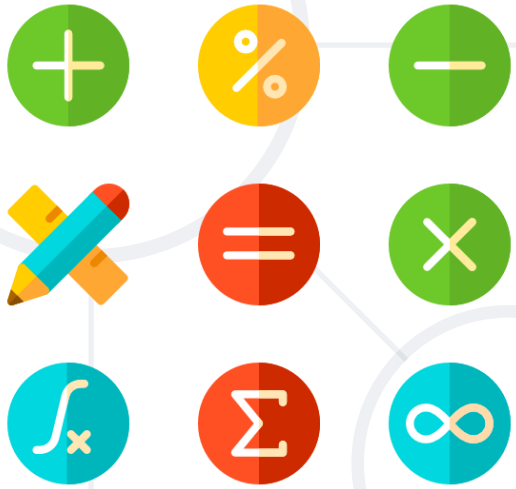
Built-in Functions

Functions and Wildcards in SQL Server



SoftUni Team

Technical Trainers

Software University

https://softuni.bg

SoftUni

Software University

Table of Contents

Questions

Software University

sli.do

#csharp-db

Functions in SQL Server

Overview

SQL Functions

- **Aggregate functions**
  - Perform a calculation on a set of values and return a single value
  - Examples: **AVG**, **COUNT**, **MIN**, **MAX**, **SUM**
- **Analytic functions**
  - Compute an aggregate value based on a group of rows
  - Unlike aggregate functions, analytic functions can return multiple rows for each group

```
PERCENTILE_CONT(0.5) WITHIN GROUP (ORDER BY Salary DESC)
OVER (PARTITION BY DepartmentId) AS MedianCont
```

SQL Functions

- **Ranking functions**
  - Return a ranking value for each row in a partition
  - **`RANK`**, **`ROW_NUMBER`**, **`DENSE_RANK`**, **`NTILE`** **`(OVER)`**
- **Rowset functions**
  - Return an object that can be used like table references in a statement
  - **`OPENDATASOURCE`**, **`OPENJSON`**, **`OPENXML`**, **`OPENROWSET`**
- **Scalar functions**
  - Operate on a single value and then return a single value
  - Scalar functions can be used wherever an expression is valid

String Functions

String Functions (1)

- **Concatenation** – combines strings

```
SELECT FirstName + ' ' + LastName
    AS [Full Name]
  FROM Employee
```

```
SELECT CONCAT(FirstName, ' ', LastName)
    AS [Full Name]
  FROM Employee
```

- **CONCAT** replaces **NULL** values with **empty string**
- **CONCAT_WS** combines strings with separator

String Functions (2)

- **SUBSTRING** – extracts a part of a string

```
SUBSTRING(String, StartIndex, Length)
```

```
SUBSTRING('SoftUni', 5, 3)
```

```
Uni
```

- Example: get short **summary** of an article

```
SELECT ArticleId, Author, Content,
       SUBSTRING(Content, 1, 200) + '...' AS Summary
  FROM Articles
```

String Functions (3)

- **REPLACE** – replaces a specific string with another

```
REPLACE(String, Pattern, Replacement)
```

```
REPLACE('SoftUni', 'Soft', 'Hard')
```

```
HardUni
```

- Example: **censor** the word blood from album names

```
SELECT REPLACE(Title, 'blood', '*****’)
 AS Title
FROM Album
```

String Functions (4)

- **LTRIM** & **RTRIM** – remove spaces from either side of string

```
LTRIM(String)
```

```
RTRIM(String)
```

- **LEN** – counts the number of characters

```
LEN(String)
```

- **DATALENGTH** – gets the number of used bytes

```
DATALENGTH(String)
```

String Functions (5)

- **LEFT** & **RIGHT** – get characters from the beginning or the end of a string

```
LEFT(String, Count)
```

```
RIGHT(String, Count)
```

- Example: name **shortened** (first 3 letters)

```
SELECT Id, Start,
       LEFT(Name, 3) AS Shortened
  FROM Games
```

String Functions (6)

