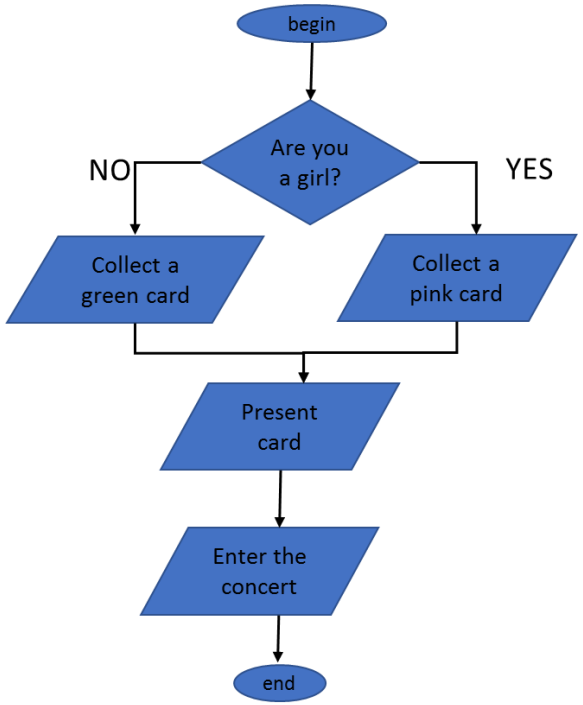
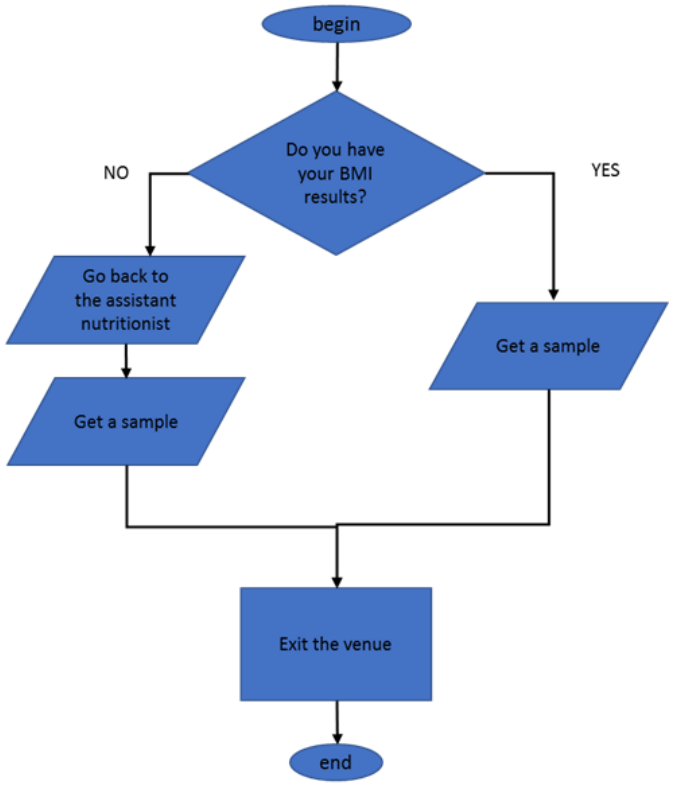
Unit 4 - Solutions to Activities

Activity 1: Create a flowchart for a real-life scenario

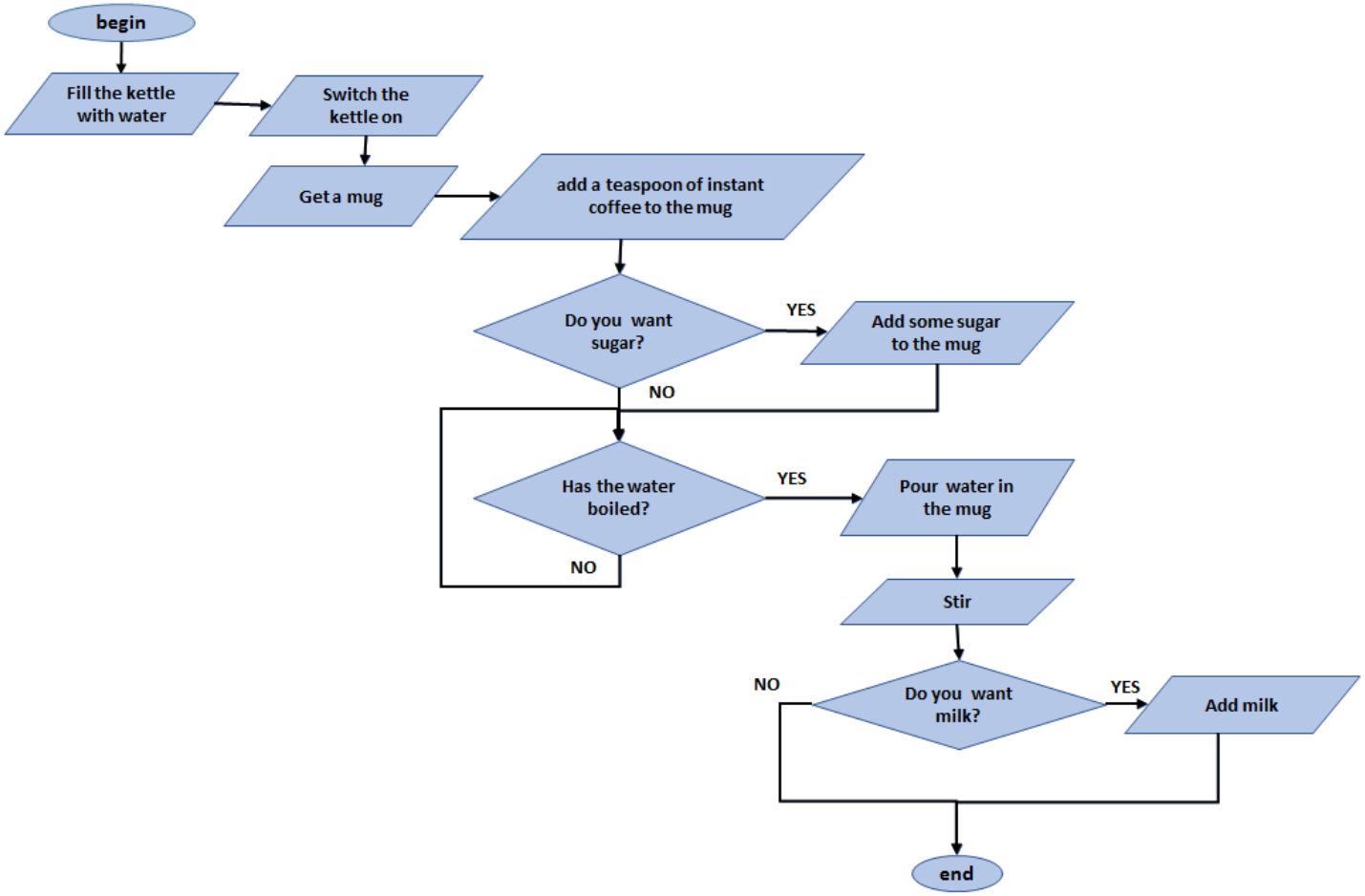
1(a)



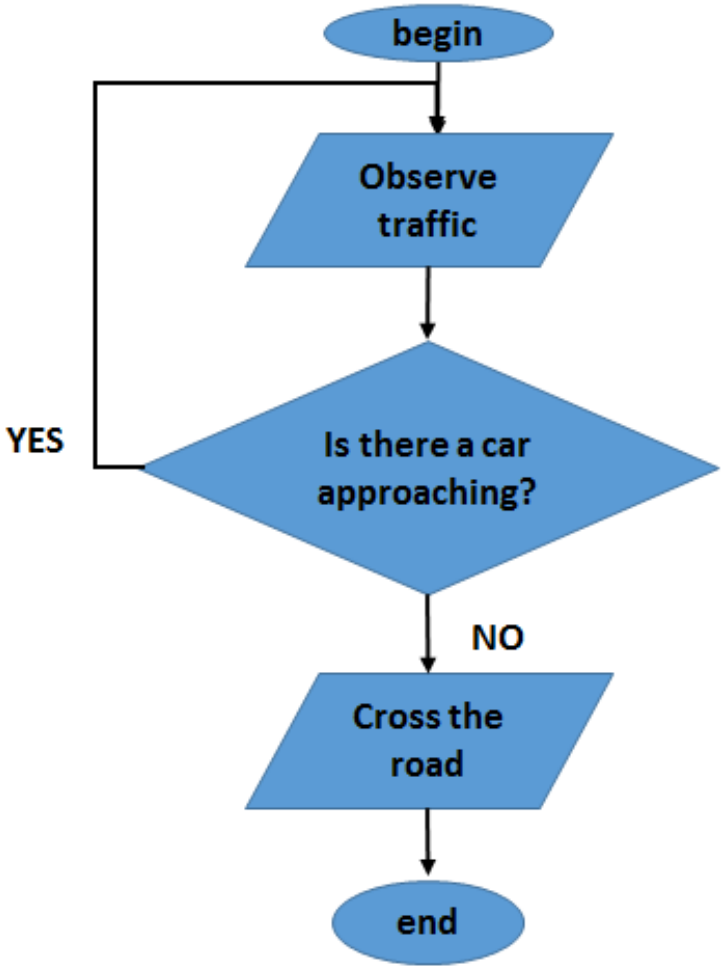
1(b)


begin
Do you have your BMI results?
NO
YES
Go back to the assistant nutritionist
Get a sample
Get a sample
Exit the venue
end

