ĐẠI HỌC ĐÀ NẴNG
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Database Systems

Chapter 4: Structured Query Language (SQL)
session 2
DML with SELECT, VIEW

Outline

1. DML with SELECT statement
2. Aggregate Functions
3. ORDER BY, GROUP, HAVING
4. VIEW

SELECT Statement

- The SELECT Statement is used to retrieve data from a database table.
- The basic syntax of SELECT Statement:

```
SELECT columnlist
FROM tablelist
[ WHERE conditionlist ]
```

  - SELECT identifies *what* columns to be projected into the table that will be the results of the command
  - FROM identifies *which* table (s) needed to process the query
  - WHERE: restricts the query to rows that meet conditions, the WHERE clause is optional.

SELECT Statement

- The contents of Product table:

	P_Code	P_Descript	P_InDate	P_QOH	P_Min	P_Price	P_Discount	V_Code
1	11QER/31	Power painter, 15 psi., 3-nozzle	2017-11-03	8	5	109.99	0.00	25595
2	13-Q2/P2	7.25-in. pwr. saw blade	2017-01-13	32	15	14.99	0.05	21344
3	14-Q1/L3	9.00-in. pwr. saw blade	2017-11-13	18	12	17.49	0.00	21344
4	1546-QQ2	Hrd. cloth, 1/4-in., 2x50	2018-01-15	15	8	39.95	0.00	23119
5	1558-QW1	Hrd. cloth, 1/2-in., 3x50	2018-01-15	23	5	43.99	0.00	23119
6	2232/QTY	B&D jigsaw, 12-in. blade	2017-12-30	8	5	109.92	0.05	24288
7	2232/Q...	B&D jigsaw, 8-in. blade	2017-12-24	6	5	99.87	0.05	24288
8	2238/QPD	B&D cordless drill, 1/2-in.	2018-01-20	12	5	38.95	0.05	25595
9	23109-HB	Claw hammer	2018-01-20	23	10	9.95	0.10	21225
10	23114-AA	Sledge hammer, 12 lb.	2018-01-02	8	5	14.40	0.05	NULL
11	54778-2T	Rat-tail file, 1/8-in. fine	2017-12-15	43	20	4.99	0.00	21344
12	89-WRE-Q	Hicut chain saw, 16 in.	2018-02-07	11	5	256.99	0.05	24288
13	PVC23D...	PVC pipe, 3.5-in., 8-ft	2018-02-20	188	75	5.87	0.00	NULL
14	SM-18277	1.25-in. metal screw, 25	2018-03-01	172	75	6.99	0.00	21225
15	SW-23116	2.5-in. wd. screw, 50	2018-02-24	237	100	8.45	0.00	21231
16	WR3/TT3	Steel matting, 4'x8'x1/6", .5" ...	2018-01-17	18	5	119.95	0.10	25595

SELECT Statement

- Example: Showing the description, date, and price of products with a vendor code of 21344

```
SELECT P_Descript, P_InDate, P_Price, V_Code
FROM Product
WHERE V_Code = 21344
```

  - Result:

	P_Descript	P_InDate	P_Price	V_Code
1	7.25-in. pwr. saw blade	2017-01-13	14.99	21344
2	9.00-in. pwr. saw blade	2017-11-13	17.49	21344
3	Rat-tail file, 1/8-in. fine	2017-12-15	4.99	21344

SELECT Statement

- Using asterisk (*) to select all columns in the table

```
SELECT * FROM Product
```

- The comparison operators can be used to restrict output

COMPARISON OPERATORS	
SYMBOL	MEANING
=	Equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to
<> or !=	Not equal to

SELECT Statement

- Example: lists all of the rows of the product for which the vendor code is *not* 21344.

```
SELECT P_Descript, P_InDate, P_Price, V_Code
FROM Product
WHERE V_Code <> 21344
```

- Result:

	P_Descript	P_InDate	P_Price	V_Code
1	Power painter, 15 psi., 3-nozzle	2017-11-03	109.99	25595
2	Hrd. cloth, 1/4-in., 2x50	2018-01-15	39.95	23119
3	Hrd. cloth, 1/2-in., 3x50	2018-01-15	43.99	23119
4	B&D jigsaw, 12-in. blade	2017-12-30	109.92	24288
5	B&D jigsaw, 8-in. blade	2017-12-24	99.87	24288
6	B&D cordless drill, 1/2-in.	2018-01-20	38.95	25595
7	Claw hammer	2018-01-20	9.95	21225
8	Hicut chain saw, 16 in.	2018-02-07	256.99	24288
9	1.25-in. metal screw, 25	2018-03-01	6.99	21225
10	2.5-in. wd. screw, 50	2018-02-24	8.45	21231
11	Steel matting, 4'x8'x1/6", .5" mesh	2018-01-17	119.95	25595

SELECT Statement

- Using Comparison Operators on Character Attributes
  - String (character) comparisons are made left-to-right ASCII character comparison

```
SELECT P_Code, P_Descript, P_QOH, P_Min, P_Price
FROM Product
WHERE P_Code < '1558-QW1'
```

  - Result:

	P_Code	P_Descript	P_QOH	P_Min	P_Price
1	11QER/31	Power painter, 15 psi., 3-nozzle	8	5	109.99
2	13-Q2/P2	7.25-in. pwr. saw blade	32	15	14.99
3	14-Q1/L3	9.00-in. pwr. saw blade	18	12	17.49
4	1546-QQ2	Hrd. cloth, 1/4-in., 2x50	15	8	39.95

SELECT Statement

- Using Comparison Operators on Dates
  - Using yyyy-mm-dd format for date

```
SELECT P_Descript, P_QOH, P_Min, P_Price, P_InDate
FROM Product
WHERE P_InDate >= '2018-01-20'
```

  - Result:

	P_Descript	P_QOH	P_Min	P_Price	P_InDate
1	B&D cordless drill, 1/2-in.	12	5	38.95	2018-01-20
2	Claw hammer	23	10	9.95	2018-01-20
3	Hicut chain saw, 16 in.	11	5	256.99	2018-02-07
4	PVC pipe, 3.5-in., 8-ft	188	75	5.87	2018-02-20
5	1.25-in. metal screw, 25	172	75	6.99	2018-03-01
6	2.5-in. wd. screw, 50	237	100	8.45	2018-02-24

SELECT Statement

- Using Computed Columns and Column Aliases
  - Example: determine the total value of each of the products

```
SELECT P_Descript, P_QOH, P_Price, P_QOH * P_Price
FROM Product
```

  - Result

	P_Descript	P_QOH	P_Price	(No column name)
1	Power painter, 15 psi., 3-nozzle	8	109.99	879.92
2	7.25-in. pwr. saw blade	32	14.99	479.68
3	9.00-in. pwr. saw blade	18	17.49	314.82
4	Hrd. cloth, 1/4-in., 2x50	15	39.95	599.25
5	Hrd. cloth, 1/2-in., 3x50	23	43.99	1011.77
6	B&D jigsaw, 12-in. blade	8	109.92	879.36
7	B&D jigsaw, 8-in. blade	6	99.87	599.22
8	B&D cordless drill, 1/2-in.	12	38.95	467.40
9	Claw hammer	23	9.95	228.85
10	Sledge hammer, 12 lb.	8	14.40	115.20
11	Rat-tail file, 1/8-in. fine	43	4.99	214.57
12	Hicut chain saw, 16 in.	11	256.99	2826.89
13	PVC pipe, 3.5-in., 8-ft	188	5.87	1103.56
14	1.25-in. metal screw, 25	172	6.99	1202.28
15	2.5-in. wd. screw, 50	237	8.45	2002.65
16	Steel matting, 4'x8'x1/6", .5" mesh	18	119.95	2159.10

SELECT Statement

Using Alias

- **Alias: alternate name given to a column or table in any SQL statement to improve the readability**
  - Is useful with calculations
  - There can also be the optional AS keyword between the column/table name and alias

```
SELECT P_Descript, P_QOH AS Quantity, P_Price Price,
                   P_QOH * P_Price AS TotalValue
FROM Product
```

