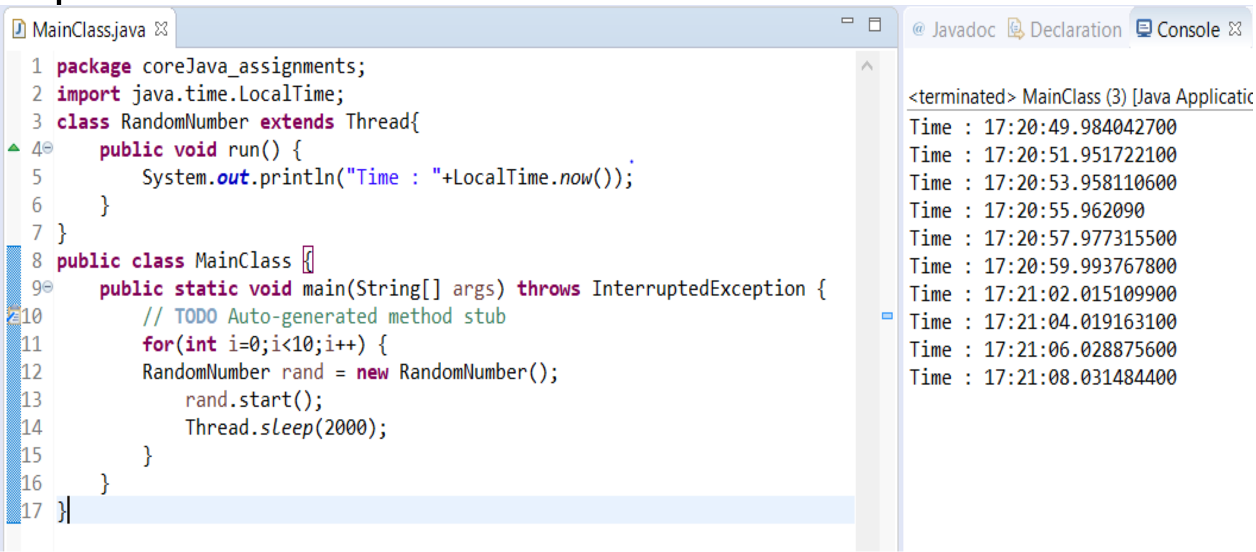
Assignment 2:

Write a Java Program which will print the current time on the console every 2 seconds. After doing this activity for 20 seconds the program quits.

Program:

```
package coreJava_assignments;
import java.time.LocalTime;
class RandomNumber extends Thread{
        public void run() {
                System.out.println("Time : "+LocalTime.now());
        }
}
public class MainClass {
        public static void main(String[] args) throws InterruptedException {
                // TODO Auto-generated method stub
                for(int i=0;i<10;i++) {
                RandomNumber rand = new RandomNumber();
                        rand.start();
                        Thread.sleep(2000);
                }
        }
}
```

Output:



```
package coreJava_assignments;
import java.time.LocalTime;
class RandomNumber extends Thread{
    public void run() {
        System.out.println("Time : "+LocalTime.now());
    }
}
public class MainClass {
    public static void main(String[] args) throws InterruptedException {
        // TODO Auto-generated method stub
        for(int i=0;i<10;i++) {
        RandomNumber rand = new RandomNumber();
            rand.start();
            Thread.sleep(2000);
        }
    }
}
```

```
<terminated> MainClass (3) [Java Applicatic
Time : 17:20:49.984042700
Time : 17:20:51.951722100
Time : 17:20:53.958110600
Time : 17:20:55.962090
Time : 17:20:57.977315500
Time : 17:20:59.993767800
Time : 17:21:02.015109900
Time : 17:21:04.019163100
Time : 17:21:06.028875600
Time : 17:21:08.031484400
```

