Regular Expression :

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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.

```
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 occurences
:"+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("a1b7@z#");
          while(m.find())
          {
```

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

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-------#		

Predefined character classes:

\s----------space character
\d----------Any digit from o to 9[o-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("a1b7 @z#");
           while(m.find())
           {
             System.out.println(m.start()+"------
"+m.group());
           }
      }
}
```

Output:

x=\\s	x=\\d	x=\\w	x=.
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:

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-------

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
                }
        }
}
```

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:

- 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][azA-Z0-9-
#]*"); (or)
        Pattern p=Pattern.compile("[a-zA-Z][azA-
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][09]{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 (0r) 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.

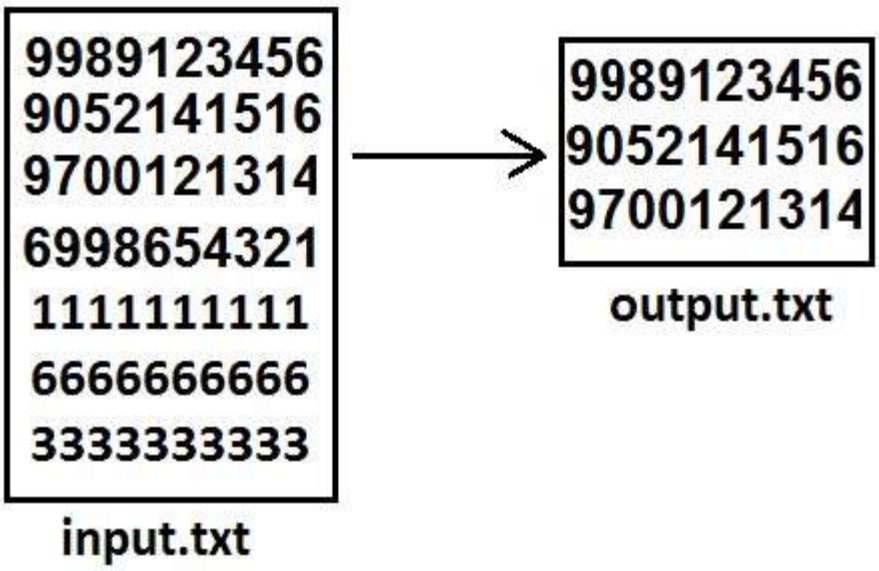
```
Program: import
java.util.regex.*; class
RegularExpressionDemo
{
     public static void main(String[] args)
     {
          Pattern p=Pattern.compile("
```

```
                                    [a-zA-Z][a-zA-Z0-
9.]*@[a-zA-Z0-9]+([.][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)?[79][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]**