WSTĘP DO PROGRAMOWANIA DLA TESTERÓW

„Everything I was I carry with me, everything I will be lies, waiting on the road ahead”

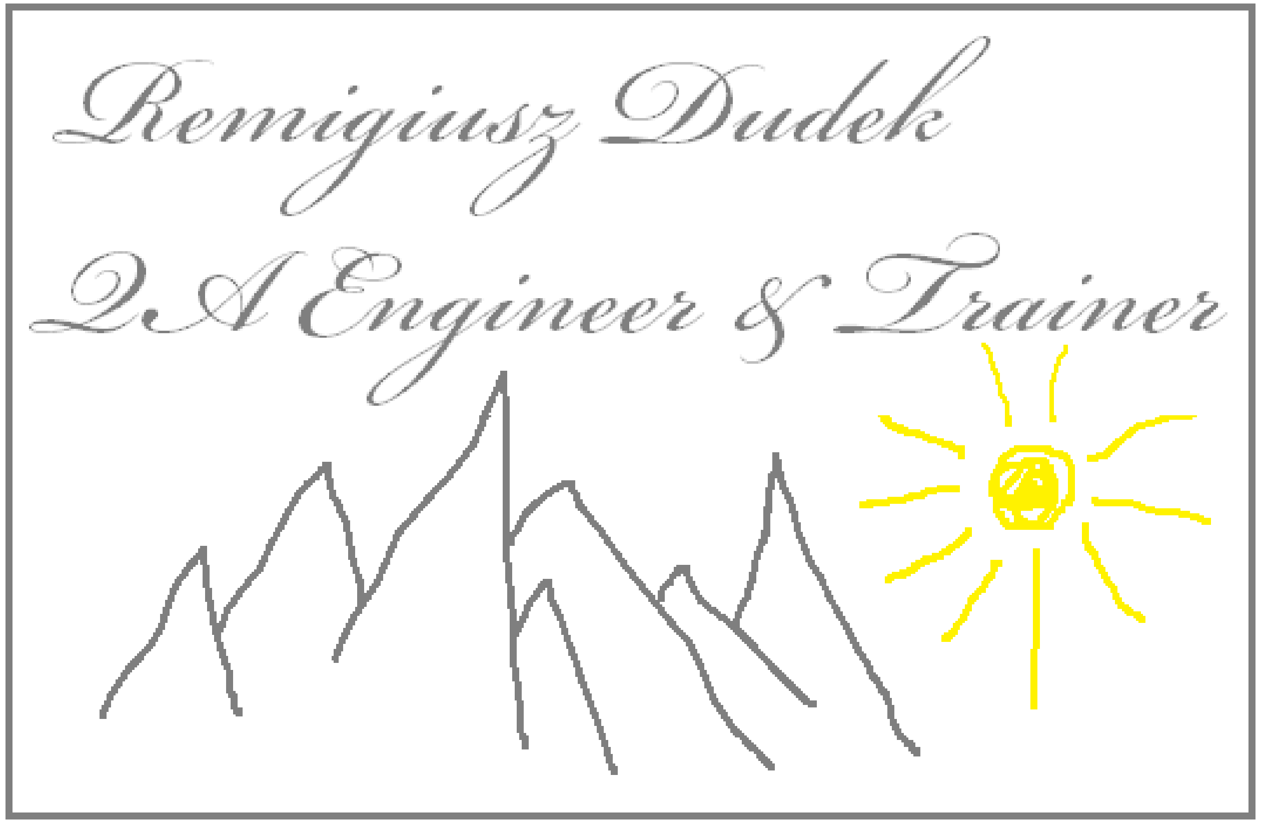
by Ma Jian

Wstęp do programowania Java dla testerów

Remigiusz Dudek

GET TO KNOW

„*LEARNING IS A JOURNEY NOT A DESTINATION*" BY RALPH WALDO EMERSON (ALMOST)



AGENDA

„*THE FIRST STEP TOWARDS GETTING SOMEWHERE IS TO DECIDE THAT YOU ARE NOT GOING TO STAY WHERE YOU ARE*" BY ANNONYMOUS

- Day 1 (Basics + Java basics)
  - IDE – project structure
  - Class/Object/Package
  - First @Test
  - Basics (variables / methods)
  - Primitive types
  - Assetions
  - Basic Classes
  - Basic inheritance / Object creation
  - Equality
  - Strings
  - Arrays/Collection
  - Steer the flow (conditions/loops)
- Day 2 (OO Design)
  - Data driven testing (Parameters & File IO)
  - Inheritance
  - Polymorphism
  - Page Object Pattern
  - Data driven testing
  - Exceptions
- Day 3 (Advanced concepts)
  - F.I.R.S.T.
  - Clean code
  - S.O.L.I.D.
  - Design patterns
  - Test frameworks

JAVA BASICS

„A journey of a thousand miles, begins with a single step”

by Lau-Tzu

Wstęp do programowania Java dla testerów

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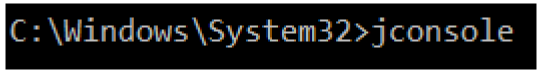
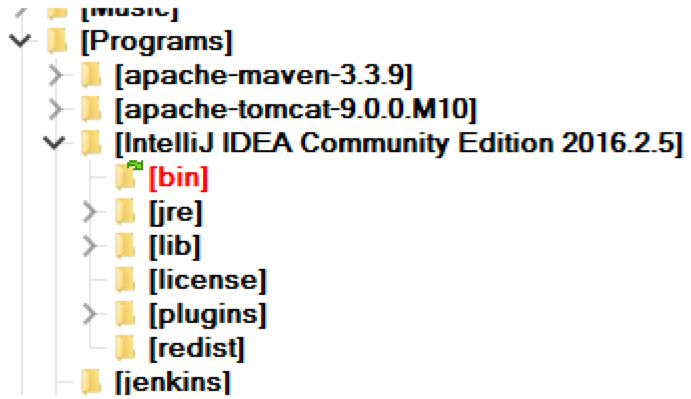
SETUP INTELLIJ

