Beyond the Basics with SQL

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Beyond the Basics with SQL

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Overview

An Important Goal for this Presentation

- **An important goal for this presentation is to show you that SQL is just another programming language. The more you work and play with it, the more you realize the power of SQL and what it can do for you as an application development or database manipulation tool. With a little thought and creativity you will find you can use SQL for things that at first glance you did not think possible.**
- **This presentation is based on the SQL function available in V5R4 of OS/400, assumes you have a basic understanding of relational database concepts and SQL, and that you are familiar with using the SELECT, INSERT, UPDATE, and DELETE statements.**

Sample Tables Used in Examples

- **Employee Table - EMP**

NBR	NAM	CLS	SEX	DPT	SAL
10	Ed	5	M	911	7,000
20	Heikki	2	M	901	6,000
30	John	5	M	977	3,200
40	Mike	4	M	977	6,500
50	Marcela	3	F	911	7,500
60	Frank	2	M	990	6,500

- **Department Table - DEP**

DPT	DNM
901	Accounts
977	Manufact
911	Sales
990	Spares

SQL Syntax Used in Examples

- **All UPPER CASE - SQL required syntax**
- **All lower case - SQL parameter data supplied by end user**
- **One or more characters enclosed in single quotes ('S') is a literal used for comparison purposes and is supplied by the end user.**
- **Anything enclosed in [ ] is optional SQL syntax or optional parameter data**

Overview

- **Part 1**
  - SQL Functions for Data manipulation and Analysis
  - Summarizing Data with the SELECT Statement
  - Other Interesting Stuff
- **Part 2**
  - Working with Edit Characters
  - Subselect - Basic to Advanced
  - Identifying Potential Duplicate Rows
  - Searching by Sound
- **Part 3**
  - Embedding SQL in RPG (and Cobol) Programs
- **Part 4**
  - Stored Procedures
  - SQL Procedure Language
- **Part 5**
  - SQL Triggers and Other Trigger Enhancements in V5

Overview Part 1

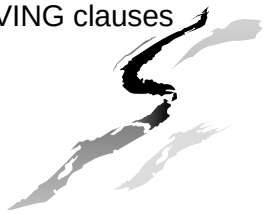
- COUNT, SUM, and AVG for data analysis
- DEC to format numeric columns
- AS to name a derived column
- SUBSTR and CONCAT for character columns
- CAST, CHAR, and DIGITS to change data type
- Summarizing Data with SELECT
- Other Interesting Stuff
- Summary
- V5R3 and V5R4 SQL Information Sources

COUNT, SUM, and AVG for Data Analysis

Counting with SQL

Types of Counting with SQL

- **Total number of rows in a table**
  - How many rows are in the table
- **Subset of rows in a table**
  - Based on selection criterion in WHERE clause
- **Distinct or unique occurences of rows**
  - How many different (distinct or unique) values exist
- **Groups of rows**
  - Summarization of data using GROUP BY and HAVING clauses



COUNT

Two Types of COUNT

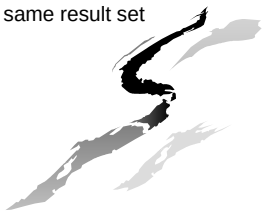
- **Column Function**
- **COUNT**
  - Result set is a large integer with precision (length) of 10
  - Max result set size is 10 digits with a limit of 2,147,483,647
- **COUNT BIG**
  - Max result set size is 32 digits
  - 9,999,999,999,999,999,999,999,999,999,999,999
  - aka COUNT REALLY REALLY BIG

COUNT...

COUNT Syntax

- **COUNT(*)**
  - Includes rows with null values in the count
- **COUNT(column_name) or COUNT(ALL column_name)**
  - Omits rows with null values from the count
- **COUNT(DISTINCT column_name)**
  - Omits rows with duplicate or null values from the count

Note: If database tables are not defined with null capable columns, COUNT(*) and COUNT(column_name) or COUNT(ALL column_name) will return the same result set



COUNT...

COUNT Examples

SELECT COUNT(*) FROM emp

COUNT(*)
6

SELECT COUNT(*) FROM emp
WHERE dpt = 977

COUNT(*)
2

COUNT...

