



Data Types

datetime2 real date int cha
bigint xml money
time geometry
decimal tinyint

Where do we use Data Types?

1. Query

```
SELECT
    productid
    , CAST(weight AS int)
FROM Production.Products
WHERE weight IS NOT NULL;
```

2. Table Columns

```
CREATE TABLE Persons.Players (
    playerID int,
    lastname nvarchar(30) NOT NULL,
    birthdate date NOT NULL,
    countryID smallint
);
```

3. Variable

```
DECLARE @id AS int = 12;

SELECT *
FROM Persons.Players
WHERE playerID = @id;
```

4. Stored Procedures, Functions, ...

```
CREATE PROCEDURE HR.EmpsInCountry
    @country AS nvarchar(30)
AS
SELECT * FROM HR.Employees
WHERE country = @country;
```

▲ Data types 1/3

- Exact Numeric

data type	length	
bigint	8	whole number $-2^{63} - 2^{63}-1$
int	4	whole number $-2^{31} - 2^{31}-1$
smallint	2	whole number $-2^{15} - 2^{15}-1$
tinyint	1	whole number 0 - 255
bit	1 bit	boolean: 0, 1, NULL
decimal(p,s)	5-17	numeric precision 1-38 (default 18) scale 0-p (default 0)
numeric(p,s)	5-17	old, same as above
money	8	old, financial 4 decimals
smallmoney	4	old, financial 4 decimals

- Approximate Numeric

data type	length	
float(m)	4-8	mant = 1-24 bits = 4 bytes mant = 25-53 bits = 8 bytes
real	4	≈ float(24)

- Binary String

data type	length	
binary(n)	1-8000	n bytes
varbinary(n)	1-8000	n bytes + 2
varbinary(max)	1-2.1 trillion	n bytes + 2

▲ Data types 2/3

- Text

data type	length	
char(n)	1-8000	n bytes padded 256 characters
varchar(n)	1-8000	n bytes + 2 256 characters
nchar(n)	1-4000	2*n bytes padded > 65.000 characters
nvarchar(n)	1-4000	2*n bytes + 2 > 65.000 characters
varchar(max)	<= 2GB	replaces old text
nvarchar(max)	<= 2GB	replaces old ntext

- Date & Time

data type	length	
datetime	8	1 Jan 1753 - 31 Dec 9999 / .000, .003 of .007 sec.
smalldatetime	4	1 Jan 1900 - 6 Jun 2079 / 1 min.
datetime2	6-8	1 Jan 0001 - 31 Dec 9999 / 100 nano sec.
date	3	1 Jan 1900 - 6 Jun 2079 / 1 min.
time	3-5	only time / 100 nano sec.
datetimeoffset	8-10	1 Jan 0001 - 31 Dec 9999 / 100 nano sec. + Timezone Info

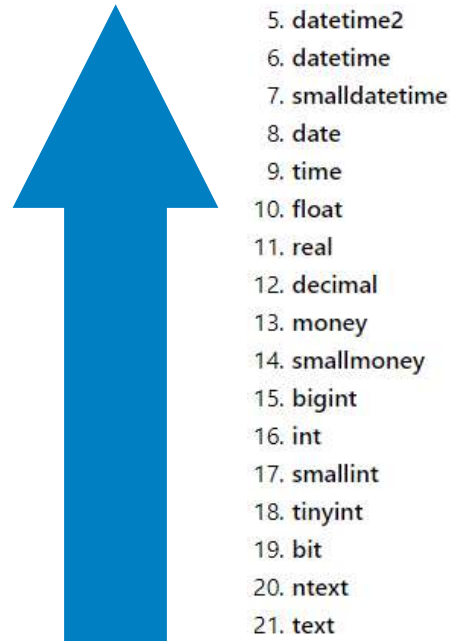
▲ Data types 3/3

- Other

data type	length	
uniqueidentifier	16	64bit GUID
geometry	0-2GB	shape definition in Euclidian geometry
geography	0-2GB	shape definition in round-earth geometry
xml	0-2GB	XML in native hierarchical structure
sql_variant	0-8000	supports more data types in one column
hierarchyid		position in a hierarchy
cursor		not for storage, but for cursor operations (try not to use)
table		not for storage, but for query operations



Implicit Data Conversion

Data type precedence (Transact-SQL)



<https://docs.microsoft.com/en-us/sql/t-sql/data-types/data-type-precedence-transact-sql>

▲ Explicit Data Conversion

- `CAST()` 
 - `TRY_CAST()`
- `CONVERT()` 
 - `TRY_CONVERT()`
- `PARSE()`
 - `TRY_PARSE()`

