

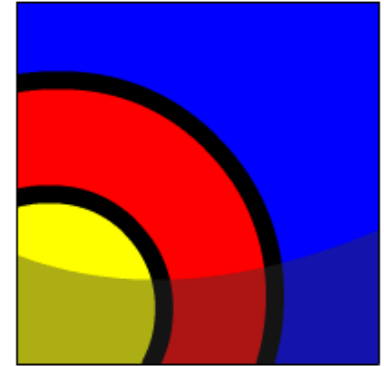
Regular Expressions



What Will I Learn?

In this lesson, you will learn to:

- Describe regular expressions
- Use regular expressions to search, match, and replace strings in SQL statements





Why Learn It?

Sometimes you have to find or replace a particular piece of text in column, text string, or document.

You already know how to perform simple pattern matching with LIKE and using wildcards. Sometimes you might need to look for very complex text strings such as find the word “Winchester” in a specified text or extract all URLs from a piece of text. Other times you might be asked to do a more complex search such as find all words whose every second character is a vowel.

Regular expressions are a method of describing both simple and complex patterns for searching and manipulating. They are used widely in the computing industry, and are not limited to Oracle. Oracle’s implementation of regular expressions is an extension of the POSIX (Portable Operating System for UNIX) and are as such, fully compatible with the POSIX standard, as controlled by the Institute of Electrical and Electronics Engineers (IEEE).

Tell Me / Show Me

REGULAR EXPRESSIONS

The use of regular expressions is based on the use of meta characters.

Meta characters are special characters that have a special meaning, such as a wildcard character, a repeating character, a non-matching character, or a range of characters. You can use several predefined meta character symbols in the pattern matching.

The next slides list the meta characters and provide a brief explanation of each.





Tell Me / Show Me

META CHARACTERS

Symbol	Description
*	Matches zero or more occurrences
 	Alteration operator for specifying alternative matches
^/\$	Matches the start-of-line/end-of-line
[]	Bracket expression for a matching list matching any one of the expressions represented in the list
{m}	Matches exactly <i>m</i> times
{m,n}	Matches at least <i>m</i> times but no more than <i>n</i> times
[: :]	Specifies a character class and matches any character in that class



Tell Me / Show Me

META CHARACTERS (continued)

Symbol	Description
\	Can have 4 different meanings: 1. Stand for itself. 2. Quote the next character. 3. Introduce an operator. 4. Do nothing.
+	Matches one or more occurrence
?	Matches zero or one occurrence
.	Matches any character in the supported character set, except NULL
()	Grouping expression, treated as a single subexpression
[==]	Specifies equivalence classes
\n	Back-reference expression
[..]	Specifies one collation element, such as a multi-character element



Tell Me / Show Me

REGULAR EXPRESSIONS EXAMPLES

A simple regular expression use is very similar to the wildcard searches you are already familiar with, so it is easy to find for instance an 'a' followed by a 'c'.

As a regular expression, this would be done as: 'a.c'.

The same expression as a standard SQL wildcard search would be: WHERE column LIKE 'a_c'.

Which of the following strings would match 'a.c'?

'ABC', 'abc', 'aqx', 'axc', 'aBc', 'abC'



Tell Me / Show Me

REGULAR EXPRESSIONS EXAMPLES

The strings in **red** would match the search string 'a.c'

'ABC', '**abc**', 'aqx', '**axc**', '**aBc**', 'abC'

The other examples fail either due to them being the wrong character in the wrong place or in the wrong case (uppercase not lowercase as specified in the search string).



Tell Me / Show Me

REGULAR EXPRESSIONS EXAMPLES

Assume you were asked to list all employees with a first name of Stephen or Steven. If you used standard Oracle wildcard searching, this would be hard to achieve, but with regular expressions, you could simply specify `'^Ste(v|ph)en$'`.

`"^"` specifies the start of the string that is being searched

Uppercase `"S"`

lowercase `"t"`

lowercase `"e"`

`"("` starts a group

lowercase `"v"`

`"|"` specifies an OR

lowercase `"p"`

Lowercase `"h"`

`")"` finishes the group of choices,

lowercase `"e"`

lowercase `"n"`

`"$"` specifies the end of the string that is being searched



Tell Me / Show Me

REGULAR EXPRESSION FUNCTIONS

Oracle provides a set of SQL functions that you can use to search and manipulate strings using regular expressions. You can use these functions on any data type that holds character data such as `CHAR`, `CLOB` and `VARCHAR2`. A regular expression must be enclosed in single quotation marks.