COUNT Examples...

```
SELECT  COUNT( DISTINCT  class )  FROM  emp
```

COUNT(*)
4

```
SELECT  dpt,  COUNT( * )  FROM  emp
    GROUP BY  dpt
    ORDER BY  dpt
```

DPT	COUNT(*)
901	1
911	2
977	2
990	1

Summing or Adding with SQL

SUM Column Function

- **Result set is the sum of a set of numbers with 1 to many numbers in the set**
  - Precision (length) is 31 with a scale (number of decimal positions) the same as the column being summed
- **Data type of column must be numeric**
  - Decimal - packed
  - Numeric - zoned
  - Smallint
  - Integer
  - Bigint
  - Float
  - Real
  - Double

SUM

SUM Syntax

- **SUM(column_name) or SUM(ALL column_name)**
  - Sum the value found in the column for all rows selected
- **SUM(DISTINCT column_name)**
  - Duplicate values are not included in the sum

SUM...

SUM Examples

SELECT SUM(sal) FROM emp

SUM(sal)
36,700

SELECT SUM(sal) FROM emp
WHERE dpt = 911

SUM(sal)
14,500

Averaging Data with SQL

AVG Column Function

- **Result set is the average of a set of numbers with 1 to many numbers in the set**
  - Precision (length) is 31 with a scale (number of decimal positions) equal to 31 minus defined column length
    - Translation: Lots of decimal positions
- **Data type of column must be numeric**
  - Decimal - packed
  - Numeric - zoned
  - Smallint
  - Integer
  - Bigint
  - Float
  - Real
  - Double

AVG

AVG Syntax

- **AVG(column_name) or AVG(ALL column_name)**
  - Average the value found in the column for all rows selected
- **AVG(DISTINCT column_name)**
  - Duplicate values are not included in the average

AVG...

AVG Examples

SELECT AVG(sal) FROM emp

AVG(sal)
6,116.6666666666666666666666666

SELECT AVG(sal) FROM emp
WHERE dpt = 911

AVG(sal)
7,250.0000000000000000000000000

- **Ugly to look at!**

DEC to Format Numeric Results

DEC to Format Numeric Results

DEC or DECIMAL Scalar Column Function

- **Result set is the representation of a number in decimal format (1234.56)**
  - Precision (length) and scale (number of decimal positions) are defined as part of the DEC function
- **Data type of column must be numeric**
  - Decimal - packed
  - Numeric - zoned
  - Smallint
  - Integer
  - Bigint
  - Float
  - Real
  - Double

DEC to Format Numeric Results...

DEC or DECIMAL Scalar Column Function

- **Newly Discovered V5R3 Secret!**
  - If data type not numeric - implicit cast of datatype to numeric
  - The DECIMAL function returns a decimal representation of a
    - Number
    - Character or graphic string representation of a
      - Decimal number
      - Integer
      - Floating-point number
- **Many V5R3 scalar functions will implicitly cast to correct data type when possible**

DEC

DEC or DECIMAL Syntax

- **DEC(expression, precision, scale, ['decimal-character'])**

DEC...

AVG Examples

SELECT AVG(sal) FROM emp

AVG(sal)
6,116.6666666666666666666666666

SELECT AVG(sal) FROM emp
WHERE dpt = 911

AVG(sal)
7,250.0000000000000000000000000

- **Ugly to look at!**

DEC...

DEC or DECIMAL Examples

SELECT DEC(AVG(sal),7,2) FROM EMP

DEC
6,116.66

SELECT DECIMAL(AVG(sal),7,2) FROM emp
WHERE dpt = 911

DEC
7,250.00

To Truncate or Round?

What is the Correct Answer?

SELECT DEC(AVG(sal),7,2) FROM emp

DEC
6,116.66

6,116.66 or 6,116.67

Rounding a Result

ROUND Scalar Column Function

- **Returns a numeric value rounded to some number of places to the right or left of the decimal point**
- **ROUND(expression, decimal-position)**
  - Postive number - round to right of decimal point
  - Negative number - round to left of decimal point

Rounding a Result...

ROUND Scalar Coulmn Function

```
SELECT  DEC(ROUND(AVG(sal),2),7,2)
   FROM  emp
```

DEC
6,116.67

What's the Difference?

Column Headings Refect the Function

SELECT DEC(AVG(sal),7,2) FROM EMP

DEC
6,116.66

SELECT DECIMAL(AVG(sal),7,2) FROM emp
WHERE dpt = 911

DEC
7,250.00

- **Easy to fix**

AS to Name a Derived Column

AS to Name a Derived Column

AS Operator

- **Used to**
  - Rename an existing column
  - Name a derived column
- **Considerations**
  - Name cannot be qualified
  - Name does not have to be unique

AS

AS Syntax

- **AS column_name**

AS...