- Check if you have java JDK installed

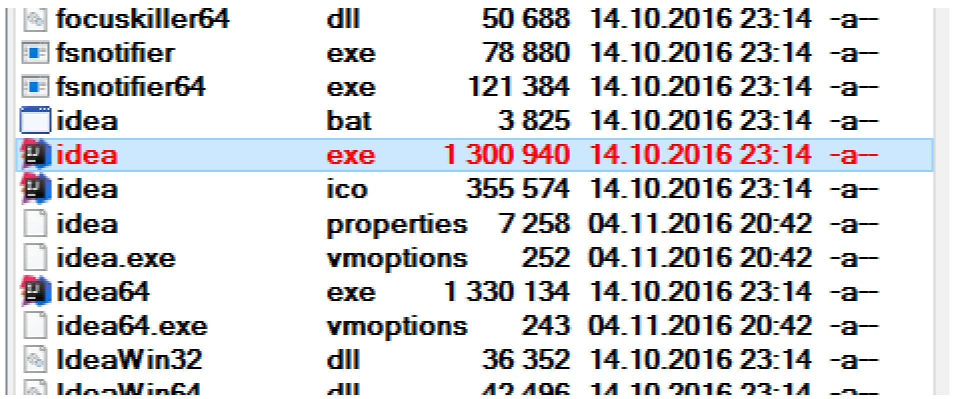


```
C:\Windows\System32>jconsole
```

- Copy `Vistula-Programs.zip` and unzip it
- Run Intellij

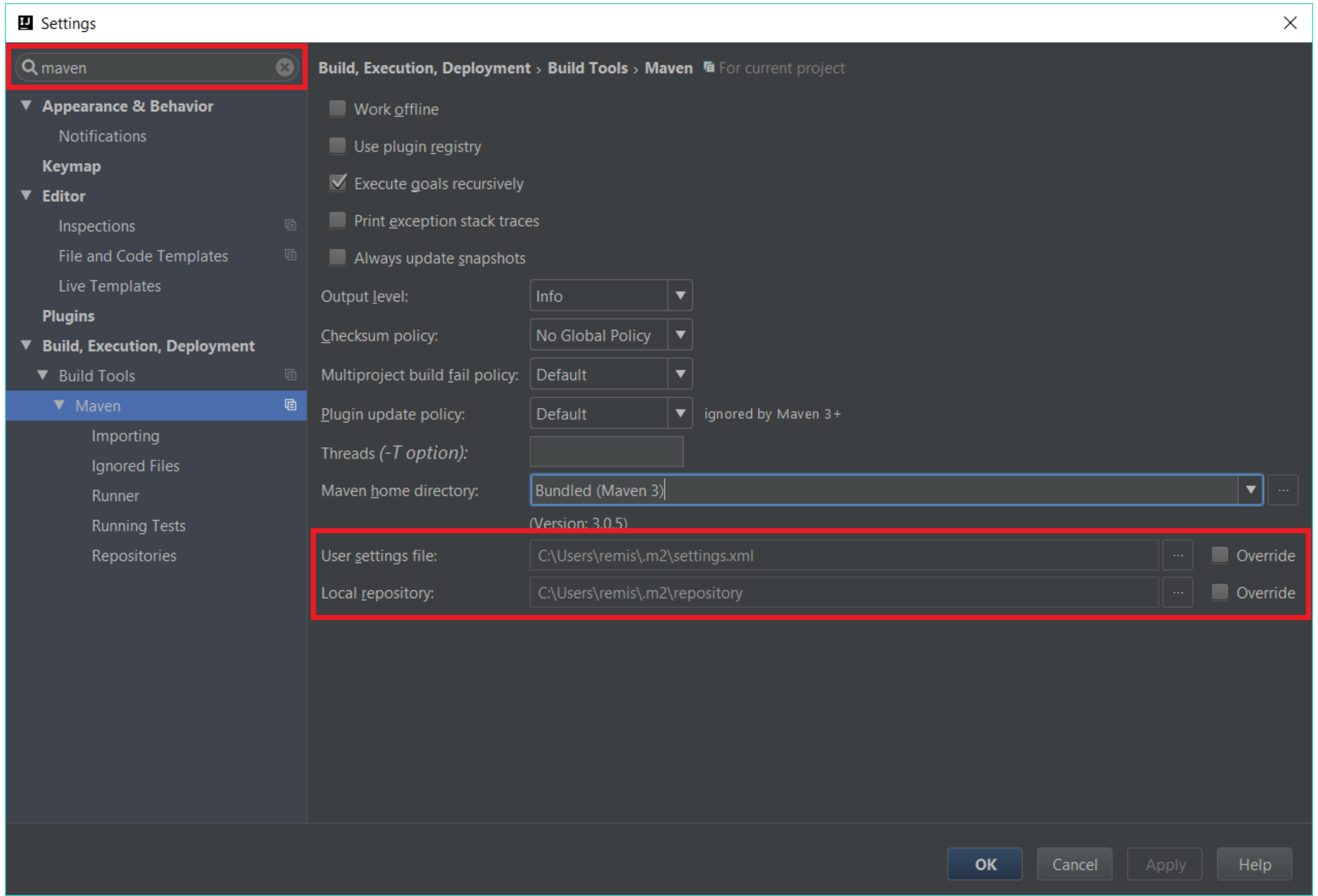


```
[Music]
[Programs]
  [apache-maven-3.3.9]
  [apache-tomcat-9.0.0.M10]
  [IntelliJ IDEA Community Edition 2016.2.5]
    [bin]
    [jre]
    [lib]
    [license]
    [plugins]
    [redist]
  [jenkins]
```



```
focuskiller64   dll               50 688  14.10.2016 23:14  -a--
fsnotifier      exe               78 880  14.10.2016 23:14  -a--
fsnotifier64    exe              121 384  14.10.2016 23:14  -a--
idea            bat                3 825  14.10.2016 23:14  -a--
idea            exe            1 300 940  14.10.2016 23:14  -a--
idea            ico              355 574  14.10.2016 23:14  -a--
idea            properties         7 258  04.11.2016 20:42  -a--
idea.exe        vmoptions            252  04.11.2016 20:42  -a--
idea64          exe            1 330 134  14.10.2016 23:14  -a--
idea64.exe      vmoptions            243  04.11.2016 20:42  -a--
IdeaWin32       dll               36 352  14.10.2016 23:14  -a--
IdeaWin64       dll               42 496  14.10.2016 23:14  -a--
```

SETUP MAVEN



Settings

maven

- Appearance & Behavior
  - Notifications
- Keymap
- Editor
  - Inspections
  - File and Code Templates
  - Live Templates
- Plugins
- Build, Execution, Deployment
  - Build Tools
    - Maven
      - Importing
      - Ignored Files
      - Runner
      - Running Tests
      - Repositories

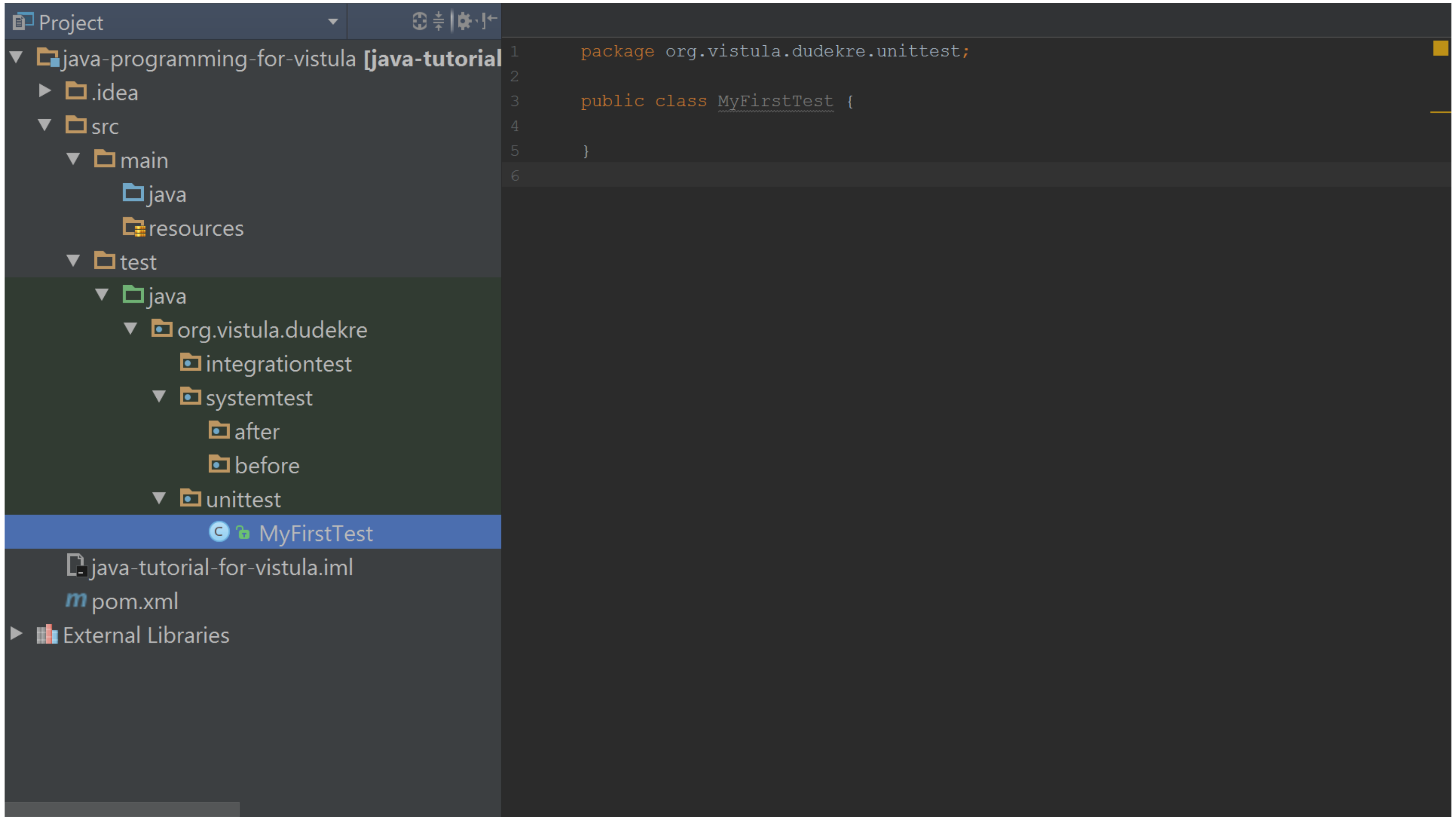
Build, Execution, Deployment › Build Tools › Maven   For current project

