



# OOP with Java

## Homework 03: Classes and Objects

Thomas Weise · 汤卫思

tweise@hfu.edu.cn · <http://iao.hfu.edu.cn>

Hefei University, South Campus 2  
Faculty of Computer Science and Technology  
Institute of Applied Optimization  
230601 Shushan District, Hefei, Anhui, China  
Econ. & Tech. Devel. Zone, Jinxiu Dadao 99

合肥学院 南艳湖校区/南2区  
计算机科学与技术系  
应用优化研究所  
中国 安徽省 合肥市 蜀山区 230601  
经济技术开发区 锦绣大道99号

- 1 Introduction
- 2 Tasks



website

- We want to practice working with objects and classes
- We use all the stuff we have learned before, including expressions, if-then-else, loops, static routines from `java.util.Math`, etc.
- This homework is comprised of two task
- Send me a zip archive named `hw03_[your_student_id].zip` (where `[your_student_id]` is replaced with your student id) with one answer-folder for each homework task (names `hw03-1` and `hw03-2` )

- ① Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).

# Task hw03-1: Class Hierarchy I



- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon`

- ① Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- ② There should be a base class `Polygon` :
  - ① with a member variable `double sideLength` to hold the side lengths,
  - ② with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)



- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for:
  - 1 equilateral triangles ([http://en.wikipedia.org/wiki/Equilateral\\_triangle](http://en.wikipedia.org/wiki/Equilateral_triangle))

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for:
  - 1 equilateral triangles ([http://en.wikipedia.org/wiki/Equilateral\\_triangle](http://en.wikipedia.org/wiki/Equilateral_triangle))
  - 2 squares (<http://en.wikipedia.org/wiki/Square>)

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for:
  - 1 equilateral triangles ([http://en.wikipedia.org/wiki/Equilateral\\_triangle](http://en.wikipedia.org/wiki/Equilateral_triangle))
  - 2 squares (<http://en.wikipedia.org/wiki/Square>)
  - 3 regular pentagons ([http://en.wikipedia.org/wiki/Pentagon#Regular\\_pentagons](http://en.wikipedia.org/wiki/Pentagon#Regular_pentagons))

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon`:
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for:
  - 1 equilateral triangles ([http://en.wikipedia.org/wiki/Equilateral\\_triangle](http://en.wikipedia.org/wiki/Equilateral_triangle))
  - 2 squares (<http://en.wikipedia.org/wiki/Square>)
  - 3 regular pentagons ([http://en.wikipedia.org/wiki/Pentagon#Regular\\_pentagons](http://en.wikipedia.org/wiki/Pentagon#Regular_pentagons))
  - 4 regular hexagons ([http://en.wikipedia.org/wiki/Hexagon#Regular\\_hexagon](http://en.wikipedia.org/wiki/Hexagon#Regular_hexagon))

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for:
  - 1 equilateral triangles ([http://en.wikipedia.org/wiki/Equilateral\\_triangle](http://en.wikipedia.org/wiki/Equilateral_triangle))
  - 2 squares (<http://en.wikipedia.org/wiki/Square>)
  - 3 regular pentagons ([http://en.wikipedia.org/wiki/Pentagon#Regular\\_pentagons](http://en.wikipedia.org/wiki/Pentagon#Regular_pentagons))
  - 4 regular hexagons ([http://en.wikipedia.org/wiki/Hexagon#Regular\\_hexagon](http://en.wikipedia.org/wiki/Hexagon#Regular_hexagon))
- 4 Create a `Main` class which instantiates each of these classes and prints the area of the corresponding polygons with `sideLength 1`

- 1 Develop a class hierarchy for convex, simple, regular, equilateral, equiangular polygons (with sides all having the same length and angles being the same).
- 2 There should be a base class `Polygon` :
  - 1 with a member variable `double sideLength` to hold the side lengths,
  - 2 with a one-parameter constructor taking a corresponding parameter and initializing the above member variable,
  - 3 with a method `int numberOfSides()` to return the actual number of sides of the polygon (returning `0` in this base class, to be overridden by subclasses)
  - 4 with a method `double area()` returning the inside area of the polygon (returning `0` in this base class, to be overridden by subclasses)
- 3 Create suitable sub-classes of `Polygon` implementing the methods for:
  - 1 equilateral triangles ([http://en.wikipedia.org/wiki/Equilateral\\_triangle](http://en.wikipedia.org/wiki/Equilateral_triangle))
  - 2 squares (<http://en.wikipedia.org/wiki/Square>)
  - 3 regular pentagons ([http://en.wikipedia.org/wiki/Pentagon#Regular\\_pentagons](http://en.wikipedia.org/wiki/Pentagon#Regular_pentagons))
  - 4 regular hexagons ([http://en.wikipedia.org/wiki/Hexagon#Regular\\_hexagon](http://en.wikipedia.org/wiki/Hexagon#Regular_hexagon))
- 4 Create a `Main` class which instantiates each of these classes and prints the area of the corresponding polygons with `sideLength 1`
- 5 The answer-folder for this task contains the complete Eclipse project, including source code (.java) and compiled (.class) file.

