Faculty of Information and Communication Technology
ICT First Years and Foundation Unit

Tshwane University of Technology
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I declare that I am familiar with, and will abide to the Examination rules of Tshwane University of Technology

_____
Signature

Principles of Programming and Introduction to Programming (Extended) (Year 1)

PPAF05D & TROF05D
SEMESTER TEST 3
PAPER A MEMO

24 August 2023 Duration: 2.5 Hours Total: 70 Full Marks: 70 Number of Pages: 13	Examiner: KS Tshehla Moderator: TA Maseko	
	Number on Class List	
	GROUP	

$\frac{\quad}{70} = \_\_\_\_\%$

Student Number

Surname	Initials

Instructions:

Read instructions at the beginning of each question.

All questions must be answered on the Electronic Campus(EC) platform.

Scientific, non-programmable calculators are allowed.

Cellular Phones are not allowed.

No sharing of calculators and/or stationery.

Round decimal answers to 2 decimal places.

Show all calculations when requested.

Question 1 (TRUE or FALSE) **[10]**

State whether the following statements are TRUE or FALSE

	Statements	Answer
1.1	The condition in an if-else statement must always be a relational expression.	**True**
1.2	The unary operator "--" increments the value of a variable by 1.	**False**
1.3	A trace table is a tool used to visualize the flow of control in a program's execution.	**True**
1.4	In Java, the operator > is used to check if a value is less than another value.	**False**
1.5	The || operator returns false if at least one operand is false.	**False**
1.6	The parentheses ( ) can be used to override the default precedence of operators in Java expressions.	**True**
1.7	A diamond symbol in a flowchart indicates the start and/or end of a program.	**False**
1.8	if - is a java keyword.	**True**
1.9	Compound assignment operators perform operations on variables of different data types.	**False**
1.10	The condition to check if quizMark is at least score 80% is; if(quizMark >= 80%)	**False**

Question 2 (MULTIPLE CHOICE) **[10]**

Select the correct answer for the following questions. Mark with an X.

2.1	In Java, what is the role of the "else" statement in an if-else statement?	
	A. It defines a new condition	A
	B. It specifies the condition for the "if" statement	B
	C. It provides an alternative block of code to execute when the "if" condition is false	C
	D. It terminates the program	D
2.2	Compound assignment operators are used to perform:	
	A. String concatenation	A
	B. Arithmetic operations and assignment	B
	C. Comparison operations	C
	D. Logical operations	D
2.3	Which unary operator decrements a variable by 1?	

	A. ++	A
	B. --	B
	C. +=	C
	D. ==	D
2.4	In an expression a || b && c, if a is true, b is false, and c is true, what will be the result of the expression?	
	A. true	A
	B. false	B
	C. Compilation error	C
	D. Depends on context	D

2.5	What will be the exact output of the following segment of code?
	int a = 25;
	System.out.print("1");
	if(++a < 25)
	System.out.println("2");
	else
	System.out.println("3");	

	A. 1	A
	B. 2	B
	C. 3	C
	D. 13	D

2.6	What will be the exact output of the following segment of code?
	int x=10, y=20, z=30;
	if(x > y || x > 10)
	z++;
	else
	z--;
	System.out.println("z "+z);	

	A. z = 29	A
	B. z = 30	B
	C. z 29	C
	D. z 31	D
2.7	In a Boolean expression, which operator is used to perform logical negation?	

	A. &&	A
	B. ||	B
	C. !	C
	D. ^	D
2.8	The following code section will display the word DONE only if which of the following options is true? if (a == 1 && b == 3 && c != 5) System.out.print("DONE");	
	A. a is one, B is 3, C is 5.	A
	B. either a is 1 or b is 3 and c is not 5.	B
	C. either a is 1 and b is 3, or C is five.	C
	D. a is 1, b is 3 and c is less or greater than 5.	D
2.9	Which of the following expressions is equivalent to (x > 5)&&(x < 10)?	
	A. !(x <= 5) && (x >= 10)	A
	B. (x > 5) || (x < 10)	B
	C. !(x <= 5 || x >= 10)	C
	D. !(x > 5) || (x < 10)	D

2.10	int a = 22;
	int b = 2 * a + 13 - --a;
	int c = b + 22 - a--;
	
	if(b > c)
	System.out.println("Greater" + b);
	else
	System.out.println("Less" + c);	

	A. Greater36	A
	B. Less37	B
	C. Greater37	C
	D. Less36	D

Question 3 (Short Answers) [15]

3.1 What will be the exact output of the following segment of code?

```
int a = -5;
int b = -3;

 if(a < b)
     System.out.print(a);
     System.out.println(b);
```

-5-3

3.2 What will be the exact output of the following segment of code?

```
boolean bChoice = false;

if (!bChoice)
   System.out.println("Go");

else
   System.out.println("Stop");
```

Go

3.3 What will be the exact output of the following segment of code?

```
int x = 23; int y = 123;

if (x > 23 || y <= 123)
    System.out.print(x + " " + y + " " + (y + x));
else
    System.out.print(x + " " + y + " " + (y - x));
```