1(c)


begin
Fill the kettle with water
Switch the kettle on
Get a mug
add a teaspoon of instant coffee to the mug
Do you want sugar?
YES
Add some sugar to the mug
NO
Has the water boiled?
YES
Pour water in the mug
NO
Stir
NO
Do you want milk?
YES
Add milk
end

1(d)



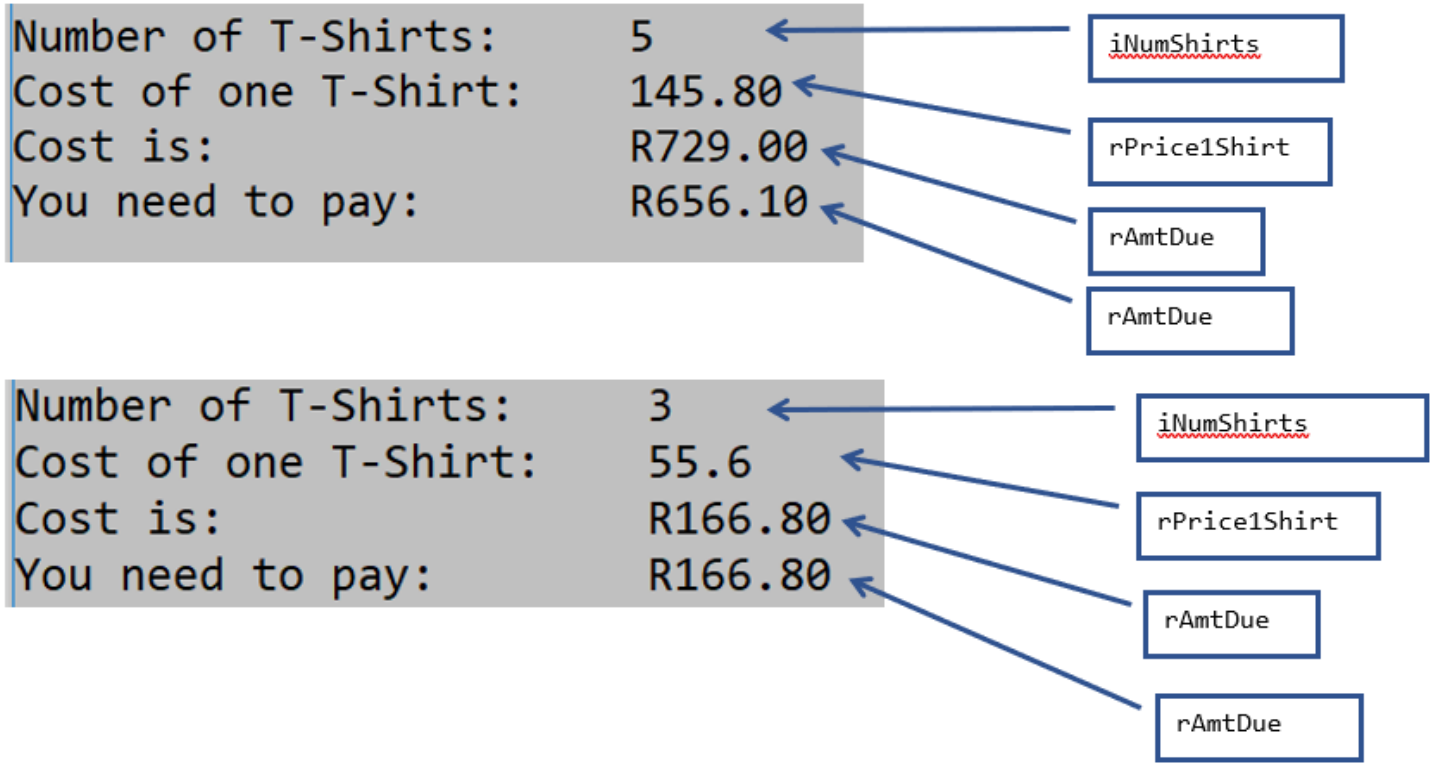
Activity 2: Create relational expressions and predict results

Determine the result (true / false) of the following conditions. The first row contains an example

Condition (question) in English	Value of variable	Relational operator	Result
Is the person 21 years or older?	iAge = 18	(iAge >= 21)	False
Is your percentage equal to 5 more than 50?	iPercent=45	(iPercent==55)	False
Is the building 6 meters high or less?	iHeight= 5	(iHeight<=6)	True
Is the number of eggs not the same as a dozen?	iNumEggs=12	(iNumEggs!=12)	False
Do you have at least 80 pens?	iNumPen=90	(iNumPen>=80)	True
Is the maximum load 50 kg?	iWeight=60	(iWeight<=50)	False
Is the number less than 1.85	rNumber=1.79	(rNumber<1.85)	True
Is your lucky number not more than 'Z'	iLuckyNum=97	iLuckyNum<='Z'	True

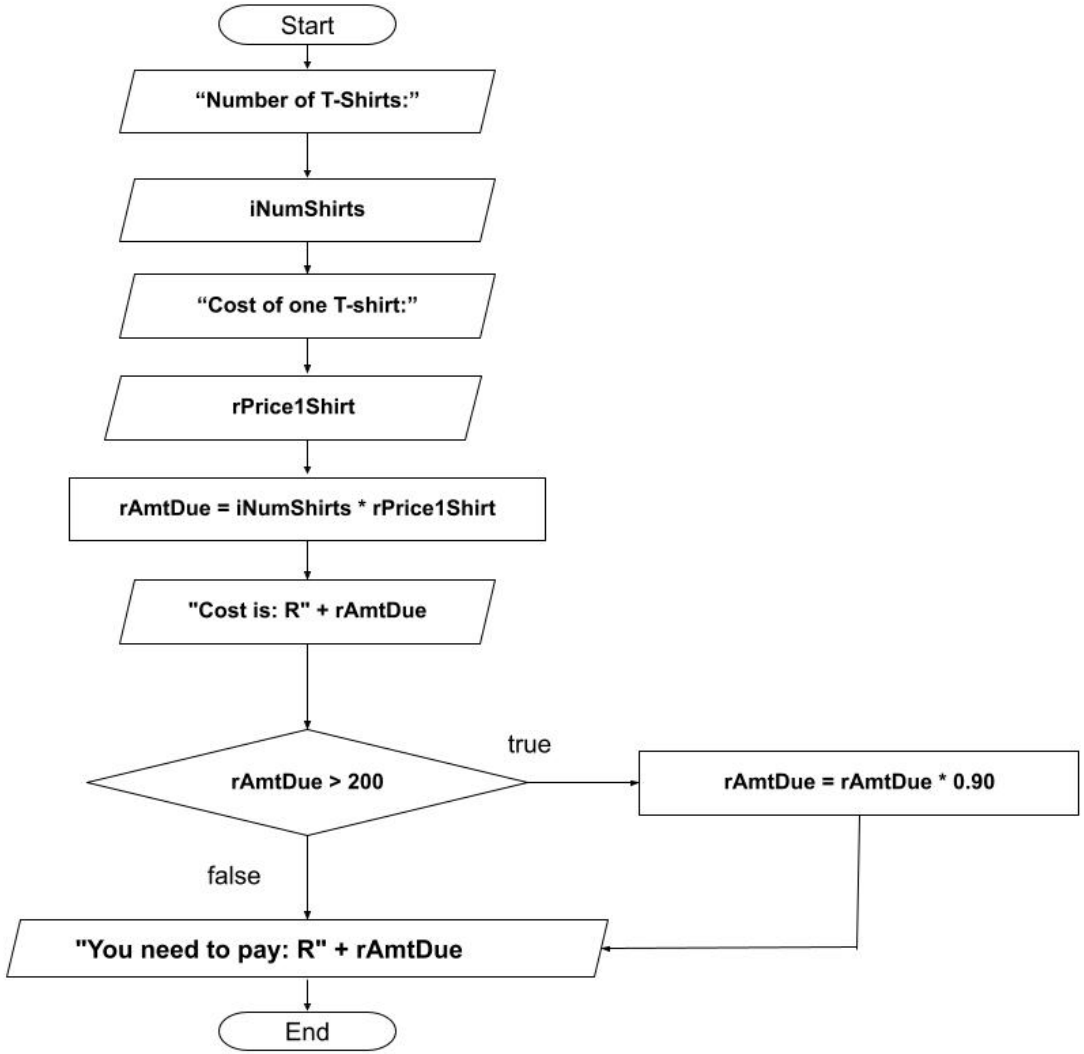
Activity 3: Create a flowchart for a real-life scenario

3(a)



Note: The variable rAmtDue is displayed twice. Once before the if statement, and again after the if-statement. In the second example, when the amount due is less than R200, the value does not change.

