Lab: Regular Expressions

Problems for exercises and homework for the "Programming Fundamentals" course @ SoftUni

You can check your solutions in Judge.

1. Match Full Name

Write a Java Program to **match full names** from a list of names and **print** them on the console.

Writing the Regular Expression

First, write a regular expression to match a valid full name, according to these conditions:

- A valid full name has the following characteristics:
  - It consists of **two words**.
  - Each word **starts** with a **capital letter**.
  - After the first letter, it **only contains lowercase letters afterwards**.
  - **Each** of the **two words** should be **at least two letters long**.
  - The **two words** are **separated** by a **single space**.

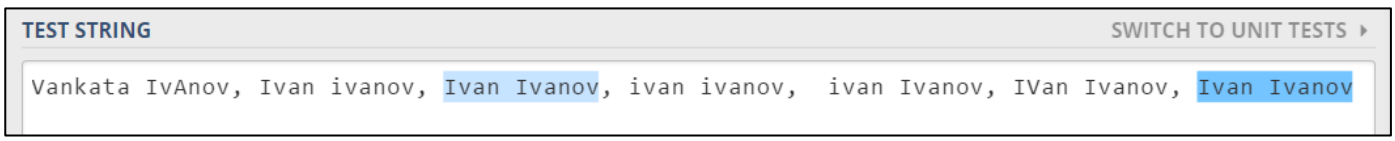
To help you out, we've outlined several steps:

1. Use an online regex tester like https://regex101.com/
2. Check out how to use **character sets** (denoted with square brackets - "**[]**")
3. Specify that you want **two words** with a space between them (the **space character** ' ', and **not** any whitespace symbol)
4. For each word, specify that it should begin with an uppercase letter using a **character set**. The desired characters are in a range – **from 'A' to 'Z'**.
5. For each word, specify that what follows the first letter are only **lowercase letters**, one or more – use another character set and the correct **quantifier**.
6. To prevent capturing of letters across new lines, put "**\b**" at the beginning and at the end of your regex. This will ensure that what precedes and what follows the match is a word boundary (like a new line).

In order to check your RegEx, use these values for reference (paste all of them in the **Test String** field):

Match ALL of these	Match NONE of these
`Ivan Ivanov`	`ivan ivanov, Ivan ivanov, ivan Ivanov, IVan Ivanov, Ivan IvAnov, Ivan  Ivanov`

By the end, the matches should look something like this:



After you've constructed your regular expression, it's time to write the solution in Java.

Implementing the Solution in Java

Create a new Java project and copy your **regular expression** into a **`String`** variable:

```
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
    String regex = "\\b[A-Z][a-z]+ [A-Z][a-z]+\\b";
```

© SoftUni – about.softuni.bg. Copyrighted document. Unauthorized copy, reproduction or use is not permitted.

Now, it's time to **read the input** and create two **classes** to help us work with **regular expressions**:

- **Pattern Class** – A Pattern object is a compiled representation of a regular expression.
- **Matcher Class** – A Matcher object is the engine that interprets the pattern and performs match operations against an input string.

```
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);

    String regex = "\\b[A-Z][a-z]+ [A-Z][a-z]+\\b";
    String input = scanner.nextLine();

    Pattern pattern = Pattern.compile(regex);
    Matcher matcher = pattern.matcher(input);
```

Now, it's time to **extract all the matches** from our input and print them. We use matcher method **find(),** which **attempts to find the next subsequence of the input sequence that matches the pattern.** To get our matches, we need to use method **group().**

```
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);

    String regex = "\\b[A-Z][a-z]+ [A-Z][a-z]+\\b";
    String input = scanner.nextLine();

    Pattern pattern = Pattern.compile(regex);
    Matcher matcher = pattern.matcher(input);

    while (matcher.find()) {
        System.out.print(matcher.group() + " ");
    }
}
```

Examples

Input
Ivan Ivanov, Ivan ivanov, ivan Ivanov, IVan Ivanov, Test Testov, Ivan Ivanov
Output
Ivan Ivanov Test Testov

2. Match Phone Number

Write a regular expression to match a **valid phone number** from **Sofia**. After you find all **valid phones**, **print** them on the console, separated by a **comma and a space** "**,** ".

Compose the Regular Expression

A valid number has the following characteristics:

- It starts with "**+359**"
- Then, it is followed by the area code (always **2**)
- After that, it's followed by the **number** itself:

© SoftUni – about.softuni.bg. Copyrighted document. Unauthorized copy, reproduction or use is not permitted.
Follow us:

- The number consists of **7 digits** (separated in **two groups** of **3** and **4 digits** respectively).
- The different **parts** are **separated** by **either a space or a hyphen** ('-').

You can use the following RegEx properties to **help** with the matching:

- Use **quantifiers** to match a **specific number** of **digits**
- Use a **capturing group** to make sure the delimiter is **only one of the allowed characters (space or hyphen)** and **not** a **combination** of both (e.g. **+359 2-111 111** has **mixed delimiters**, it is **invalid**). Use a **group backreference** to achieve this.
- Add a **word boundary** at the **end** of the match to avoid **partial matches** (the last example on the right-hand side).
- Ensure that before the **'+'** sign there is either a **space** or the **beginning of the string**.

You can use the following table of values to test your RegEx against:

Match ALL of these	Match NONE of these
+359 2 222 2222 +359-2-222-2222	359-2-222-2222, +359/2/222/2222, +359-2 222 2222 +359 2-222-2222, +359-2-222-222, +359-2-222-22222

Implement the Solution in Java

Now it's time to write the solution, so let's start writing!