DEC or DECIMAL Examples

```
SELECT  DEC(AVG(sal),7,2)  FROM  EMP
```

DEC
6,116.67

```
SELECT  DECIMAL(AVG(sal),7,2)  FROM  emp
   WHERE  dpt  =  911
```

DEC
7,250.00

AS...

AS Examples

```
SELECT  DEC(AVG(sal),7,2)  AS  avgsal
   FROM  EMP
```

AVGSAL
6,116.67

```
SELECT  DECIMAL(AVG(sal),7,2)  AS  avg911sal
   FROM  emp
   WHERE  dpt  =  911
```

AVG911SAL
7,250.00

AS...

AS Can Be Implied

```
SELECT  DEC(AVG(sal),7,2)  avgsal
   FROM  EMP
```

AVGSAL
6,116.67

```
SELECT  DECIMAL(AVG(sal),7,2)  avg911sal
   FROM  emp
   WHERE  dpt  =  911
```

AVG911SAL
7,250.00

SUBSTR and CONCAT for Character Columns

SUBSTR for a Character Column

SUBSTR or SUBSTRING Scalar Function

- **Result is a subset or substring or a character column**
  - Start position and length of resulting string is defined in the function
- **Data type must be character**
  - Fixed or variable length - including large object (BLOB)
  - Single or double byte
- **V5R3 implicit cast**

SUBSTR...

SUBSTR or SUBSTRING Syntax

- **SUBSTR(string_expression, start_position, length)**
- **SUBSTRING(string_expression FROM start_position FOR length)**

SUBSTR...

SUBSTR or SUBSTRING Examples

SELECT dpt, SUBSTR(dnm,1,4) AS sname
FROM dep

DPT	SNAME
901	Acco
977	Manu
911	Sale
990	Spar

DPT	DNM
901	Accounts
977	Manufact
911	Sales
990	Spares

SUBSTR...

SUBSTR and V5R3 Implicit Cast

SELECT dpt, SUBSTR(dpt,2,2) AS sdpt
FROM dep

DPT	SDPT
901	01
977	77
911	11
990	90

DPT	DNM
901	Accounts
977	Manufact
911	Sales
990	Spares

CONCAT for a Character Column

CONCAT Scalar Function

- **Combines or concatenates two string expressions together**
- **Result is a single string consisting of the first string expression, followed by the second string expression**
- **Data type must be character**
  - Fixed or variable length - including large object (BLOB)
  - Single or double byte
- **V5R3 Implicit Cast**

CONCAT...

CONCAT Syntax - Industry Standard

- **CONCAT(string_expression_01, string_expression_02)**

CONCAT Syntax - Non Standard

- **string_01 || string_02 || string_03**
  - || = double pipe (upper case backward slash)
- **string_01 CONCAT string_02 CONCAT string_03**

CONCAT...

CONCAT Examples - Simple CONCAT

```
SELECT  nbr,  nam,
        CONCAT(sex,  nam)  AS  sexnam
   FROM  emp
```

NBR	NAM	SEXNAM
10	Ed	MEd
20	Heikki	MHeikki
30	John	MJohn
40	Mike	MMike
50	Marcela	FMarcela
60	Frank	MFrank

CONCAT...

CONCAT Examples - CONCAT with SUBSTR

```
SELECT  dpt,
        CONCAT(SUBSTR(dnm,1,4),  SUBSTR(dnm,1,4))
           AS  double
   FROM  dep
```

DPT	DOUBLE
901	AccoAcco
977	ManuManu
911	SaleSale
990	SparSpar

CONCAT...

CONCAT Examples - CONCAT with a Literal

```
SELECT  dpt,
        CONCAT(SUBSTR(dnm,1,4),  'Stuff')
           AS  stuff
   FROM  dep
```

DPT	STUFF
901	AccoStuff
977	ManuStuff
911	SaleStuff
990	SparStuff

CONCAT...

CONCAT Examples - Concat with 3 Strings

```
SELECT  dpt,
        CONCAT(CONCAT(SUBSTR(dnm,1,4),  '-'),  'Stuff')
              AS  hyphen
   FROM  dep
```

DPT	HYPHEN
901	Acco-Stuff
977	Manu-Stuff
911	Sale-Stuff
990	Spar-Stuff

CONCAT...