3(b)


Start
“Number of T-Shirts:”
iNumShirts
“Cost of one T-shirt:”
rPrice1Shirt
rAmtDue = iNumShirts * rPrice1Shirt
"Cost is: R" + rAmtDue
rAmtDue > 200
true
rAmtDue = rAmtDue * 0.90
false
"You need to pay: R" + rAmtDue
End

3(c)

```java
package tshirtdiscount;
import java.util.Scanner;
import java.text.DecimalFormat;

public class TshirtDiscount
{ //start class
    public static void main(String[] args)
    { //start main method
            Scanner keyboard = new Scanner(System.in);
            DecimalFormat df = new DecimalFormat(".00");
            int iNumShirts;
            double rPrice1Shirt, rAmtDue;
            System.out.print("Number of T-Shirts:\t");
            iNumShirts = keyboard.nextInt();
            System.out.print("Cost of one T-Shirt: \t");
            rPrice1Shirt = keyboard.nextDouble();
            rAmtDue = iNumShirts * rPrice1Shirt;
            System.out.println("Cost is: \t\tR" + df.format(rAmtDue));
            // Processing
            if (rAmtDue > 200)
            {
                rAmtDue = rAmtDue * 0.9; //Give 10% discount - keep 90% of the price
            }
            System.out.println("You need to pay: \tR" + df.format(rAmtDue));
    } //end main method
} //end class
```

Activity 4: Questions regarding the Courier company class

Answer the following questions regarding the Courier company example:

a) What values are input values? Provide the names of the variables as well as a description of what will be stored in each variable.

Name of input variable	Description	Data type
rMass	Number of kg to transport	double
rKM	Number of km	double
cTransp	Type of transport	character
cInsure	Parcel insurance	character

b) If the customer chooses to send the parcel by train, what will the cost per km be?

R 0.5 (50^{c})

c) What is the name of the constant where the cost of transport per km is stored when a customer chooses to send the parcel by air?

AIR

d) Use the values in the following table and calculate what the cost should be using a pocket calculator.

Mass	Kilometres	Transport mode	Insurance	Total cost
55.6kg	245	Train	Yes	546.72495
10kg	55.8	Road	No	114.586
500.5kg	1050	Air	Yes	5524.372875

e) Write the program as provided in the example. Use the values provided in the previous question to test your output. You should see the same values displayed as provided in d).

f) What will happen if the customer enters the value y instead of Y when asked whether insurance is required? The program will NOT include the insurance cost, because the value 'Y' is not the same as 'y'.

g) Add code to format the output as in the screenshot below.

```
package courierCost;
import java.util.Scanner;
import java.text.DecimalFormat;
public class CourierCost
{ //start class
      public static void main(String[] args)
      { //start main method
            Scanner keyboard = new Scanner(System.in);
            DecimalFormat formatter = new DecimalFormat("R#,###.00");

            final int VAT = 15, INSURE_PERC = 11;
            final double PERKG = 5.5, ROAD = 0.8, TRAIN = 0.5, AIR = 1.5;
            double rMass, rKM, rTotal, rTransp = 0;
            char cTransp, cInsure;

            //input
            System.out.print("Number of kg to transport: \t\t\t");
            rMass = keyboard.nextDouble();
            System.out.print("Number of km : \t\t\t\t\t");
            rKM = keyboard.nextDouble();
            System.out.print("Is transport by <R>oad, <T>rain or <A>ir \t");
            cTransp = keyboard.next().charAt(0);
            System.out.print("Insurance <Y>es or <N>o \t\t\t");
            cInsure = keyboard.next().charAt(0);

            //set the transport cost based on the mode of travel
            if (cTransp == 'R')
                  rTransp = ROAD;
            if (cTransp == 'T')
```

```
                  rTransp = TRAIN;
            if (cTransp == 'A')
                  rTransp = AIR;

            //calculate the cost based on the mass and the distance
            rTotal = rMass * PERKG + rTransp * rKM;

            //add insurance cost if chosen
            if (cInsure == 'Y')
                  rTotal = rTotal + INSURE_PERC/100 * rTotal;

            //Add VAT to the total
            rTotal = rTotal + VAT/100 * rTotal;

            //output
            System.out.println("You need to pay: \t\t\t\t" + formatter.format(rTotal));
      } //end main method
} //end class
```

h) Change this declaration statement

```
double rMass, rKM, rTotal, rTransp = 0;
```

to the following;

```
double rMass, rKM, rTotal, rTransp;
```

Why will the program not compile after you removed = 0?

rTransp needs to be initialised, setting rTransp to 0 initialises the variable. The Java compiler is 'intelligent' and can determine that the variable rTransp may never be assigned a value. For example, if the user types the value E by mistake, all the conditions of the if statements will be false, and no value will be assigned by a Java assignment statement. Therefore the Java compiler forces you as the programmer to initialise the value. This code is not the best solution to this problem. Later when you learn more techniques, you will learn to let the program stop when an invalid value is entered.

Activity 5: Create Java programs from the provided flowcharts

5(a)

```
package Amount;
import java.util.Scanner;

public class Amount
{
	public static void main(String[]args)
	{
		double rAmount;
		//create a scanner for input
		Scanner scanner = new Scanner(System.in);

		//prompt the user to enter the number of kilometers
		System.out.print("How many kilometres?");
		int iNumKm=scanner.nextInt();

		//prompt the user to enter the cost per kilometer
		System.out.print("How much per kilometre?");
		double rKmPrice=scanner.nextDouble();

		//prompt the user to enter the number of days
		System.out.print("How many days?");
		int iDays=scanner.nextInt();
```

```
            if( iNumKm > 400 )
                  {
                  rAmount= (300+ iNumKm*rKmPrice*0.95)*iDays;
                  }
            else
                  {
                  rAmount=(300 + iNumKm*rKmPrice)*iDays;
                  }
            System.out.println (" The amount to pay is R"+ rAmount);
      }
}
```

5(b)

```
package Tax;
import java.util.Scanner;

public class Tax
{
      public static void main(String[]args)
      {
            double rTax, rPercTax;
            //create a scanner for input
            Scanner kb = new Scanner(System.in);

            //prompt the user to enter the salary
            System.out.print("What is the salary: R");
            double rSalary = kb.nextDouble();

            if( rSalary < 20000 )
                  {
                  rPercTax=0.18;
                  }
```

```
            else
                  {
                  rPercTax=0.27;
                  }

            rTax = rSalary * rPercTax;
            System.out.println ("The tax amount is R" + rTax);
      }
}
```

5(c)

```
package Values;
import java.util.Scanner;

public class Values
{
      public static void main(String[]args)
      {
            int iFirst, iSecond;
            //create a scanner for input
            Scanner kb = new Scanner(System.in);
            //prompt the user to enter the numbers
            System.out.print("Provide the first integer: ");
            int iValue1 = kb.nextInt();
            System.out.print("Provide the second integer: ");
            int iValue2 = kb.nextInt();

            if( iValue1 > iValue2 )
                  {
                  iFirst = iValue1;
                  iSecond = iValue2;
                  }
            else
                  {
```

```
                    iFirst = iValue2;
                    iSecond = iValue1;
                    }
            System.out.println ("The smaller number is " + iSecond + " and the bigger number is: " + iFirst);
      }
}
```

Activity 6: Predict the output of code segments

Type of statement	rNumerator	rDenominator	rQuotient	Outcome of IF	Display / output
output					Enter the numerator:
input	5				
output					Enter the denominator:
input		20			
IF				false	
calculation			5/20 = 0.4		
output					Quotient is: 0.25

6.1(a)

Let rNumerator = 5; and rDenominator = 20

Output

```
Enter the numerator: 5
Enter the denominator: 20
Quotient is: 0.25
```

6.1(b)

Let rNumerator = 3; and rDenominator = 0

Type of statement	rNumerator	rDenominator	rQuotient	Outcome of IF	Display / output
output					Enter the numerator:
input	3				
output					Enter the denominator:
input	0				
IF				true	
output					You cannot divide by zero!

Output

```
Enter the numerator: 3
Enter the denominator: 0
You cannot divide by zero!
```

6.2(a)

Let iYearOfBirth = 1998; and iCurrentYear = 2021

Output

```
In which year were you born? 1998
What year is it currently? 2021
You turn 23 in 2021
```

6.2(b)

Let iYearOfBirth = 2021; and iCurrentYear = 2000.

Type of statement	iYearOfBirth	iCurrentYear	iAge	Outcome of IF	Display / output
output					In which year were you born?
input	1998				
output					What year is it currently?
input	2021				
IF				false	
calculation			2021 - 1998 = 23		
output					You turn 23 in 2021

Output

Type of statement	iYearOfBirth	iCurrentYear	iAge	Output / Display	Display / output
output				What is the big number?:	In which year were you born?
input	2021				
output				Possible factor of 20?	What year is it currently?
input		2000			
IF			false	false	
output				3 is NOT a factor of 20	You cannot be born in the future!

In which year were you born? 2021
What year is it currently? 2000
You cannot be born in the future!

6.3(a)

Let iNumber = 20; and iFactor = 3.

