UML Diagrams and Comparison

# Sample Problem 1: School Results Application

## Class Diagram

+----------------+ +----------------+ +---------------------+  
| Student |<>-------->| Subject | | GradeCalculator |  
+----------------+ +----------------+ +---------------------+  
| - name: String | | - name: String | | |  
| - id: int | | - marks: int | +---------------------+  
+----------------+ +----------------+ | +calculateGrade() |  
| +getSubjects() | +---------------------+  
+----------------+

## Object Diagram

Student: John  
 └── Subject: Maths (90)  
 └── Subject: Science (85)

## Sequence Diagram

Student -> GradeCalculator : requestGrade()  
GradeCalculator -> Student : getSubjects()  
GradeCalculator -> Subject : getMarks()  
GradeCalculator -> Subject : getMarks()  
GradeCalculator -> Student : returnGrade("A")

# Sample Problem 2: Grocery Store Bill Generation Application

## Class Diagram

+----------------+ +----------------+ +---------------------+  
| Customer | \*-->| Product | | BillGenerator |  
+----------------+ +----------------+ +---------------------+  
| - name: String | | - name: String | | |  
| - id: int | | - qty: double | +---------------------+  
+----------------+ | - price: double| | +generateBill() |  
| +getProducts() | +----------------+ +---------------------+  
+----------------+

## Object Diagram

Customer: Alice  
 └── Product: Apples (2kg @ $3/kg)  
 └── Product: Milk (1L @ $2/L)

## Sequence Diagram

Customer -> BillGenerator : generateBill()  
BillGenerator -> Customer : getProducts()  
BillGenerator -> Product : getQty(), getPrice()  
BillGenerator -> Product : getQty(), getPrice()  
BillGenerator -> Customer : returnTotal($8)

# Comparison of the Two Scenarios

|  |  |  |
| --- | --- | --- |
| Feature | School Results Application | Grocery Store Bill Application |
| Classes | Student, Subject, GradeCalculator | Customer, Product, BillGenerator |
| Relationships | Aggregation | Composition |
| Primary Function | Calculate grade | Generate total bill |
| Key Entities | Students, Subjects, Grades | Customers, Products, Bills |