	P_Descript	Quantity	Price	TotalValue
1	Power painter, 15 psi., 3-nozzle	8	109.99	879.92
2	7.25-in. pwr. saw blade	32	14.99	479.68
3	9.00-in. pwr. saw blade	18	17.49	314.82
4	Hrd. cloth, 1/4-in., 2x50	15	39.95	599.25
5	Hrd. cloth, 1/2-in., 3x50	23	43.99	1011.77
6	B&D jigsaw, 12-in. blade	8	109.92	879.36
7	B&D jigsaw, 8-in. blade	6	99.87	599.22
8	B&D cordless drill, 1/2-in.	12	38.95	467.40
9	Claw hammer	23	9.95	228.85
10	Sledge hammer, 12 lb.	8	14.40	115.20
11	Rat-tail file, 1/8-in. fine	43	4.99	214.57
12	Hicut chain saw, 16 in.	11	256.99	2826.89
13	PVC pipe, 3.5-in., 8-ft	188	5.87	1103.56
14	1.25-in. metal screw, 25	172	6.99	1202.28
15	2.5-in. wd. screw, 50	237	8.45	2002.65
16	Steel matting, 4'x8'x1/6", .5" mesh	18	119.95	2159.10

SELECT Statement

- Logical Operators: AND, OR, NOT

```
SELECT P_Descript, P_InDate, P_Price, V_Code
FROM Product
WHERE V_Code = 21344 OR V_Code = 24288
```

	P_Descript	P_InDate	P_Price	V_Code
1	7.25-in. pwr. saw blade	2017-01-13	14.99	21344
2	9.00-in. pwr. saw blade	2017-11-13	17.49	21344
3	B&D jigsaw, 12-in. blade	2017-12-30	109.92	24288
4	B&D jigsaw, 8-in. blade	2017-12-24	99.87	24288
5	Rat-tail file, 1/8-in. fine	2017-12-15	4.99	21344
6	Hicut chain saw, 16 in.	2018-02-07	256.99	24288

SELECT Statement

- Logical Operators: AND, OR, NOT
  - You can combine the logical OR with the logical AND to place further restrictions on the output

```
SELECT P_Descript, P_InDate, P_Price, V_Code
FROM Product
WHERE (P_Price < 50 AND P_InDate > '2018-01-15')
      OR V_Code = 24288
```

	P_Descript	P_InDate	P_Price	V_Code
1	B&D jigsaw, 12-in. blade	2017-12-30	109.92	24288
2	B&D jigsaw, 8-in. blade	2017-12-24	99.87	24288
3	B&D cordless drill, 1/2-in.	2018-01-20	38.95	25595
4	Claw hammer	2018-01-20	9.95	21225
5	Hicut chain saw, 16 in.	2018-02-07	256.99	24288
6	PVC pipe, 3.5-in., 8-ft	2018-02-20	5.87	NULL
7	1.25-in. metal screw, 25	2018-03-01	6.99	21225
8	2.5-in. wd. screw, 50	2018-02-24	8.45	21231

SELECT Statement

- Special Operators
  - **BETWEEN** - Used to check whether an attribute value is within a range.
  - **IS NULL** - Used to check whether an attribute value is null
  - **LIKE** - Used to check whether an attribute value matches a given string pattern
  - **IN** - Used to check whether an attribute value matches any value within a value list
  - **EXISTS** - Used to check whether a subquery returns any rows

SELECT Statement

- Special operators
  - **BETWEEN**

```
SELECT * FROM Product
WHERE P_Price BETWEEN 50.00 AND 100.00
```

```
SELECT * FROM Product
WHERE P_Price>= 50.00 AND P_Price<= 100.00
```

	P_Code	P_Descript	P_InDate	P_QOH	P_Min	P_Price	P_Discount	V_Code
1	2232/QWE	B&D jigsaw, 8-in. blade	2017-12-24	6	5	99.87	0.05	24288

SELECT Statement

- Special operators
  - **IS NULL**

```
SELECT P_Code, P_Descript, V_Code
FROM Product
WHERE V_Code IS NULL
```

	P_Code	P_Descript	V_Code
1	23114-AA	Sledge hammer, 12 lb.	NULL
2	PVC23DRT	PVC pipe, 3.5-in., 8-ft	NULL

  - NULL is a special property of an attribute that represents the absence of any value

