

I chose Encapsulation and Polymorphism as a persuasive pair for OO fundamentals.

1. Encapsulation

- 1- Encapsulation makes a class guarantee that its data always remain in a valid configuration by keeping state private and exposing only controlled accessors.
- 2- A defined public interface works like a contract that other module can rely on which is the key in terms of improving communications.
- 3- It reduces the risk and cost of maintenance of callers in large code bases by hiding implementation details.

```
1 public final class BankAccount {
2     private double balance;
3
4     public BankAccount(double initial) {
5         if (initial < 0) throw new IllegalArgumentException();
6         balance = initial;
7     }
8     public void deposit(double amt) {
9         if (amt <= 0) throw new IllegalArgumentException();
10        balance += amt;
11    }
12    public boolean withdraw(double amt) {
13        if (amt <= 0 || amt > balance) return false;
14        balance -= amt;
15        return true;
16    }
17    public double getBalance() {
18        return balance;
19    }
20 }
```

2. Polymorphism

- 1- It allows new behaviors to be added by adding new subclasses rather than editing existing code, which keeps tested code untouched.
- 2- It leads to cleaner and shorter code since callers work with an abstract type and need not branch on concrete classes.

3- Runtime objects can be swapped without altering client code.

```
1  interface Shape {
2      double area();
3  }
4
5  class Circle implements Shape {
6      private final double r;
7      Circle(double r) { this.r = r; }
8      public double area() { return Math.PI * r * r; }
9  }
10
11 class Rectangle implements Shape {
12     private final double w, h;
13     Rectangle(double w, double h) { this.w = w; this.h = h; }
14     public double area() { return w * h; }
15 }
16
17 public static double totalArea(List<Shape> shapes) {
18     double sum = 0.0;
19     for (Shape s : shapes) sum += s.area();
20     return sum;
21 }
22
```