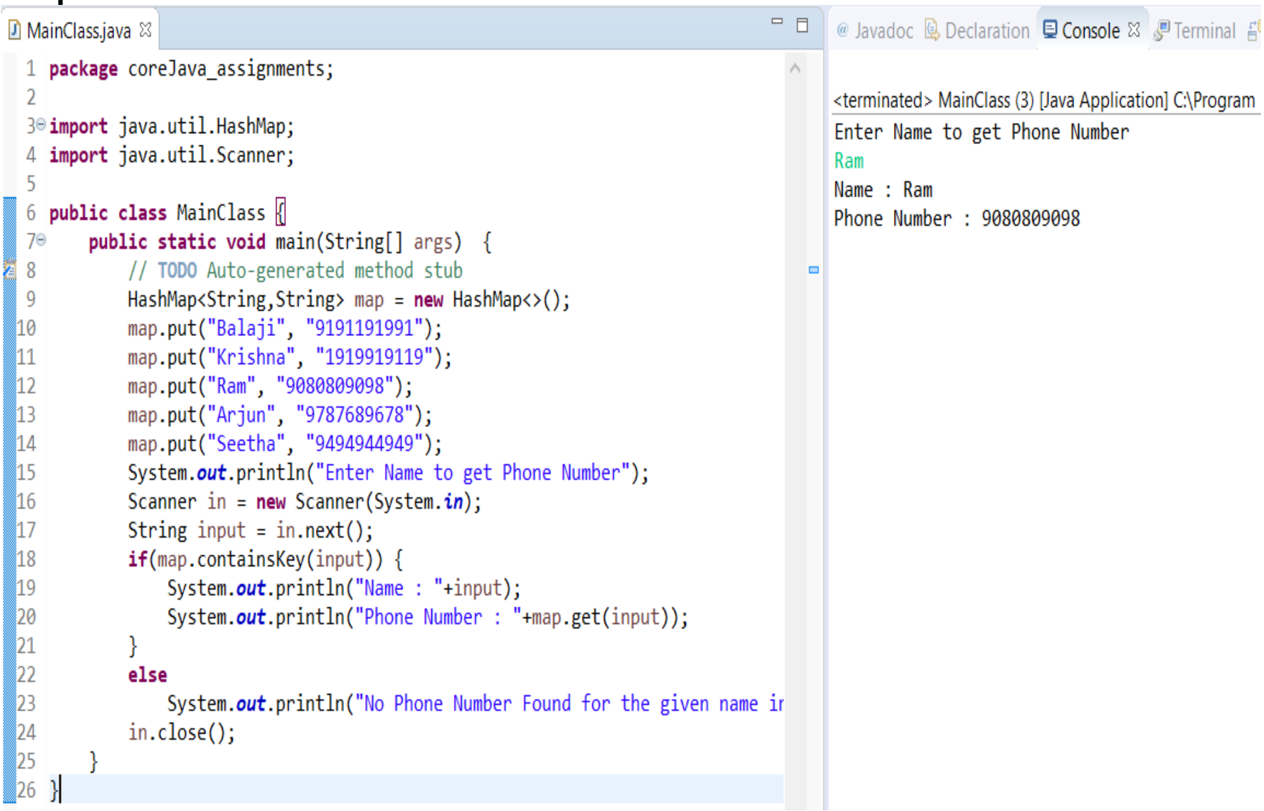
Assignment 4:

Write a program creates a HashMap to store name and phone number (Telephone book). When name is give, we can get back the corresponding phone number.

Program:

```
package coreJava_assignments;

import java.util.HashMap;
import java.util.Scanner;

public class MainClass {
        public static void main(String[] args)  {
                // TODO Auto-generated method stub
                HashMap<String,String> map = new HashMap<>();
                map.put("Balaji", "9191191991");
                map.put("Krishna", "1919919119");
                map.put("Ram", "9080809098");
                map.put("Arjun", "9787689678");
                map.put("Seetha", "9494944949");
                System.out.println("Enter Name to get Phone Number");
                Scanner in = new Scanner(System.in);
                String input = in.next();
                if(map.containsKey(input)) {
                        System.out.println("Name : "+input);
                        System.out.println("Phone Number : "+map.get(input));
                }
                else
                        System.out.println("No Phone Number Found for the given name in Phone Book");
                in.close();
        }
}
```

