# Software Methodology 11.15

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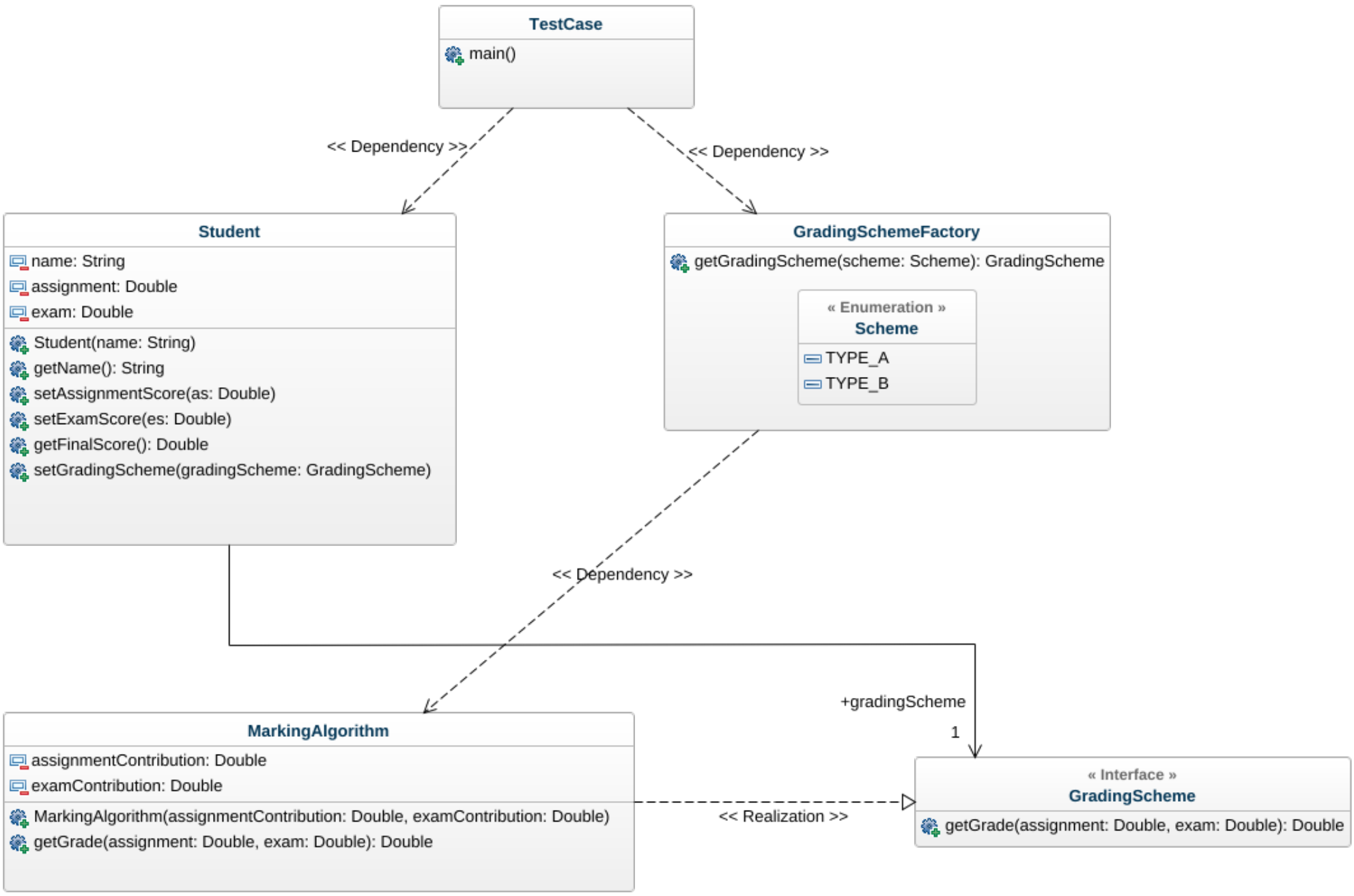
## Design Pattern

