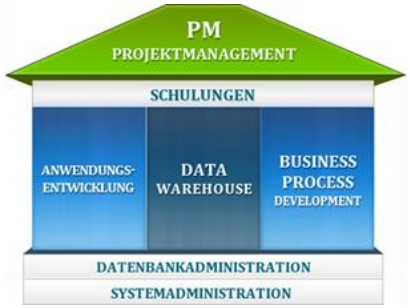
QuickReference
v1.1

Oracle SQL Advanced Functions

-english-

author
Sven-Uwe Weller



syntegris
information solutions GmbH
Hermannstr. 54-56
63263 Neu-Isenburg
Germany
Sven.Weller@syntegris.de
www.syntegris.de

Other available QuickReferences are:
- Oracle SQL Basic Functions
- Oracle Apex APIs

Regular expressions

Functions

regexp_count (*source, pattern, position, match_params*) (11.1)
regexp_instr (*source, pattern, position, occur, return_option, match_params, subexpr*)
regexp_like (*source, pattern, match_params*)
regexp_replace (*source, pattern, replace, position, occur, match_params*)
regexp_substr (*source, pattern, position, occur, match_params, subexpr*)

Parameters

source		input string
pattern		search pattern
replace		replacement text backreferences allowed
position		starting position for the search
occur		number of occurrence for multiple matches
return_option	0|1	which position to return
	0	first matching character
	1	position after the match
match_params		special settings for the search
	n	"." includes newline chars
	m	multi lines. ^and $ work for each line
	i	case insensitive search
	c	case sensitive search
	x	ignore whitespaces
subexpr	*1..9*	which () to return (11.1)

Regexp Syntax (Posix)

.	any	any character but newline
*	0 or more	greedy (10.2)
+	1 or more	greedy
?	0 or 1	makes other expr. non greedy
|	OR	alternative expression
/	backslash	can be escape char
^	start	of the full string
$	end	of the complete string
()		subexpression
{n,m}		n to m repetitions
\n	1..9	backreference for ()
[]	any list	match any char in this list
[^]	any not in list	
[==]	equivalence class	[=a=] matches a|A|á|Ä
[::]		character class
[:digit:]	0-9	numerical chars
[:xdigit:]	A-Fa-f0-9	hexadecimal digits
[:alpha:]	a-zA-Z	text
[:alnum:]	0-9a-zA-Z	no whitespaces|tabs
[:space:]		whitespaces, tabs
[:ascii|blank|cntrl|graph|lower|upper|print|space|word:]		

Meta characters (PERL syntax) (10.2)

\d	single digit character
\D	non digit character
\w	word character
\W	non word chararcter
\s	whitespace character
\S	non whitespace character
\A	beginning
\Z	end of the string

? after *,+,?, {n}, {n,}, {n,m} will make this non greedy

Back references

\1 references the first pair of parenthesis (). Up to 9 backreferences (\1 .. \9). Can be used in the *pattern* and the *replace* parameters. In *subexpr* just the number is used.

^Regexp_(.*) examples

Examples

Count the number of words

```
nvl(length(regexp_replace(str,'\s*\S+\s*','x')),0)
regexp_count(str, '(\w)+'))
regexp_count(str, '([[:alnum:].]+)'))
```

str	result 1	result 2	result 3
This is just a test	5	5	5
_	1	1	0
two.words ?	2	2	1

Search for multiple strings (case insensitive)

```
regexp_like (str, 'ABC|xyz|999', 'i')
```

Extract only the numbers

```
regexp_substr(col,'[0-9]+')          (until 10.1)
regexp_replace(col,'[^0-9]')         (all versions)
regexp_replace(col,'\D+')            (10.2)
```

Validate an email address

```
regexp_like('^[[:alnum:]._%+-]+@[[:alnum:].-]+\.[[:alpha:]]{2,4}$')
```
this allows only short domains

Validate an URL

```
regexp_like('^http[s]?://[A-Za-z0-9-.]+.[A-Za-z.]{2,5}(/[A-Za-z0-9%-_.?=&@#]*)?$')
```