CONCAT Examples - Concat with 3 Strings

```
SELECT  dpt,
        SUBSTR(dnm,1,4)  ||  '-'  ||  'Stuff'
              AS  hyphen
   FROM  dep
```

DPT	HYPHEN
901	Acco-Stuff
977	Manu-Stuff
911	Sale-Stuff
990	Spar-Stuff

CONCAT...

CONCAT Examples - Concat with 3 Strings

```
SELECT  dpt,
        SUBSTR(dnm,1,4)  CONCAT  '-'  CONCAT  'Stuff'
              AS  hyphen
   FROM  dep
```

DPT	HYPHEN
901	Acco-Stuff
977	Manu-Stuff
911	Sale-Stuff
990	Spar-Stuff

CONCAT...

CONCAT and V5R3 Implicit Cast

```
SELECT  dpt,
        SUBSTR(dnm,1,4)  CONCAT  '-'  CONCAT  dpt
              AS  hyphen
   FROM  dep
```

DPT	HYPHEN
901	Acco-901
977	Manu-977
911	Sale-911
990	Spar-990

SUBSTR & CONCAT

SUBSTR & CONCAT with Numeric Columns

- **Can be used with numeric columns but data type must be changed from numeric to character**
- **V5R3 Implicit Cast**

CAST, CHAR, and DIGITS to Change Data Type

CAST to Change Data Type

CAST Scaler Function

- **Converts the existing data type of the CAST expression to the specified data type**
  - Numeric to character
  - Character to numeric
  - Numeric to numeric
  - Character to character
  - See SQL Reference for supported CAST from/to data types
- **When converting numeric to character**
  - Leading zeros are truncated
  - Decimal point included and digits to the right are part of result string
  - Digits are left justified

CHAR to Change Data Type

CHAR Scaler Function

- **Converts the existing data type of the CHAR expression to character data type**
  - Numeric to character
  - Character to character
  - See SQL Reference for supported CHAR data types
- **When converting numeric to character**
  - Leading zeros are truncated
  - Decimal point included and digits to the right are part of result string
  - Digits are left justified

DIGITS to Change Data Type

DIGITS Scalar Function

- **Only converts numeric to character data type**
- **When converting numeric to character**
  - Leading zeros are NOT truncated
  - Decimal point ignored and digits to the right are part of result string
  - Digits are left justified

CAST, CHAR, and DIGITS

CAST Syntax

- **CAST(expression AS data_type)**

CHAR Syntax

- **CHAR(expression [,attribute])**

DIGITS Syntax

- **DIGITS(numeric_expression)**

CAST, CHAR, and DIGITS...

CAST, CHAR, and DIGITS Example

```
SELECT nbr, nam,
       SUBSTR(CAST(dpt AS CHAR(3)),2,2) AS chardpt
   FROM emp
```

```
SELECT nbr, nam,
       SUBSTR(CHAR(dpt)),2,2) AS chardpt
   FROM emp
```

```
SELECT nbr, nam,
       SUBSTR(DIGITS(dpt),2,2) AS chardpt
   FROM emp
```

CAST, CHAR, and DIGITS...

CAST, CHAR, and DIGITS Example

NBR	NAM	CHARDPT
10	Ed	11
20	Heikki	01
30	John	77
40	Mike	77
50	Marcela	11
60	Frank	90

CAST and DIGITS...

CAST and DIGITS Example

```
SELECT  *  FROM  empd
     ORDER BY  nbr
```

NBR	NAM	CLS	SEX	DPT	SAL	EDATE
10	Ed	5	M	911	7,000	11,152,000
20	Heikki	2	M	901	6,000	03,122,002
30	John	5	M	977	3,200	05,152,001
40	Mike	4	M	977	6,500	10,152,000
50	Marcela	3	F	911	7,500	12,012,001
60	Frank	2	M	990	6,500	09,152,003

Note: Neither Interactive SQL nor RUN SQL Scripts will show leading zeros in EDATE

CAST and DIGITS...

CAST and DIGITS Example

```
SELECT  *  FROM  empd
     ORDER BY  edate
```

NBR	NAM	CLS	SEX	DPT	SAL	EDATE
20	Heikki	2	M	901	6,000	03,012,002
30	John	5	M	977	3,200	05,152,001
60	Frank	2	M	990	6,500	09,152,003
40	Mike	4	M	977	6,500	10,152,000
10	Ed	5	M	911	7,000	11,152,000
50	Marcela	3	F	911	7,500	12,012,001

Note: Neither Interactive SQL nor RUN SQL Scripts will show leading zeros in EDATE

CAST and DIGITS...