The design pattern I chose is the **factory pattern**. First, in this program the user wants to create a grading algorithm, as long as he knows its name, and does not need to care about its specific implementation. Secondly, the extensibility is high, if needed to add a new grading algorithm, just change the factory class. At last, Shielding the specific implementation of the product, the caller only needs to care about the interface of the product

## Class Diagram




## Code

### GradingScheme.java

```java
public interface GradingScheme {
    public double getGrade(double assignment, double exam);
}
```

### GradingSchemeFactory.java

```java
public class GradingSchemeFactory {
    public static enum Scheme {
        TYPE_A,
        TYPE_B
    }
    public GradingScheme getGradingScheme(Scheme scheme){
        if(scheme == Scheme.TYPE_A){
            return new MarkingAlgorithm(0.4,0.6);
        }
        else if(scheme == Scheme.TYPE_B){
            return new MarkingAlgorithm(0.5,0.5);
        }
        throw new RuntimeException("Unknown scheme");
    }
}
```

### MarkingAlgorithm.java

```java
public class MarkingAlgorithm implements GradingScheme {
    private double assignmentContribution;
    private double examContribution;

    public MarkingAlgorithm(double assignmentContribution, double examContribution) {
        if ((assignmentContribution < 0 || assignmentContribution > 1)
                || (examContribution < 0 || examContribution > 1)) {
            throw new RuntimeException(
                    "The assignment contribution and " +
                            "exam contribution should be " +
                            "between 0 and 1, now: " +
                            assignmentContribution +
                            " " +
                            examContribution);
        }
        if ((assignmentContribution + examContribution) != 1) {
            throw new RuntimeException("The sum of assignment contribution and " +
                    "exam contribution should be " +
                    "1, now: " +
                    (assignmentContribution + examContribution));
        }
        this.assignmentContribution = assignmentContribution;
        this.examContribution = examContribution;
    }

    @Override
    public double getGrade(double assignment, double exam) {
        return assignmentContribution * assignment + examContribution * exam;
    }
}
```

### Student.java

```java
public class Student {

    private String name;        // full name of the student
    private Double assignment;  // score for the assignment
    private Double exam;        // score for the exam
    private GradingScheme gradingScheme;

    /**
     * Construct the student from their name
     * @param name full name of the student
     */
    public Student(String name) {
        this.name = name;
        assignment = 0.0;
        exam = 0.0;
    }

    /**
     * @return the student's full name
     */
    public String getName() {
        return name;
    }

    /**
     * @param as the assignment score to set
     */
    public void setAssignmentScore(double as) {
        assignment = as;
    }
    /**
     * @param es the exam score to set
     */
    public void setExamScore(double es) {
        exam = es;
    }

    // TODO get the final score
    public Double getFinalScore() {
        if(gradingScheme == null) {
            throw new RuntimeException("Grading scheme not set");
        }
        return gradingScheme.getGrade(assignment, exam);
    }

    public void setGradingScheme(GradingScheme gradingScheme) {
        this.gradingScheme = gradingScheme;
    }
}
```

## TestCase.java

```java
public class TestCase {

    public static void main(String[] args) {

        Student student = new Student("Harry Potter");
        student.setAssignmentScore(88);
        student.setExamScore(66);

        GradingSchemeFactory factory = new GradingSchemeFactory();
        // TODO switch to algorithm A:
        student.setGradingScheme(
                factory.getGradingScheme(
                        GradingSchemeFactory.Scheme.TYPE_A
                ));
        System.out.println(
                student.getName()
                        + "  "
                        + student.getFinalScore().toString());

        // TODO switch to algorithm B
        student.setGradingScheme(
                factory.getGradingScheme(
                        GradingSchemeFactory.Scheme.TYPE_B
                ));
            System.out.println(
                    student.getName()
                            + "  "
                            + student.getFinalScore().toString());

    }

}
```

## Output

```
Harry Potter  74.80000000000001
Harry Potter  77.0
```