Quiz 5

The Art of Computer Programming

3 November 2025

Full name: .....

You have 10 minutes to answer this quiz, directly on this sheet of paper. No electronic devices or material of any kind is allowed. Do not forget to add your name above. Every question amounts to 2 points; the quiz is graded out of 10 points.

Questions

Q1. Circle the correct statement about **object-oriented programming (OOP)**:

a. An object is a class that defines properties and methods.

b. A class is an instance of an object.

c. Objects of different subclasses of the same superclass can behave polymorphically.

d. In OOP, all programming languages require every value to be an object.

Q2. Match each OOP concept with its correct definition by drawing a line between them.

Concept	Definition
Encapsulation	A special method used to initialize an object when it is created
Inheritance	Hiding the internal details of an object and exposing only necessary parts
Polymorphism	Using the same method name to perform different tasks depending on object
Constructor	Allowing a class to derive properties and methods from another class

Q3. Circle the correct statement about **constructors and destructors**:

a. In Python, the constructor is named `__construct__`.

b. In C++, the destructor is a special method named `delete`.

c. In Python, `__del__` is rarely used because its call time is not guaranteed.

d. In C++, constructors must always be virtual.

Q4. Consider the following C++ program:

```
#include <iostream>

class Shape {
public:
  virtual double area() const = 0;
  virtual ~Shape() {}
};

class Circle : public Shape {
  double r;
public:
  Circle(double radius) { r=radius; }
  double area() const override { return 3.14159 * r * r; }
};

int main()
{
  Shape *s = new Circle(2);
  std::cout << s->area() << std::endl;
  delete s;
  return 0;
}
```

What is its behavior? Circle the correct answer.

a. This does not compile as `Shape` is an abstract class.

b. The call to `area()` results in undefined behavior as it is a pure virtual method.

c. The program prints an approximation of 4π.

d. The program prints an unpredictable value as `r` is uninitialized.

Q5. Circle the correct statement about **structured data in C**:

a. A `struct` in C supports inheritance and polymorphism.

b. All members of a C `struct` are private by default.

c. Methods can be defined inside a `struct` in C.

d. A `struct` groups related data but has no built-in methods.