- **LOWER** & **UPPER** – change letter casing

```
LOWER(String)
```

```
UPPER(String)
```

- **REVERSE** – reverses order of all characters in a string

```
REVERSE(String)
```

- **REPLICATE** – repeats a string

```
REPLICATE(String, Count)
```

- **FORMAT** – format a value with a valid .NET format string

```
FORMAT(SomeDate, 'yyyy-MMMM-dd', 'bg-BG')
```

Problem: Obfuscate CC Numbers

- The database contains credit card details for customers
- Provide a summary without revealing the serial numbers

ID	FirstName	LastName	PaymentNumber
1	Guy	Gilbert	5645322227179083
2	Kevin	Brown	4417937746396076
…	…		…

ID	FirstName	LastName	PaymentNumber
1	Guy	Gilbert	564532**********
2	Kevin	Brown	441793**********
…	…		…

Solution : Obfuscate CC Numbers

- Reveal the first 6 digits and obfuscate the rest

```
SELECT CustomerID,
       FirstName,
       LastName,
       LEFT(PaymentNumber, 6) + '**********'
  FROM Customers
```

- Bonus – create a View for the use of clients

```
CREATE VIEW v_PublicPaymentInfo AS
…
```

String Functions (7)

- **CHARINDEX** – locates a specific pattern (substring) in a string

Optional, begins at 1

```
CHARINDEX(Pattern, String, [StartIndex])
```

- **STUFF** – inserts a substring at a specific position

```
STUFF(String, StartIndex, Length, Substring)
```

Number of chars to delete

Math Functions

Arithmetic, PI, ABS, ROUND, Etc.

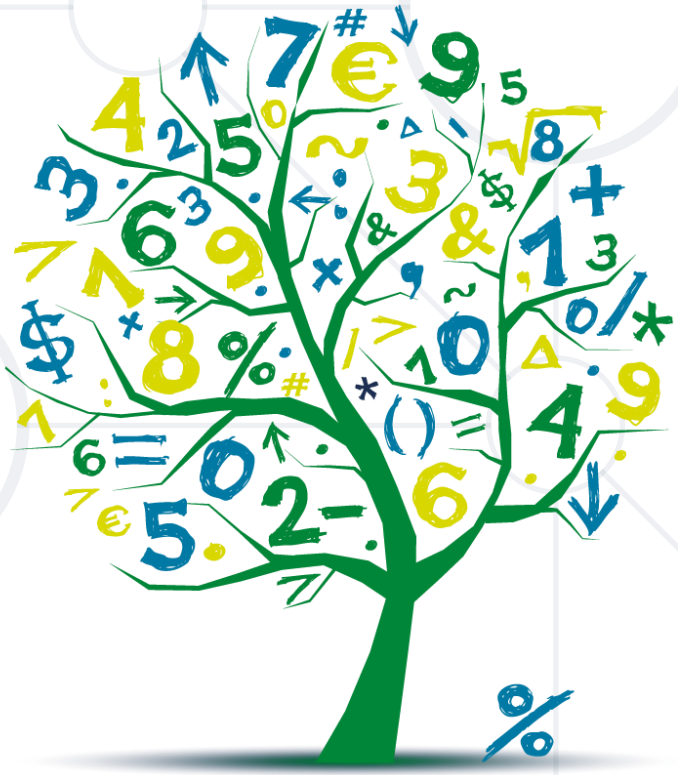
Math Functions (1)

- SQL Server supports **basic arithmetic operations**
- Example: find the area of triangles by the given side and height

Id	A	H
1	2	4
2	1	18
3	4.5	3
4	8	12
5	3	5

Id	Area
1	4
2	9
3	6.75
4	48
5	7.5

```
SELECT Id,
       (A*H)/2 AS Area
  FROM Triangles2
```



Math Functions (2)

- **PI** – gets the value of Pi as a float (15 –digit precision)

```
SELECT PI() --3.14159265358979
```

