Lab: Regular Expressions

You can check your solutions here: https://judge.softuni.bg/Contests/3178/Additional-Exercises.

1. Match Full Name

Write a C# 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**.

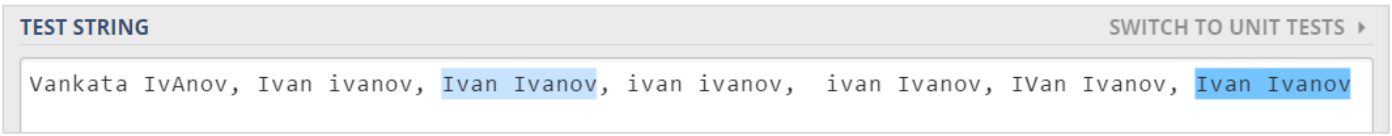
To help you out, we've outlined several steps:

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 C#.

Implementing the Solution in C#

Create a new C# project and copy your **regular expression** into a **`string`** variable:

```
static void Main(string[] args)
{
    string regex = @"[redacted]";
}
```

Note: It's usually a good idea to use a **verbatim string** (@ in front of the string literal) to store **regular expressions**, since characters like the backslash "****" can clash with **string escaping**.

Now, it's time to **read the input** and **extract all the matches** from it. For this, we can use the **`MatchCollection`** class:

```
static void Main(string[] args)
{
    string regex = @"[illegible]";

    string names = Console.ReadLine();

    MatchCollection matchedNames = Regex.Matches(names, regex);
}
```

After we extract all the matches, we need to **iterate** over the **`MatchCollection`** and **print** every match that we found:

```
static void Main(string[] args)
{
    string regex = @"[illegible]";

    string names = Console.ReadLine();

    MatchCollection matchedNames = Regex.Matches(names, regex);

    foreach (Match name in matchedNames)
    {
        Console.Write(name.Value + "\n");
    }

    Console.WriteLine();
}
```

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:
    - 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 C#

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:

```
static void Main(string[] args)
{
    var regex = @"[illegible]";
}
```

After that, let's make a **`MatchCollection`** for our matches:

```
static void Main(string[] args)
{
    var regex = @"[illegible]";

    var phones = Console.ReadLine();

    var phoneMatches = Regex.Matches(phones, regex);
}
```

Let's try to print **all the matches**, using only a **single line of code**. Since **`MatchCollection`** is, as its name suggests, a **collection**, we can use **`LINQ`** methods on it.

In order to get all of the matches and put them into a string array, we need to perform several manipulations on the **`MatchCollection`**:

1. Cast every single element of the **`MatchCollection`** to the **`Match`** type using **`Cast<Match>()`**.
2. Since every element is a **`Match`** now, we can extract just the **`Value`** property of the match itself, which holds the **match value** as a **string**, using **`Select()`**. We can also **`Trim()`** the **value**, to get rid of any **leading** or **trailing spaces**.
3. After getting the match value, we can use **`ToArray()`** to **convert** the collection to an **array**.

Here's what that looks like as a **`LINQ`** query:

```
var matchedPhones = phoneMatches
    .Cast<Match>()
    .Select(a => a.Value.Trim())
    .ToArray();
```

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

```
static void Main(string[] args)
{
    var regex = @"[illegible]";

    var phones = Console.ReadLine();

    var phoneMatches = Regex.Matches(phones, regex);

    var matchedPhones = phoneMatches
        .Cast<Match>()
        .Select(a => a.Value.Trim())
        .ToArray();

    Console.WriteLine(string.Join(", ", matchedPhones));
}
```

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.

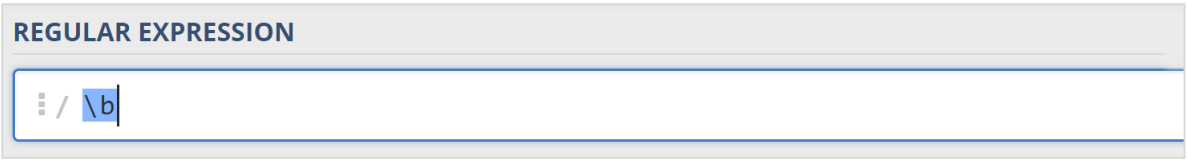
You can follow the table below to help with composing your RegEx:

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**":



- 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})
```

- 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 C#

First off, we're going to put our RegEx in a variable and get a **`MatchCollection`** from the string:

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

var datesStrings = Console.ReadLine();

var dates = Regex.Matches(datesStrings, regex);
```

Since RegEx works differently across different languages, before we continue, we're going to **set our backreference from \2 to \1**. This is because **C# backreferences** don't count **named capture groups for backreferences**. So, **change it before we continue**.

Next, we're going to **iterate** over every single **`Match`** and **extract** the **day**, **month** and **year** from the **groups**. We can use a special syntax in C# to get a match's group **value** by its **key**, the **same way** as when we access a **`Dictionary`**'s values:

```
foreach (Match date in dates)
{
    var day = date.Groups["day"].Value;
    var month = date.Groups["month"].Value;
    var year = date.Groups["year"].Value;

    Console.WriteLine($"Day: {day}, Month: {month}, Year: {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