- [ ] Work offline
- [ ] Use plugin registry
- [x] Execute goals recursively
- [ ] Print exception stack traces
- [ ] Always update snapshots

Output level:	Info
Checksum policy:	No Global Policy
Multiproject build fail policy:	Default
Plugin update policy:	Default ignored by Maven 3+
Threads (-T option):	
Maven home directory:	Bundled (Maven 3) (Version: 3.0.5)
User settings file:	C:\Users\remis\.m2\settings.xml ☐ Override
Local repository:	C:\Users\remis\.m2\repository ☐ Override

PROJECT STRUCTURE

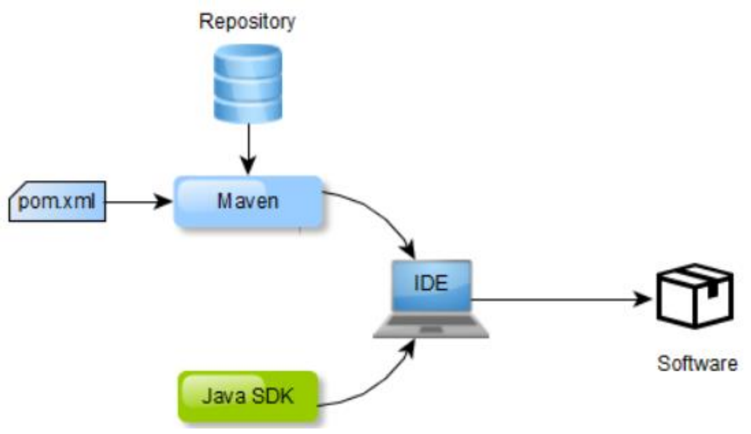
„THE KEY TO SUCCESSFULL LEARNING ENVIRONMENT IS STRUCTURE” BY CARA CAROLL



```
package org.vistula.dudekre.unittest;

public class MyFirstTest {

}
```

BIG PICTURE

1. What we need to build Java software?
   1. Something that would change text into runnable code – Java Software Development Kit (SDK)
   2. Something that would give as parts that we can use, so we do not need to create everything from scratch – Maven/Gradle
   3. Something that would build a deployable package – Maven/Gradle
2. How can we tell Maven/Gradle what are the parts that we need or how to build the package? – pom.xml/build.gradle
3. Wherefrom does Maven/Gradle take these parts – Repository
4. What do we need to run Java software? – Java Runtime Environment (JRE)



Java Runtime Environment
Software

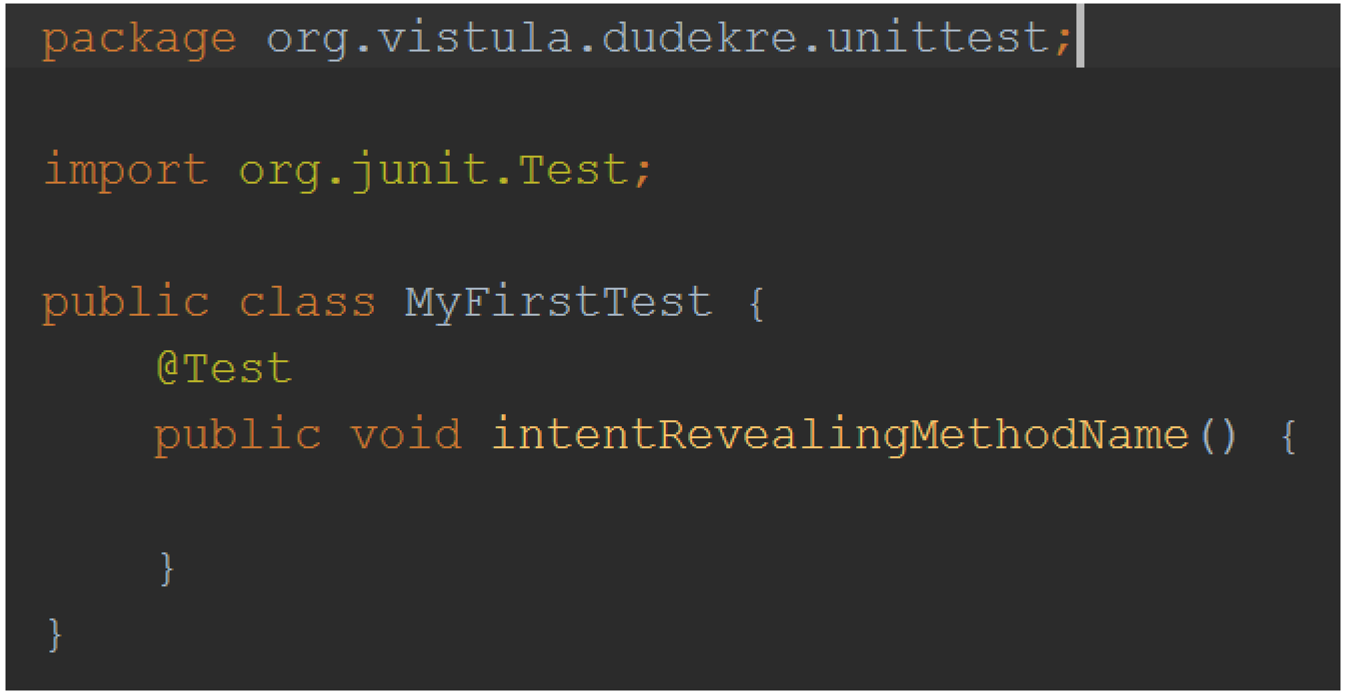
EXCERCISE (P)

1. Create your own project
2. Create following package structure (test source directory)
   a) `org.vistula.<your name>.systemtest.before`
   b) `org.vistula.<your name>.systemtest.after`
3. Create class `VistulaTest`

PACKAGE/CLASS/OBJECT

„IF YOU CORRECT YOUR MIND, THE REST OF YOUR LIFE WILL FALL INTO PLACE" BY LAO-TZU

- What is class?
- What is object?
- Naming conventions
  - Package
  - Class
  - Variables
  - Methods



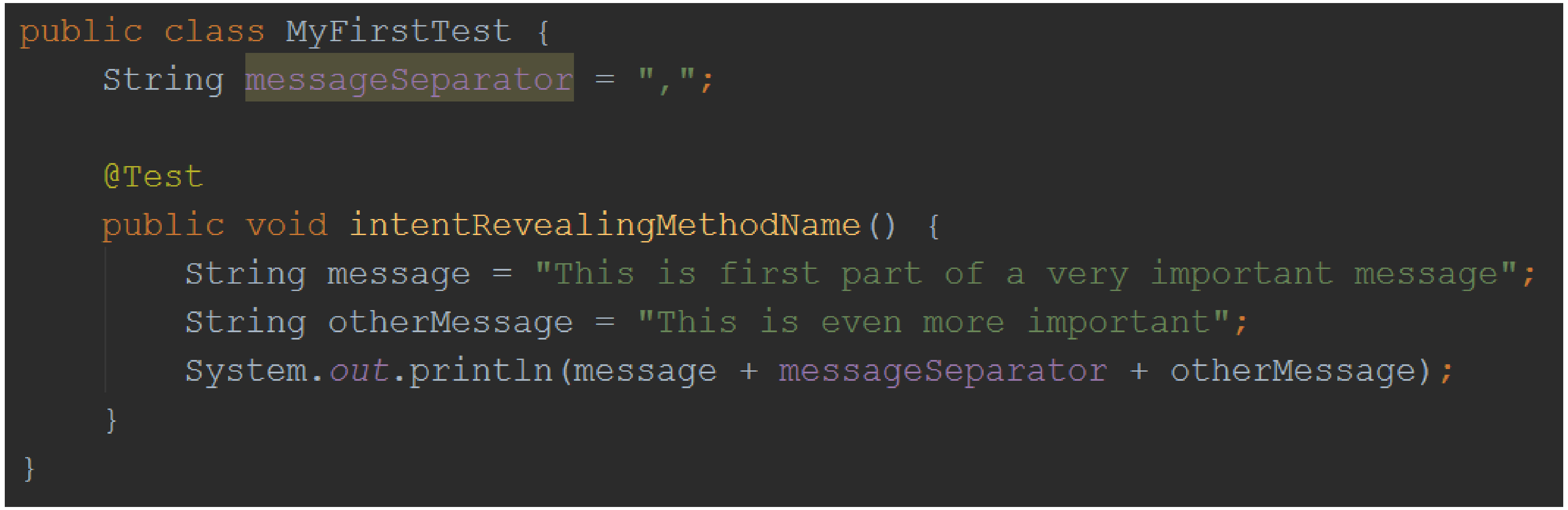
```
package org.vistula.dudekre.unittest;

import org.junit.Test;

public class MyFirstTest {
    @Test
    public void intentRevealingMethodName() {

    }
}
```