Output:



```
package coreJava_assignments;

import java.util.HashMap;
import java.util.Scanner;

public class MainClass {
    public static void main(String[] args)  {
        // TODO Auto-generated method stub
        HashMap<String,String> map = new HashMap<>();
        map.put("Balaji", "9191191991");
        map.put("Krishna", "1919919119");
        map.put("Ram", "9080809098");
        map.put("Arjun", "9787689678");
        map.put("Seetha", "9494944949");
        System.out.println("Enter Name to get Phone Number");
        Scanner in = new Scanner(System.in);
        String input = in.next();
        if(map.containsKey(input)) {
            System.out.println("Name : "+input);
            System.out.println("Phone Number : "+map.get(input));
        }
        else
            System.out.println("No Phone Number Found for the given name i
        in.close();
    }
}
```

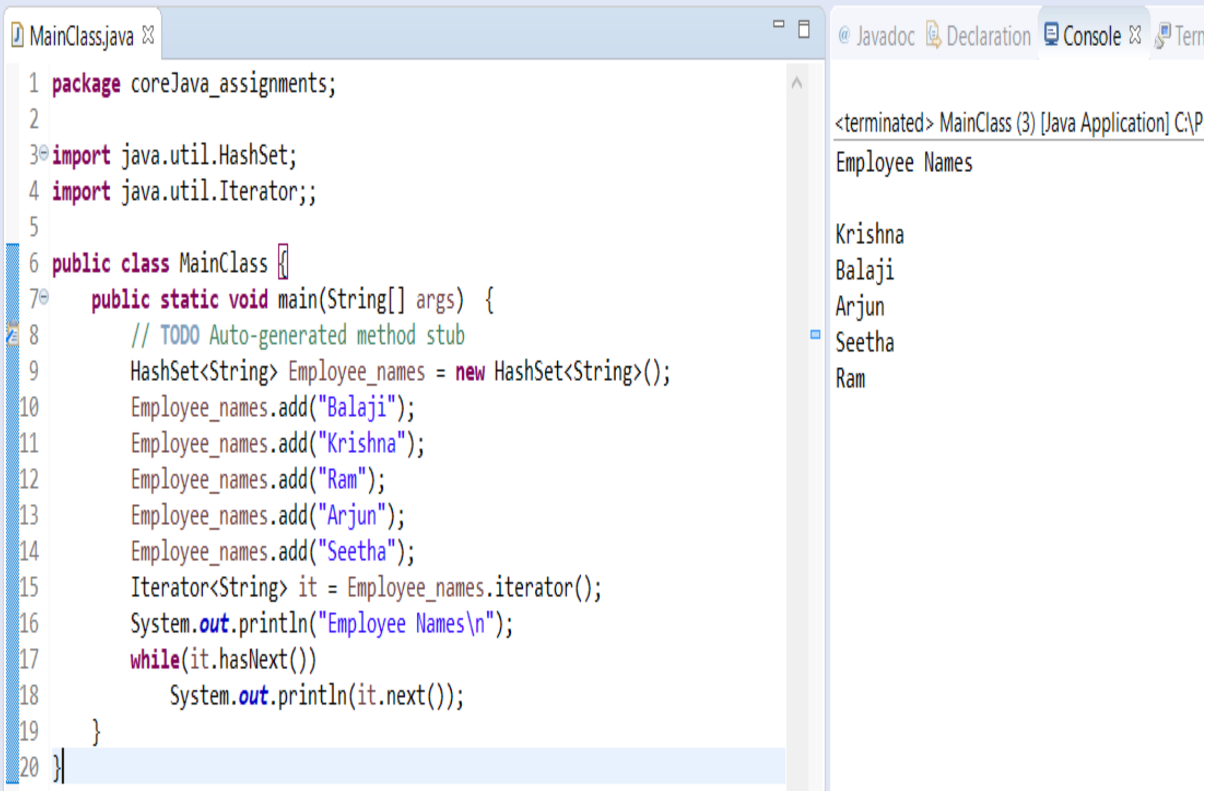
```
<terminated> MainClass (3) [Java Application] C:\Program
Enter Name to get Phone Number
Ram
Name : Ram
Phone Number : 9080809098
```