- **ABS** – absolute value

```
ABS(Value)
```

- **SQRT** – square root (the result will be float)

```
SQRT(Value)
```

- **SQUARE** – raise to power of two

```
SQUARE(Value)
```

Example: Line Length

- Find the length of a line by given coordinates of the end points

Id	X1	Y1	X2	Y2
1	0	0	10	0
2	0	0	5	3
4	-1	5	8	-3
5	18	23	8882	134

Id	Length
1	10
2	5.8309518948453
4	12.04159457879229
5	8864.69497501183

```
SELECT Id,
       SQRT(SQUARE(X1-X2) + SQUARE(Y1-Y2))
    AS Length
  FROM Lines
```

Math Functions (3)

- **POWER** – raises value to the desired exponent

```
POWER(Value, Exponent)
```

- **ROUND** – obtains the desired precision
  - Negative precision rounds characters before the decimal point

```
ROUND(Value, Precision)
```

- **FLOOR** & **CEILING** – return the nearest integer

```
FLOOR(Value)
```

```
CEILING(Value)
```

Problem: Pallets

- Calculate the required number of pallets to ship each item
  - `BoxCapacity` specifies how many items can fit in one box
  - `PalletCapacity` specifies how many boxes can fit in a pallet

Id	Name	Quantity	BoxCapacity	PalletCapacity
1	Perlenbacher 500ml	108	6	18
2	Perlenbacher 500ml	10	6	18
3	Chocolate Chips	350	24	3
4	Oil Pump	100	1	12
5	OLED TV 50-Inch	13	1	5
6	Penny	1	2239488	1

Number of pallets
1
1
5
9
3
1

Solution: Pallets

- Since we can't use half a box or half a pallet, we need to round up to the nearest integer value

```
SELECT
  CEILING(
    CEILING(
      CAST(Quantity AS float) /
      BoxCapacity) / PalletCapacity)
    AS [Number of pallets]
  FROM Products
```

Math Functions (4)

- **SIGN** – returns 1, -1 or 0, depending on the value of the sign

```
SIGN(Value)
```

- **RAND** – gets a random float value in the range [0, 1]
  - If Seed is not specified, it will be assigned randomly

```
RAND()
```

```
RAND(Seed)
```

Date Functions

GETDATE, DATEDIFF, DATEPART, Etc.

Date Functions (1)

- **DATEPART** – extract a segment from a date as an integer
  - Part can be any part and format of date or time

```
DATEPART(Part, Date)
```

year, yyyy, yy	YEAR(Date)
month, mm, m	MONTH(Date)
day, dd, d	DAY(Date)

- For a full list, take a look at the official documentation

Problem: Quarterly Report

- Prepare sales data for aggregation by displaying yearly quarter, month, year and day of sale

InvoiceId	InvoiceDate	Total
1	2023-01-01	1.98
2	2023-01-02	3.96
3	2023-01-03	5.94
4	2023-01-06	8.91

InvoiceId	Total	Quarter	Month	Year	Day
1	1.98	1	1	2023	1
2	3.96	1	1	2023	2
3	5.94	1	1	2023	3
4	8.91	1	1	2023	6

Solution: Quarterly Report

- Use **DATEPART** to get the relevant parts of the date

```
SELECT InvoiceId, Total,
       DATEPART(QUARTER, InvoiceDate) AS Quarter,
       DATEPART(MONTH, InvoiceDate) AS Month,
       DATEPART(YEAR, InvoiceDate) AS Year,
       DATEPART(DAY, InvoiceDate) AS Day
  FROM Invoice
```

- This statement might be useful as a View

Date Functions (2)

- **DATEDIFF** – finds the difference between two dates
  - **Part** can be **any part** and **format** of date or time

```
DATEDIFF(Part, FirstDate, SecondDate)
```

- Example: Show employee experience

```
SELECT ID, FirstName, LastName,
       DATEDIFF(YEAR, HireDate, '2017/01/25')
    AS [Years In Service]
  FROM Employees
```

Date Functions (3)

- **DATENAME** – gets a string representation of a date's part

```
DATENAME(Part, Date)
```

```
SELECT DATENAME(weekday, '2017/01/27')
```