EXCERCISE (L)

1. Create `@Test` printing out „Hello <your name>”
2. Run the test in ***Run Window***
3. Run the test in ***Debug Window***

VARIABLES

- Why do we need them?
- Type
- Class/Method variable



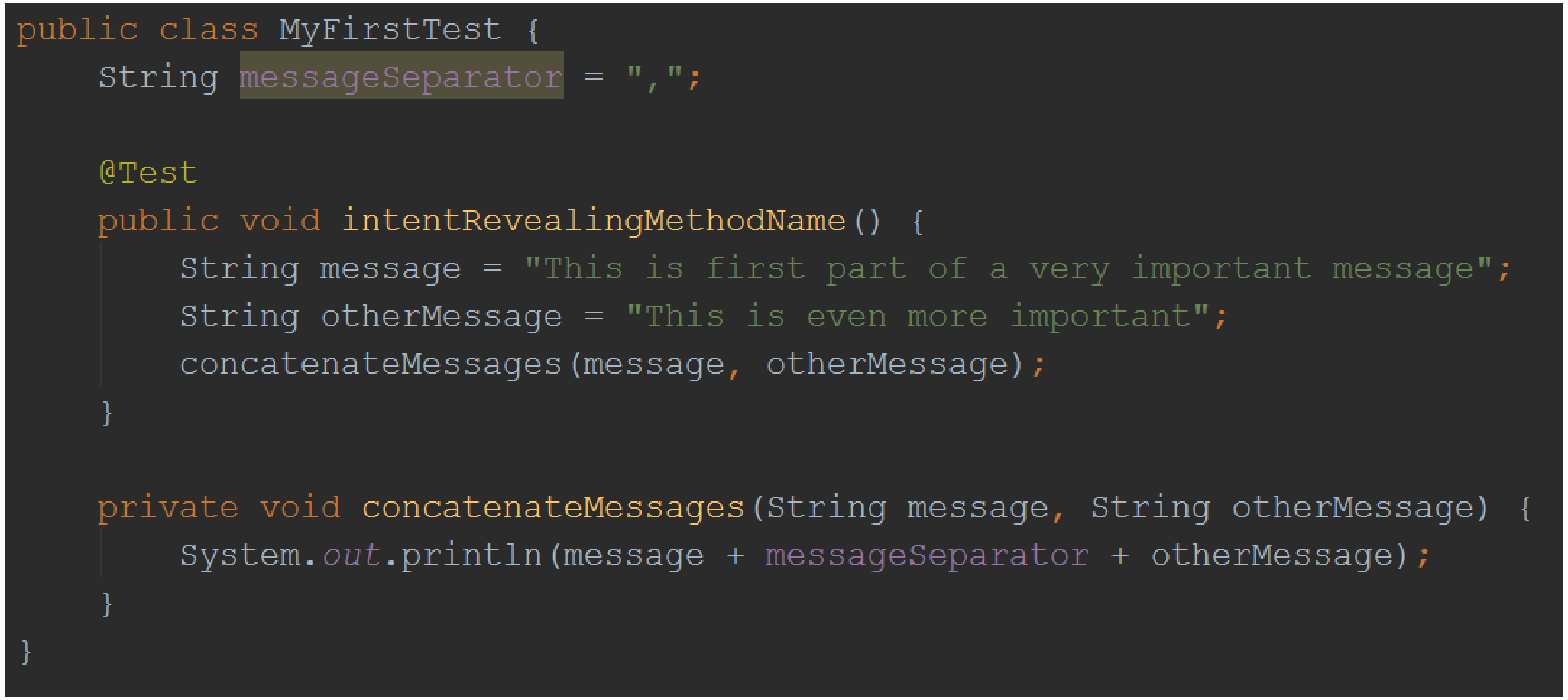
```
public class MyFirstTest {
    String messageSeparator = ",";

    @Test
    public void intentRevealingMethodName() {
        String message = "This is first part of a very important message";
        String otherMessage = "This is even more important";
        System.out.println(message + messageSeparator + otherMessage);
    }
}
```

EXCERCISE (P)

1. Print the same greeting as previously but this time assign your name to variable
2. Run the test in ***Run Window***
3. Run the test in ***Debug Window*** *(do you see any difference?)*

METHODS

- Encapsulation
- Method signature
  - Parameters
  - Return value



```
public class MyFirstTest {
    String messageSeparator = ",";

    @Test
    public void intentRevealingMethodName() {
        String message = "This is first part of a very important message";
        String otherMessage = "This is even more important";
        concatenateMessages(message, otherMessage);
    }

    private void concatenateMessages(String message, String otherMessage) {
        System.out.println(message + messageSeparator + otherMessage);
    }
}
```

EXCERCISE (L)

1. Extract greeting method taking your name as a parameter
2. Run the test in ***Run Window***
3. Run the test in ***Debug Window*** *(do you see any difference?)*

NUMBER VARIABLES

- Number types (int, long, float, double)
- Boxing types
- Mathematical operators (=, +, -, *, /)
  - Dividing integers!
  - MAX_VALUE/MIN_VALUE
- Other operators (++, --, +=, -=)
- Basic assertions

```
@Test
public void mathematicalOperations() {
    int integerNumber = 5;
    long largeIntegerNumber = 5L;
    float floatingPointNumber = 1.3f;
    double largeFloatingPointNumber = 1.3d;
    System.out.println(2 * integerNumber);
}
```

EXCERCISE (P)

1. Create a method that takes two parameters and:
   1. adds them (what is the result of adding different variables types)
   2. Play with MAX_VALUE, MIN_VALUE
   3. Divide them (divide different types)
2. Create a test that ensures that method works
3. Run the test in ***Run Window***
4. Run the test in ***Debug Window*** *(do you see any difference?)*

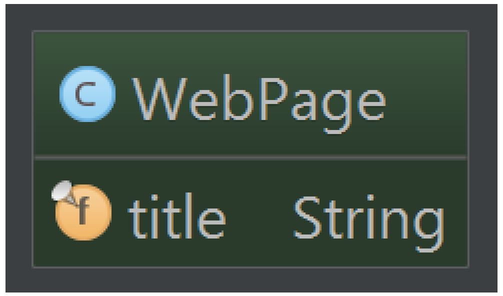
CREATING OBJECTS

- Encapsulation
- Constructor (`new` keyword, `this` keyword)
  - Default
  - Non-default
- Private/Public access modifier
  - Default values of fields
- Class methods
- Basic inheritance - each object in Java is `Object`

```
public class Point {
    private int x;
    private int y;

    public Point(int x, int y) {
        this.x = x;
        this.y = y;
    }

    public int changeXCoordinate(int newX) {
        return x;
    }

    public int getX() {
        return x;
    }

    public int getY() {
        return y;
    }
}
```

EXCERCISE (L)

1. Create `WebPage` class that has `title` attribute
2. The `title` attribute should be set at construction time
3. Assert that `title` is correct



STEER THE FLOW

1. Conditionals
   a) If
   b) If / else
   c) If /else if / else
2. Operators
   a) ==, !=
   b) <, >
   c) <=, >=
   d) &&, ||

```java
@Test
public void twoPointsShouldBeEqual() {
    Point a = new Point(1,2);
    Point b = new Point(2,3);
    Point c = new Point(3,4);

    if (a.getX() == b.getX()) {
        System.out.println("a & b have equal x");
    }

    if (a.getX() != b.getX() && a.getY() == b.getY()) {
        System.out.println("a has different x and the same y
coordinate as point b");
    }

    if (a.equals(b)) {
        System.out.println("a equals to b");
    } else if (a.equals(c)) {
        System.out.println("a equals to c");
    } else {
        System.out.println("a is unique");
    }
}
```