Assignment 5:
Write a program to store a group of employee names into a HashSet, retrieve the elements one by one using an Iterator.

Program:

```
package coreJava_assignments;

import java.util.HashSet;
import java.util.Iterator;;

public class MainClass {
	public static void main(String[] args)  {
		// TODO Auto-generated method stub
		HashSet<String> Employee_names = new HashSet<String>();
		Employee_names.add("Balaji");
		Employee_names.add("Krishna");
		Employee_names.add("Ram");
		Employee_names.add("Arjun");
		Employee_names.add("Seetha");
		Iterator<String> it = Employee_names.iterator();
		System.out.println("Employee Names\n");
		while(it.hasNext())
			System.out.println(it.next());
	}
}
```

Output:



```
package coreJava_assignments;

import java.util.HashSet;
import java.util.Iterator;;

public class MainClass {
    public static void main(String[] args)  {
        // TODO Auto-generated method stub
        HashSet<String> Employee_names = new HashSet<String>();
        Employee_names.add("Balaji");
        Employee_names.add("Krishna");
        Employee_names.add("Ram");
        Employee_names.add("Arjun");
        Employee_names.add("Seetha");
        Iterator<String> it = Employee_names.iterator();
        System.out.println("Employee Names\n");
        while(it.hasNext())
            System.out.println(it.next());
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\P
Employee Names

Krishna
Balaji
Arjun
Seetha
Ram
```

Assignment 6:
Develop a java class that has finalize method which displays “Finalize method called”. Create another class which creates objects of the previous class and it uses the same object reference for creating these objects. For example, if A1 is the class name, then the objects are created as below :

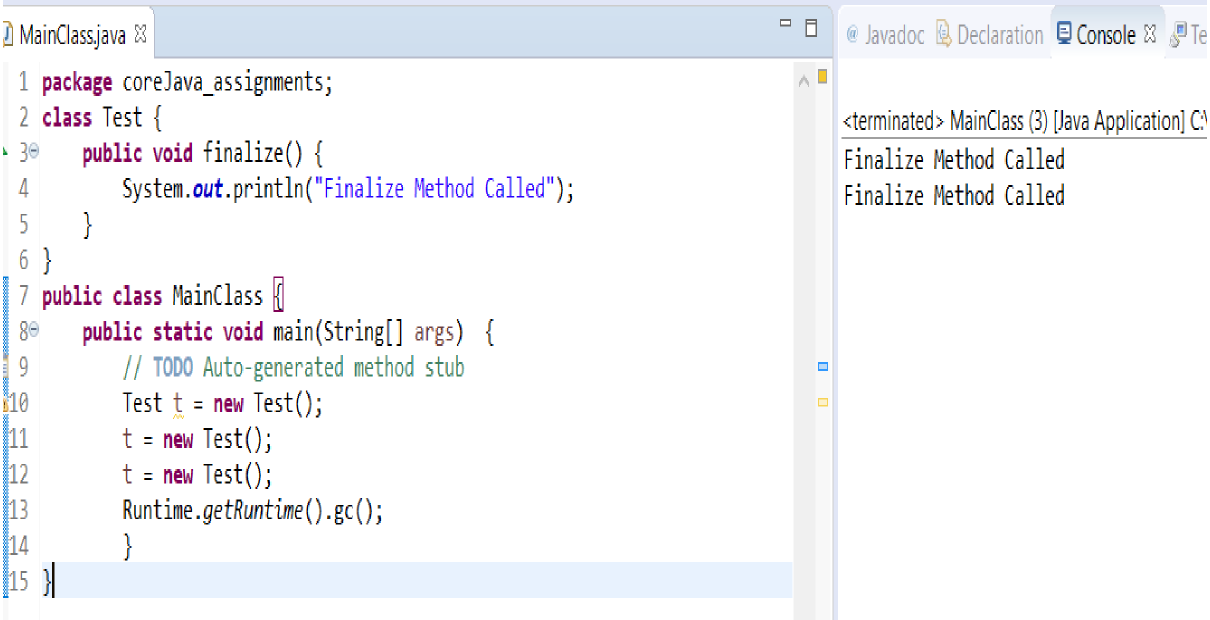
```
 A1 a = new A1();
 a = new A1();
 a = new A1();
```