Count dots in a string

```
regexp_count('This.is.my.website','\.')   3
```

Find everything after the last dot

```
regexp_substr('This.is.my.website','[^\.]+$')   website
```

Third part (dot as delimiter) in a string

```
regexp_substr('This.is.my.website','[^\.]+',1,3)   my
```

Get all strings starting with "ABC" from a list

```
Ltrim(regexp_replace(list,
'(^|;)(ABC[[:alnum:]]+)|.', '\1\2'), ';')
```

list	result
ABC123;DEF123;ABC345	ABC123;ABC345
DEF123;ABCDEF	ABCDEF

Find and eliminate repeating strings

```
regexp_replace(str,'^(.+?)\1*$','\1')
```

str	result
ABCABC	ABC
333	3
A123A123A123A123	A123
ababX	ababX

get the next TD element from a html document after a search string

```
regexp_replace(htmlDoc
  , '^.*?<td>SearchStr</td>.*?<td>(\w+)</td>.*$'
  ,'\1' ,1 ,1 ,'n')                    (10.2)
regexp_substr (htmlDoc
  , '^.*?<td>SearchStr</td>.*?<td>(\w+)</td>.*$'
  , 1, 1, 'n', 1)                      (11.2)
```

{JSON} (12.1.0.2)

Functions

***data* is [not] json**
json_exists(*data*, *$path on_error*)
json_textcontains(column, *$path, searchstring*)
json_query(*data, $path returning query_wrapper on_error*)
json_table(*data, $path returning on_error COLUMNS columnlist*)
json_value (*data, $path returning on_error*)

hint: is json can be used in a check constraint to make sure that a column holds only valid json documents.

Syntax $path (object or array)

```
$
[ { . { * | simplename | "complexname" } }
  |
  { [ { integer [TO integer]
      [, integer [TO integer]
      ]…
      }
      | *
    ]
  }
] …
```

Parameters

data		json varchar2, clob or a blob blobs need to add "FORMAT JSON"
$path		json search path
on_error		action when return error happens ERROR|NULL|EMPTY|DEFAULT literal|TRUE|FALSE ON ERROR
	ERROR, NULL	for all functions
	TRUE|FALSE	for json_exists
	EMPTY	for json_query
	DEFAULT	for json_table, json_value
returning		return data type and formatting PRETTY ASCII
query_wrapper		WITH|WITHOUT ARRAY WRAPPER
columnlist		json column list
	EXISTS PATH	like json_exists
	PATH	like json_query or json_value
	NESTED PATH	single row unnesting
	FOR ORDINALITY	row numbers

Examples

```
'{a:[5, 10, 15]}' is json                          true
json_value('{a:[5, 10, 15]}', '$.a[2]')            15
json_value('{firstname:"Sven"}', '$.lastname')
 default 'No last name found.'          No last name found.

select * from json_table('{a:[5, 10, 15]}', '$.a[*]'
columns ( RN for ordinality,
          VAL1 number path '$' ));
-or-
select * from json_table('{a:[5, 10, 15]}', '$'
columns ( val2 varchar2(20) format json path '$.a',
          nested path '$.a' columns (val3 number path '$[0]',
                                     val4 number path '$[2]' ) ));
```

RN	VAL1	VAL2	VAL3	VAL4
1	5	[5,10,15]	5	15
2	10			
3	15			

Analytic functions

Syntax

```
analytic_function([arguments])
  OVER
    ([partition by ... ]
     [order by ... ]
     [ windowing_clause ])
```

Windowing clause:

```
{ ROWS | RANGE }
{ BETWEEN
  { UNBOUNDED PRECEDING
  | CURRENT ROW
  | value { PRECEDING | FOLLOWING }
  }
  AND
  { UNBOUNDED FOLLOWING
  | CURRENT ROW
  | value { PRECEDING | FOLLOWING }
  }
| { UNBOUNDED PRECEDING
  | CURRENT ROW
  | value PRECEDING
  }
}
```