Output

What is the big number?: 20
Possible factor of 20?: 3
3 is NOT a factor of 20

6.3(b)

Let iNumber = 20; and iFactor = 5

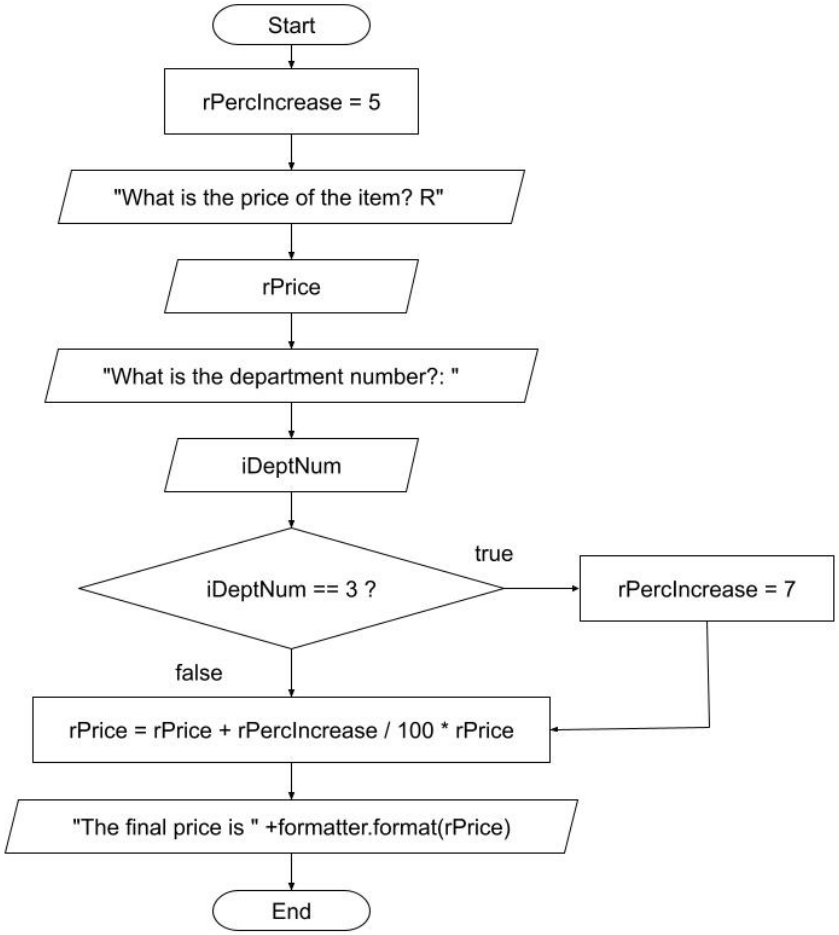
Output

Type of statement	iNumber	iFactor	Outcome of IF	Display / output
output				What is the big number?:
input	20			
output				Possible factor of 20?:
input		5		
IF			true	
output				5 is a factor of 20

```
What is the big number?: 20
Possible factor of 20?: 5
5 is a factor of 20
```

Activity 7: Create a flowchart for if-statement scenarios, then write a Java program

7(a) - Flowchart



7(a) – Java code

```
package grocerystore;
import java.util.Scanner;
import java.text.DecimalFormat;
public class GroceryStore
```

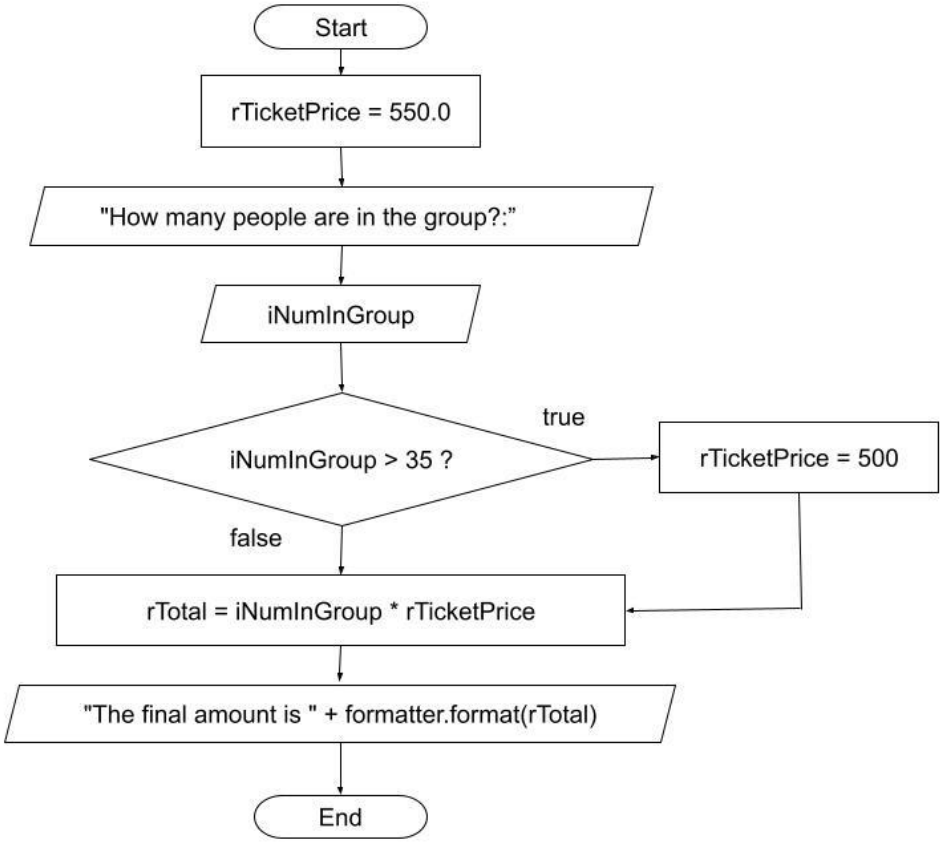
```
{
	public static void main( String[] args)
	{
	Scanner kb = new Scanner(System.in);
	DecimalFormat formatter = new DecimalFormat("R#,###.00");
	double rPercIncrease = 5;

	//prompt the user to enter an integer
	System.out.print("What is the price of the item? R");
	double rPrice = kb.nextDouble();
	System.out.print("What is the department number?: ");
	int iDeptNum = kb.nextInt();

	if (iDeptNum == 3 ) rPercIncrease = 7;
	rPrice = rPrice + rPercIncrease / 100 * rPrice;
	System.out.println("The final price is " + formatter.format(rPrice));

	}
}
```

7(b) - Flowchart



7(b) – Java code

```
package parlotones;
import java.util.Scanner;
```

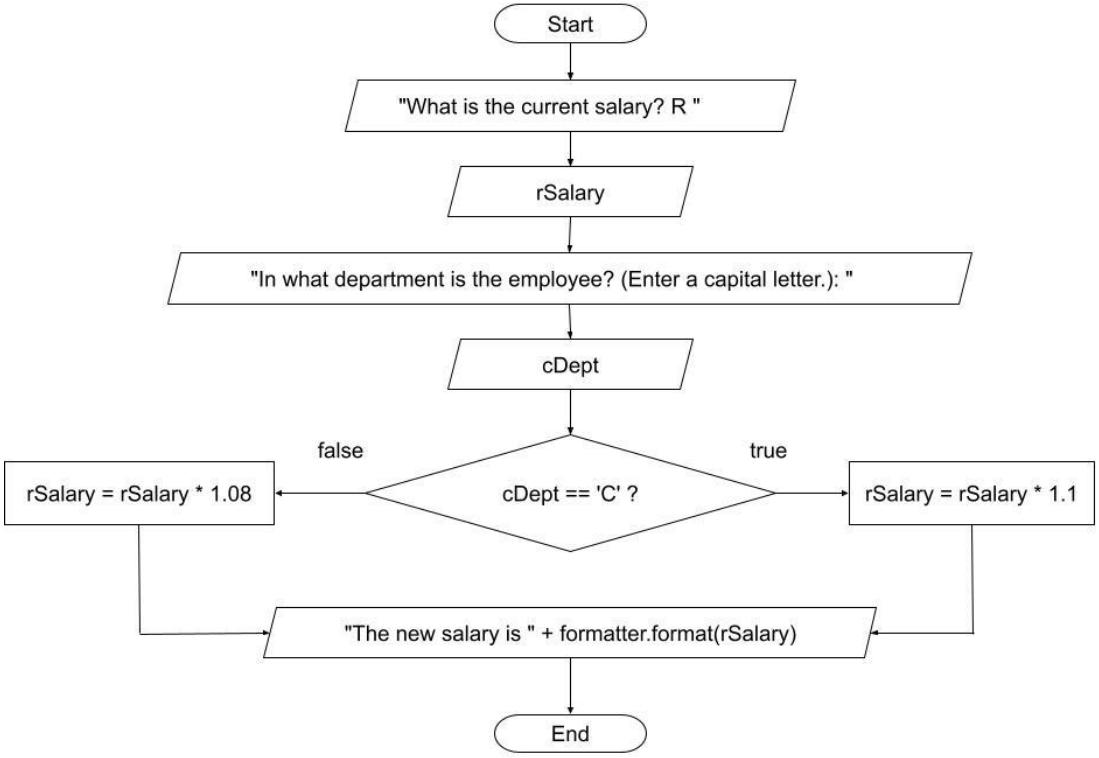
```
import java.text.DecimalFormat;
public class Parlotones
{
	public static void main( String[] args)
	{
	Scanner kb = new Scanner(System.in);
	DecimalFormat formatter = new DecimalFormat("R#,###.00");
	double rTicketPrice = 550.0;
	double rTotal;
	System.out.print("How many people are in the group?: ");
	int iNumInGroup = kb.nextInt();

	if (iNumInGroup > 35 ) rTicketPrice = 500;
	rTotal = iNumInGroup * rTicketPrice;
	System.out.println("The final amount is " + formatter.format(rTotal));

	} //end main
} //end class
```