Name	Description
REGEXP_LIKE	Similar to the LIKE operator, but performs regular expression matching instead of simple pattern matching
REGEXP_REPLACE	Searches for a regular expression pattern and replaces it with a replacement string
REGEXP_INSTR	Searches for a given string for a regular expression pattern and returns the position where the match is found
REGEXP_SUBSTR	Searches for a regular expression pattern within a given string and returns the matched substring



Tell Me / Show Me

REGULAR EXPRESSION FUNCTION EXAMPLES

Use of the regular expression REGEXP_LIKE could be used to solve the problem mentioned earlier in this lesson of listing either Steven or Stephen:

```
SELECT first_name, last_name
```

```
FROM employees
```

```
WHERE REGEXP_LIKE (first_name, '^Ste(v|ph)en$');
```

FIRST_NAME	LAST_NAME
Steven	King



Tell Me / Show Me

REGULAR EXPRESSION FUNCTION EXAMPLES

Searching for addresses that do not start with a number and listing the position of the first non-alpha character in that address could be done like this:

```
SELECT street_address,  
       REGEXP_INSTR(street_address,'^[[:alpha:]]')  
FROM   locations  
WHERE  REGEXP_INSTR(street_address,'^[[:alpha:]]')> 1;
```

Explanation and result can be found on the next slide.



Tell Me / Show Me

REGULAR EXPRESSION FUNCTION EXAMPLES

```
REGEXP_INSTR(street_address,'^[[:alpha:]]')
```

“**[**” specifies the start of the expression

“**^**” indicates NOT

“**[[:alpha:]]**” specifies alpha character class, i.e. not numbers

“**]**” ends the expression

STREET_ADDRESS	REGEXP_INSTR(STREET_ADDRESS,'^[[:ALPHA:]]')
Magdalen Centre, The Oxford Science Park	9



Tell Me / Show Me

REGULAR EXPRESSION FUNCTION EXAMPLES

To return only the first word in a column containing a sentence you could issue following statement:

```
SELECT REGEXP_SUBSTR(street_address , ' [^ ]+ ') "Road"  
FROM locations;
```

Road
Jabberwocky
Interiors
Charade
Bloor
Centre,



Tell Me / Show Me

REGULAR EXPRESSION FUNCTION EXAMPLES

REGEXP_SUBSTR(street_address , ' [^]+ ')

“[“ specifies the start of the expression

“^” indicates NOT

“ ” indicates a space

“]” ends the expression

“+” indicates one or more

“ ” indicates a space

Road
Via
Calle
Jabberwocky
Interiors
Zagora
Charade



Tell Me / Show Me

REGULAR EXPRESSION FUNCTION EXAMPLES

Regular expressions could also be used as part of the application code to ensure that only valid data is stored in the database. It is possible to include a call to a regular expression function in, for instance, a CHECK constraint. So if you wanted to ensure that no email addresses without '@' were captured in a table in your database, you could simply add the following check constraint:

```
ALTER TABLE employees  
ADD CONSTRAINT email_addr_chk  
CHECK(REGEXP_LIKE(email,'@'));
```

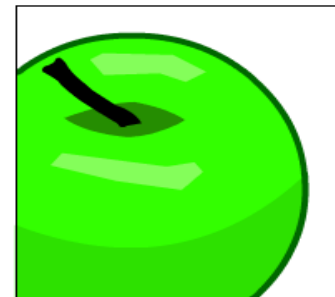
This would ensure that all email addresses has a “@” sign somewhere in it.

Tell Me / Show Me

Terminology

Key terms used in this lesson include:

REGULAR EXPRESSIONS

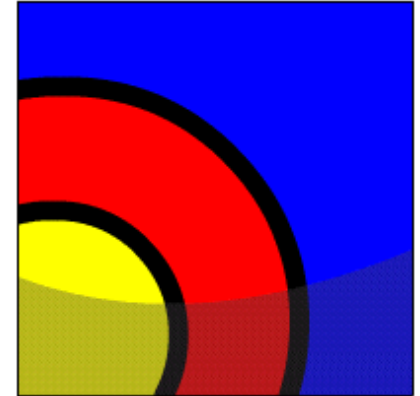




Summary

In this lesson you have learned to:

- Describe regular expressions
- Use regular expressions to search, match, and replace strings in SQL statements



Summary

Practice Guide

The link for the lesson practice guide can be found in the course resources in Section 0.

