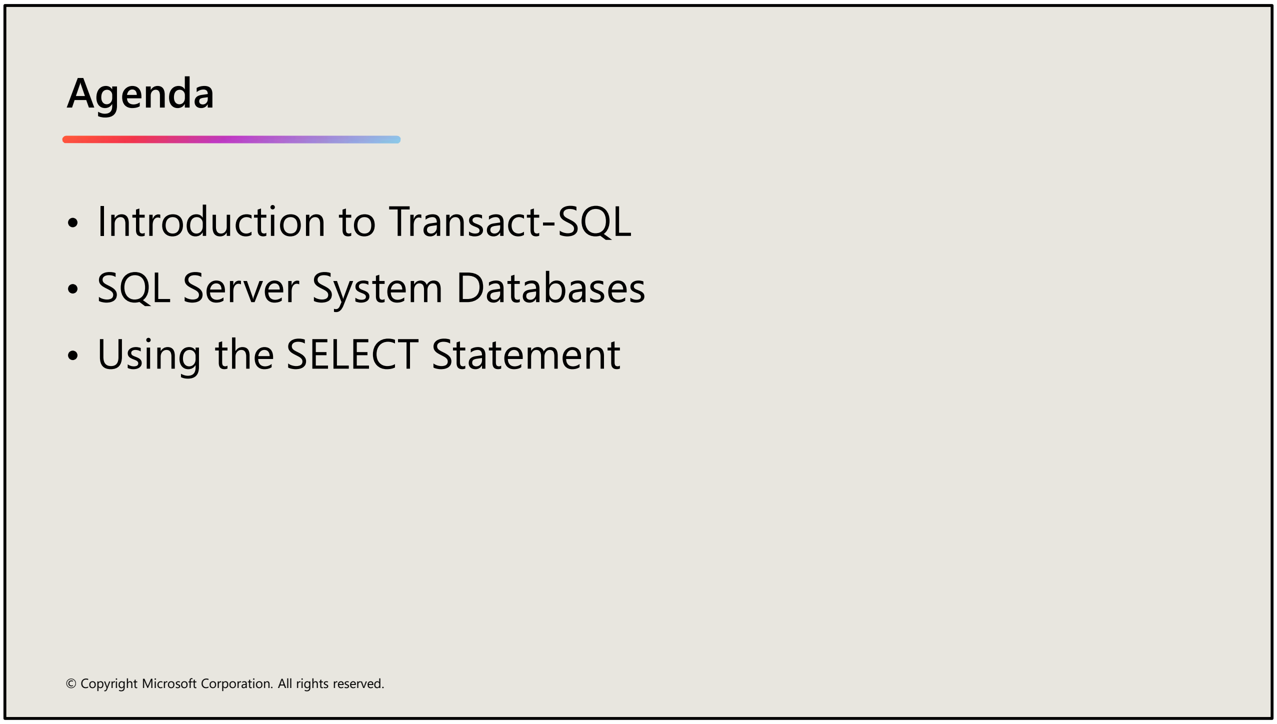
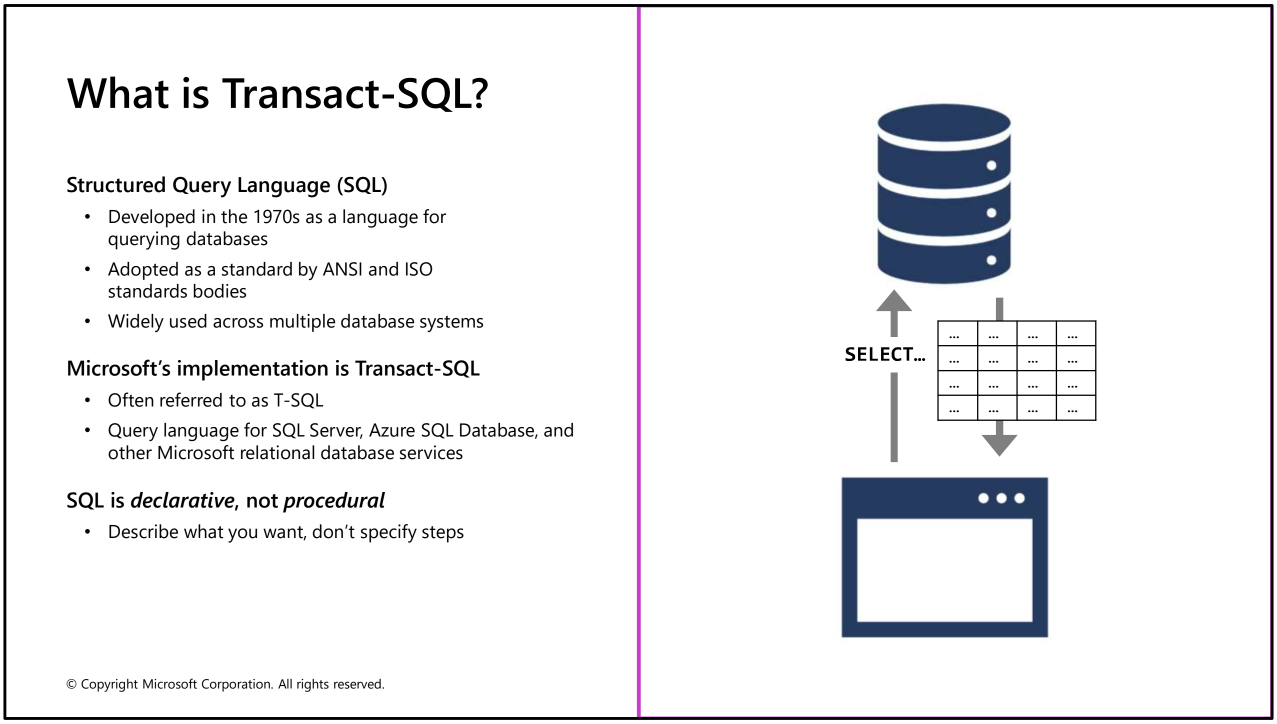
Getting started with Transact-SQL



Agenda

- Introduction to Transact-SQL
- SQL Server System Databases
- Using the SELECT Statement

1: Introduction to Transact-SQL



What is Transact-SQL?