23 123 146

3.4 Re-write Only the if statement line to give correct result:

```
if(17 < iAge < 60)
    sCategory = "ADULT";
```

if(iAge > 17 && iAge < 60)

3.5 Write two java statement that prints "*Same sign*" if *iNum1* and *iNum2* have the same sign (-/+).

```
if(iNum1 * iNum2 > 0)
    System.out.println("Same sign");
```

OR

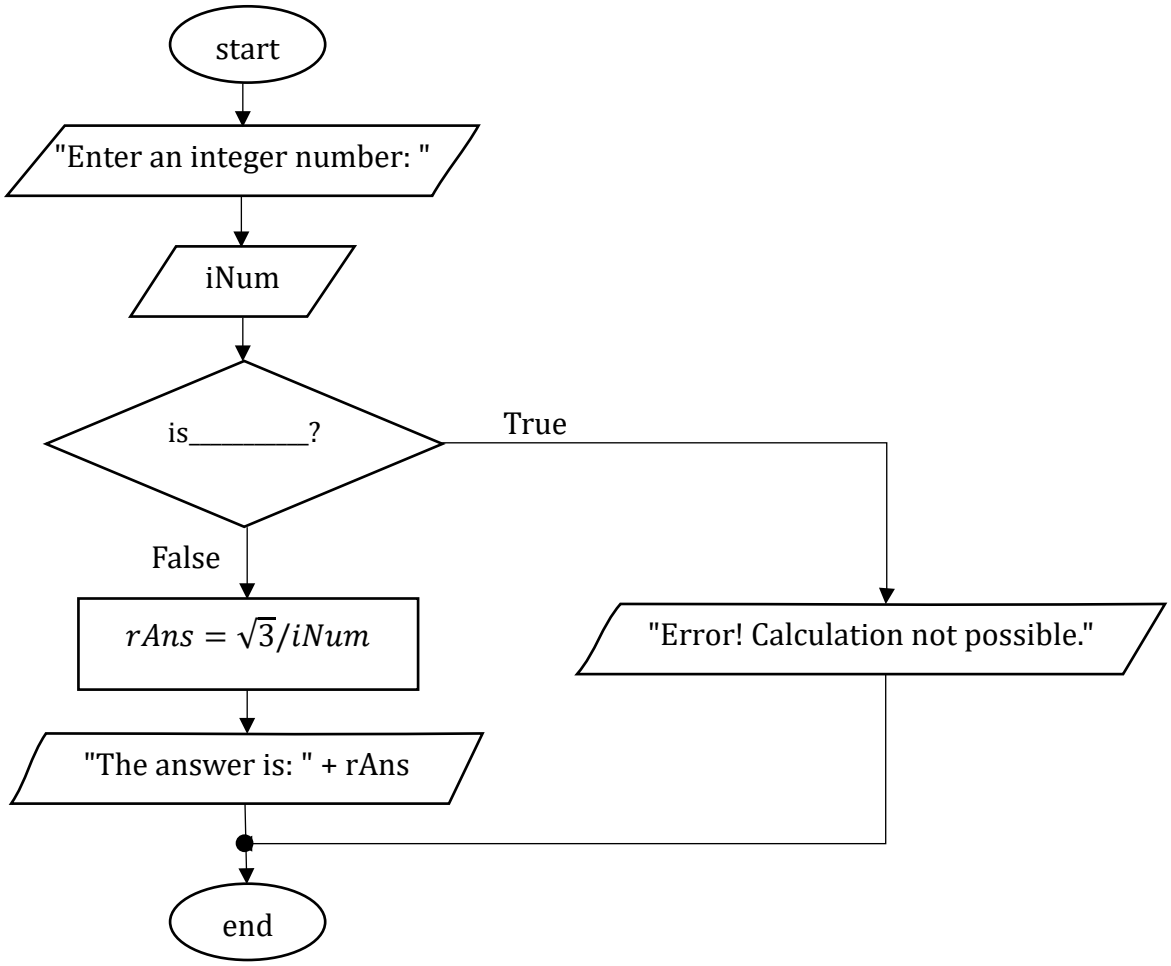
```
if(iNum1 > 0 && iNum2 > 0 || iNum1 < 0 && iNum2 < 0)
    System.out.println("Same sign");
```

3.6 Normal body temperature ranges from 36.1°C to 37.2°C. Write two java statements that checks if the variable rBodyTemp is within limits and display "Normal body temperature".

```
if(rBodyTemp >= 36.1 && rBodyTemp <= 37.2)
   System.out.println("Normal body temperature");
```

Question 4 (Convert flowchart to Java program) [10]

The flowchart below illustrates a program that calculates and displays the square root of three divided by a given integer number. However, before performing the calculation, you need to check if the input value is valid to avoid undefined results. Figure out what the condition should be and write the Java code that implements this chart.