EXCERCISE (P)

1. Create class `Person` that has attribute `age`
2. `Person` should be able to give an answer to a question whether it is working/non-working
   a) nonWorking (age below 18 and above 67)
   b) Working (age between 18 and 67)

```
@Test
public void personIsWorkingIfAgeBetween18And67() {
}

@Test
public void personIsNotWorkingIfAgeBelow18() {
}

@Test
public void personIsNotWorkingIfAgeAbove67() {
}
```

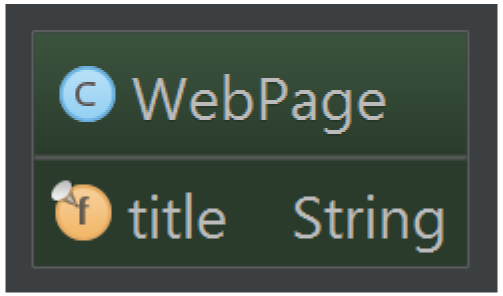
EQUALITY

- Boolean : true / false
- operator == (what a reference is?)
- Equality
  - Any object can never be equal to null (**what is null !!!**)
  - Every object is always equal to itself
  - When objects are equal their hash is equal
  - Two objects with the same hash does not need to be equal

```java
public class Point {
    private int x;
    private int y;

    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null) return false;
        if (getClass() != o.getClass())
            return false;

        Point point = (Point) o;

        if (x != point.x) return false;
        return y == point.y;
    }

    @Override
    public int hashCode() {
        int result = x;
        result = 31 * result + y;
        return result;
    }
}
```

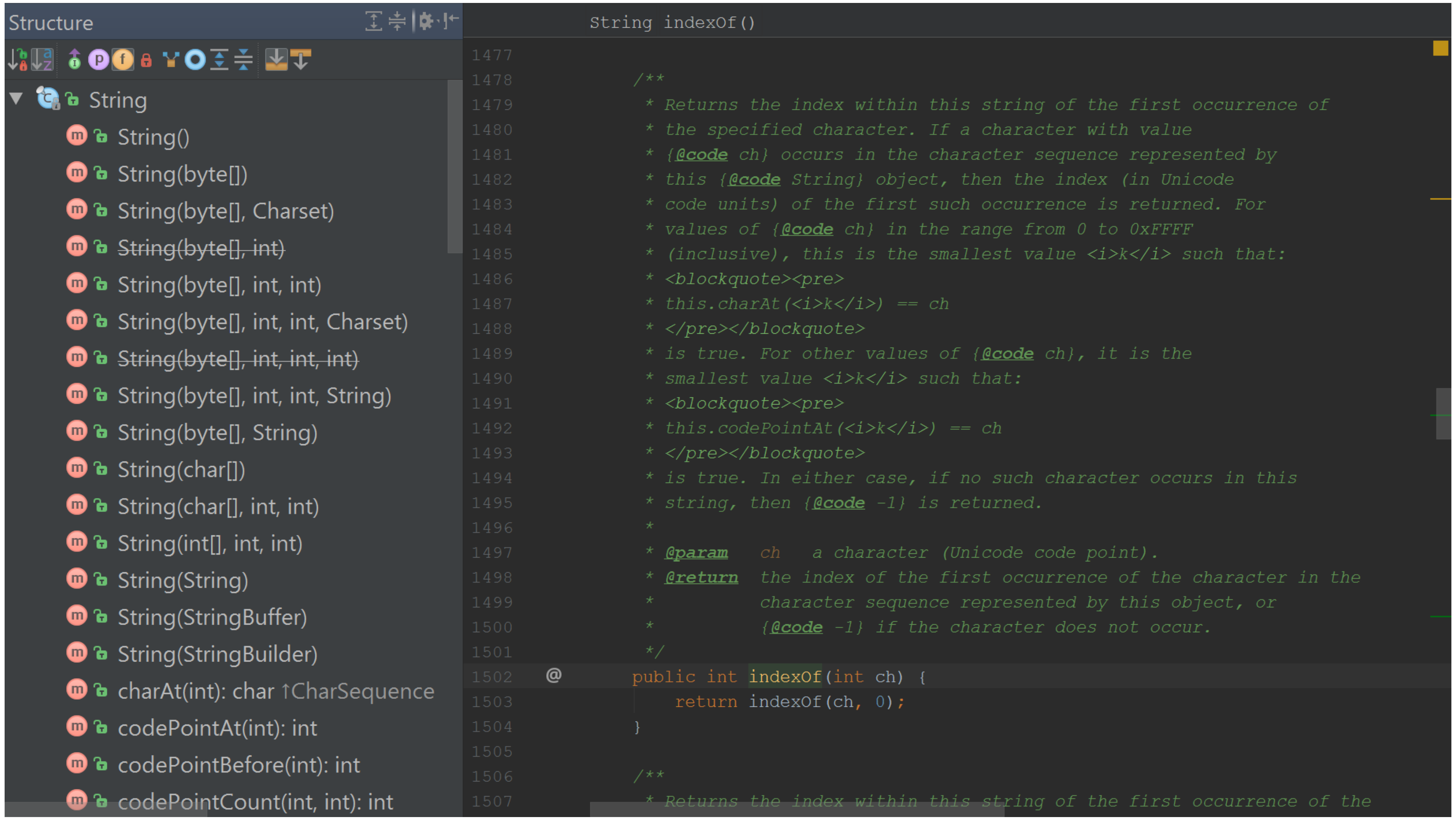
EXCERCISE (P)

1. Make two `WebPages` equal when their `titles` are equal
2. Play with == operator



STRING VARIABLES

1. String API
2. Convertions
   a) `toString()`
   b) From string



Structure

String
- String()
- String(byte[])
- String(byte[], Charset)
- ~~String(byte[], int)~~
- String(byte[], int, int)
- String(byte[], int, int, Charset)
- ~~String(byte[], int, int, int)~~
- String(byte[], int, int, String)
- String(byte[], String)
- String(char[])
- String(char[], int, int)
- String(int[], int, int)
- String(String)
- String(StringBuffer)
- String(StringBuilder)
- charAt(int): char ↑CharSequence
- codePointAt(int): int
- codePointBefore(int): int
- codePointCount(int, int): int

String indexOf()

```
    /**
     * Returns the index within this string of the first occurrence of
     * the specified character. If a character with value
     * {@code ch} occurs in the character sequence represented by
     * this {@code String} object, then the index (in Unicode
     * code units) of the first such occurrence is returned. For
     * values of {@code ch} in the range from 0 to 0xFFFF
     * (inclusive), this is the smallest value <i>k</i> such that:
     * <blockquote><pre>
     * this.charAt(<i>k</i>) == ch
     * </pre></blockquote>
     * is true. For other values of {@code ch}, it is the
     * smallest value <i>k</i> such that:
     * <blockquote><pre>
     * this.codePointAt(<i>k</i>) == ch
     * </pre></blockquote>
     * is true. In either case, if no such character occurs in this
     * string, then {@code -1} is returned.
     *
     * @param   ch   a character (Unicode code point).
     * @return  the index of the first occurrence of the character in the
     *          character sequence represented by this object, or
     *          {@code -1} if the character does not occur.
     */
    public int indexOf(int ch) {
        return indexOf(ch, 0);
    }

    /**
     * Returns the index within this string of the first occurrence of the
```

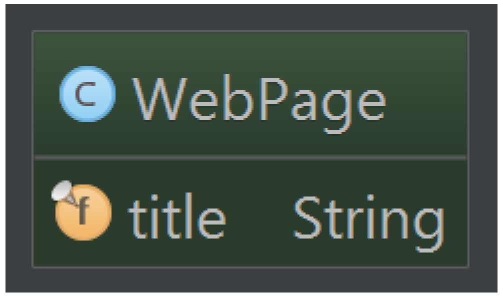
EXCERCISE (L)

1. Create a method that is able to extract numer of animals from text
2. Create a test for the method

```
@Test
public void shouldExtractNumber() {
    String text = "There are 4 animals in the room";
    int numberOfAnimals = extractNumberOfAnimals(text);
    //assert that numberOfAnimals == 4
}

private int extractNumberOfAnimals(String text) {

    return 0;
}
```

EXCERCISE (P)