Analytic functions

avg (…)	average
count (*|distinct expr)	count
dense_rank ()	rank with no gaps
first_value (…) respect|ignore nulls	first value in set
hint: "respect|ignore nulls" part is ansi conform since 11.2 (abbreviation=r|i)	
lag (… ,offset, default) r|i nulls	previous row
last_value (…) r|i nulls	last value in set
lead (… ,offset, default) r|i nulls	next row
listagg (…, delimiter) within group (order by) (11.1)	creates a list with delimiters
max (…)	maximum
median (…)	middle value
min (…)	minimum
nth_value (…, n) from first|last r|i nulls	value in nth row (11.2)
ntile (x)	creates x buckets
rank ()	ranking with gaps
ratio_to_report (…)	ratio of row to sum of set
row_number ()	rownum for groups
sum (…)	sum

Analytic functions for statistics

corr|corrs_s|corr_k	correlation functions
covar_pop	population covariance
covar_samp	sample covariance
cume_dist	cumulative distribution (>0 <=1)
percent_rank	cumulative distribution (>=0 <=1) first row = 0
percentile_cont	inverse distribution function
percentile_disc	inverse distribution function
regr_…	linear regression functions
regr_slope|intercept|count|r2|avgx|avgy|sxx|syy|sxy	
stddev	standard deviation (0 for 1 row)
stddev_pop	population standard deviation
stddev_samp	standard deviation (null for 1 row)
var_pop	population variance
var_samp	sample variance
variance	variance

Analytic functions for data mining (12.1.0.1)

cluster_details|distance|id|probability|set	highest probability cluster
feature_details|id|set|value	highest value feature (scoring)
prediction|cost|details|probablility|set	a prediction based upon purpose

KEEP syntax

```
aggregate_function keep (dense_rank
first|last order by …) [over (partition by
...)]
```

first|last rows in window, then aggregate

Example

Customer who bought the most

```
select max(customer) keep (dense_rank first order by sum(itmcount)
desc) as customer
from orders o
join orderitems oi on oi.orderid = o.id
group by customer                                    = John
```

Flashback

The flashback expression comes directly after the table expression just before the table alias.

Syntax

```
{ AS OF { SCN | TIMESTAMP }
| VERSIONS BETWEEN { SCN | TIMESTAMP }
  minvalue AND maxvalue
}
```

two query variations are possible
as of = Get the data how it was some time ago.
versions between = get all versions of the data for a specified period

Both versions can be applied to a **timestamp** value or to a **scn** number.

hint: flashback privilege on the table is needed to run a flashback query.

Pseudocolumns

VERSIONS_STARTSCN	first scn of the row with this value
VERSIONS_STARTTIME	first time the row had this value
VERSIONS_ENDSCN	last scn of the row with this value
VERSIONS_ENDTIME	last time the row had this value
VERSIONS_XID	version number in raw
VERSIONS_OPERATION	type of change
I	after insert
U	during update
D	before delete

Examples

List of employees how they were yesterday

```
Select e.*
from emp as of timestamp systimestamp - interval '1' day e;
```

All changes during the last 10 minutes

```
Select versions_xid, versions_operation, e.*
from emp versions between
        timestamp systimestamp - interval '10' minute
        and systimestamp e;
```

This can return multiple results for a single row.

Subtotal grouping

Syntax

```
GROUP BY
   { expr
   [ | rollup
     | cube
     | grouping sets (grouping expression)
   ] }
```

Group clause

all versions calculate and add subtotal rows

rollup	rolls up the dimensions from left to right
cube	all combinations for all subtotals
grouping sets	most flexible definition using sets

Hint: Master grouping sets, understand the others!

Transformations

```
rollup(a, b)
== cube(a, b)
== grouping sets ((a, b), (a), (b), ())

group by a, cube (b, c)
== group by grouping sets
   ((a, b, c), (a, b), (a, c), (b, c), ())

group by a, rollup(b, c)
== group by grouping sets
   ((a, b, c), (a, b), (a, c), (a), ())
```

Hint: () will add a line for a group over all rows.