When the statement Runtime.getRuntime().gc() is invoked, how many times the finalize method is called

Program:

```
package coreJava_assignments;
class Test {
        public void finalize() {
                System.out.println("Finalize Method Called");
        }
}
public class MainClass {
        public static void main(String[] args)  {
                // TODO Auto-generated method stub
                Test t = new Test();
                t = new Test();
                t = new Test();
                Runtime.getRuntime().gc();
                }
}
```

Output:
Finalize method is called 2 times.



```
package coreJava_assignments;
class Test {
    public void finalize() {
        System.out.println("Finalize Method Called");
    }
}
public class MainClass {
    public static void main(String[] args)  {
        // TODO Auto-generated method stub
        Test t = new Test();
        t = new Test();
        t = new Test();
        Runtime.getRuntime().gc();
        }
}
```

```
<terminated> MainClass (3) [Java Application] C:\
Finalize Method Called
Finalize Method Called
```

Topic 5: Command Line Args, System Properties, Packaging

Assignment 1:
Create a package called test package; Define a class called foundation inside the test package; Inside the class, you need to define 4 integer variables; Var1 as private; Var2 as default; Var3 as protected; Var4 as public; Import this class and packages in another class. Try to access all 4 variables of the foundation class and see what variables are accessible and what are not accessible.

Program:

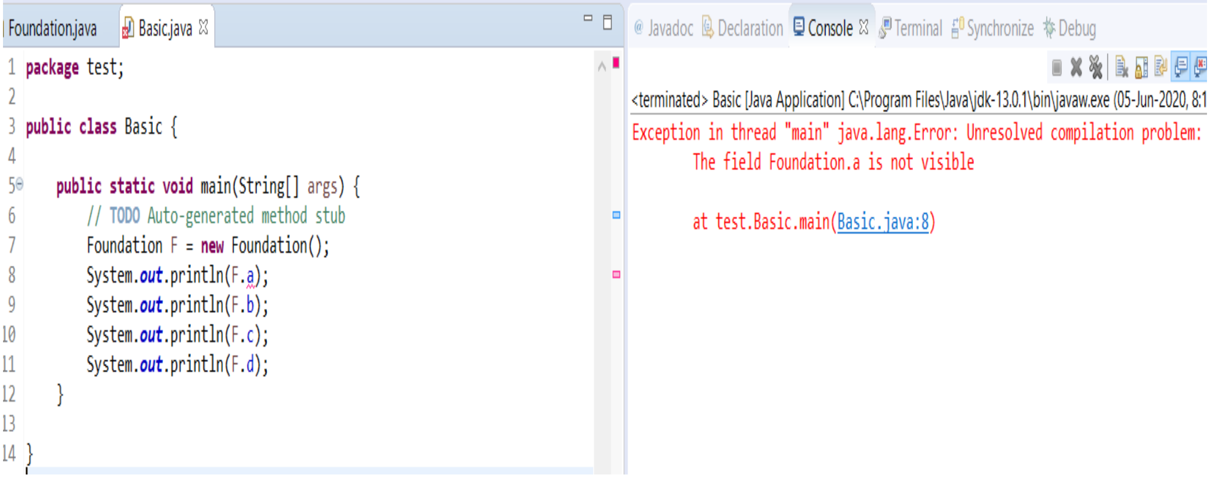
Foundation.java

```
package test;

public class Foundation {
        private String a = "Private variable";
        String b="Default Variable";
        protected String c= "Protected variable";
        public String d = "Public variable";
}
```