1. Print `WebPage` nicely [WebPage {title: <title>}]
2. Replace $tradeId to some id in string `"tradeId: ${tradeId}"`

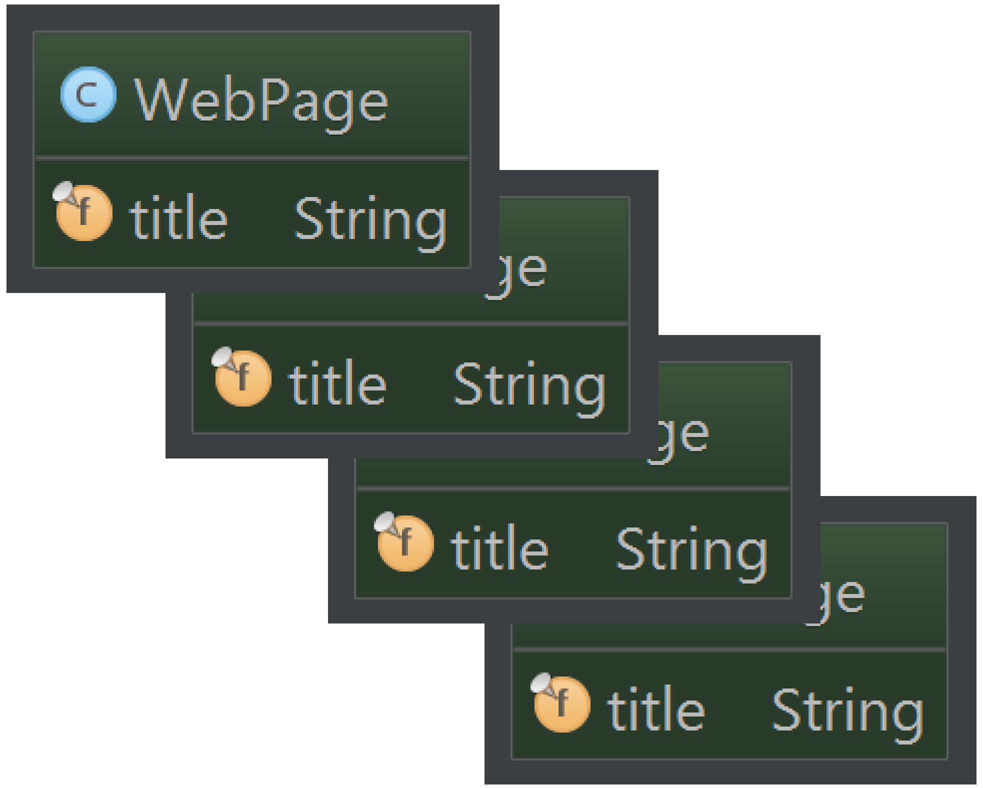

WebPage
title String

JAVA COLLECTIONS – ARRAY LIST

1. Collections
   a) ArrayList
   b) HashSet
   c) HashMap
2. Passing variables trough copy of reference

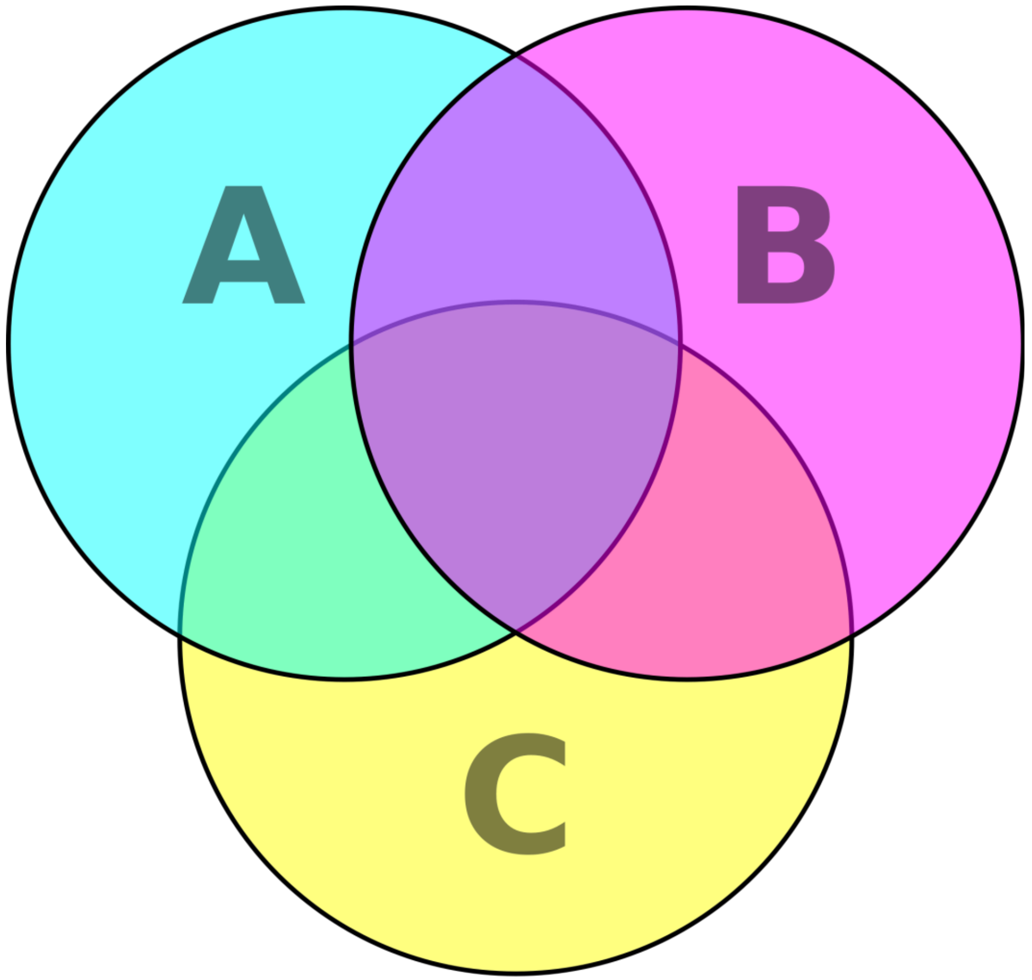
EXCERCISE (L)