CAST Truncates Leading Zeros

```
SELECT nbr, nam, edate,
     CONCAT(SUBSTR(CAST(edate AS CHAR(8)),5,4),
          SUBSTR(CAST(edate AS CHAR(8)),1,4))
               AS  hire_date
     FROM empd  ORDER BY hire_date
```

NBR	NAM	EDATE	HIRE_DATE
30	John	5152001	001 5152
20	Heikki	3012002	002 3012
60	Frank	9152003	003 9152
40	Mike	10152000	20001015
10	Ed	11152000	20001115
50	Marcela	12012001	20011201

CAST turned 05152001 into 5152001_

CAST and DIGITS...

DIGITS Preserves Leading Zeros

```
SELECT nbr, nam, edate,
    CONCAT(SUBSTR(DIGITS(edate),5,4),
           SUBSTR(DIGITS(edate),1,4)) AS hire_date
    FROM empd
    ORDER BY hire_date
```

NBR	NAM	EDATE	HIRE_DATE
40	Mike	10152000	20001015
10	Ed	11152000	20001115
30	John	5152001	20010515
50	Marcela	12012001	20011201
20	Heikki	3012002	20020301
60	Frank	9152003	20030915

Summarizing Data with SELECT

Summarizing Data with SELECT

The SELECT statement is an *Either Or* Proposition

- ***Either*** **return detail rows in the result set**
- ***Or*** **return summarized data in the result set**
- **A single SQL statement has no capability to do**
  - Detail
  - Detail
  - Level break
  - Detail
  - Level break
- **Query Manager *CAN* do above**
  - SQL based query product

Summarizing Data with SELECT...

SELECT Statement Clauses

SELECT . . . . . (columns, *, or expressions)

FROM . . . . . .(tables or views)

WHERE . . . . .(row selection criteria)

GROUP BY. . .(row summarization criteria)

HAVING. . . . . (GROUP BY selection criteria)

ORDER BY. . .(column ordering criteria)

Summarizing Data with SELECT...

GROUP BY Clause

- **Defines grouping or summary criteria for SELECT**
- **Format**

```
SELECT   fldA,  fldE,   FUNCTION(fldG),   FUNCTION(fldH)
        FROM   table-name
        WHERE selection-criteria
        GROUP BY   fldE,   fldA
        ORDER BY   fldA,   fldE
```

- **If a column referenced in the column list of the SELECT statement is not operated on by a function, that column must be referenced as part of the grouping criteria in the GROUP BY clause**

Summarizing Data with SELECT...

GROUP BY Clause...

- **For each department list the total salary and total number of employees**

```
SELECT   dpt,   SUM(sal),   COUNT ( * )
        FROM   emp
        GROUP BY   dpt
        ORDER BY   dpt
```

DPT	SUM(SAL)	COUNT(*)
901	6,000	1
911	14,500	2
977	9,700	2
990	6,500	1

Summarizing Data with SELECT...

HAVING Clause...

- **Defines GROUP BY selection criteria**
- **Format**

```
SELECT   fldA,  fldE,   FUNCTION(fldG),   FUNCTION(fldH)
        FROM   table-name
        WHERE selection-criteria
        GROUP BY   fldE,   fldA
        HAVING   group-by-selection-criteria
        ORDER BY   fldA,   fldE
```


Summarizing Data with SELECT...

HAVING Clause...

- **For those departments that have more than one employee, list the total salary and total number of employees**

```
SELECT   dpt,   SUM(sal)   AS   saltot,
                    COUNT( * )   AS   emptot
        FROM   emp
        GROUP BY   dpt
        HAVING   COUNT ( * )   >   1
        ORDER BY   dpt
```

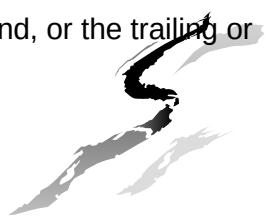
DPT	SALTOT	EMPTOT
911	14,500	2
977	9,700	2

Other Interesting Stuff

Other Interesting Stuff

Some Other Interesting SQL Scalar Functions

- **CASE**
  - Allows selection and substitution of a value based on a condition
- **RRN**
  - Returns the relative record number of a row in a table
- **HEX**
  - Returns the hexadecimal representation of a value
- **RTRIM** **(Right Trim)**
  - Removes blanks or hexadecimal zeros from the end, or the trailing or right side, of a string expression
- **LENGTH**
  - Returns the length of a number or character value



Other Interesting Stuff...

