**Week 1 - Design Patterns - Hands-On Exercise**

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**Exercise 2: Implementing the Factory Method Pattern**

**Solution:**

**1. Understanding Factory Method Pattern**

**What is Factory Method Pattern?**

Factory Method pattern is used to create objects without specifying their exact class. Instead of creating objects directly using new keyword, we use factory classes to create objects. This pattern is useful when we have multiple types of similar objects and want to create them based on some condition.

The pattern works by having an abstract factory class with a method to create objects, and concrete factory classes that implement this method to create specific types of objects.

**2. Setup**

I created a document management system with different document types (Word, PDF, Excel) using Factory Method pattern. Each document type has its own factory class that creates the specific document object.

**3. Implementation**

I implemented Factory Method pattern with these components:

* Document interface with common methods (open, save, close)
* Concrete document classes (WordDocument, PdfDocument, ExcelDocument)
* Abstract DocumentFactory class with createDocument() method
* Concrete factory classes for each document type

**4. Analysis**

**Benefits:** Easy to add new document types, separates object creation logic, follows open-closed principle.

**Time Complexity:** O(1) for creating any document object.

**Flexibility:** Adding new document types requires only creating new document class and its factory, no changes to existing code.

**Conclusion:** Factory Method pattern provides flexible way to create different types of objects and makes the system easy to extend with new document types.

**Program Output:**