1. Create ArrayList of WebPages
2. Assert that list contains added WebPages
3. Print this list out



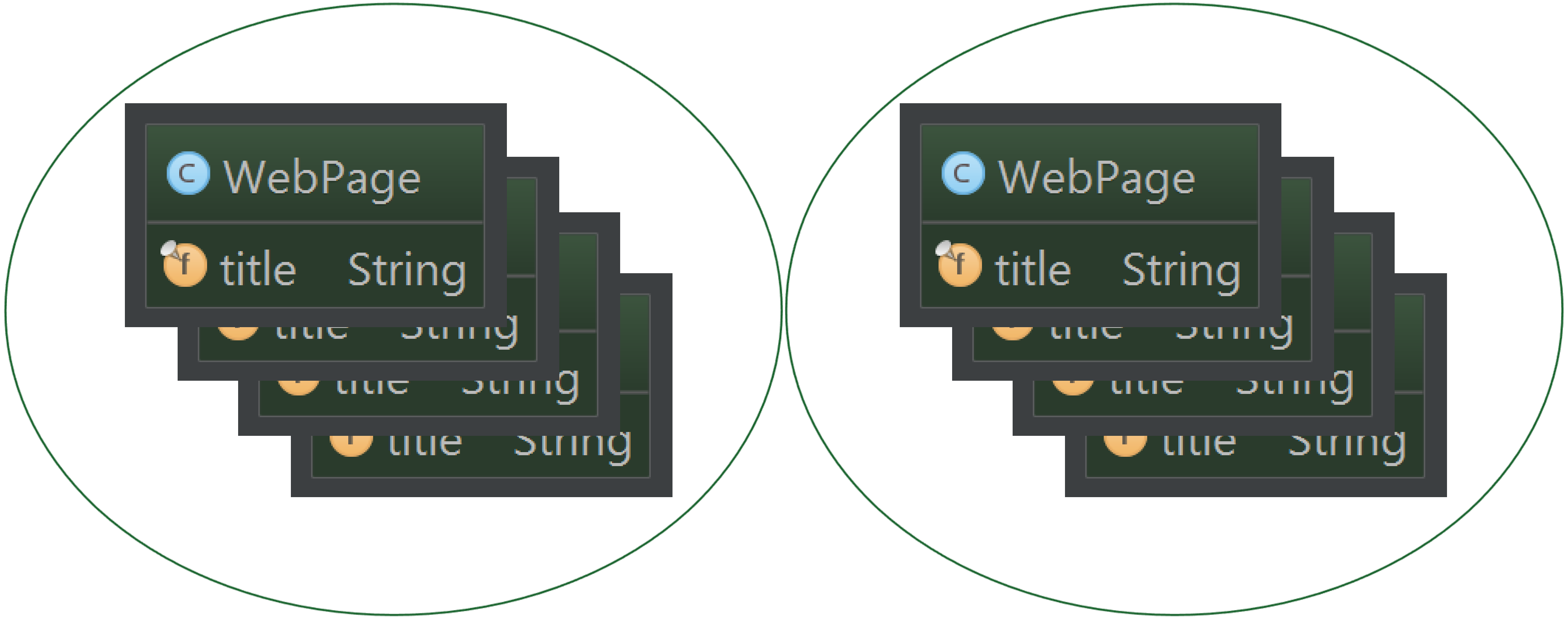
JAVA COLLECTIONS – HASH SET

1. Collections
   a) ArrayList
   b) HashSet
   c) HashMap
2. Passing variables trough copy of reference



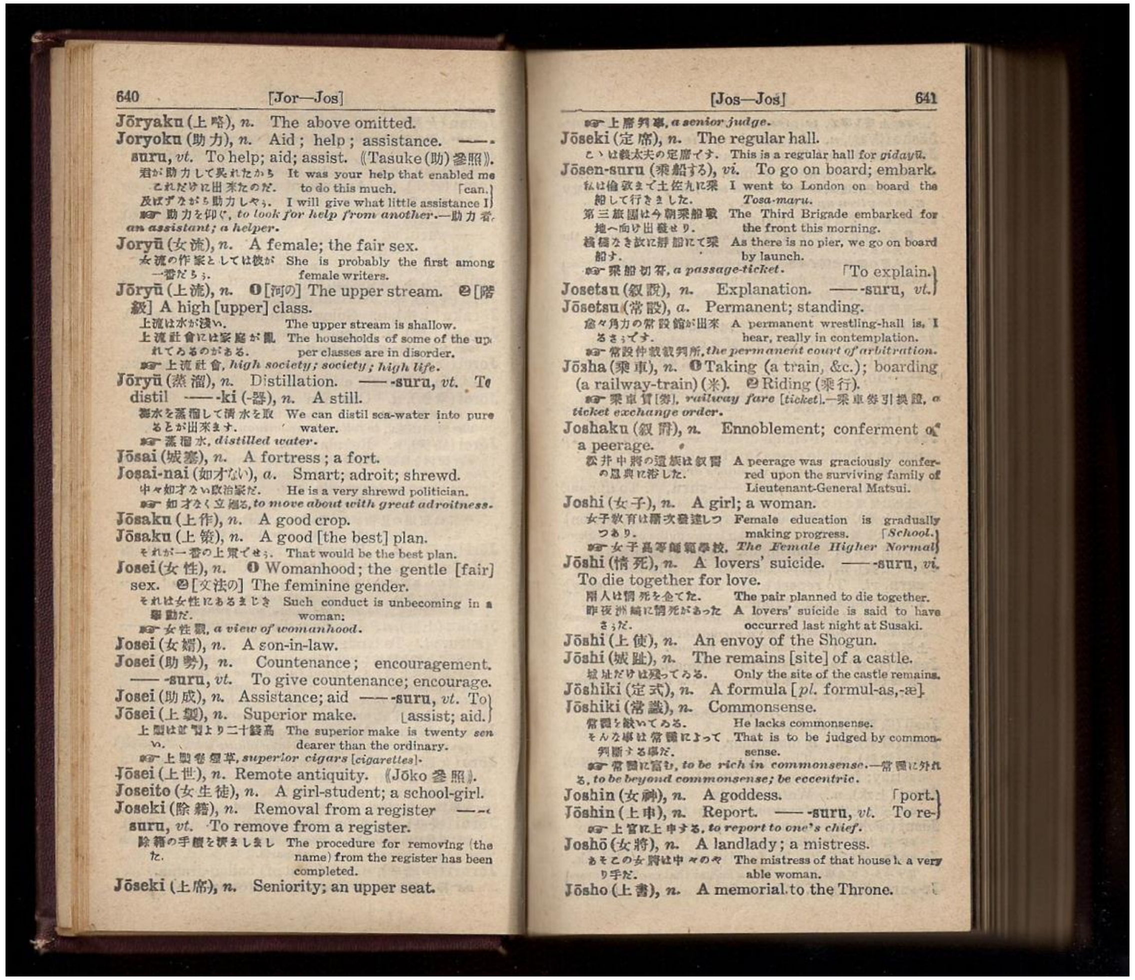
EXCERCISE (P)

1. Create HashSet of WebPages – try to add two equal WebPages



JAVA COLLECTIONS – HASH MAP

1. Collections
   a) ArrayList
   b) HashSet
   c) HashMap
2. Passing variables trough copy of reference



640 [Jor—Jos]

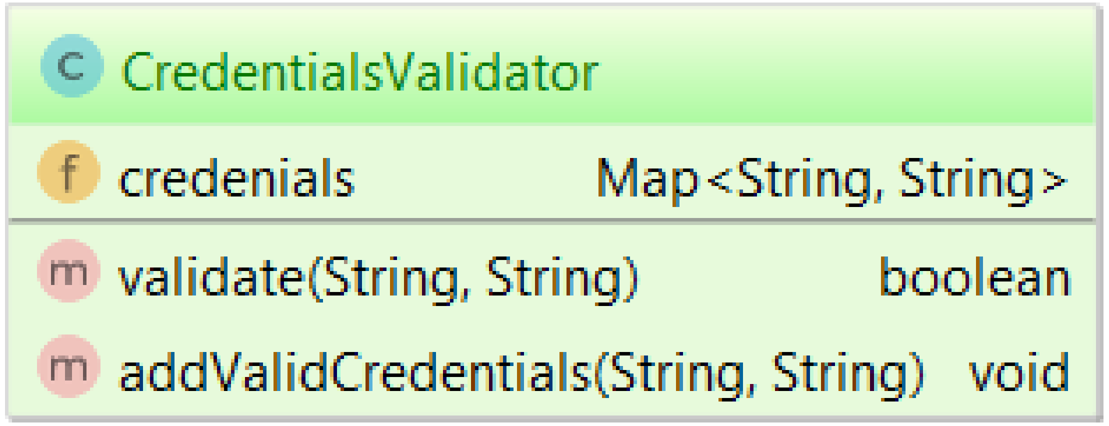
Jōryaku (上略), *n.* The above omitted.
Joryoku (助力), *n.* Aid; help; assistance. ——-**suru**, *vt.* To help; aid; assist. 《Tasuke (助) 參照》.
君が助力して呉れたからこれだけに出來たのだ. It was your help that enabled me to do this much.
及ばずながら助力しやう. I will give what little assistance I can.
☞ 助力を仰ぐ, *to look for help from another.*—助力者, *an assistant; a helper.*
Joryū (女流), *n.* A female; the fair sex.
女流の作家としては彼が一番だらう. She is probably the first among female writers.
Jōryū (上流), *n.* ❶[河の] The upper stream. ❷[階級] A high [upper] class.
上流は水が淺い. The upper stream is shallow.
上流社會には家庭が亂れてゐるのがある. The households of some of the upper classes are in disorder.
☞ 上流社會, *high society; society; high life.*
Jōryū (蒸溜), *n.* Distillation. ——-**suru**, *vt.* To distil ——-**ki** (-器), *n.* A still.
海水を蒸溜して清水を取ることが出來ます. We can distil sea-water into pure water.
☞ 蒸溜水, *distilled water.*
Jōsai (城塞), *n.* A fortress; a fort.
Josai-nai (如才ない), *a.* Smart; adroit; shrewd.
中々如才ない政治家だ. He is a very shrewd politician.
☞ 如才なく立廻る, *to move about with great adroitness.*
Jōsaku (上作), *n.* A good crop.
Jōsaku (上策), *n.* A good [the best] plan.
それが一番の上策でせう. That would be the best plan.
Josei (女性), *n.* ❶ Womanhood; the gentle [fair] sex. ❷[文法の] The feminine gender.
それは女性にあるまじき擧動だ. Such conduct is unbecoming in a woman.
☞ 女性觀, *a view of womanhood.*
Josei (女婿), *n.* A son-in-law.
Josei (助勢), *n.* Countenance; encouragement. ——-**suru**, *vt.* To give countenance; encourage.
Josei (助成), *n.* Assistance; aid ——-**suru**, *vt.* To assist; aid.
Jōsei (上製), *n.* Superior make.
上製は並製より二十錢高い. The superior make is twenty *sen* dearer than the ordinary.
☞ 上製卷煙草, *superior cigars [cigarettes].*
Jōsei (上世), *n.* Remote antiquity. 《Jōko 參照》.
Joseito (女生徒), *n.* A girl-student; a school-girl.
Joseki (除籍), *n.* Removal from a register ——-**suru**, *vt.* To remove from a register.
除籍の手續を濟ましました. The procedure for removing (the name) from the register has been completed.
Jōseki (上席), *n.* Seniority; an upper seat.