New V5R3 Scalar Functions

- **INSERT**
  - Inserts a number or character string into an existing string and optionally overlays specific positions in the existing string with the insert string
- **REPLACE**
  - Replaces all occurrences of a search string in a number or character string with a replacement string

CASE for Substitution of a Value

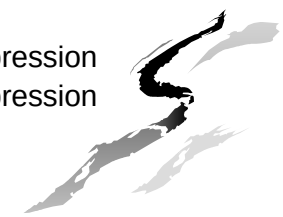
Two forms of CASE Syntax

- **Simple WHEN clause**

```
CASE  expression
    WHEN  expression  THEN  result-expression
    WHEN  expression  THEN  result-expression
    ...
    ELSE  result-expression
    END CASE
```

- **Searched WHEN clause**

```
CASE
    WHEN  search-condition  THEN  result expression
    WHEN  search-condition  THEN  result expression
    ...
    ELSE  result-expression
    END CASE
```



CASE...

Two forms of Case...

- **Simple WHEN clause**

```
SELECT  nbr,  nam,
        CASE  dpt
            WHEN 901 THEN 'Accounts'
            WHEN 911 THEN 'Sales'
            WHEN 977 THEN 'Manufact'
            WHEN 990 THEN 'Spares'
            ELSE  'No Name'
            END CASE
    FROM  emp  ORDER BY  nbr
```

CASE...

Two forms of Case...

- **Searched WHEN clause**

```
SELECT  nbr,  nam,
        CASE
            WHEN  dpt = 901 THEN 'Accounts'
            WHEN  dpt = 911 THEN 'Sales'
            WHEN  dpt = 977 THEN 'Manufact'
            WHEN  dpt = 990 THEN 'Spares'
            ELSE  'No Name'
            END CASE
    FROM  emp  ORDER BY  nbr
```

CASE...

Two forms of Case...

- **Results Set for both CASE Examples**

NBR	NAM	CASE
10	Ed	Sales
20	Heikki	Accounts
30	John	Manufact
40	Mike	Manufact
50	Marcela	Sales
60	Frank	Spares

RRN to Find Relative Record Number

RRN Scalar Function

- **Result set is the relative record number of a row**
  - Length is 15 with zero decimal positions

RRN Syntax

- **RRN(table_name)**

RRN

RRN Example

```
SELECT nbr, nam, RRN(ax) AS rec
  FROM emp ax ORDER BY nbr
```

NBR	NAM	REC
10	Ed	2
20	Heikki	1
30	John	5
40	Mike	4
50	Marcela	3
60	Frank	6

HEX to Find Hexadecimal Value

HEX Scalar Function

- **Result set is the hexadecimal representation of a value**
  - Length is twice the defined length with a max length of approx 32K

HEX Syntax

- **HEX(expression)**

HEX

HEX Example

```
SELECT nbr, nam, HEX(nam) AS hex_nam
   FROM emp ORDER BY nbr
```

NBR	NAM	HEX_NAM
10	Ed	C5844040404040404040
20	Heikki	C8858992928940404040
30	John	D1968895404040404040
40	Mike	D4899285404040404040
50	Marcela	D4819983859381404040
60	Frank	C6998195924040404040

RTRIM to Remove Trailing Blanks

RTRIM Scalar Function

- **Result set is the RTRIM expression with trailing blanks or hexadecimal zeros removed**
  - Length of the result set is the length of the expression minus the number of blanks or hex zeros removed

RTRIM Syntax

- **RTRIM(expression)**

RTRIM

RTRIM Example

```
SELECT nbr, nam, RTRIM(nam) AS tnam
   FROM emp ORDER BY nbr
```

NBR	NAM	TNAM
10	Ed	Ed
20	Heikki	Heikki
30	John	John
40	Mike	Mike
50	Marcela	Marcela
60	Frank	Frank

- **What's the difference between NAM and TNAM?**

LENGTH to Determine the Length of a Value

LENGTH Scalar Function

- **Result set is the length of the string in the expression including any blanks or zeros**
  - Result set length is 10 digits with zero decimals

LENGTH Syntax

- **LENGTH(expression)**

LENGTH

LENGTH Example

```
SELECT nbr, nam, LENGTH(nam) AS len1
   FROM emp ORDER BY nbr
```