Activity 8: Create a flowchart for if..else statement scenarios, then write a Java program

8(a) - Flowchart



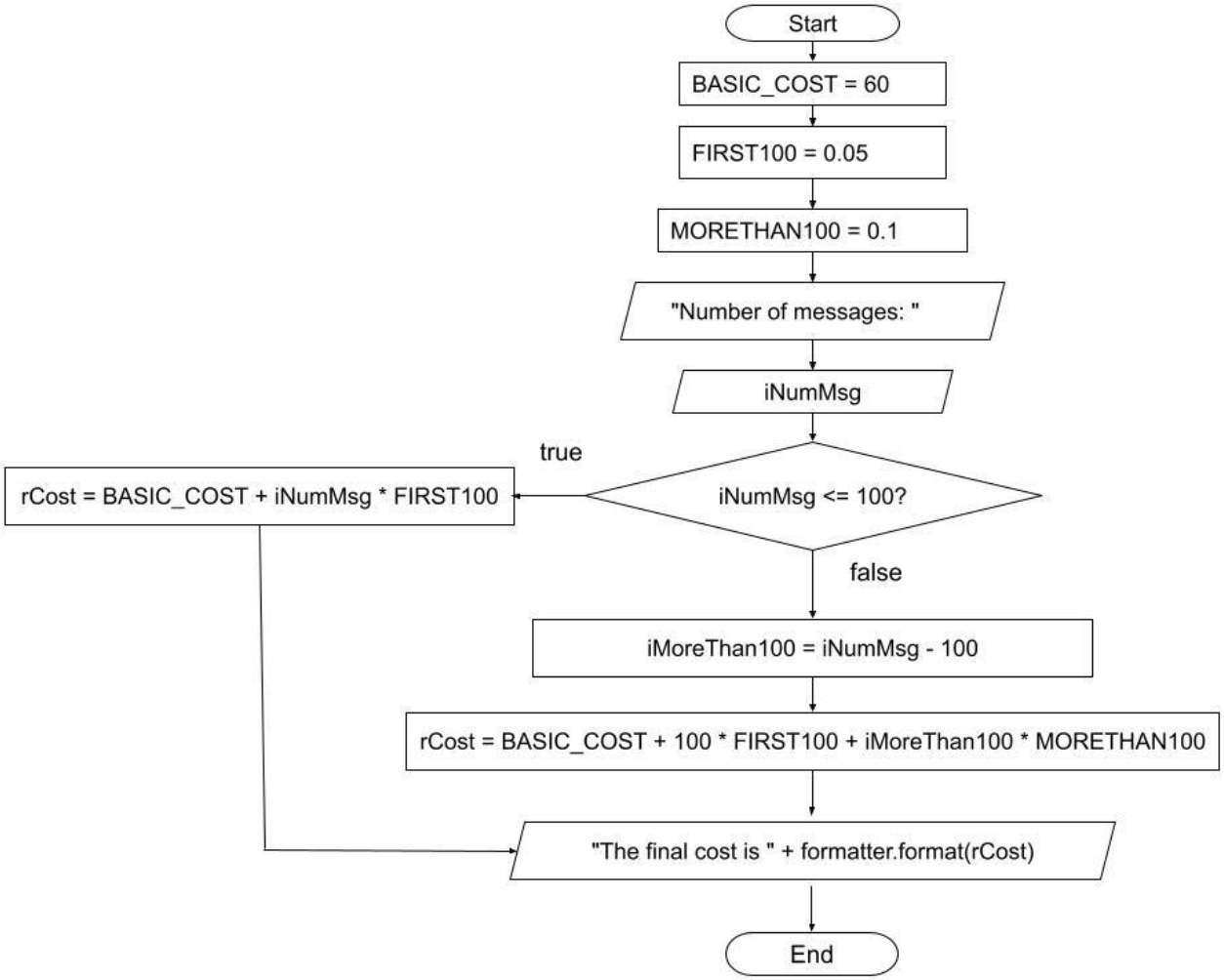
8(a) – Java code

```
package IncreaseSalary;
import java.util.Scanner;
import java.text.DecimalFormat;
public class IncreaseSalary
{
```

```
    public static void main( String[] args)
    {
    Scanner kb = new Scanner(System.in);
    DecimalFormat formatter = new DecimalFormat("R#,###.00");
    double rSalary;
    char cDept;
    System.out.print("What is the current salary? R ");
    rSalary = kb.nextDouble();
    System.out.print("In what department is the employee? (Enter a capital letter.): ");
    cDept = kb.next().charAt(0);

    if (cDept == 'C')
    {
         System.out.println("You receive 10% increase");
         rSalary = rSalary * 1.1;
    }
    else
    {
         System.out.println("You receive 8% increase");
         rSalary = rSalary * 1.08;
    }
    System.out.println("The new salary is " + formatter.format(rSalary));
    } //end main
} //end class
```

8(b) - Flowchart


Start
BASIC_COST = 60
FIRST100 = 0.05
MORETHAN100 = 0.1
"Number of messages: "
iNumMsg
true
rCost = BASIC_COST + iNumMsg * FIRST100
iNumMsg <= 100?
false
iMoreThan100 = iNumMsg - 100
rCost = BASIC_COST + 100 * FIRST100 + iMoreThan100 * MORETHAN100
"The final cost is " + formatter.format(rCost)
End

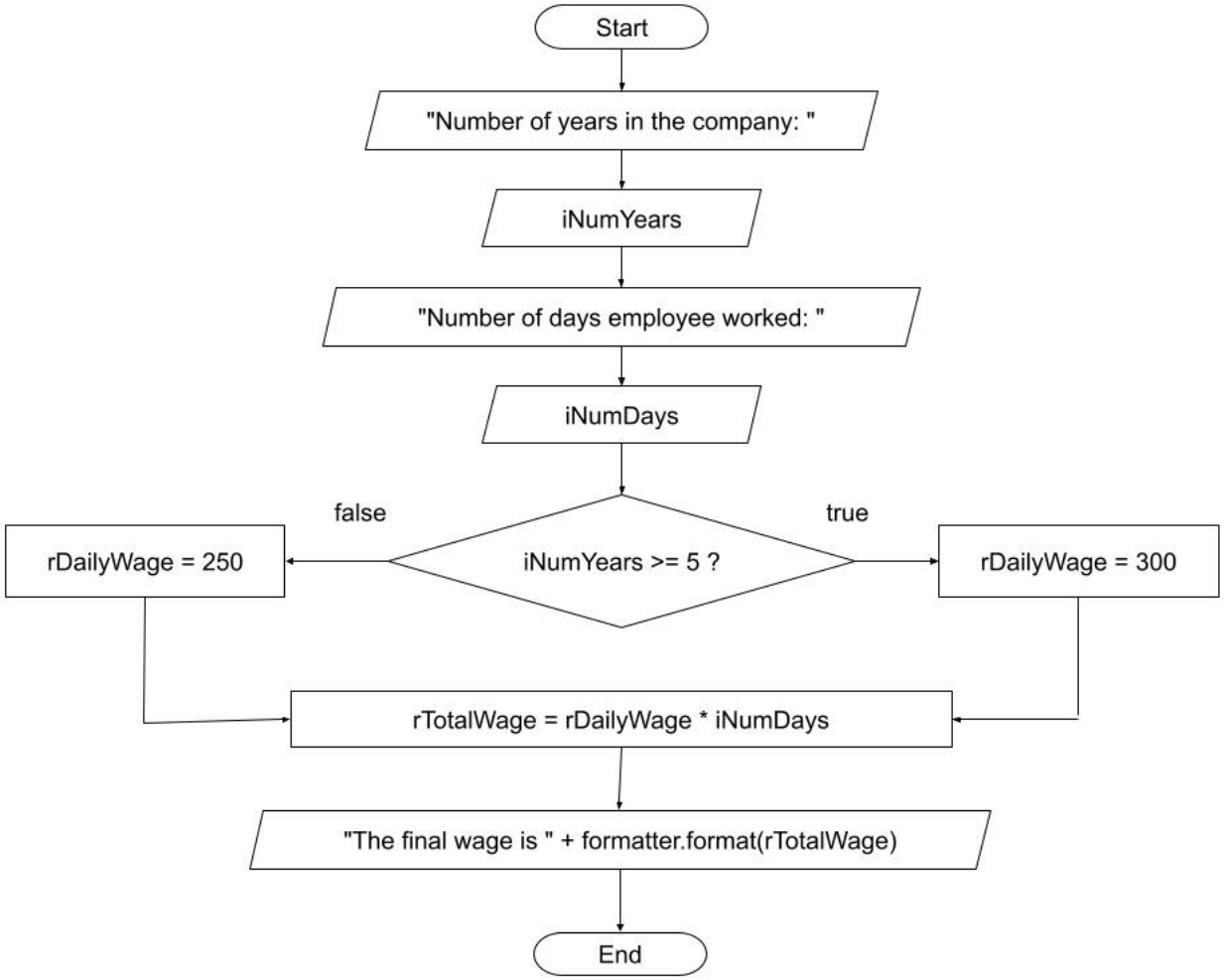
8(b) – Java code

```
package abc_company;
import java.util.Scanner;
import java.text.DecimalFormat;
public class ABC_Company
{
      public static void main( String[] args)
      {
      Scanner kb = new Scanner(System.in);
      DecimalFormat formatter = new DecimalFormat("R#,###.00");
      final double BASIC_COST = 60;
      final double FIRST100 = 0.05;
      final double MORETHAN100 = 0.1;
      int iNumMsg, iMoreThan100;
      double rCost;

      System.out.print("Number of messages: ");
      iNumMsg = kb.nextInt();

      if (iNumMsg <= 100)
      {
            rCost = BASIC_COST + iNumMsg * FIRST100;
      }
      else
      {
            iMoreThan100 = iNumMsg - 100;
            rCost = BASIC_COST + 100 * FIRST100 + iMoreThan100 * MORETHAN100;
      }
      System.out.println("The final cost is " + formatter.format(rCost));
      } //end main
} //end class
```