- **DATEADD** – performs date arithmetic
  - **Part** can be **any part** and **format** of date or time

```
DATEADD(Part, Number, Date)
```

- **GETDATE** – obtains the current date and time

```
SELECT GETDATE()
```

- **EOMONTH** – returns the last day of the month

Other Functions

CAST, CONVERT, OFFSET, FETCH

Other Functions (1)

- **CAST** & **CONVERT** – conversion between data types

```
CAST(Data AS NewType)
CONVERT(NewType, Data)
```

- **ISNULL** – swaps **NULL** values with a specified **default value**

```
ISNULL(Data, DefaultValue)
```

- Example: Display "Not Finished" for projects with **no EndDate**

```
SELECT ProjectID, Name,
       ISNULL(CAST(EndDate AS varchar), 'Not Finished')
  FROM Projects
```

Other Functions (2)

- **COALESCE** – evaluates the arguments in order and returns the current value of the first expression that initially does not evaluate to **NULL**

```
SELECT COALESCE(NULL, NULL, 'third_value',
'fourth_value');

// third_value
```

Other Functions (3)

- **OFFSET** & **FETCH** – get only specific rows from the result set
  - Used in combination with **ORDER BY** for pagination

```
SELECT ID, FirstName, LastName
    FROM Employees
ORDER BY ID
  OFFSET 10 ROWS
   FETCH NEXT 5 ROWS ONLY
```

Rows to skip

Rows to include

Ranking Functions

- **ROW_NUMBER** – always generate unique values without any gaps, even if there are ties
- **RANK** – can have gaps in its sequence and when values are the same, they get the same rank
- **DENSE_RANK** – returns the same rank for ties, but it doesn't have any gaps in the sequence
- **NTILE** – Distributes the rows in an ordered partition into a specified number of groups

Wildcards

Selecting Results by Partial Match

Using WHERE … LIKE

- **Wildcards** are used with **WHERE** for partial filtration
- Similar to **Regular Expressions**, but **less capable**
- Example: Find all employees who's first name **starts with "Ro"**

```
SELECT ID, FirstName, LastName
  FROM Employees
 WHERE FirstName LIKE 'Ro%'
```

Wildcard symbol

Wildcard Characters

- Supported characters include:

```
%     -- any string, including zero-length
_     -- any single character
[…]   -- any character within range
[^…]  -- any character not in the range
```

- **ESCAPE** – specify a prefix to treat special characters as normal

```
SELECT ID, Name
  FROM Tracks
 WHERE Name LIKE '%max!%' ESCAPE '!'
```

Summary

- Various **built-in functions**
- String functions - **CONCAT**, **LEFT**/**RIGHT**, **REPLACE**, etc.
- Math functions - **PI**, **ABS**, **POWER**, **ROUND**, etc.
- Date functions - **DATEPART**, **DATEDIFF**, **GETDATE**, etc.
- Using **Wildcards**, we can obtain results by partial string matches

Questions?

SoftUni

Software University

SoftUni Creative

SoftUni Digital

SoftUni Foundation

SoftUni Kids

Finance Academy

SoftUni Diamond Partners

Software University

SUPER HOSTING .BG

Coca-Cola HBC Bulgaria

Flutter™ International

INDEAVR
Serving the high achievers

AMBITIONED

DRAFT KINGS

SOFTWARE GROUP

BOSCH

Postbank
Решения за твоето утре

PHAR VISION

SmartIT

DXC TECHNOLOGY

createX

Trainings @ Software University (SoftUni)

- Software University – High-Quality Education, Profession and Job for Software Developers
  - softuni.bg, about.softuni.bg
- Software University Foundation
  - softuni.foundation
- Software University @ Facebook
  - facebook.com/SoftwareUniversity
- Software University Forums
  - forum.softuni.bg

License

- This course (slides, examples, demos, exercises, homework, documents, videos and other assets) is **copyrighted content**
- Unauthorized copy, reproduction or use is illegal
- © SoftUni – https://about.softuni.bg
- © Software University – https://softuni.bg