NBR	NAM	LEN1
10	Ed	10
20	Heikki	10
30	John	10
40	Mike	10
50	Marcela	10
60	Frank	10

- **Why is the length for each NAM string = 10?**

Combining RTRIM and LENGTH

How Many Non Blank Characters are in Each Name?

```
SELECT nbr, nam, LENGTH(RTRIM(nam)) AS len2
   FROM emp ORDER BY nbr
```

NBR	NAM	LEN2
10	Ed	2
20	Heikki	6
30	John	4
40	Mike	4
50	Marcela	7
60	Frank	5

INSERT to Overlay Positions In a String

INSERT Scalar Function - New for V5R3

- **Result set is the source string with the insert string placed into the source string at the specified start position, and optionally specified positions in the source string overlaid with the insert string**
  - Result set length is length of the source string plus length of the insert string minus the number of positions overlaid (if any)
  - Result set length cannot exceed the maximum length of the data type
  - Data type of the source string and insert string must be compatible

INSERT Syntax

- **INSERT(source_string, start, length, insert_string)**

INSERT

INSERT Example with No Overlay

```
SELECT nbr, nam, INSERT(nam, 3, 0, 'xy') AS insrt1
  FROM emp ORDER BY nbr
```

NBR	NAM	INSRT1
10	Ed	Edxy
20	Heikki	Hexyikki
30	John	Joxyhn
40	Mike	Mixyke
50	Marcela	Maxyrcela
60	Frank	Frxyank

INSERT...

INSERT Example Overlaying Positions 3 and 4

```
SELECT nbr, nam, INSERT(nam, 3, 2, 'xy') AS insrt2
  FROM emp ORDER BY nbr
```

NBR	NAM	INSRT2
10	Ed	Edxy
20	Heikki	Hexyki
30	John	Joxy
40	Mike	Mixy
50	Marcela	Maxyela
60	Frank	Frxyk

- **Easy way to update part of a character string!**

REPLACE - Based on a Search String

REPLACE Scalar Function - New for V5R3

- **Result set is the source string with all occurrences of the search string replaced with the replace string**
  - Result set length is length of the source string plus length of the replace string minus the length of the search string
  - Result set length cannot exceed the maximum length of the data type
  - Data type of the source string and replace string must be compatible
  - If no match with the search string, the source string is returned unchanged as the result set

REPLACE Syntax

- **REPLACE(source_string, search_string, replace_string)**

REPLACE

REPLACE Example

```
SELECT nbr, nam, REPLACE(nam, 'ik', 'qqq') AS replc1
   FROM emp ORDER BY nbr
```

NBR	NAM	REPLC1
10	Ed	Ed
20	He**ik**ki	He**qqq**ki
30	John	John
40	M**ik**e	M**qqq**e
50	Marcela	Marcela
60	Frank	Frank

- **Easy way to update part of a character string!**

Summary

I Didn't Know You Could Do that with SQL!

- **COUNT, SUM, and AVG for data analysis**
- **DEC to format numeric columns**
- **AS to name a derived column**
- **SUBSTR and CONCAT for character columns**
- **CAST, CHAR, and DIGITS to change data type**
- **Summarizing Data with SELECT**
- **CASE**
- **HEX and RRN**
- **RTRIM and LENGTH**
- **INSERT and REPLACE - New for V5R3**

Summary...

I Didn't Know You Could Do that with SQL...

- **From this presentation you should have a better understanding of SQL as a programming language.**
- **The more you work and play with it, the more you realize the power of SQL and what it can do for you as an application development or database manipulation tool.**
- **With a little thought and creativity you will find you can use SQL for things that at first glance you did not think possible.**

V5R3 and V5R4 SQL Information Sources

- **iSeries Information Center Publications - Web or CD**
  - SQL Reference
  - SQL Programming
  - Embedded SQL Programming
  - Query Manager Use
  - SQL Messages and Codes
- **To access Info Center on the Web**
  - **http://publib.boulder.ibm.com/infocenter/iseries/v5r3/index.jsp**
  - **http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp**
    - **In left scroll bar**
      - **Click on iSeries Information Center ...**
      - **Click on Database**
      - **Click on Printable PDFs**
      - **Use right scroll bar to scroll down to above SQL publication**
- **DB2 UDB for iSeries on the Web**
  - **http://www.ibm.com/servers/eserver/iseries/db2/**