

CORE JAVA

With

SCJP / OCJP

Study Material

Chapter 13: Regular Expressions



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Regular Expression

Agenda

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2. The main important application areas of Regular Expression
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4. Matcher class
5. Important methods of Matcher class
6. Character classes
7. Predefined character classes
8. Quantifiers
9. Pattern class split() method
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12. Requirements:
 - Write a regular expression to represent all valid identifiers in java language
 - Write a regular expression to represent all mobile numbers
 - Write a regular expression to represent all Mail Ids
 - Write a program to extract all valid mobile numbers from a file
 - Write a program to extract all Mail IDS from the File
 - Write a program to display all .txt file names present in specific(E:\scjp) folder



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Introduction

A Regular Expression is a expression which represents a group of Strings according to a particular pattern.

Example:

- We can write a Regular Expression to represent all valid mail ids.
- We can write a Regular Expression to represent all valid mobile numbers.

The main important application areas of Regular Expression are:

- To implement validation logic.
- To develop Pattern matching applications.
- To develop translators like compilers, interpreters etc.
- To develop digital circuits.
- To develop communication protocols like TCP/IP, UDP etc.

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Example:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        int count=0;
        Pattern p=Pattern.compile("ab");
        Matcher m=p.matcher("abbbabbaba");
        while(m.find())
        {
            count++;
        }
    }
}
```

```

        System.out.println(m.start()+"-----"+m.end()+"--
-----"+m.group());
    }
    System.out.println("The no of occurrences
:"+count);
}
}

```

Output:

0-----2-----ab

4-----6-----ab

7-----9-----ab

The no of occurrences: 3

Pattern class:

- A Pattern object represents "compiled version of Regular Expression".
- We can create a Pattern object by using compile() method of Pattern class.

```
public static Pattern compile(String regex);
```

Example:

```
Pattern p=Pattern.compile("ab");
```

Note: if we refer API we will get more information about pattern class.



Matcher:

A Matcher object can be used to match character sequences against a Regular Expression.

We can create a Matcher object by using matcher() method of Pattern class.

```

public Matcher matcher(String target);
    Matcher m=p.matcher("abbbabbaba");

```


Important methods of Matcher class:

1. `boolean find();`
It attempts to find next match and returns true if it is available otherwise returns false.
2. `int start();`
Returns the start index of the match.
3. `int end();`
Returns the offset(equalize) after the last character matched.(or)
Returns the "end+1" index of the matched.
4. `String group();`
Returns the matched Pattern.

Note: Pattern and Matcher classes are available in `java.util.regex` package, and introduced in 1.4 version



Character classes:

1. `[abc]`-----Either 'a' or 'b' or 'c'
2. `[^abc]` -----Except 'a' and 'b' and 'c'
3. `[a-z]` -----Any lower case alphabet symbol
4. `[A-Z]` -----Any upper case alphabet symbol
5. `[a-zA-Z]` -----Any alphabet symbol
6. `[0-9]` -----Any digit from 0 to 9
7. `[a-zA-Z0-9]` -----Any alphanumeric character
8. `[^a-zA-Z0-9]` -----Any special character

Example:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p=Pattern.compile("x");
        Matcher m=p.matcher("alb7@z#");
```

```

while(m.find())
{
    System.out.println(m.start()+"-----"
"+m.group());
}
}

```

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Output:

x=[abc]	x=[^abc]	x=[0-9]	x=[a-z]
0-----a	1-----1	1-----1	0-----a
2-----b	3-----7	3-----7	2-----b
	4-----@		5-----z
	5-----z		
	6-----#		

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Predefined character classes:

\s-----space character
 \d-----Any digit from 0 to 9[0-9]
 \w-----Any word character[a-zA-Z0-9_]

.-----Any character including special characters.

|S-----any character except space character

|D-----any character except digit

|W-----any character except word character(special character)

Example:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p=Pattern.compile("x");
        Matcher m=p.matcher("alb7 @z#");
        while(m.find())
        {
            System.out.println(m.start()+"-----
"+m.group());
        }
    }
}
```

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Output:

<u>x=\\s</u>	<u>x=\\d</u>	<u>x=\\w</u>	<u>x=.</u>
4-----	1-----1	0-----a	0-----a
	3-----7	1-----1	1-----1
		2-----b	2-----b
		3-----7	3-----7
		6-----z	4-----
			5-----@
			6-----z
			7-----#

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Quantifiers:

Quantifiers can be used to specify no of characters to match.

a-----Exactly one 'a'

a+-----At least one 'a'

a*-----Any no of a's including zero number

a?-----At most one 'a' *Zero or one a*

Example:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p=Pattern.compile("x");
        Matcher m=p.matcher("abaabaaab");
        while(m.find())
```



```
        {  
            System.out.println(m.start()+"-----"  
"+m.group());  
        }  
    }  
}
```



Output:

x=a	x=a+	x=a*	x=a?
0-----a	0-----a	0-----a	0-----a
2-----a	2-----aa	1-----	1-----
3-----a	5-----aaa	2-----aa	2-----a
5-----a		4-----	3-----a
6-----a		5-----aaa	4-----
7-----a		8-----	5-----a
		9-----	6-----a
			7-----a
			8-----
			9-----

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Pattern class split() method:

Pattern class contains split() method to split the given string against a regular expression.