8(c) - Flowchart


Start
"Number of years in the company: "
iNumYears
"Number of days employee worked: "
iNumDays
false
true
rDailyWage = 250
iNumYears >= 5 ?
rDailyWage = 300
rTotalWage = rDailyWage * iNumDays
"The final wage is " + formatter.format(rTotalWage)
End

8(c) – Java code

```
package wage;
import java.util.Scanner;
import java.text.DecimalFormat;
public class Wage
{
	public static void main( String[] args)
	{
	Scanner kb = new Scanner(System.in);
	DecimalFormat formatter = new DecimalFormat("R#,###.00");
	int iNumYears, iNumDays;
	double rDailyWage, rTotalWage;

	System.out.print("Number of years in the company: ");
	iNumYears = kb.nextInt();
	System.out.print("Number of days employee worked: ");
	iNumDays = kb.nextInt();

	if (iNumYears >= 5) rDailyWage = 300;
	else rDailyWage = 250;

	rTotalWage = rDailyWage * iNumDays;

	System.out.println("The final wage is " + formatter.format(rTotalWage));
	} //end main
} //end class
```

Activity 9: Create pseudo code for if..else-statement scenarios, then write a Java program

9(a) – Pseudo code

```
EvenOddSquareNot  // the class name
```

```
begin  //start of the class
      main method
            //declare variables
            int iNumber
            double rRoot

            // Input
            display"Provide a number?: "
            enter iNumber

            //Check even or Odd
            if (iNumber MOD 2 == 0)
                  display"It's an even number"
            else
                  display "It's an odd number"

            //extract the square root
            rRoot = iNumber^(1/2)

            //check if number is perfect or not
            if (rRoot MOD 1 == 0) // (rRoot*rRoot==iNumber)
                  display"It's a perfect square"
            else
                  display"It is not a perfect square"
      end  // end main
end  // end of the class
```

9(a) – Java code

```
package evenoddsquarenot;
import java.util.Scanner;

public class EvenOddSquareNot
```

```
{
	public static void main(String[]args)
	{
		int iNumber; double rRoot;

		//create a scanner for input
		Scanner scanner = new Scanner(System.in);
		//prompt the user to enter the number
		System.out.print("\nProvide a number?: ");
		iNumber=scanner.nextInt();


		if (iNumber%2==0)
			{
			System.out.print("\nIt's an even number");
			}
		else
			{

			System.out.print("\nIt's an odd number");
			}


		rRoot=Math.sqrt(iNumber);

		if (rRoot%1==0) // (rRoot*rRoot==iNumber)
			{
			System.out.print("\nIt's a perfect square");
			}
		else
			{
			System.out.print("\nIt is not a perfect square");
			}
	}
}
```

9(b) – Pseudo code

```
MultipleOne
begin
      main method
            //declare variables
            int iNumber1
            int iNumber2

            // Input
            display"Provide the 1st number: "
            enter iNumber1
            display"Provide the 2nd number: "
            enter iNumber2

            //Check multiple
            if (iNumber2 MOD iNumber1==0)
                  display iNumber2+" is a multiple of "+iNumber1
            else
                  iNumber2+" is not a multiple of "+iNumber1

      end  // end main
end  // end of the class
```

9(b) – Java code

```
package multipleone;
import java.util.Scanner;
public class MultipleOne
{
```

```
	public static void main(String[]args)
	{
		int iNumber1; int iNumber2;

		//create a scanner for input
		Scanner scanner = new Scanner(System.in);

		//prompt the user to enter the number
		System.out.print("\nProvide the 1st number: ");
		iNumber1=scanner.nextInt();
		System.out.print("Provide the 2nd number: ");
		iNumber2=scanner.nextInt();

		if (iNumber2%iNumber1==0)
			{
			System.out.print(iNumber2+" is a multiple of "+iNumber1);
			}
		else
			{

			System.out.print(iNumber2+" is not a multiple of "+iNumber1);
			}
	} //end main
} //end class
```

9(c) – Pseudo code

```
Root
begin
	main method
		//declare variable
		int iNumber1
```

```
            // Input
            display"Provide the number: "
            enter iNumber1

            //check if number is not positive,
            //if it is calculate sqrt
            if (iNumber1 >= 0)
                  rRoot=iNumber1^(1/2)
                  display"The square root of "+iNumber1+" is "+rRoot
            else
                  display"You have entered a wrong number"

      end  // end main
end  // end of the class
```

9(c) – Java code

```
package root;
import java.util.Scanner;
public class Root
{
      public static void main(String[]args)
      {
            int iNumber1;

            //create a scanner for input
            Scanner scanner = new Scanner(System.in);

            //prompt the user to enter the number
            System.out.print("\nProvide the number: ");
            iNumber1=scanner.nextInt();
```

```
            if (iNumber1 >= 0)
                  {
                  double rRoot=Math.sqrt(iNumber1);
                  System.out.print("The square root of "+iNumber1+" is "+rRoot);
                  }
            else
                  System.out.print("You have entered a wrong number");
      }
}
```

9(d) – Pseudo code

```
MultipleOf_10
begin
      main method
            //declare variable
            int iNumber1

            // Input
            display"Enter an integer: "
            enter iNumber1

            //check if number is multiple of 10,
            if (iNumber1 MOD 10)
                  display"iNumber+" is a multiple of 10"
            else
                  display iNumber+" is not a multiple of 10"

      end  // end main
end  // end of the class
```

9(d) – Java code

```
package multipleof_10;
import java.util.Scanner;
public class MultipleOf_10
{
      public static void main( String[] args)
      {
      //create a scanner for input
      Scanner kb = new Scanner(System.in);
      //prompt the user to enter an integer
      System.out.print("Enter an integer: ");
      int iNumber = kb.nextInt();
      if (iNumber%10 == 0 )
            {
            System.out.println(iNumber+" is a multiple of 10");
            }
      else
            {
            System.out.println(iNumber+" is not a multiple of 10");
            }
      }
}
```

9(e) – Pseudo code

```
Absolute
begin
      main method
            //declare variable
```

```
            int iValue1

            // Input
            display"Enter an integer: "
            enter iValue1

            //check if number is positive,
            if (iValue1 >= 0)
                  display"The absolute value of "+iValue1 +" is "+iValue1"
            else
                  int iValue2=iValue1*(-1);
                  display"The absolute value of "+iValue1 +" is "+iValue2) "

      end  // end main
end  // end of the class
```

9(e) – Java code

```
package absolute;
import java.util.Scanner;
public class Absolute
{
      public static void main(String[]args)
      {
            //create a scanner for input
            Scanner kb = new Scanner(System.in);

            //prompt the user to enter the numbers
            System.out.print("Provide an integer: ");
            int iValue1=kb.nextInt();
```

```
            if( iValue1>=0 )
                  {
                  System.out.print("The absolute value of "+iValue1 +" is "+iValue1);
                  }
            else
                  {
                  int iValue2=iValue1*(-1);
                  System.out.print("The absolute value of "+iValue1 +" is "+iValue2);
                  }
      }
}
```

9(f) – Pseudo code

```
Positive
begin
      main method
            //declare variable
            int iNumber1

            // Input
            display"Enter an integer: "
            enter iValue1

            //check if number is positive,
            if (iValue1 >= 0)
                  display"It is a positive number "
            else
                  display"It is a negative number "

      end  // end main
```

```
end  // end of the class
```

9(f) – Java code

```
package positive;
import java.util.Scanner;
public class Positive
{
      public static void main(String[]args)
      {
            //create a scanner for input
            Scanner kb = new Scanner(System.in);

            //prompt the user to enter the numbers
            System.out.print("Provide an integer: ");
            int iValue1=kb.nextInt();

            if( iValue1 >= 0 )
                  {
                  System.out.print("It is a positive number ");
                  }
            else
                  {
                  System.out.print("It is a negative number ");
                  }
      }
}
```

Activity 10: Evaluate Boolean expressions

Evaluate the following Boolean expressions.