Possible Solution

```
import java.util.Scanner;

public class FractionCalculator {
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);

        int iNum;
        double rAns;

        System.out.print("Enter an integer number: ");
        iNum = keyboard.nextInt();

        if (iNum == 0)
        {
            System.out.println("Error! Calculation not possible.");
        }
        else
        {
            rAns = Math.sqrt(3) / iNum;
            System.out.println("The answer is: " + rAns);
        }
    }
}
```

Question 5 (Write a Java program from IPO table) **[10]**

Consider the following program that reads an integer from the user, calculates, and displays both the double and half of the entered value. Complete a trace table to determine the final output of the algorithm. Use a value of 5 as input for variable iValue.

```
import java.util.Scanner;

public class DoubleAndHalfCalculator {
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);

        int iValue;
        double rDouble;
        double rHalf;

        System.out.print("Enter an integer: ");
        iValue = keyboard.nextInt();

        rDouble = iValue * 2.0;
        rHalf = iValue / 2.0;

        System.out.println("Double of the value: " + rDouble);
        System.out.println("Half of the value: " + rHalf);
    }
}
```

Step	Type of statement				Display
1					
2					
3					
4					
5					
6					
				Exact Output	

Possible solutions:

Step	Type of statement	iValue	rDouble	rHalf	Display/Output
1	display				Enter an integer:
2	enter	5			
3	calculation		5*2.0=10.0		
4	calculation			5/2.0=2.5	
5	display				Double of the value: 10.0
6	display				Half of the value: 2.5
				Exact Output	Enter an integer: Double of the value: 10.0 Half of the value: 2.5

Question 6 (Problem solving with Java programs) [20]

TV Purchase Finance Calculator

You have been assigned the task of creating a program that helps customers choose a TV and provides them with information about instalment plans. The program will present customers with three TV options of different sizes, along with their prices. The customers will choose an option by selecting the corresponding letter. Your program should validate the choice, calculate the monthly instalment, and display the credit price after interest. Interest charged at 74.15%.

Program Requirements:

Write a Java program that meets the following requirements:

- Use the DecimalFormat class to format currency values and escape sequences for alignment and spaces.
- Declare constants to store the prices of three TV options. This ensures that any changes made to the value of a constant will automatically be reflected in all displays and calculations.
- Display the TV options to the user:

```
C:\Test Java>java TVPurchaseCalculator

                Select a TV:
        A - 32-inch TV  Price: R2,499.00
        B - 40-inch TV  Price: R3,999.00
        C - 55-inch TV  Price: R5,799.00

        Enter your choice:
```

- Read the letter from the user to select a TV.
- Use if statements (without else) to select the correct TV's price based on the user's choice.
- Use an if-else statement to validate if the choice is not valid (not A, B, or C), display the message:

```
        Enter your choice: H

        Invalid choice! Option 'H' does not exist.

C:\Test Java>
```

- The program should only accept uppercase letters as valid. Lowercase should be treated as invalid.

```
        Enter your choice: a

        Invalid choice! Option 'a' does not exist.
```

- If the choice is valid, calculate the monthly instalment amount and the total credit price. The total credit amount financed, includes the original TV price plus the interest amount is spread out over 24 months in instalments.

```
C:\Test Java>java TVPurchaseCalculator

               Select a TV:
       A - 32-inch TV  Price: R2,499.00
       B - 40-inch TV  Price: R3,999.00
       C - 55-inch TV  Price: R5,799.00

       Enter your choice: B

       Pay as little as: R290.18 pm x 24 months
       ========================================


       ***Credit Price: R6,964.26

C:\Test Java>_
```

Possible solution:

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

public class TVPurchaseCalculator {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        DecimalFormat pretty = new DecimalFormat("R#,###.00");
        final double TV32 = 2499, TV40 = 3999, TV55 = 5799;
        final double RATE = 0.7415; // 74.15% as a decimal
        double rPrice = 0, rLoan, rInstallment;

        System.out.println("\n\t\tSelect a TV:");
        System.out.println("\tA - 32-inch TV\tPrice: " + pretty.format(TV32));
        System.out.println("\tB - 40-inch TV\tPrice: " + pretty.format(TV40));
        System.out.println("\tC - 55-inch TV\tPrice: " + pretty.format(TV55));
        System.out.print("\n\tEnter your bChoice: ");
        char bChoice = scanner.next().charAt(0);

        if (bChoice == 'A')
            rPrice = TV32;
        if (bChoice == 'B')
            rPrice = TV40;
        if (bChoice == 'C')
            rPrice = TV55;

        if( bChoice != 'A' && bChoice != 'B' && bChoice != 'C' )
        {
            System.out.println("\n\tInvalid choice! Option '" + bChoice + "' does not exist.");
        }
        else
        {
            // Calculate the monthly installment including interest
            rLoan = rPrice + (rPrice * RATE);
            rInstallment = rLoan / 24;

            System.out.println("\n\tPay as little as: " + pretty.format(rInstallment) + " pm x 24 months");
            System.out.println("\t=======================================");
            System.out.println("\n\n\t***Credit Price: " + pretty.format(rLoan));
        }
    }
}
```