Structured Query Language (SQL)

- Developed in the 1970s as a language for querying databases
- Adopted as a standard by ANSI and ISO standards bodies
- Widely used across multiple database systems

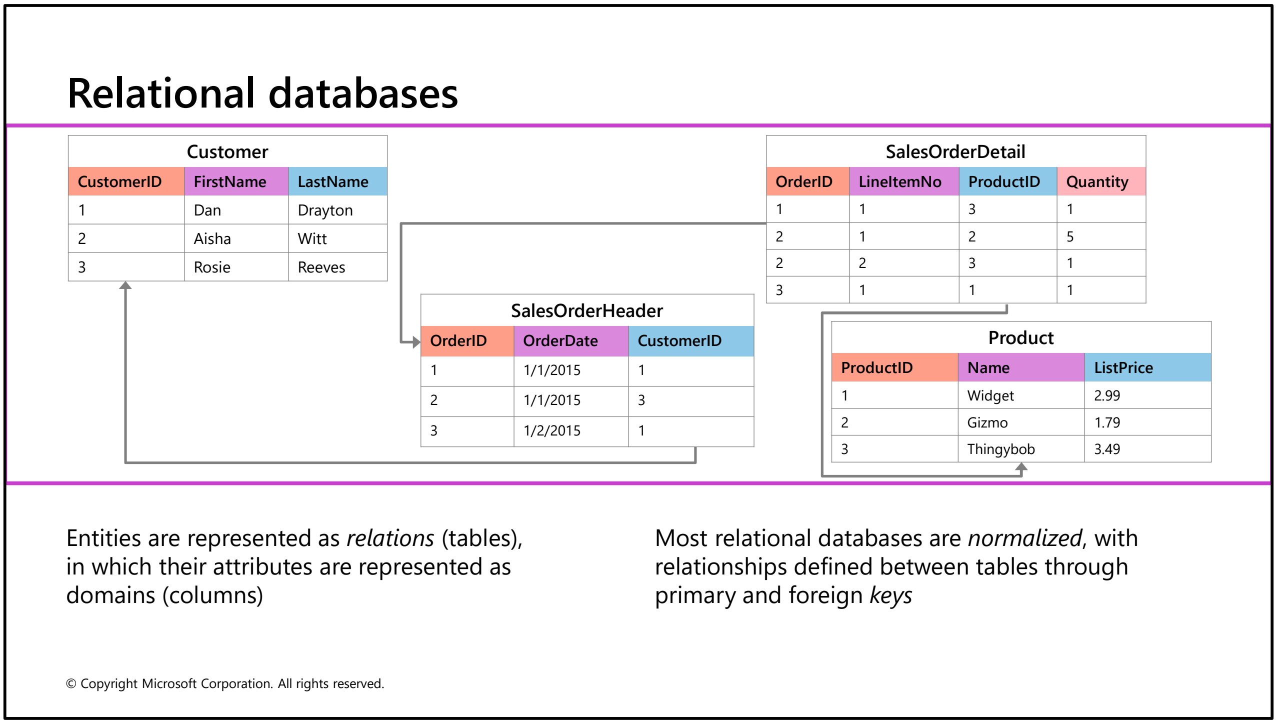
Microsoft’s implementation is Transact-SQL

- Often referred to as T-SQL
- Query language for SQL Server, Azure SQL Database, and other Microsoft relational database services

SQL is *declarative*, not *procedural*

- Describe what you want, don’t specify steps

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/1-introduction



Relational databases

Customer

CustomerID	FirstName	LastName
1	Dan	Drayton
2	Aisha	Witt
3	Rosie	Reeves

SalesOrderDetail

OrderID	LineItemNo	ProductID	Quantity
1	1	3	1
2	1	2	5
2	2	3	1
3	1	1	1

SalesOrderHeader

OrderID	OrderDate	CustomerID
1	1/1/2015	1
2	1/1/2015	3
3	1/2/2015	1

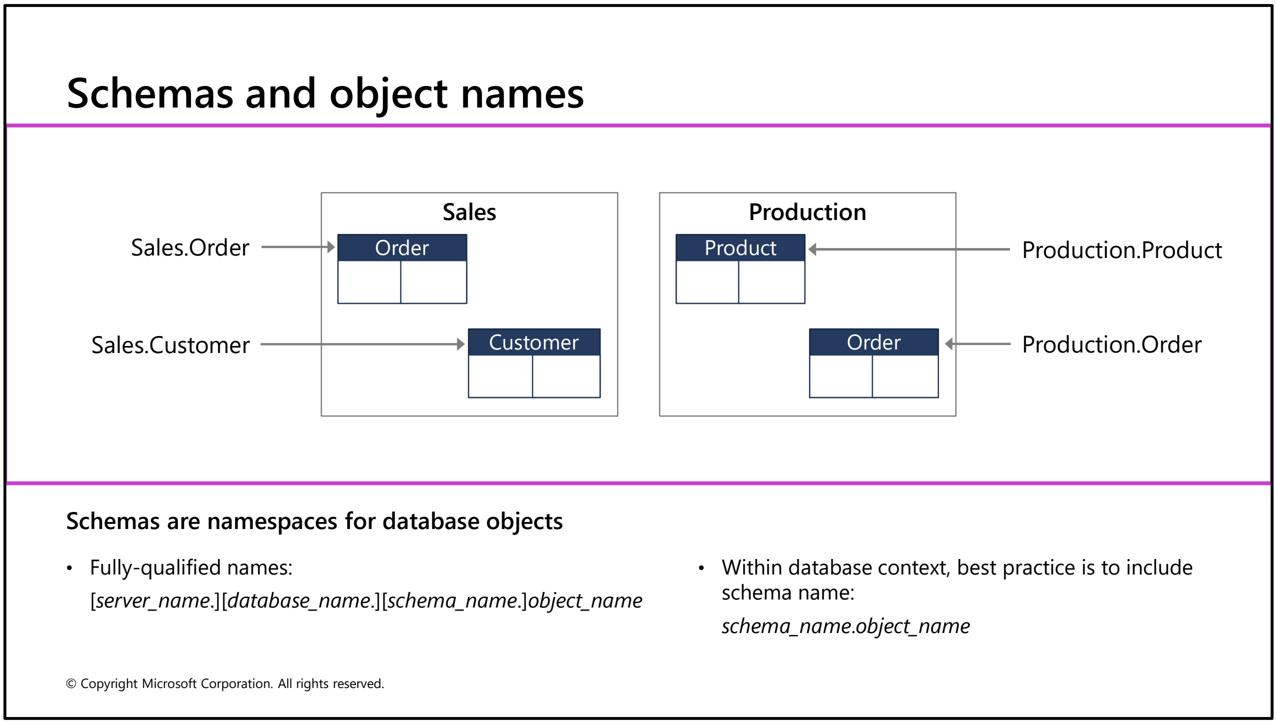
Product

ProductID	Name	ListPrice
1	Widget	2.99
2	Gizmo	1.79
3	Thingybob	3.49

Entities are represented as *relations* (tables), in which their attributes are represented as domains (columns)

Most relational databases are *normalized*, with relationships defined between tables through primary and foreign *keys*

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/1-introduction

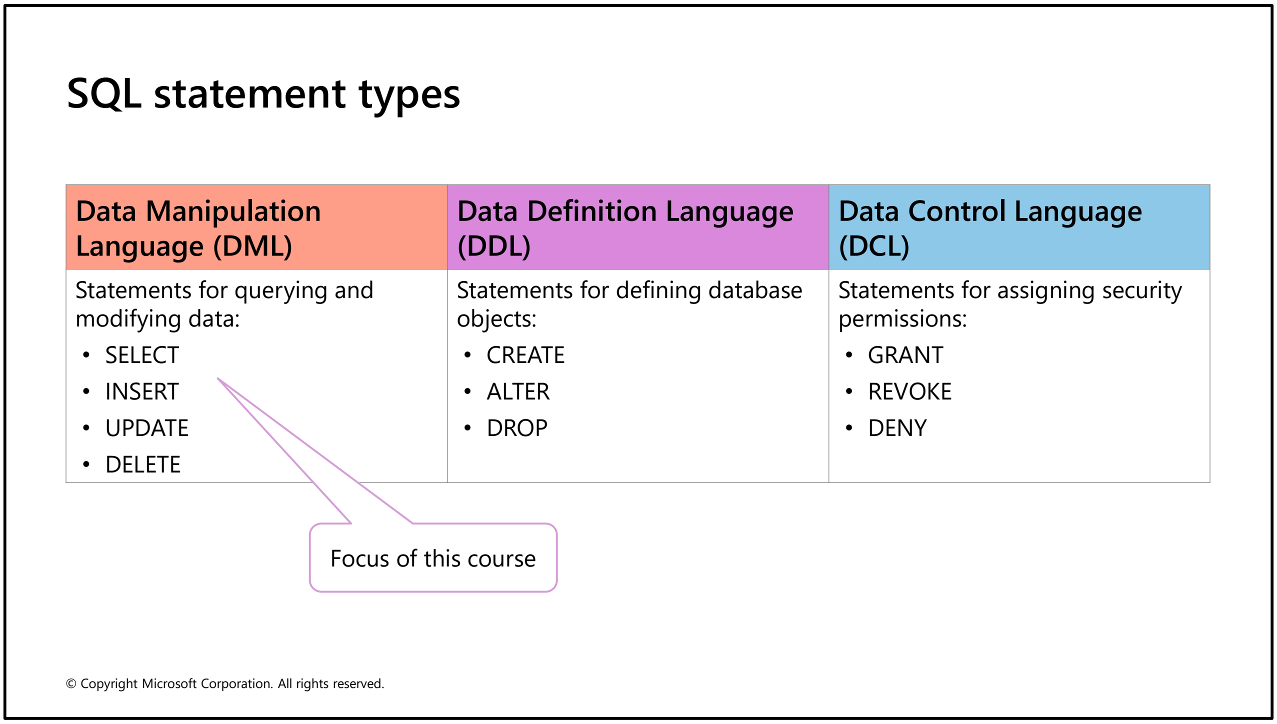


Schemas and object names

Schemas are namespaces for database objects

- Fully-qualified names:
  [*server_name*.][*database_name*.][*schema_name*.]*object_name*
- Within database context, best practice is to include schema name:
  schema_name.object_name

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/2-work-with-schemas



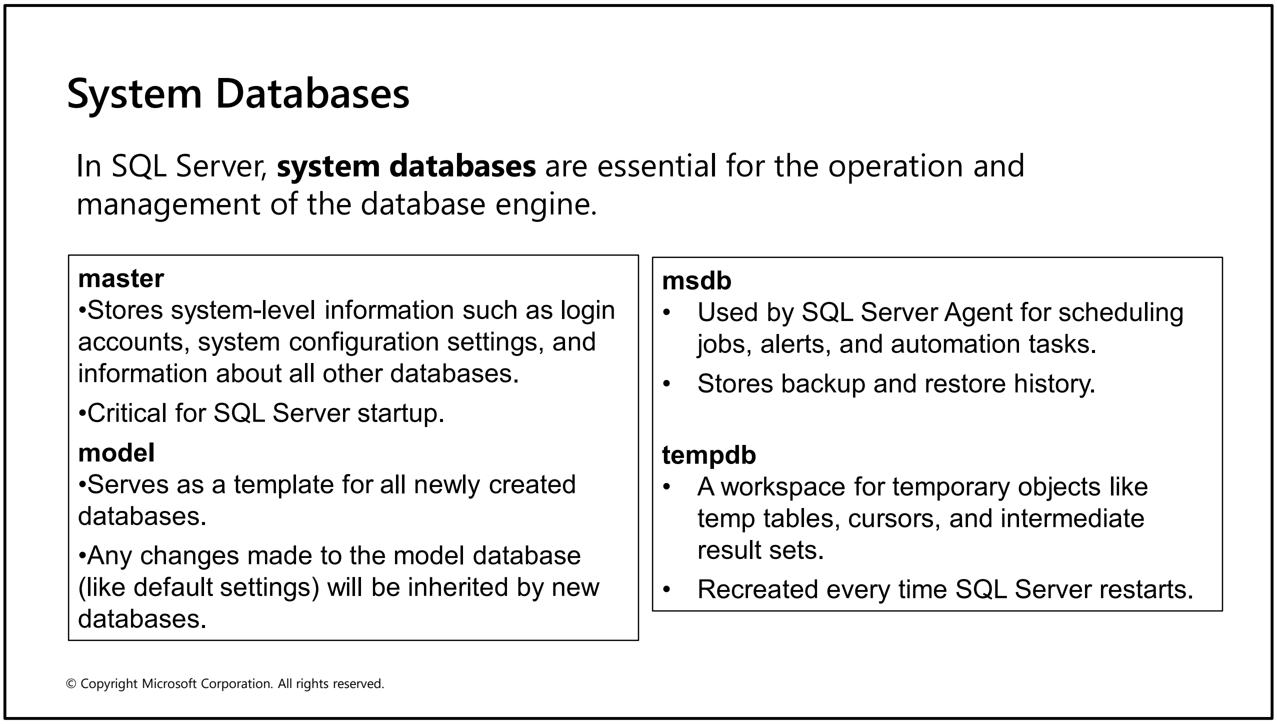
SQL statement types

Data Manipulation Language (DML)	Data Definition Language (DDL)	Data Control Language (DCL)
Statements for querying and modifying data: • SELECT • INSERT • UPDATE • DELETE	Statements for defining database objects: • CREATE • ALTER • DROP	Statements for assigning security permissions: • GRANT • REVOKE • DENY

Focus of this course

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/3-explore-structure-sql-statements

2: SQL Server System Databases



System Databases

In SQL Server, **system databases** are essential for the operation and management of the database engine.

master
- Stores system-level information such as login accounts, system configuration settings, and information about all other databases.
- Critical for SQL Server startup.

model
- Serves as a template for all newly created databases.
- Any changes made to the model database (like default settings) will be inherited by new databases.

msdb
- Used by SQL Server Agent for scheduling jobs, alerts, and automation tasks.
- Stores backup and restore history.

tempdb
- A workspace for temporary objects like temp tables, cursors, and intermediate result sets.
- Recreated every time SQL Server restarts.

SQL Server includes several **system databases** that are essential for its operation. These databases store system-level information, manage temporary data, and serve as templates for user databases. Below is an overview of the system databases available in SQL Server:

1. Master Database

The **master database** records all system-level information for an instance of SQL Server. It contains details about server configuration, logins, linked servers, and the location of user database files. If the master database is unavailable, the SQL Server instance cannot start. It is crucial to back up the master database regularly to ensure recovery in case of corruption.

2. MSDB Database

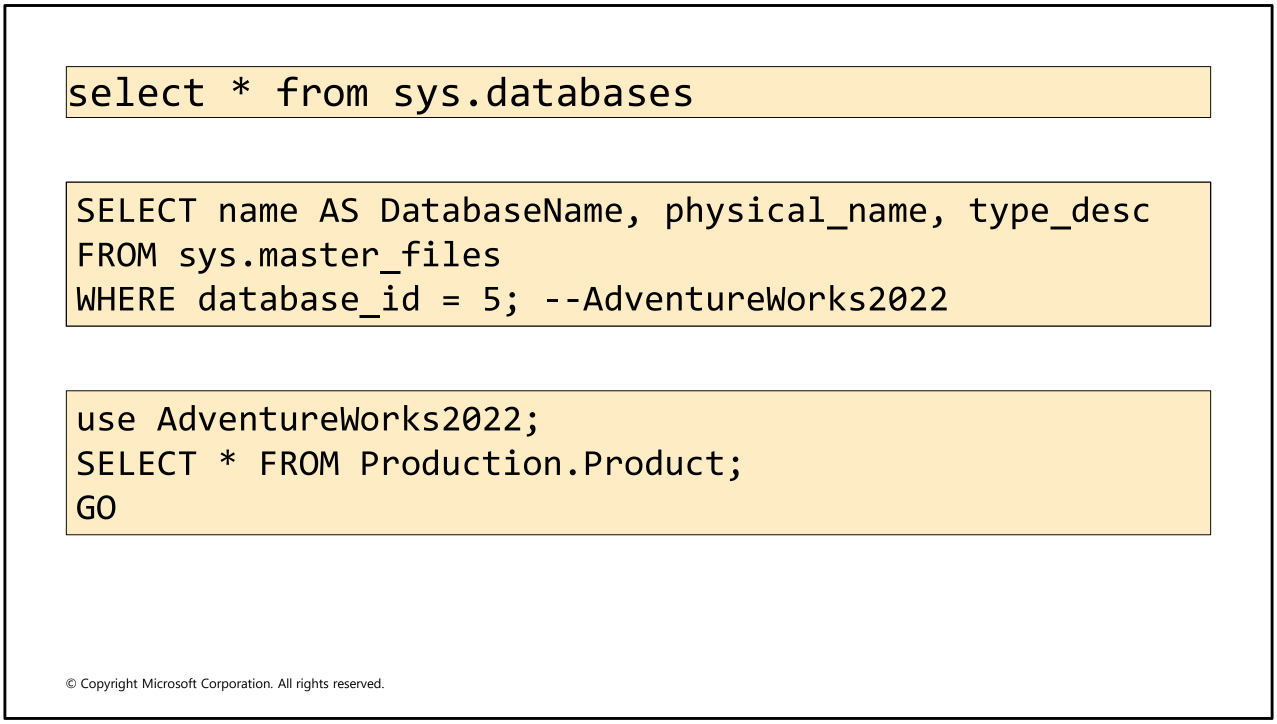
The **msdb database** is used by SQL Server Agent for scheduling jobs, alerts, and managing job histories. It also supports features like Database Mail, Service Broker, and backup/restore history. This database is essential for automating administrative tasks.

3. Model Database

The **model database** serves as a template for creating new databases. Any changes made to the model database, such as collation or recovery model settings, are applied to all subsequently created databases. Additionally, the model database is used to initialize the **tempdb** database each time SQL Server starts.

4. TempDB Database

The **tempdb database** is a workspace for temporary objects, such as temporary tables, table variables, and intermediate query results. It is recreated every time SQL Server restarts, making it non-persistent. Since it is used extensively for query processing, optimizing tempdb performance is critical for overall server performance.

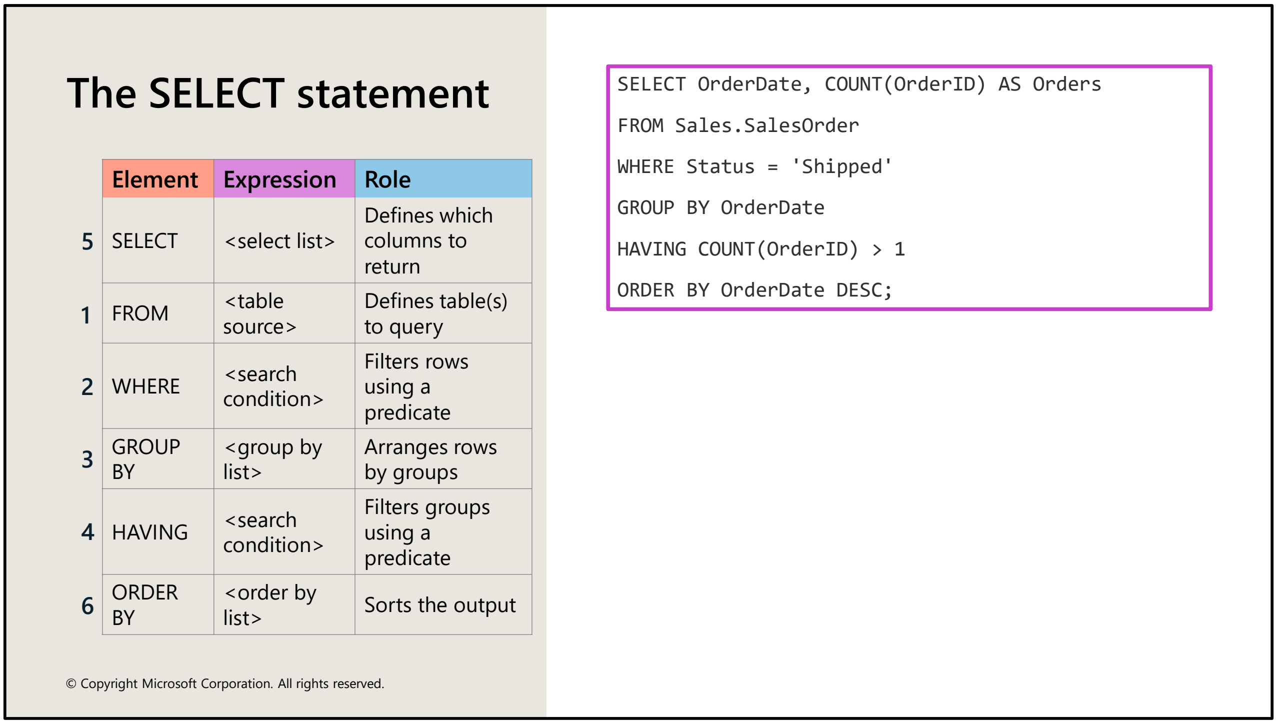


```
select * from sys.databases
```

```
SELECT name AS DatabaseName, physical_name, type_desc
FROM sys.master_files
WHERE database_id = 5; --AdventureWorks2022
```

```
use AdventureWorks2022;
SELECT * FROM Production.Product;
GO
```

3: Using the SELECT statement

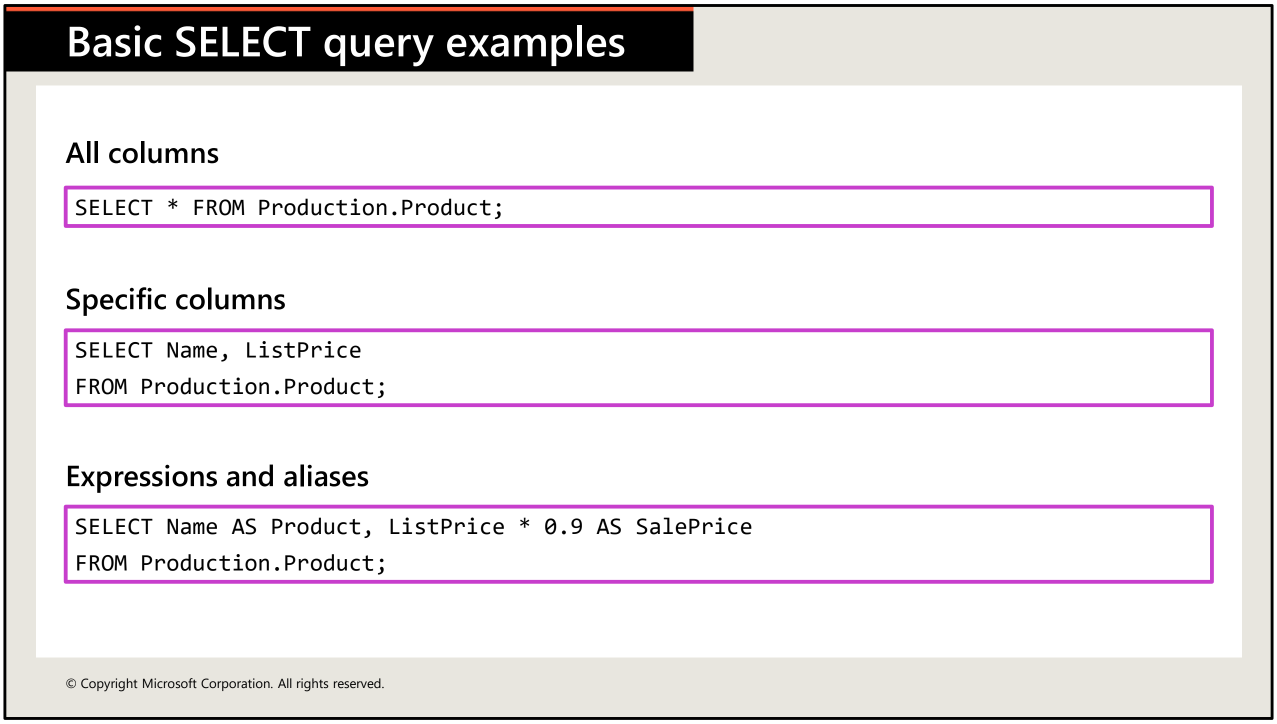


The SELECT statement

	Element	Expression	Role
5	SELECT	<select list>	Defines which columns to return
1	FROM	<table source>	Defines table(s) to query
2	WHERE	<search condition>	Filters rows using a predicate
3	GROUP BY	<group by list>	Arranges rows by groups
4	HAVING	<search condition>	Filters groups using a predicate
6	ORDER BY	<order by list>	Sorts the output

```
SELECT OrderDate, COUNT(OrderID) AS Orders

FROM Sales.SalesOrder

WHERE Status = 'Shipped'

GROUP BY OrderDate

HAVING COUNT(OrderID) > 1

ORDER BY OrderDate DESC;
```

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/3-explore-structure-sql-statements



Basic SELECT query examples

All columns

```
SELECT * FROM Production.Product;
```

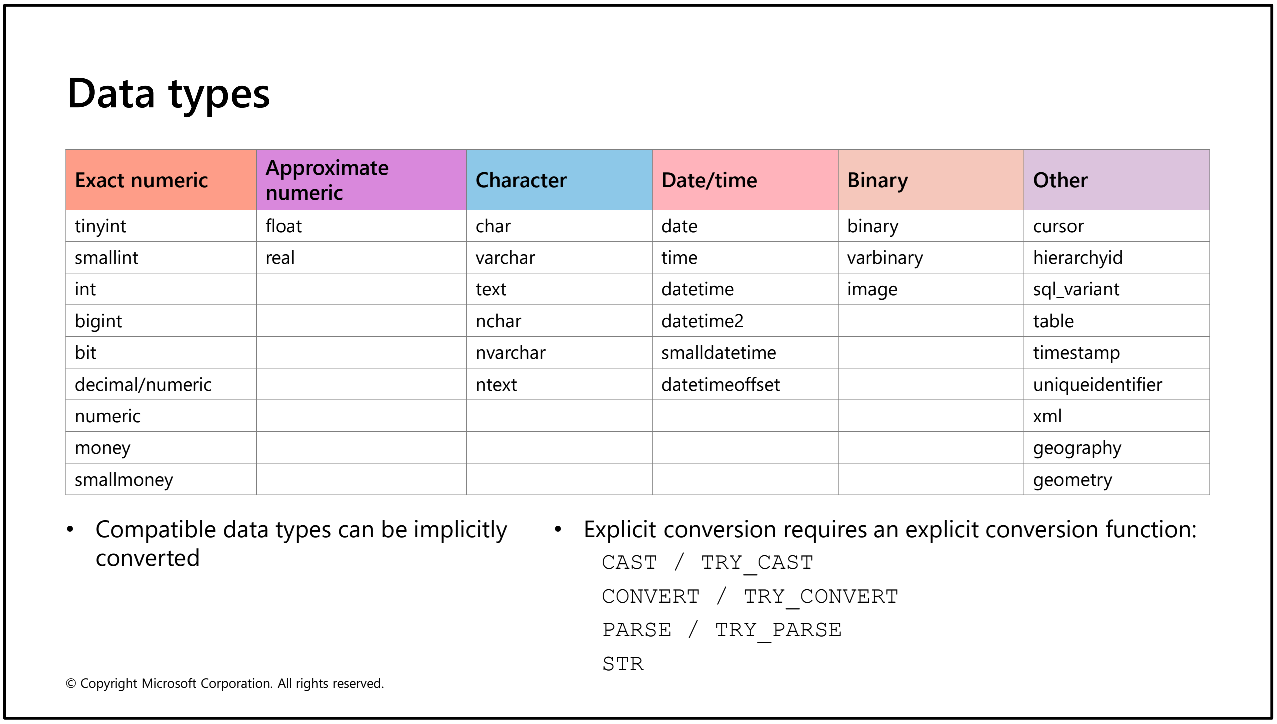
Specific columns

```
SELECT Name, ListPrice
FROM Production.Product;
```

Expressions and aliases

```
SELECT Name AS Product, ListPrice * 0.9 AS SalePrice
FROM Production.Product;
```

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/4-examine-select-statement



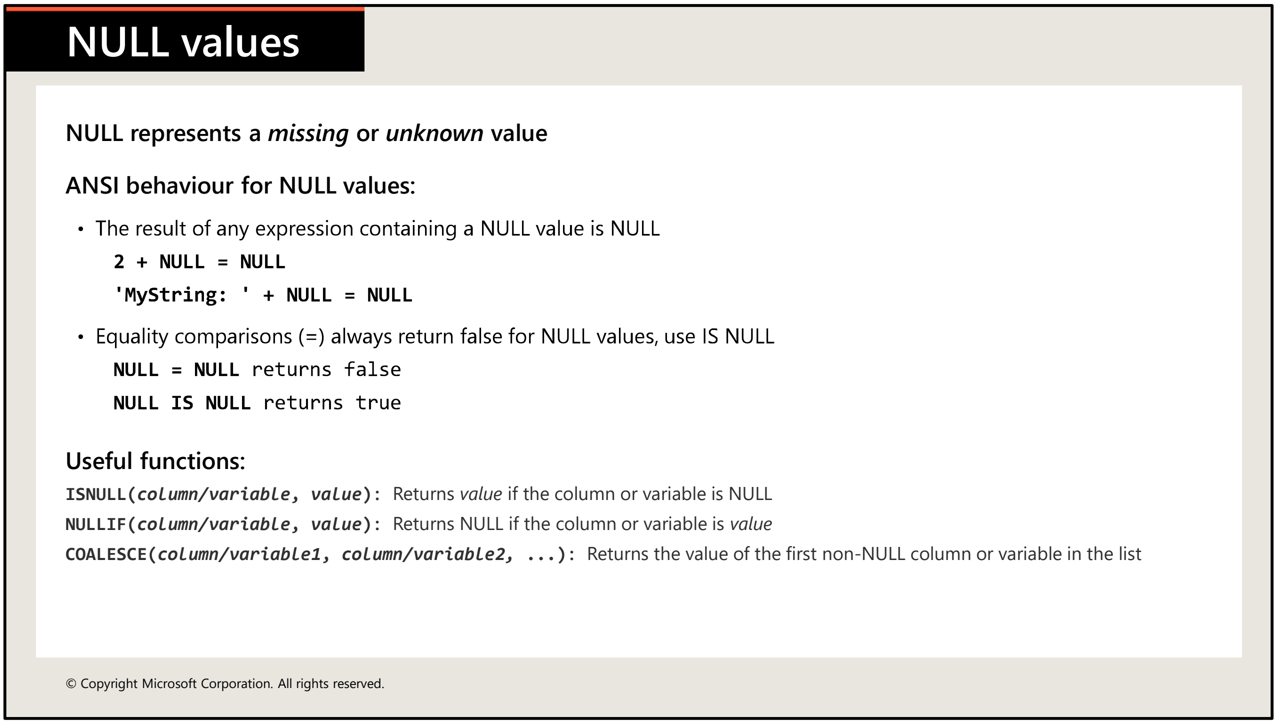
Data types

Exact numeric	Approximate numeric	Character	Date/time	Binary	Other
tinyint	float	char	date	binary	cursor
smallint	real	varchar	time	varbinary	hierarchyid
int		text	datetime	image	sql_variant
bigint		nchar	datetime2		table
bit		nvarchar	smalldatetime		timestamp
decimal/numeric		ntext	datetimeoffset		uniqueidentifier
numeric					xml
money					geography
smallmoney					geometry

- Compatible data types can be implicitly converted
- Explicit conversion requires an explicit conversion function:

```
CAST / TRY_CAST
CONVERT / TRY_CONVERT
PARSE / TRY_PARSE
STR
```

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/5a-data-types



NULL values

NULL represents a *missing* or *unknown* value

ANSI behaviour for NULL values:

- The result of any expression containing a NULL value is NULL

```
2 + NULL = NULL
'MyString: ' + NULL = NULL
```

- Equality comparisons (=) always return false for NULL values, use IS NULL

```
NULL = NULL returns false
NULL IS NULL returns true
```

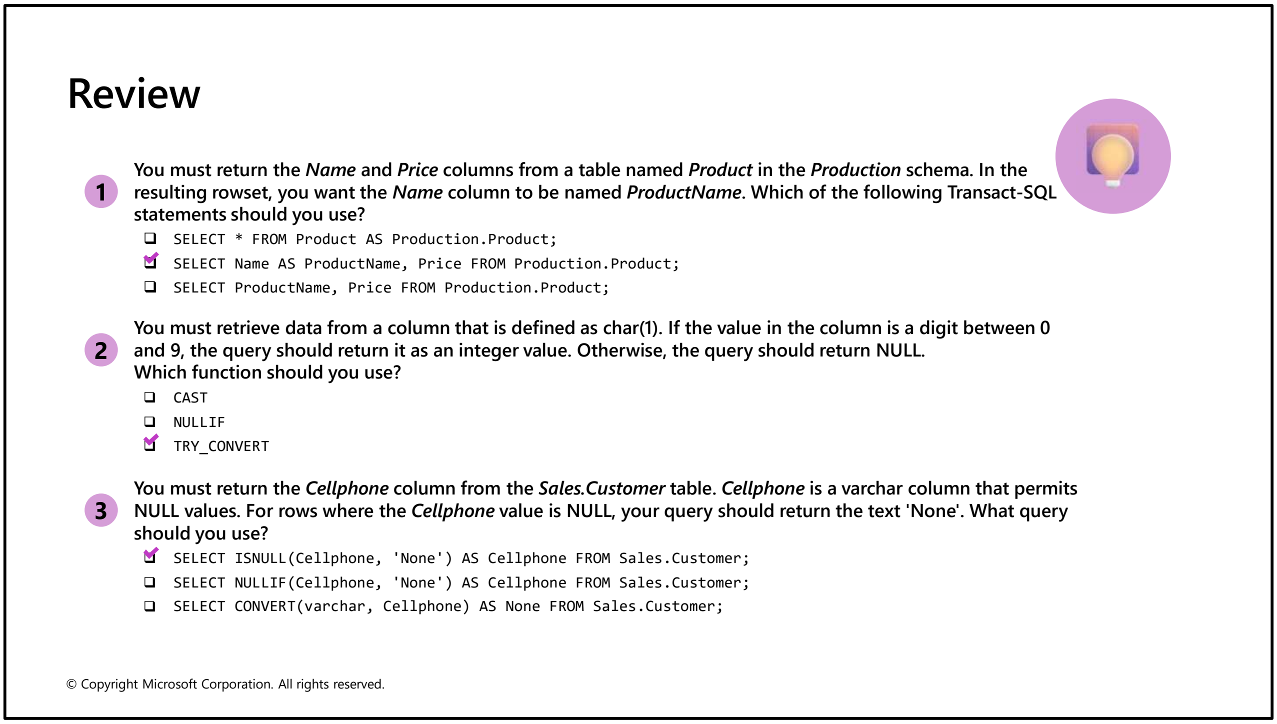
Useful functions:

`ISNULL(column/variable, value)`: Returns *value* if the column or variable is NULL

`NULLIF(column/variable, value)`: Returns NULL if the column or variable is *value*

`COALESCE(column/variable1, column/variable2, ...)`: Returns the value of the first non-NULL column or variable in the list

https://learn.microsoft.com/en-us/training/modules/introduction-to-transact-sql/5b-handle-nulls



Review

1 You must return the *Name* and *Price* columns from a table named *Product* in the *Production* schema. In the resulting rowset, you want the *Name* column to be named *ProductName*. Which of the following Transact-SQL statements should you use?

- □ `SELECT * FROM Product AS Production.Product;`
- ☑ `SELECT Name AS ProductName, Price FROM Production.Product;`
- □ `SELECT ProductName, Price FROM Production.Product;`

2 You must retrieve data from a column that is defined as char(1). If the value in the column is a digit between 0 and 9, the query should return it as an integer value. Otherwise, the query should return NULL.
Which function should you use?

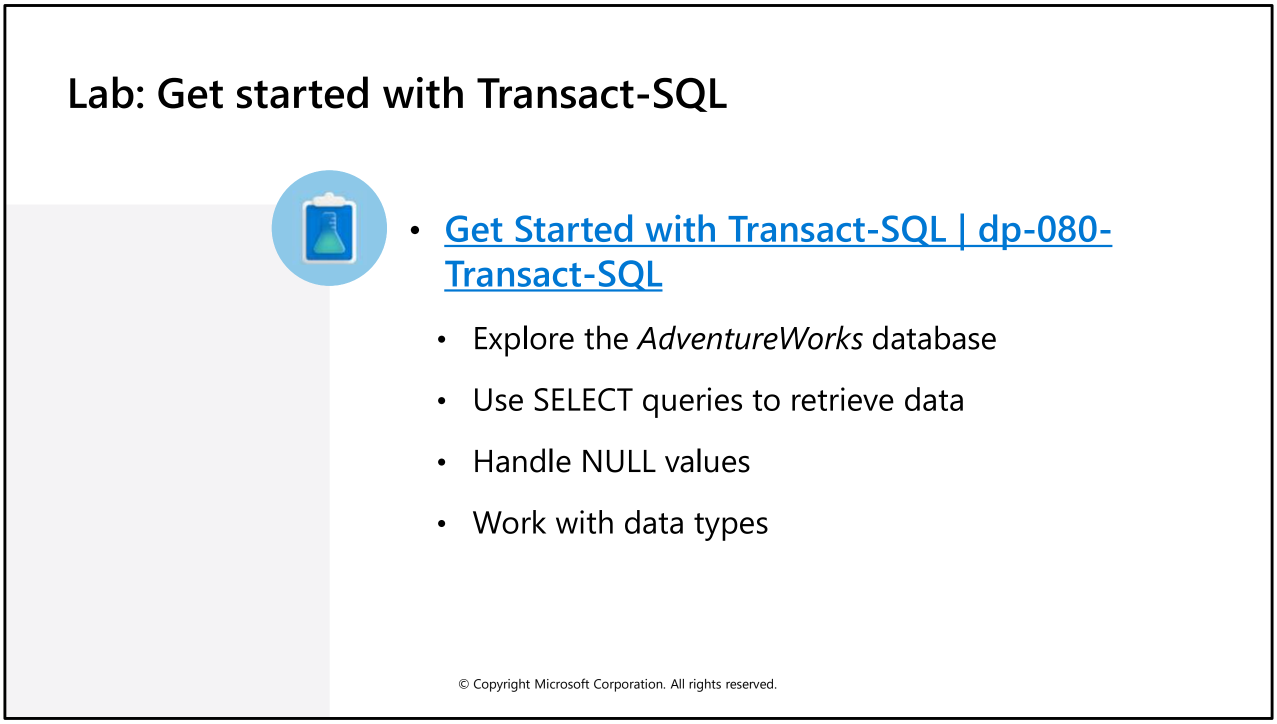
- □ `CAST`
- □ `NULLIF`
- ☑ `TRY_CONVERT`

3 You must return the *Cellphone* column from the *Sales.Customer* table. *Cellphone* is a varchar column that permits NULL values. For rows where the *Cellphone* value is NULL, your query should return the text 'None'. What query should you use?

- ☑ `SELECT ISNULL(Cellphone, 'None') AS Cellphone FROM Sales.Customer;`
- □ `SELECT NULLIF(Cellphone, 'None') AS Cellphone FROM Sales.Customer;`
- □ `SELECT CONVERT(varchar, Cellphone) AS None FROM Sales.Customer;`

Use the slide animation to reveal the correct answers.

Tutorial



Lab: Get started with Transact-SQL

- Get Started with Transact-SQL | dp-080-Transact-SQL
  - Explore the *AdventureWorks* database
  - Use SELECT queries to retrieve data
  - Handle NULL values
  - Work with data types

https://microsoftlearning.github.io/dp-080-Transact-SQL/Instructions/Labs/01-get-started-with-tsql.html