Basic.java

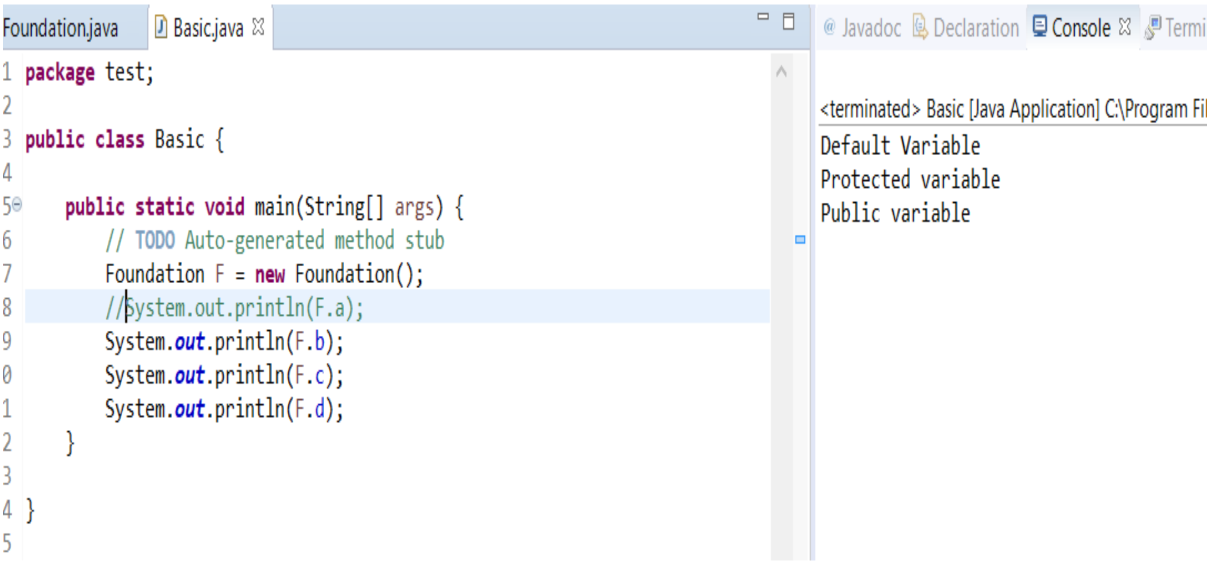
```
package test;

public class Basic {

        public static void main(String[] args) {
                // TODO Auto-generated method stub
                Foundation F = new Foundation();
                //System.out.println(F.a);
                System.out.println(F.b);
                System.out.println(F.c);
                System.out.println(F.d);
        }

}
```

Output:
Except Private variable all other variables are visible outside the class within the package.



```
package test;

public class Basic {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Foundation F = new Foundation();
        System.out.println(F.a);
        System.out.println(F.b);
        System.out.println(F.c);
        System.out.println(F.d);
    }

}
```

```
<terminated> Basic [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (05-Jun-2020, 8:1
Exception in thread "main" java.lang.Error: Unresolved compilation problem:
	The field Foundation.a is not visible

	at test.Basic.main(Basic.java:8)
```



```
package test;

public class Basic {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Foundation F = new Foundation();
        //System.out.println(F.a);
        System.out.println(F.b);
        System.out.println(F.c);
        System.out.println(F.d);
    }

}
```

```
<terminated> Basic [Java Application] C:\Program Fil
Default Variable
Protected variable
Public variable
```

