

University of Cape Town
Department of Computer Science

Computer Science CSC115F

Final Exam

-
- Answer all questions.
 - All questions that refer to elements of programming make reference to the Java programming language as studied in class.
 - Good luck !

Marks: 25

- Approximate marks per question are shown in brackets

Time: some minutes

- The use of calculators is permitted

NAME:

Surname	Initials

STUDENT NO: **COURSE CODE:**

This paper consists of 2 questions and 7 pages (including this cover page).

Mark Allocation							
Quest	Marks	Internal	External	Quest	Marks	Internal	External
1	[10]			2	[15]		
Total				Total			
Grand Total							
Final Mark							
Internal Examiner:				External Examiner:			

Section 1. Basic Java Concepts

Question 1. [10 marks]

Study the following program and answer the questions that follow.

```
public class sandwich
{
    public static void main ( String [] args )
        throws java.io.IOException
    {
        int wich;

        do {
            wich = Keyboard.readInt("sandwich number? ");

            switch (wich)
            {
                case 1 : System.out.println ("add onions");
                case 2 : System.out.println ("add garlic");
                case 3 : System.out.println ("add tomato");
                break;
                default: System.out.println ("read the menu again!");
            }
        } while (wich != 0);
    }
}
```

a) What is a **class**? [2]

it is a template for creating objects
or
it is a grouping together of instance variables with their
related methods in the program source

b) Is *wich* an instance variable or a local variable? Briefly explain why you believe
this is so. [2]

local variable [1]
It is defined within a method. [1]

c) What is the output of the program if the input is "2"? [1]

add garlic
add tomato

d) The switch statement executes at least once, even if the user enters "0". How can
the program be modified to prevent this? [2]

encapsulate the switch in an if statement

or

convert the do-while to a while, move the input outside and duplicate at the bottom of the loop

- e) Assuming you want to use path testing, provide a minimal sequence of test values to be used as input. [3]

1 2 3 [1] 4/5/6/... [1] 0 [1]

Section 2. Problem Solving

Question 2. [15 marks]

- a) Write a program to calculate and output both roots of the quadratic polynomial $ax^2 + bx + c$. The formula for this is $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. Output an error if the roots cannot be found (i.e., they are complex numbers). [7]

```
public class roots
{
    public static void main ( String [] args )
        throws java.io.IOException
    {
        float a = Keyboard.readInt("Enter a: ");
        float b = Keyboard.readInt("Enter b: ");
        float c = Keyboard.readInt("Enter c: ");

        // write your code here

    }
}
```

```
public class roots
{
    public static void main ( String [] args )
        throws java.io.IOException
    {
        float a = Keyboard.readInt("Enter a: ");
        float b = Keyboard.readInt("Enter b: ");
        float c = Keyboard.readInt("Enter c: ");

        float discriminant = (b*b - 4*a*c);
        if (discriminant < 0)
            System.out.println ("Error");
        else
        {
            System.out.println ("root 1 = " + ((-b+Math.sqrt(discriminant))/(2*a))
            System.out.println ("root 2 = " + ((-b-Math.sqrt(discriminant))/(2*a))
        }
    }
}
```

- b) Write a method **calcPayments** to calculate the number of payments needed to repay a bank loan, if at the end of each month a payment of *payment* rands is made before interest is calculated and added at a monthly rate of *interest* (percent). Assume the initial amount of the loan is *loan*. Assume all values are floating point values and ignore issues related to rounding. [8]

```
public class loan
{
    public static void main ( String [] args )
    {
        loanCalc l = new loanCalc ();

        // test the class
        System.out.println ("Months = " +
            l.calcLoan (150000, 1, 2000));
    }
}

class loanCalc
{
    public int calcPayments ( float loan, float interest, float payment )
    {
        // write your code here

    }
}
```

```
public int calcPayments ( float loan, float interest, float payment )
{
    int months = 0;
    while (loan > 0)
    {
        loan -= payment;
        months++;
        loan += loan * (interest / 100);
    }
    return months;
}
```