First, just like in the previous problem, put your RegEx in a variable:

```
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);

    String regex = "\\+359([- ])2\\1[\\d]{3}\\1[\\d]{4}\\b";
```

Again we need a **Pattern** and **Matcher.**

```
public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);

    String regex = "\\+359([- ])2\\1[\\d]{3}\\1[\\d]{4}\\b";
    String phones = scanner.nextLine();

    Pattern pattern = Pattern.compile(regex);
    Matcher phoneMatcher = pattern.matcher(phones);
```

We can also save our matches in a List if we need.

```
List<String> matchedPhones = new LinkedList<>();

while (phoneMatcher.find()) {
    matchedPhones.add(phoneMatcher.group());
}
```

After that, just print the valid phone number list, using **`string.Join()`**:

```
System.out.println(String.join( delimiter: ", ", matchedPhones));
```


© SoftUni – about.softuni.bg. Copyrighted document. Unauthorized copy, reproduction or use is not permitted.

Examples

Input
+359 2 222 2222,359-2-222-2222, +359/2/222/2222, +359-2 222 2222 +359 2-222-2222, +359-2-222-222, +359-2-222-22222 +359-2-222-2222
Output
+359 2 222 2222, +359-2-222-2222

3. Match Dates

Write a program, which matches a date in the format "**dd{separator}MMM{separator}yyyy**". Use **named capturing groups** in your regular expression.

Compose the Regular Expression

Every valid date has the following characteristics:

- Always starts with **two digits**, followed by a **separator**
- After that, it has **one uppercase** and **two lowercase** letters (e.g. **Jan**, **Mar**).
- After that, it has a **separator** and **exactly 4 digits** (for the year).
- The separator could be either of three things: a period ("**.**"), a hyphen ("**-**") or a forward slash ("**/**")
- The separator needs to be **the same** for the whole date (e.g. 13**.**03**.**2016 is valid, 13**.**03**/**2016 is **NOT**). Use a **group backreference** to check for this.

You can follow the table below to help with composing your RegEx:

Match ALL of these	Match NONE of these
13/Jul/1928, 10-Nov-1934, 25.Dec.1937	01/Jan-1951, 23/sept/1973, 1/Feb/2016

Use **named capturing groups** for the **day**, **month** and **year**.

Since this problem requires more complex RegEx, which includes **named capturing groups**, we'll take a look at how to construct it:

- First off, we don't want anything at the **start** of our date, so we're going to use a **word boundary** "**\b**":

  REGULAR EXPRESSION

  / \b

- Next, we're going to match the **day**, by telling our RegEx to match **exactly two digits**, and since we want to **extract** the day from the match later, we're going to put it in a **capturing group**:

  REGULAR EXPRESSION

  / \b(\d{2})

  We're also going to give our group a **name**, since it's easier to navigate by **group name** than by **group index**:

  REGULAR EXPRESSION

  / \b(?<day>\d{2})

© SoftUni – about.softuni.bg. Copyrighted document. Unauthorized copy, reproduction or use is not permitted.

- Next comes the separator – either a **hyphen**, **period** or **forward slash**. We can use a **character class** for this:

  REGULAR EXPRESSION

  ```
  / \b(?<day>\d{2})[-.\/]
  ```

  Since we want to use the separator we matched here to match the **same separator** further into the date, we're going to put it in a **capturing group**:

  REGULAR EXPRESSION

  ```
  / \b(?<day>\d{2})([-.\/])
  ```

- Next comes the **month**, which consists of a **capital Latin letter** and **exactly two lowercase Latin letters**:

  REGULAR EXPRESSION

  ```
  / \b(?<day>\d{2})([-.\/])(?<month>[A-Z][a-z]{2})
  ```

- Next, we're going to match the **same separator we matched earlier**. We can use a **backreference** for that:

  REGULAR EXPRESSION

  ```
  / \b(?<day>\d{2})([-.\/])(?<month>[A-Z][a-z]{2})\2
  ```

- Next up, we're going to match the year, which consists of **exactly 4 digits**:

  REGULAR EXPRESSION

  ```
  / \b(?<day>\d{2})([-.\/])(?<month>[A-Z][a-z]{2})\2(?<year>\d{4})
  ```

- Finally, since we don't want to match the date if there's anything else **glued to it**, we're going to use another **word boundary** for the end:

  REGULAR EXPRESSION

  ```
  / \b(?<day>\d{2})([-.\/])(?<month>[A-Z][a-z]{2})\2(?<year>\d{4})\b
  ```

Now it's time to find all the **valid dates** in the input and **print each date** in the following format: "**`Day: {day}, Month: {month}, Year: {year}`**", each on a **new line**.

Implement the Solution in Java

First off, we're going to put our RegEx in a variable.

```
String regex = "\\b(?<day>\\d{2})([-.\\/])(?<month>[A-Z][a-z]{2})\\2(?<year>[\\d]{4})\\b";
String datesStrings = scanner.nextLine();
Pattern pattern = Pattern.compile(regex);
Matcher dates = pattern.matcher(datesStrings);
```


© SoftUni – about.softuni.bg. Copyrighted document. Unauthorized copy, reproduction or use is not permitted.

Next, we're going to **iterate** over every single **`Match`** and **extract** the **day**, **month** and **year** from the **groups.**

```
while (dates.find()){

    String day = dates.group( name: "day");
    String month = dates.group( name: "month");
    String year = dates.group( name: "year");

    System.out.printf("Day: %s, Month: %s, Year: %s%n", day,month,year);
}
```

Examples

Input
13/Jul/1928, 10-Nov-1934, , 01/Jan-1951,f 25.Dec.1937 23/09/1973, 1/Feb/2016
Output
Day: 13, Month: Jul, Year: 1928 Day: 10, Month: Nov, Year: 1934 Day: 25, Month: Dec, Year: 1937

© SoftUni – about.softuni.bg. Copyrighted document. Unauthorized copy, reproduction or use is not permitted.
Follow us: