

# **CORE JAVA**

## **With**

# **SCJP / OCJP**

## **Study Material**

### **Chapter 13: Regular Expression**



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# Regular Expression

## Agenda

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

## 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.

**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");
```

Target String

**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());
        }
    }
}
```

Output:

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

### 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());
        }
    }
}
```

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-----#

### 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'

### 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:

<u>x=a</u>	<u>x=a+</u>	<u>x=a*</u>	<u>x=a?</u>
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-----

### Pattern class split() method:

Pattern class contains **split()** method to split the given string against a regular expression. It returns an array of strings resulting from the split.

#### 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
    }
}

```

### 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.

### StringTokenizer:

StringTokenizer is a class that allows us to break the string into tokens (smaller parts or words) based on the given delimiter.

- 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
        }
    }
}

```

RE/Pattern/Delimeter

#### 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:

```

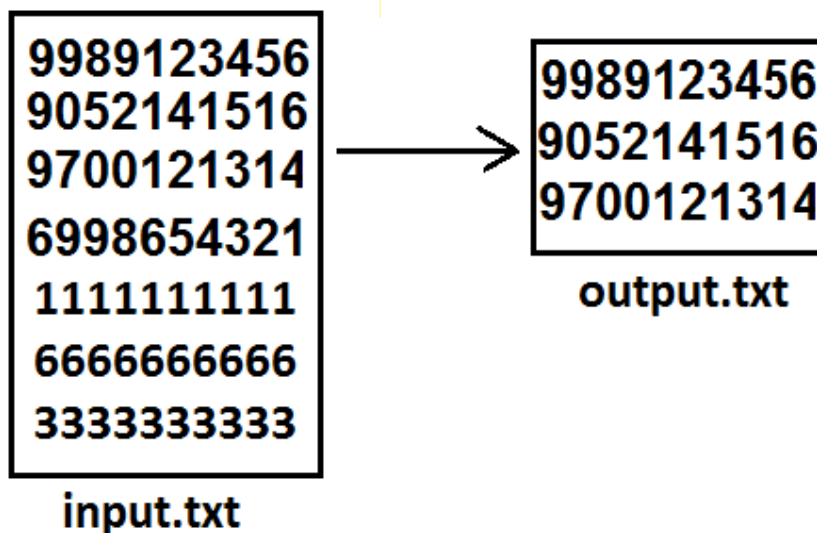
E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo sunmicrosystem@gmail.com
Valid mail id
E:\scjp>java RegularExpressionDemo 999sunmicrosystem@gmail.com
Invalid mail id
E:\scjp>java RegularExpressionDemo 999sunmicrosystem@gmail.co9
Invalid mail id

```

#### Requirement:

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

#### 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]`