Code segments with Boolean expressions			Result (true / false)
a)	double rSalary = 4000; int iNumberYears = 3;	(rSalary >= 3000 && iNumberYears >=2)	**true**
b)	double rSalary = 1500; int iNumberYears = 3;	(rSalary >= 3000 && iNumberYears >=2)	**false**
c)	double rSalary = 2000; int iNumberYears = 2;	(rSalary >= 3000 && iNumberYears >=2)	**false**
d)	Int iResult=65; int iSubPassed=5	(iResult>49 || iSubPassed>3)	**true**
e)	Int iResult=25; int iSubPassed=0	(iResult>49 || iSubPassed>3)	**false**
f)	Int iResult=49; int iSubPassed=4	(iResult>49 || iSubPassed>3)	**true**
g)	Double rHeight=1.72	! (rHeight>2)	**true**
h)	Int iNumber1=45; Int iNumber2=12;	(iNumber1>iNumber2 &&iNumber2>25)	**false**
i)	int iSides=3;	! (iSides>=3)	**false**

Activity 11: Create pseudo code for scenarios with Boolean expressions, then write a Java program

N.B: Only Java codes are provided below.

Act 11.a)

```
package ticketsales;
import java.util.Scanner;
import java.text.DecimalFormat;
public class TicketSales
{
	public static void main( String[] args)
	{
	Scanner kb = new Scanner(System.in);
	DecimalFormat formatter = new DecimalFormat("R#,###.00");
	double rTotalSales, rStudPayment;
```

```
      int iNumStudTickets, iNumLectTickets;
      final double REGULAR_PERC = 0.1;
      final double MORE_PERC = 0.12;
      final double COST_STUD = 50.0;
      final double COST_LECT = 60.0;
      //input
      System.out.print("Number of student tickets sold?: ");
      iNumStudTickets = kb.nextInt();
      System.out.print("Number of lecturer tickets sold?: ");
      iNumLectTickets = kb.nextInt();
      //processing
      rTotalSales = iNumLectTickets * COST_LECT +  iNumStudTickets * COST_STUD ;
      if (iNumLectTickets > 10 && iNumStudTickets > 20)
            rStudPayment = rTotalSales * MORE_PERC;
      else
            rStudPayment = rTotalSales * REGULAR_PERC;
      //output
      System.out.println("The total sales is " + formatter.format(rTotalSales));
      System.out.println("The student's payment is " + formatter.format(rStudPayment));
      } //end main
} //end class
```

Act 11.b)

```
package speedfine;
import java.util.Scanner;
import java.text.DecimalFormat;
public class SpeedFine
{
      public static void main( String[] args)
      {
      Scanner kb = new Scanner(System.in);
      DecimalFormat formatter = new DecimalFormat("R#,###.00");
      double rSpeed, rTotalFine, rSpeedInterval;
```

```
	//input
	System.out.print("Enter the speed of the vehicle: ");
	rSpeed = kb.nextDouble();

	if (rSpeed <= 80)
	{
		System.out.println("No violation of speed limit.");
		System.exit (0);
	}

	if (rSpeed > 80 && rSpeed <= 120)
	{
		rSpeedInterval = rSpeed - 80;
		rTotalFine = 250 * Math.floor(rSpeedInterval / 10);
	}
	else //speed is more than 120
	{
		rSpeedInterval = rSpeed - 120;
		rTotalFine = 4 * 250 + 500 * Math.floor(rSpeedInterval / 10);
	}

	System.out.println("The final fine is " + formatter.format(rTotalFine));

	} //end main
} //end class
```

Act 11.c)

```
package sum;
import java.util.Scanner;
import java.util.Random;

public class Sum
```

```
{
	public static void main(String[]args)
	{
		int iNumber1; int iNumber2;

		//create a scanner for input
		Scanner scanner = new Scanner(System.in);
		Random x=new Random();
		iNumber1=x.nextInt(1000);
		iNumber2=x.nextInt(1000);


		System.out.println("The 1st number is: "+iNumber1);
		System.out.println("The 2nd number is: "+iNumber2);
		System.out.println("Provide the sum of the two numbers: ");

		int iSumUser=scanner.nextInt();
		int iSumCorrect=iNumber1+iNumber2;

		if (iSumCorrect==iSumUser)
		{
			System.out.print("Correct answer!!");
		}
		else
		{
			System.out.print("Incorrect answer!!");
		}
	}
}
```

Act 11.d)

```
package coordinate;
import java.util.Scanner;
import java.util.Random;

public class Coordinate
{
	public static void main(String[]args)
	{
		int iX; int iY;

		//create a scanner for input
		Scanner scanner = new Scanner(System.in);

		System.out.print("Provide the X coordinate: ");
		iX = scanner.nextInt();
		System.out.print("Provide the Y coordinate:  ");
		iY = scanner.nextInt();

		if (iX < 0 && iY > 0)
		{
			System.out.println("Second quadrant");
		}
		else
		{
			System.out.println("NOT in the second quadrant");
		}
	}
}
```

Act 11.e)

```
package deposit;
import java.util.Scanner;
public class Deposit
{
	public static void main(String[]args)
	{
		int iAmount;

		//create a scanner for input
		Scanner scanner = new Scanner(System.in);

		System.out.print("Provide the integer amount: ");
		iAmount=scanner.nextInt();

		if (iAmount >= 100 && iAmount <= 999)
		{
			System.out.println(iAmount + " is a 3 digits integer");
		}
		else
		{
			System.out.println(iAmount + " is NOT a 3 digits integer");
		}
	}
}
```

Activity 12: Boolean expressions taking precedence into account

Act 12.a)

```
package techcollege;
import java.util.Scanner;
public class TechCollege
{
    public static void main(String[]args)
    {
        int iSemTest, iProject;
        Scanner scanner = new Scanner(System.in);

        //Input
        System.out.print("Provide the semester test mark: ");
        iSemTest=scanner.nextInt();
        System.out.print("Provide the practical project mark: ");
        iProject=scanner.nextInt();

        if((iSemTest >= 50 && iProject >= 50) && (iSemTest >= 80 || iProject >= 80))
                  System.out.println ("You are promoted to the next year");
        else
           System.out.println ("You are NOT promoted to the next year");
    }
}
```

Act 12.b)

```
package triangle;
import java.util.Scanner;
public class Triangle
{
```

```
	public static void main(String[]args)
	{
		int iPerimeter;
		//create a scanner for input
		Scanner scanner = new Scanner(System.in);

		//prompt the user to enter the lengths
		System.out.print("\nProvide the first length: ");
		int iLength1=scanner.nextInt();
		System.out.print("Provide the second length: ");
		int iLength2=scanner.nextInt();
		System.out.print("provide the third length: ");
		int iLength3=scanner.nextInt();

		if( iLength1 < iLength2+iLength3 && iLength2 < iLength1+iLength3 && iLength3 < iLength2+iLength1 )
			{
			System.out.print("\nYou can make a Triangle!!");
			}
		else
			{
			System.out.print("\nYou cannot make a Triangle!!");
			}
	}
}
```

Act 12.c)

```
package values;
import java.util.Scanner;

public class Values
{
	public static void main(String[]args)
	{
```

```
            int iValue1, iValue2, iValue3;double rAnswer;
            //create a scanner for input
            Scanner scanner = new Scanner(System.in);

            //prompt the user to enter the numbers
            System.out.print("Provide the first integer: ");
            iValue1=scanner.nextInt();

            System.out.print("Provide the second integer: ");
            iValue2=scanner.nextInt();

            System.out.print("Provide the third integer: ");
            iValue3=scanner.nextInt();

            if( iValue1>iValue2 &&iValue1<iValue3 ||iValue2==iValue3 )
                  {
                  rAnswer=iValue1/iValue2*1.05;
                  }
            else
                  {
                  rAnswer=iValue1*iValue3*87.5;
                  }
            System.out.println ("The answer is number is "+ rAnswer);
      }
}
```

Act 12.d)

```
package happyhour;
import java.util.Scanner;

public class HappyHour
{
      public static void main(String[]args)
```

```
	{
		int iYear, iHour, iValue3;double rAnswer;
		//create a scanner for input
		Scanner scanner = new Scanner(System.in);

		//prompt the user to enter the years of experience
		System.out.print("Provide the number of years of experience ");
		iYear=scanner.nextInt();

		System.out.print("Provide the number of working hours per day");
		iHour=scanner.nextInt();;


		if( iYear>4 &&iYear<11 || iHour>=6)
		{
			System.out.print("You are in team A");

			}
		else
			{
			System.out.print("You are in team B");
			}
	}
}
```

Act 12.e)

```
package fourvalues;
import java.util.Scanner;

public class FourValues
{
	public static void main(String[]args)
	{
```

```
            int iValue1, iValue2, iValue3;double rAnswer;
            //create a scanner for input
            Scanner scanner = new Scanner(System.in);

            //prompt the user to enter the numbers
            System.out.print("Provide the first integer: ");
            iValue1=scanner.nextInt();

            System.out.print("Provide the second integer: ");
            iValue2=scanner.nextInt();

            System.out.print("Provide the third integer: ");
            iValue3=scanner.nextInt();

            System.out.print("Provide the fourth integer: ");
            int iValue4=scanner.nextInt();

            if( !(iValue1>iValue2) || !(iValue2<iValue4) && iValue2==iValue3 )
                  {
                  System.out.print("Correct values");

                  }
            else
                  {
                  System.out.print("Incorrect values");
                  }
      }
}
```

Activity 13: Checking numeric ranges with Boolean operators

Act 13.a)

Interval notation / Set builder notation	Java if statement with Boolean expression	Value of rValue	Result
{x| 1 < x <15, x∈N}	if (rValue > 1 && rValue <15) System.out.println("Valid value");	rValue= 1	False
{x| x < 10 or x >15, x∈N}	***if (rValue < 10 || rValue >15)*** ***System.out.println("Valid value");***	rValue=45	***True***
[57,78) (x ∈ R)	***if (rValue >=57 && rValue<78)*** ***System.out.println("Valid value");***	rValue=78	***False***
{x| -25 < x < 27, x∈Z}	***if (rValue >-25 && rValue <27)*** ***System.out.println("Valid value");***	rValue=0	***True***
(−∞, 2] U (7, +∞) (x ∈ R)	***if (rValue < 2 || rValue >7)*** ***System.out.println("Valid value");***	rValue=3	***False***

Act 13.b)

```
package concert;
import java.util.Scanner;

public class Concert
{
	public static void main(String[]args)
	{
		int iAge;
		double rPrice=50.00;
		//create a scanner for input
```

```
            Scanner scanner = new Scanner(System.in);

            //prompt the user to enter the age
            System.out.print("\nWhat is your age: ");
            iAge=scanner.nextInt();

            if (iAge>4 && iAge<13 || iAge> 60 )
                  {
                  System.out.print("\nYou qualify for a discount");
                  }
            else
                  {
                  System.out.print("\nNo discount");
                  }
      }
}
```

Act 13.c)

```
package sugar;
import java.util.Scanner;

public class Sugar
{
      public static void main(String[]args)
      {
            double rPackKg;

            //create a scanner for input
            Scanner scanner = new Scanner(System.in);

            //prompt the user to enter the bag kg
            System.out.print("\nWhat is the packet weight?: ");
            rPackKg=scanner.nextDouble();
```

```
            if (rPackKg>1.5 && rPackKg<5)
                  {
                  System.out.print("\nHe can buy the packet");
                  }
            else
                  {
                  System.out.print("\nHe can't buy the packet");
                  }
      }
}
```

Activity 14: Rewrite if .. else statements using the ternary operator

If…else statement	Statement using conditional operator

If (iAge >=65)
{
sCategory= “pensioner”
}
else
{
sCategory= “normal”
}
System.out.println(sCategory)
	sCategory= (iAge>=65)? “pensioner”: “Normal”;
	
	OR
	
	sCategory = (iAge>=65)
	? “pensioner” //the if block
	: “Normal”; //the else block
	System.out.println(sCategory)

if !(iNum%2==0)
{
iSum=iNum+1;
}
else
{
	iSum= !(iNum%2==0)? iNum+1: iNum+2;
	System.out.println(“the sum is ”+iSum)
	OR
	
	iSum= !(iNum%2==0)
	? iNum+1
	: iNum+2;

iSum=iNum+2;
}
System.out.println("the sum is " + iSum);
	System.out.println("the sum is "+iSum)

if (100>iGameTrial)
{
iGameTrial=iGameTrial-1
}
else
{
iGameTrial=0
}
System.out.println("remaining trials for the game = " + iGameTrial);
	iGameTrial= (100>iGameTrial)? iGameTrial-1: 0;
	System.out.println("remaining trials for the game = " + iGameTrial)
	OR
	iGameTrial= (100>iGameTrial)
	? iGameTrial-1
	: 0;
	
	System.out.println("remaining trials for the game = " + iGameTrial)

Activity 15: Using flags with Boolean operators

Note: the Java codes below can still be optimised!

Act 15.a)

```
package engineeringaccess;
import java.util.Scanner;

public class EngineeringAccess
{
    public static void main(String[] args)
    {
        // Create the Scanner object
        Scanner kb = new Scanner(System.in);
```

```
  char cHasMaths,cHasPhys;
  //Marks of subjects
  int iMaths =0, iPhys= 0;
  int iSubj3 =0, iSubj4 =0, iSubj5 =0, iSubj6 =0;
  //Names of other subjects
  String sSubj3, sSubj4, sSubj5, sSubj6;

  //input
System.out.print("Did you have Maths: <Y>es or <N>o: ");
cHasMaths = kb.nextLine().charAt(0);
  System.out.print("Did you have Physical Science: <Y>es or <N>o: ");
cHasPhys = kb.nextLine().charAt(0);

  if (cHasMaths=='Y' && cHasPhys=='Y')
  {
      System.out.print("Enter mark for Maths:");
      iMaths = kb.nextInt();
      System.out.print("Enter mark for Physical Sc:");
      iPhys = kb.nextInt();

      System.out.println("Enter other subjects (excluding LO)");
      //3rd Subject
      System.out.print("Enter name of the 3rd Subject: ");
      sSubj3 = kb.next();
      System.out.print("Enter mark for "+sSubj3+": ");
      iSubj3 = kb.nextInt();

      //4th Subject
      System.out.print("Enter name of the 4th Subject: ");
      sSubj4 = kb.next();
      System.out.print("Enter mark for "+sSubj4+": ");
      iSubj4 = kb.nextInt();

      //5th Subject
      System.out.print("Enter name of the 5th Subject: ");
```

```
    sSubj5 = kb.next();
    System.out.print("Enter mark for "+sSubj5+": ");
    iSubj5 = kb.nextInt();

    //6th Subject
    System.out.print("Enter name of the 6th Subject: ");
    sSubj6 = kb.next();
    System.out.print("Enter mark for "+sSubj6+": ");
    iSubj6 = kb.nextInt();
}
else
{
    System.out.println("\nYou do NOT qualify for Eng...");
    System.exit(0);
}

//count No. of Subj with mark >80
int iNum = 0;
iNum = (iMaths>=80)? iNum+1: iNum;
iNum = (iPhys>=80)? iNum+1: iNum;
iNum = (iSubj3>=80)? iNum+1: iNum;
iNum = (iSubj4>=80)? iNum+1: iNum;
iNum = (iSubj5>=80)? iNum+1: iNum;
iNum = (iSubj6>=80)? iNum+1: iNum;

//FLAGS
//Flag Maths and Phys > 70
boolean bMathPhys70 = (iMaths>=70&&iPhys>=70);
//Flag ALL Subj to be >60%
boolean bFlagMore60 = (iMaths>=60&&iPhys>=60&&iSubj3>=60&&
                       iSubj4>=60&&iSubj5>=60&&iSubj6>=60);
//Average 65 flag
double rAvgMark = (iMaths+iPhys+iSubj3+iSubj4+iSubj5+iSubj6)/6.0;
boolean bAvgMark65= (rAvgMark>=65);
```

```
        //Check if Student Qualify for Eng. or Not
        String sResult = (bMathPhys70==true&&iNum>=4&&bFlagMore60==true&&bAvgMark65==true)
                    ?"Qualify for Eng"
                    :"Do NOT qualify for Eng";

        System.out.println("\nResult: "+sResult);
    }
}
```

Act 15.b)

```
package triangularframe;
import java.util.Scanner;
public class TriangularFrame
{
    public static void main(String[] args)
    {
        // TODO code application logic here
        Scanner kb = new Scanner(System.in);
        //variables
        int iSide1, iSide2, iSide3;

            //Inputs
        System.out.print("Provide the first length:");
        iSide1 = kb.nextInt();
        System.out.print("Provide the second length:");
        iSide2 = kb.nextInt();
        System.out.print("Provide the third length:");
        iSide3 = kb.nextInt();

        //Flags
        boolean bFlag1 = !(iSide1>(iSide2+iSide3));
        boolean bFlag2 = !(iSide2>(iSide1+iSide3));
        boolean bFlag3 = !(iSide3>(iSide1+iSide2));
```

```
        if(bFlag1==true&&bFlag2==true&&bFlag3==true)
            System.out.println("Acceptable Dimensions!!");
        else
            System.out.println("Dimensions not acceptable!!");
    }
}
```

Act 15.c)

```
package bestemployee;
import java.util.Scanner;
public class BestEmployee
{
    public static void main(String[] args)
    {
        // TODO code application logic here

        Scanner kb = new Scanner(System.in);
        //variables
        int iNoYearExp, iEmpLevel,iAge;
        int iNoTechSkills, iNoMgtSkills;

        //Inputs
        System.out.print("Provide the number of years of experience: ");
        iNoYearExp = kb.nextInt();
        System.out.print("Provide the employee's Level: ");
        iEmpLevel = kb.nextInt();
        System.out.print("Provide the number of technical skills: ");
        iNoTechSkills = kb.nextInt();
        System.out.print("Provide the number of management related skills: ");
        iNoMgtSkills = kb.nextInt();
```

```
        System.out.print("Provide the employee's age: ");
        iAge = kb.nextInt();

        //Flags
        boolean bFlag1 =(iNoYearExp>=2||iEmpLevel>4&&iEmpLevel<7);
        boolean bFlag2 = (iNoTechSkills>=3 ||iNoMgtSkills>=5);
        boolean bFlag3 = !(iAge>=60);

        if(bFlag1==true&&bFlag2==true&&bFlag3==true)
            System.out.println("The Employee can be nominated");
        else
            System.out.println("Unfortunately, the employee cannot be nominated");
    }
}
```