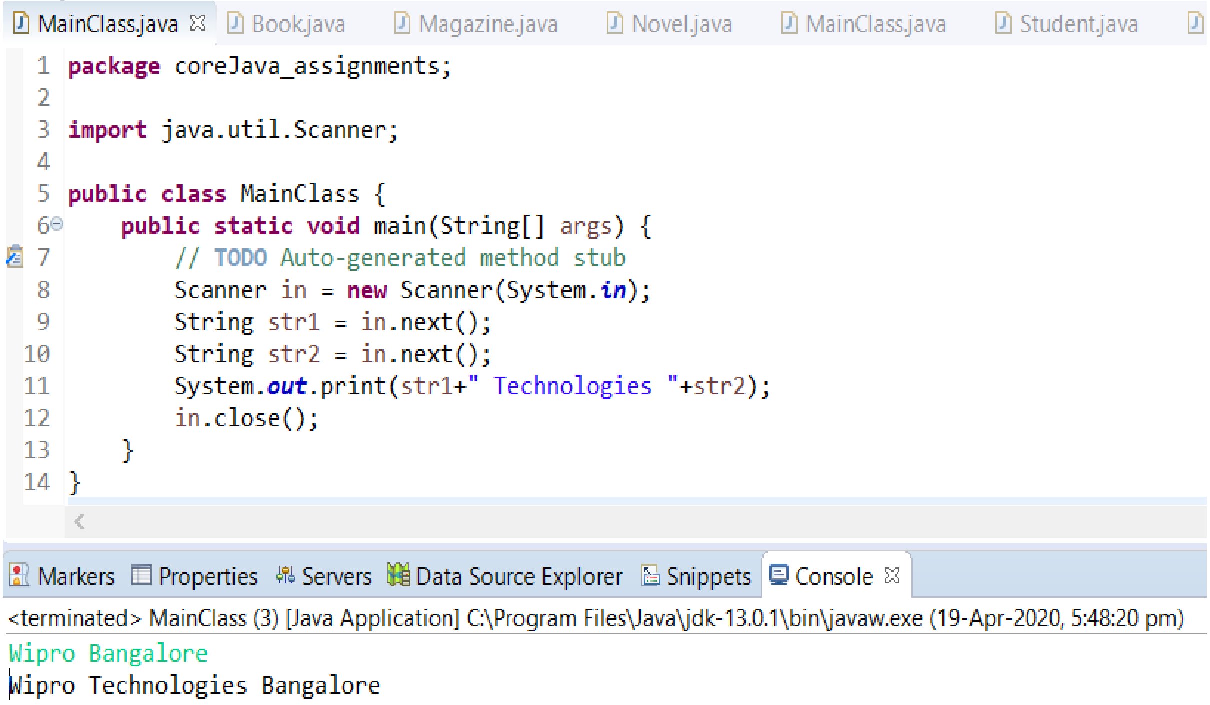
Assignment 2:
Write a Program to accept two Strings Wipro Bangalore as command line arguments and print the output “Wipro Technologies Bangalore” If the command line is “ABC Mumbai”, then it should print “ABC Technologies Mumbai” .

Program:

```
package coreJava_assignments;

import java.util.Scanner;
```

```
public class MainClass {
	public static void main(String[] args) {
		// TODO Auto-generated method stub
		Scanner in = new Scanner(System.in);
		String str1 = in.next();
		String str2 = in.next();
		System.out.print(str1+" Technologies "+str2);
		in.close();
	}
}
```

Output:



```
package coreJava_assignments;

import java.util.Scanner;

public class MainClass {
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Scanner in = new Scanner(System.in);
        String str1 = in.next();
        String str2 = in.next();
        System.out.print(str1+" Technologies "+str2);
        in.close();
    }
}
```

```
<terminated> MainClass (3) [Java Application] C:\Program Files\Java\jdk-13.0.1\bin\javaw.exe (19-Apr-2020, 5:48:20 pm)
Wipro Bangalore
Wipro Technologies Bangalore
```