# Task hw03-2: Class Hierarchy II



- ① We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*



## Task hw03-2: Class Hierarchy II



- ① We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- ② A fraction is a number like  $\frac{3}{4}$ , which equals 0.75

## Task hw03-2: Class Hierarchy II



- ① We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- ② A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- ③ In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))

- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$

## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`

## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their  $\text{gcd}$ , which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))

## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their  $\text{gcd}$ , which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))
  - 4 if the fraction is negative, the sign is stored in the `numerator`, i.e.,  $-0.2$  be  $\frac{-1}{5}$ , not  $\frac{1}{-5}$  (the constructor must take care of this)

- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their  $\text{gcd}$ , which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))
  - 4 if the fraction is negative, the sign is stored in the `numerator`, i.e.,  $-0.2$  be  $\frac{-1}{5}$ , not  $\frac{1}{-5}$  (the constructor must take care of this)
  - 5 overrides the inherited methods `toString()`, `doubleValue()`, and `floatValue()` with reasonable behavior

## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their *gcd*, which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))
  - 4 if the fraction is negative, the sign is stored in the `numerator`, i.e.,  $-0.2$  be  $-\frac{1}{5}$ , not  $\frac{1}{-5}$  (the constructor must take care of this)
  - 5 overrides the inherited methods `toString()`, `doubleValue()`, and `floatValue()` with reasonable behavior
  - 6 overrides the inherited methods `intValue()` and `longValue()` to return  $\left\lfloor \frac{\text{numerator}}{\text{denominator}} \right\rfloor$



## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their  $\text{gcd}$ , which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))
  - 4 if the fraction is negative, the sign is stored in the `numerator`, i.e.,  $-0.2$  be  $-\frac{1}{5}$ , not  $\frac{1}{-5}$  (the constructor must take care of this)
  - 5 overrides the inherited methods `toString()`, `doubleValue()`, and `floatValue()` with reasonable behavior
  - 6 overrides the inherited methods `intValue()` and `longValue()` to return  $\lfloor \frac{\text{numerator}}{\text{denominator}} \rfloor$
  - 7 implements the instance methods `add`, `sub`, `mul`, `div`, and `mod` to return the results of the addition, subtraction, multiplication, division, and rest of the division of the current number and their one argument of type `Fraction`

## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their  $\text{gcd}$ , which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))
  - 4 if the fraction is negative, the sign is stored in the `numerator`, i.e.,  $-0.2$  be  $-\frac{1}{5}$ , not  $\frac{1}{-5}$  (the constructor must take care of this)
  - 5 overrides the inherited methods `toString()`, `doubleValue()`, and `floatValue()` with reasonable behavior
  - 6 overrides the inherited methods `intValue()` and `longValue()` to return  $\frac{\text{numerator}}{\text{denominator}}$
  - 7 implements the instance methods `add`, `sub`, `mul`, `div`, and `mod` to return the results of the addition, subtraction, multiplication, division, and rest of the division of the current number and their one argument of type `Fraction`
- 5 Create a `Main` class which computes and prints the result of  $\frac{\frac{16}{3} * (\frac{2}{3} - \frac{10}{70})}{\frac{83}{176}}$  both as fraction and as `double` (you can verify your results with tools such as <http://www.calculator.net/fraction-calculator.html>)

## Task hw03-2: Class Hierarchy II



- 1 We want to extend the class `java.lang.Number` by creating a new sub-class for dealing with *fractions*
- 2 A fraction is a number like  $\frac{3}{4}$ , which equals 0.75
- 3 In other words, a number  $\frac{i}{j}$  where  $i, j \in \mathbb{Z}$  ([https://en.wikipedia.org/wiki/Fraction\\_\(mathematics\)](https://en.wikipedia.org/wiki/Fraction_(mathematics)))
- 4 Create a class named `Fraction` which:
  - 1 has two member variables of type `long` named `numerator` and `denominator` such that its instances represent numbers  $\frac{\text{numerator}}{\text{denominator}}$
  - 2 has two constructors, one which takes a single number  $i$  to represent `numerator` =  $i$  and `denominator` = 1 and one which accepts the values of both `numerator` and `denominator`
  - 3 both the `numerator` and `denominator` shall always be normalized by using the greatest common divisor, i.e.,  $\text{gcd}(\text{numerator}, \text{denominator}) \stackrel{!}{=} 1$  (the constructor must take care of this by dividing both input parameters by their  $\text{gcd}$ , which you can compute using, e.g., Euclid's algorithm ([https://en.wikipedia.org/wiki/Euclidean\\_algorithm#Implementations](https://en.wikipedia.org/wiki/Euclidean_algorithm#Implementations)))
  - 4 if the fraction is negative, the sign is stored in the `numerator`, i.e.,  $-0.2$  be  $\frac{-1}{5}$ , not  $\frac{1}{-5}$  (the constructor must take care of this)
  - 5 overrides the inherited methods `toString()`, `doubleValue()`, and `floatValue()` with reasonable behavior
  - 6 overrides the inherited methods `intValue()` and `longValue()` to return  $\lfloor \frac{\text{numerator}}{\text{denominator}} \rfloor$
  - 7 implements the instance methods `add`, `sub`, `mul`, `div`, and `mod` to return the results of the addition, subtraction, multiplication, division, and rest of the division of the current number and their one argument of type `Fraction`
- 5 Create a `Main` class which computes and prints the result of  $\frac{16}{3} * (\frac{2}{3} - \frac{10}{70})$  both as fraction and as `double` (you can verify your results with tools such as <http://www.calculator.net/fraction-calculator.html>)
- 6 The answer-folder for this task contains the complete Eclipse project, including source code (.java) and compiled (.class) file.

# 谢谢

## Thank you

Thomas Weise [汤卫思]  
tweise@hfu.edu.cn  
<http://iao.hfu.edu.cn>

Hefei University, South Campus 2  
Institute of Applied Optimization  
Shushan District, Hefei, Anhui,  
China



Caspar David Friedrich, "Der Wanderer über dem Nebelmeer", 1818  
[http://en.wikipedia.org/wiki/Wanderer\\_above\\_the\\_Sea\\_of\\_Fog](http://en.wikipedia.org/wiki/Wanderer_above_the_Sea_of_Fog)