

061306T4CSC

COMPUTER SCIENCE LEVEL 6

ICT/OS/CS/CR/04/6

Understand Fundamentals of Programming

March/April 2026



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

WRITTEN ASSESSMENT

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATE

1. The paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** (3) questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. Do not write on this question paper.

This paper consists of FIVE (5) printed pages

Candidate should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (40 MARKS)***Answer ALL The Questions in This Section***

1. Programming languages undergo several phases during development. List FOUR phases of program development in their correct sequence. (4 marks)
2. Write Java statements to declare variables for storing a student's registration number (as text), age (as whole number), and average score (as decimal number). (3 marks)
3. The Java Development Kit (JDK) provides various tools for developing Java applications. Explain TWO JDK tools used in program development. (4 marks)
4. A trainee software developer attempted to write a simple Java program to calculate and display the product of a number and 5. Identify THREE syntax errors in the following Java program that prevent it from executing correctly:

```
Public class student {
    public static void main(String[] args) {
        int 1stNumber = 50;
        int result = 1stNumber * 5
        System.out.println(result);
    }
}
```

(3 marks)

5. State the difference between `private` and `public` access specifiers, providing an example of when each would be appropriately used. (4 marks)
6. Outline a Java program segment that declares a `String` variable called `studentName`, assigns it the value "John Doe", then uses TWO different `String` methods to:
 - Display the length of the name
 - Convert the name to lowercase
 (4 marks)
7. Operators in Java are classified based on the number of operands they operate on. Distinguish between unary and binary operators by providing ONE example of each with its operation. (4 marks)
8. A trainee programmer is testing decision-making logic in a Java application that compares student scores stored in variables. Determine the output of the following Boolean expressions that is being tested:

```
int x = 15;
int y = 20;
```

```
int z = 15;  
boolean outcome1 = (x == z);  
boolean outcome2 = (x > y);  
boolean outcome3 = (x <= y) && (y > z);  
boolean outcome4 = (x != z) || (y < z);
```

(4 marks)

9. Loops enable repetitive execution of code blocks . Write a Java program segment using a `while` loop to display even numbers from 2 to 20. (4 marks)
10. Exception handling improves program robustness. Explain the purpose of `try`, `catch`, and `finally` blocks in Java exception handling. (3 marks)
11. Write a Java program segment that creates an array called `temperatures` containing five integer values: 23, 25, 28, 22, 26. The program should calculate and display the average temperature. (3 marks)

SECTION B (60 MARKS)***Answer Any THREE Questions in This Section***

12. a. Algorithm design is fundamental to problem-solving in programming.
- Define the term algorithm as used in programming. (2 marks)
 - A teacher wants to calculate the average of three test scores and determine if a student has passed (average ≥ 50). Design a flowchart to represent this algorithm. (6 marks)
 - Convert the flowchart in (ii) above into a complete Java program that accepts three scores from the keyboard and displays both the average and pass/fail status. (6 marks)
- b. Object-oriented programming utilizes specific principles to structure code effectively. Explain TWO principles of object-oriented programming: Abstraction and Polymorphism, providing a practical example for each. (6 marks)
13. a. A supermarket needs a program to calculate the total cost of items purchased. Develop a complete Java program that:
- Prompts the user to enter the item name, unit price, and quantity
 - Calculates the subtotal (price $\times$ quantity)
 - Applies a 10% discount if the subtotal exceeds Ksh. 5000
 - Calculates and displays: item name, subtotal, discount amount, and final amount to pay
- Use appropriate data types and include proper output formatting. (10 marks)
- b. Control structures determine the flow of program execution. Compare the use of `if-else` statements and `switch-case` statements, highlighting TWO advantages of each. (4 marks)
- c. Construct a Java program using a `for` loop to display the multiplication table of 7 from 7×1 to 7×12 in the format:
- ```

7 x 1 = 7
7 x 2 = 14
...

```
- (6 marks)
14. a. Classes and objects are fundamental concepts in Java programming.
- Show the difference between a class and an object, using a real-world analogy to illustrate your explanation. (4 marks)
  - Create a Java class called `BankAccount` with the following specifications:
    - Private data members: `accountNumber` (String), `balance` (double)
    - A constructor to initialize both data members

- A method called `deposit()` that accepts an amount and adds it to the balance
  - A method called `getBalance()` that returns the current balance
  - Demonstrate the creation of an object with account number "ACC001" and initial balance 5000, then deposit 2000 and display the final balance (12 marks)
- b. Methods enhance code reusability and organization. Explain the difference between methods with return values and void methods, providing a Java code example of each. (4 marks)
15. a. Inheritance is a key feature of object-oriented programming that promotes code reuse. Illustrate the concept of inheritance by creating:
- A parent class called `Employee` with attributes: `name (String)` and `salary (double)`, including a constructor and a method `displayInfo()` to print employee details
  - A child class called `Manager` that inherits from `Employee` and adds an attribute `department (String)`, with its own constructor and an overridden `displayInfo()` method
  - Create an object of the `Manager` class with name "Alice Smith", salary 80000, and department "IT", then display the information (12 marks)
- b. Method overloading allows multiple methods with the same name but different parameters. Demonstrate method overloading by creating THREE methods called `calculateArea()` that:
- Calculate the area of a square (one parameter: side)
  - Calculate the area of a rectangle (two parameters: length and width)
  - Calculate the area of a circle (one parameter: radius, use  $\pi = 3.14159$ )
- Include the method declarations and sample method calls. (8 marks)