Example 1:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p = Pattern.compile("\\s");
        String[] s = p.split("ashok software solutions");
    }
}
```

```

        for(String s1:s)
        {
            System.out.println(s1);//ashok
                                   //software
                                   //solutions
        }
    }
}
Example 2:
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p=Pattern.compile("\\."); // (or) [.]
        String[] s=p.split("www.dugrajobs.com");
        for(String s1:s)
        {
            System.out.println(s1);//www
                                   //dugrajobs
                                   //com
        }
    }
}

```

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String class split() method:

String class also contains split() method to split the given string against a regular expression.

Example:

```

import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        String s="www.saijobs.com";
        String[] s1=s.split("\\.");
        for(String s2:s1)
        {
            System.out.println(s2);//www

```

```

        //saijobs
        //com
    }
}
}

```

Note : String class split() method can take regular expression as argument where as pattern class split() method can take target string as the argument.

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StringTokenizer:

- This class present in java.util package.
- It is a specially designed class to perform string tokenization.

Example 1:

```

import java.util.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        StringTokenizer st = new StringTokenizer("sai
software solutions");
        while(st.hasMoreTokens())
        {
            System.out.println(st.nextToken()); //sai
                                                    //software
                                                    //solutions
        }
    }
}

```

The default regular expression for the StringTokenizer is space.

Example 2:


```
import java.util.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
```



```
StringTokenizer st = new StringTokenizer("1,99,988", ",");
while (st.hasMoreTokens())
{
    System.out.println(st.nextToken()); //1
                                         //99
                                         //988
}
}
```

Requirement:

Write a regular expression to represent all valid identifiers in java language.

Rules:

The allowed characters are:

1. a to z, A to Z, 0 to 9, -, #
2. The 1st character should be alphabet symbol only.
3. The length of the identifier should be at least 2.

Program:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
```

```

    {
        Pattern p=Pattern.compile("[a-zA-Z][a-zA-Z0-9-#]+"); (or)
        Pattern p=Pattern.compile("[a-zA-Z][a-zA-Z0-9-#][a-zA-Z0-9-#]*");
        Matcher m=p.matcher(args[0]);
        if(m.find()&&m.group().equals(args[0]))
        {
            System.out.println("valid identifier");
        }
        else
        {
            System.out.println("invalid identifier");
        }
    }
}

```

Output:

E:\scjp>javac RegularExpressionDemo.java

E:\scjp>java RegularExpressionDemo ashok

Valid identifier

E:\scjp>java RegularExpressionDemo ?ashok

Invalid identifier

Requirement:

Write a regular expression to represent all mobile numbers.

1. Should contain exactly 10 digits.
2. The 1st digit should be 7 to 9.

Program:

```

import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p=Pattern.compile("
            [7-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]");
        //Pattern p=Pattern.compile("[7-9][0-9]{9}");
        Matcher m=p.matcher(args[0]);
        if(m.find()&&m.group().equals(args[0]))
        {
            System.out.println("valid number");
        }
        else
    }
}

```

```

        {
            System.out.println("invalid number");
        }
    }
}

```

Analysis:

10 digits mobile:

```

[7-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]    (or)
[7-9][0-9]{9}

```

Output:

```

E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo 9989123456
Valid number

```

```

E:\scjp>java RegularExpressionDemo 6989654321
Invalid number
10 digits (or) 11 digits:
(0?[7-9][0-9]{9})

```

Output:

```

E:\scjp>javac RegularExpressionDemo.java

E:\scjp>java RegularExpressionDemo 9989123456
Valid number

```

```

E:\scjp>java RegularExpressionDemo 09989123456
Valid number

```

```

E:\scjp>java RegularExpressionDemo 919989123456
Invalid number
10 digits (or) 11 digit (or) 12 digits:
(0|91)?[7-9][0-9]{9}    (or)
(91)?(0?[7-9][0-9]{9})

```

```

E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo 9989123456
Valid number
E:\scjp>java RegularExpressionDemo 09989123456
Valid number
E:\scjp>java RegularExpressionDemo 919989123456
Valid number
E:\scjp>java RegularExpressionDemo 69989123456
Invalid number

```



Requirement:

Write a regular expression to represent all Mail Ids.

Program:

```
import java.util.regex.*;
class RegularExpressionDemo
{
    public static void main(String[] args)
    {
        Pattern p=Pattern.compile("[a-zA-Z][a-zA-Z0-9-\\.]*@[a-zA-Z0-9-9]*([\\.][a-zA-Z]+)*");
        Matcher m=p.matcher(args[0]);
        if(m.find() && m.group().equals(args[0]))
        {
            System.out.println("valid mail id");
        }
        else
        {
            System.out.println("invalid mail id");
        }
    }
}
```


Output:

```
E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo sunmicrosystem@gmail.com
Valid mail id
E:\scjp>java RegularExpressionDemo 999sunmicrosystem@gmail.com
Invalid mail id
E:\scjp>java RegularExpressionDemo 999sunmicrosystem@gmail.co9
Invalid mail id
```


Requirement:

Write a program to extract all valid mobile numbers from a file.

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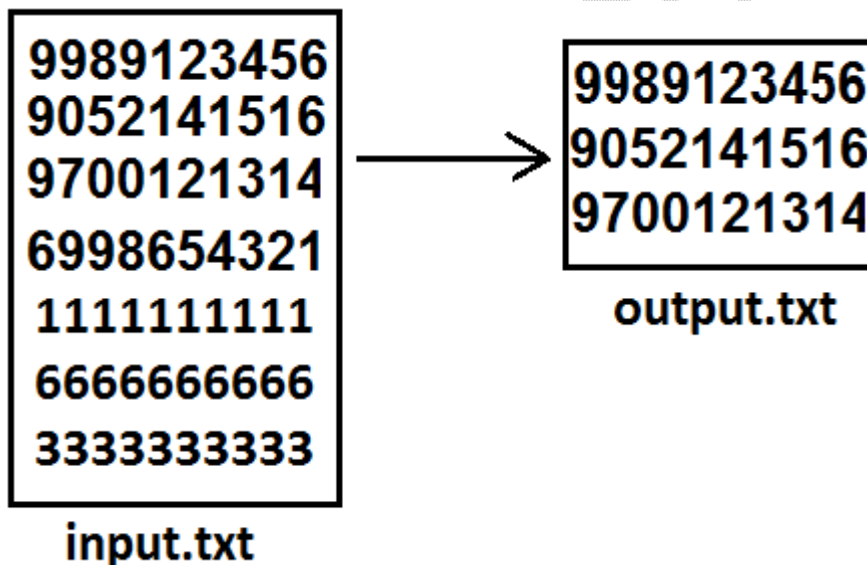
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Diagram:



Program:

```

import java.util.regex.*;
import java.io.*;
class RegularExpressionDemo
{
    public static void main(String[] args) throws IOException
    {
        PrintWriter out=new PrintWriter("output.txt");
    }
}
    
```

```

        BufferedReader br = new BufferedReader(new
FileReader("input.txt"));
        Pattern p = Pattern.compile("(0|91)?[7-9][0-
9]{9}");
        String line = br.readLine();
        while (line != null)
        {
            Matcher m = p.matcher(line);
            while (m.find())
            {
                out.println(m.group());
            }
            line = br.readLine();
        }
        out.flush();
    }
}

```

Requirement:

Write a program to extract all Mail IDs from the File.

Note: In the above program replace mobile number regular expression with MAIL ID regular expression.

Requirement:

Write a program to display all .txt file names present in E:\scjp folder.

Program:

```

import java.util.regex.*;
import java.io.*;
class RegularExpressionDemo
{
    public static void main(String[] args) throws IOException
    {
        int count = 0;
        Pattern p = Pattern.compile("[a-zA-Z0-9-
$.]+[.]txt");
        File f = new File("E:\\scjp");
        String[] s = f.list();
        for (String s1 : s)
        {
            Matcher m = p.matcher(s1);
            if (m.find() && m.group().equals(s1))
            {
                count++;
                System.out.println(s1);
            }
        }
    }
}

```

```

        System.out.println(count);
    }
}
Output:
input.txt
output.txt
outut.txt
3

```



Write a program to check whether the given mailid is valid or not.

In the above program we have to replace mobile number regular expression with mailid regular expression

Write a regular expressions to represent valid Gmail mail id's :

`[a-zA-Z0-9][a-zA-Z0-9-]*@gmail[.].com`

Write a regular expressions to represent all Java language identifiers :

Rules :

- The length of the identifier should be atleast two.
- The allowed characters are
 - a-z
 - A-Z
 - 0-9
 - #
 - \$
 -
 -
- The first character should be lower case alphabet symbol k-z , and second character should be a digit divisible by 3

`[k-z][0369][a-zA-Z0-9#$]*`

Write a regular expressions to represent all names starts with 'a'

`[aA][a-zA-Z]*`

To represent all names starts with 'A' ends with 'K'

`[aA][a-zA-Z]*[kK]`



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