Select clause functions

Group_id	0|1	find duplicate groups
Grouping	0|1	extra (superaggregate) row
Grouping_id	0..x	multiple grouping combo

Examples

Count orders per region and total count

```
select region, count(*)
from orders o
group by rollup(region);
```

region	count(*)
America	1
Europe	2
UK	1
	4

Total sum price for each order and region

```
select decode(grouping(o.region), 1,'-world-',o.region) region
  , decode(grouping_id(o.order#,o.region), 2,'-total-',3,'-world-
',to_char(o.order#)) orders
  , o.customer customer
  , sum(itmcount) items#
  , sum(i.price*oi.itmcount) price
from orders o
join orderitems oi on oi.orderid = o.id
join items i on i.id = oi.itemid
group by grouping sets((o.order#, o.customer, o.region),(o.region), ())
order by o.region, o.order#;
```

region	orders	customer	items#	amount
America	173	John	6	2210
America	-total-		6	2210
Europe	240	Hans	3	1299
Europe	241	Francois	3	450
Europe	-total-		6	1749
UK	170	Paul	1	999
UK	-total-		1	999
-world-	-world-		13	4958

Subquery factoring

Syntax (9i)

```
WITH query_name
([column1, column2, ...])                    (11.1)
AS (subquery)
[search_clause][cycle_clause]                (11.2)
[, query_name AS (subquery)]...

search_clause:
{ SEARCH
  { DEPTH|BREADTH
    FIRST BY column1 [, column2] ...
    [ASC|DESC][NULLS FIRST|LAST]
  } SET ordering_column }

cycle_clause:
{ CYCLE column1 [, column2]...
    SET cycle_mark_column TO value
    DEFAULT no_cycle_value }
```

Typical usages include

- reuse repeating subqueries
- test data creation
- temporarily store the data (db links)
- code densification and clarification
- recursive logic

sample data

The following virtual tables are used during the selects on this page. With clause subquery factoring allows to create this test data on the fly and to experiment with different data values. The column nameing for the orders table is available since 11g. In 9 or 10g add the column names as it is done for the items and orderitems subqueries.

```
with
orders (id, order#, customer,region) as                    (11.1)
 (select 1 , 173 , 'John' , 'America' from dual union all
  select 2 , 170 , 'Paul' , 'UK' from dual union all
  select 3 , 240 , 'Hans' , 'Europe' from dual union all
  select 4 , 241 , 'Francois' , 'Europe' from dual )
,items as                                                  (9i)
 (Select 1 id, 'TV' item, 2000 price from dual union all
  Select 2 id, 'Radio' item, 150 price from dual union all
  Select 3 id, 'IR control' item, 15 price from dual union all
  Select 4 id, 'PC' item, 999 price from dual )
,orderitems as
 (select 1 orderid, 1 num, 1 itemid, 1 itmcount from dual union all
  select 1 orderid, 2 num, 2 itemid, 1 itmcount from dual union all
  select 1 orderid, 3 num, 3 itemid, 4 itmcount from dual union all
  select 2 orderid, 1 num, 4 itemid, 1 itmcount from dual union all
  select 3 orderid, 1 num, 4 itemid, 1 itmcount from dual union all
  select 3 orderid, 2 num, 2 itemid, 2 itmcount from dual union all
  select 4 orderid, 1 num, 2 itemid, 3 itmcount from dual union all
  select 5 orderid, 1 num, 4 itemid, 4 itmcount from dual )
/* end of test data creation */
select o.order#, o.customer, o.region, i.item, i.price, oi.itmcount
from orders o
join orderitems oi on oi.orderid = o.id
join items i on i.id = oi.itemid
order by oi.orderid, oi.num;
```

order#	customer	region	item	price	itmcount
173	John	America	TV	2000	1
173	John	America	Radio	150	1
173	John	America	IR control	15	4
170	Paul	UK	PC	999	1
240	Hans	Europe	PC	999	1
240	Hans	Europe	Radio	150	2
241	Francois	Europe	Radio	150	3