[Jos—Jos] 641

☞ 上席判事, *a senior judge.*
Jōseki (定席), *n.* The regular hall.
こゝは義太夫の定席です. This is a regular hall for *gidayū.*
Jōsen-suru (乘船する), *vi.* To go on board; embark.
私は倫敦まで土佐丸に乘船して行きました. I went to London on board the *Tosa-maru.*
第三旅團は今朝乘船戰地へ向け出發せり. The Third Brigade embarked for the front this morning.
棧橋なき故に艀船にて乘船す. As there is no pier, we go on board by launch.
☞ 乘船切符, *a passage-ticket.*
Josetsu (叙說), *n.* Explanation. ——-**suru**, *vt.* To explain.
Jōsetsu (常設), *a.* Permanent; standing.
愈々角力の常設館が出來るさうです. A permanent wrestling-hall is, I hear, really in contemplation.
☞ 常設仲裁裁判所, *the permanent court of arbitration.*
Jōsha (乘車), *n.* ❶ Taking (a train, &c.); boarding (a railway-train) (米). ❷ Riding (乘行).
☞ 乘車賃[券], *railway fare [ticket].*—乘車券引換證, *a ticket exchange order.*
Joshaku (叙爵), *n.* Ennoblement; conferment of a peerage.
松井中將の遺族は叙爵の恩典に浴した. A peerage was graciously conferred upon the surviving family of Lieutenant-General Matsui.
Joshi (女子), *n.* A girl; a woman.
女子教育は漸次發達しつゝあり. Female education is gradually making progress.
☞ 女子高等師範學校, *The Female Higher Normal School.*
Jōshi (情死), *n.* A lovers' suicide. ——-**suru**, *vi.* To die together for love.
兩人は情死を企てた. The pair planned to die together.
昨夜洲崎に情死があったさうだ. A lovers' suicide is said to have occurred last night at Susaki.
Jōshi (上使), *n.* An envoy of the Shogun.
Jōshi (城趾), *n.* The remains [site] of a castle.
城址だけは殘ってゐる. Only the site of the castle remains.
Jōshiki (定式), *n.* A formula [*pl.* formul-as,-æ].
Jōshiki (常識), *n.* Commonsense.
常識を缺いてゐる. He lacks commonsense.
そんな事は常識によって判斷する事だ. That is to be judged by commonsense.
☞ 常識に富む, *to be rich in commonsense.*—常識に外れる, *to be beyond commonsense; be eccentric.*
Joshin (女神), *n.* A goddess.
Jōshin (上申), *n.* Report. ——-**suru**, *vt.* To report.
☞ 上官に上申する, *to report to one's chief.*
Joshō (女將), *n.* A landlady; a mistress.
あそこの女將は中々のやり手だ. The mistress of that house is a very able woman.
Jōsho (上書), *n.* A memorial to the Throne.

EXCERCISE (L)

1. Create and test CredentialsValidator using HashMap



CredentialsValidator	
credenials	Map<String, String>
validate(String, String)	boolean
addValidCredentials(String, String)	void

STEER THE FLOW - LOOPS

1. Loops
   a) For
   b) While

```
@Test
public void forLoopOverCollection() {
    List<Integer> grades = new ArrayList<Integer>();
    for (Integer grade : grades) {
        System.out.println(grade);
    }
}
@Test
public void forLoopClasic() {
    for (int i = 0; i < 10; i++) {
        System.out.println(i);
    }
}
@Test
public void whileLoopClasic() {
    int idx = 0;
    while (idx < 10) {
        System.out.println(i);
        idx++;
    }
}
```

EXCERCISE (P)

1. Create list of `Persons` with different `age (for)`
2. Divide this list into three lists (`for +if`)
   a) nonWorking (age below 18)
   b) Working (age between 18 and 67)
   c) Retired (age above 67)
3. Find first `Person` with `age` above 18 (`while`)

```java
@Test
public void workStatusDivision() {
    List<Person> people = new ArrayList<Person>();
    people.add(new Person(10));
    people.add(new Person(17));
    people.add(new Person(18));
    people.add(new Person(45));
    people.add(new Person(66));
    people.add(new Person(67));
    people.add(new Person(120));

    List<Person> juniors = getJuniors(people);
    List<Person> workinClass = getWorkingClass(people);
    List<Person> seniors = getSeniors(people);
}

private List<Person> getSeniors(List<Person> people) {
    return null;
}

private List<Person> getWorkingClass(List<Person> people) {
    return null;
}

private List<Person> getJuniors(List<Person> people) {
    return null;
}
```

HOMEWORK

1. Create a method that returns n'th element of a fibonacci series (1, 1, 2, 3, 5, 8, …)
2. Write a `Triangle` class which has method `field()` returning the field of an triangle
3. Write a `TriangleValidator` that checks if it is possible to create a triangle using three sides of given length

```
public class TriangleValidator {
    public boolean validate(int a, int b, int c) {
        // a + b > c
        // a + c > b
        // b + c > a
        // return true if all inequalities are met
        // return false if at least one inequality is not met
    }
}
```

HOMEWORK

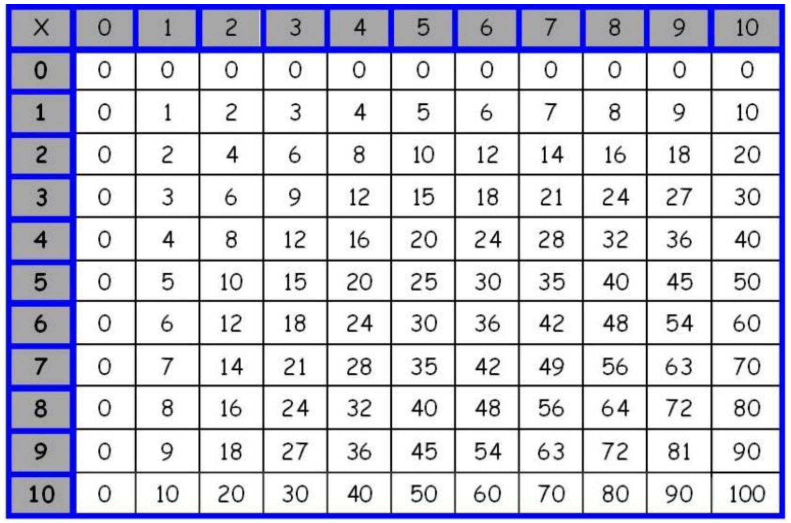
4. Create a program that would keep titles of webpages and amount of visits each webpage received

```
public class WebPageVisitCounter {
    private HashMap<String, Integer> visits = new HashMap<String, Integer>();

    public void visit(String title) {

    }

    public int getNumberOfVisits(String title) {
        return 0;
    }
}
```

5. Write a program that checks if given word is a palindrome (ex. Kajak, Ala)

HOMEWORK

6. Create a `Rectangle` class that is able to calculate field and perimeter
7. Create a `PercentGrader` class that translates percentage to a grade
   a) 95% - 100% - 6
   b) 85% - 95% - 5
   c) 75% - 85% - 4
   d) 65% - 75% - 3
   e) 55% - 65% - 2
   f) 0% - 55% - 1
8. Write a program that draws multiplication table – no test required



X	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100