SELECT Statement

- Special operators
  - **LIKE**
    - The LIKE special operator is **used in conjunction with wildcards to find patterns within string attributes.**
    - use the percent sign (%) and underscore (_) wildcard characters
      - ✓% matches any substring.
      - ✓_ matches *one* character

SELECT Statement

- Special operators
  - **LIKE**

```
SELECT V_Name, V_Contact, V_AreaCode, V_Phone
FROM dbo.Vendor
WHERE V_Contact LIKE 'Smith%'
```

	V_Name	V_Contact	V_AreaCode	V_Phone
1	Bryson, Inc.	Smithson	615	223-3234
2	Dome Supply	Smith	901	678-1419
3	B&K, Inc.	Smith	904	227-0093

SELECT Statement

- Special operators
  - **IN**
    - All of the values in the list must be of the same data type.

```
SELECT *
FROM Product
WHERE V_Code IN (21344, 24288)
```

```
SELECT *
FROM Product
WHERE V_Code = 21344 OR V_Code = 24288
```

	P_Code	P_Descript	P_InDate	P_QOH	P_Min	P_Price	P_Discount	V_Code
1	13-Q2/P2	7.25-in. pwr. saw blade	2017-01-13	32	15	14.99	0.05	21344
2	14-Q1/L3	9.00-in. pwr. saw blade	2017-11-13	18	12	17.49	0.00	21344
3	2232/QTY	B&D jigsaw, 12-in. blade	2017-12-30	8	5	109.92	0.05	24288
4	2232/QWE	B&D jigsaw, 8-in. blade	2017-12-24	6	5	99.87	0.05	24288
5	54778-2T	Rat-tail file, 1/8-in. fine	2017-12-15	43	20	4.99	0.00	21344
6	89-WRE-Q	Hicut chain saw, 16 in.	2018-02-07	11	5	256.99	0.05	24288

SELECT Statement

- Special operators
  - **EXISTS**
    - Is used to check if **a subquery returns any rows, run the main query; otherwise, do not.**
    - **EX:** list all vendors but only if there are products with the quantity on hand, and less than double the minimum quantity

```
SELECT *
FROM Vendor
WHERE EXISTS(SELECT*FROM Product WHERE P_QOH < P_Min * 2)
```

SELECT Statement

- Use DISTINCT keyword to eliminates all duplicate rows in the table resulting from the query

```
SELECT  V_Code
FROM Product
```

	V_Code
1	25595
2	21344
3	21344
4	23119
5	23119
6	24288
7	24288
8	25595
9	21225
10	NULL
11	21344
12	24288
13	NULL
14	21225
15	21231
16	25595

```
SELECT DISTINCT V_Code
FROM Product
```

	V_Code
1	NULL
2	21225
3	21231
4	21344
5	23119
6	24288
7	25595

Sorting Results: The ORDER BY Clause

- ORDER BY clause is used to sort the result set in ascending (ASC) or descending (DESC) order. the default order is ascending.
  - Syntax:

```
SELECT      columnlist
FROM        tablelist
[WHERE      conditionlist ]
[ORDER BY   columnlist [ASC | DESC] ]
```

  - If the ordering column has nulls, they are listed either first or last, depending on the RDBMS.
  - The ORDER BY clause must always be listed last in the SELECT command sequence.

Sorting Results: The ORDER BY Clause

- Example:

```
SELECT P_Code, P_Descript, P_QOH, P_Price
FROM dbo.Product
ORDER BY P_Price
```

	P_Code	P_Descript	P_QOH	P_Price
1	54778-2T	Rat-tail file, 1/8-in. fine	43	4.99
2	PVC23DRT	PVC pipe, 3.5-in., 8-ft	188	5.87
3	SM-18277	1.25-in. metal screw, 25	172	6.99
4	SW-23116	2.5-in. wd. screw, 50	237	8.45
5	23109-HB	Claw hammer	23	9.95
6	23114-AA	Sledge hammer, 12 lb.	8	14.40
7	13-Q2/P2	7.25-in. pwr. saw blade	32	14.99
8	14-Q1/L3	9.00-in. pwr. saw blade	18	17.49
9	2238/QPD	B&D cordless drill, 1/2-in.	12	38.95
10	1546-QQ2	Hrd. cloth, 1/4-in., 2x50	15	39.95
11	1558-QW1	Hrd. cloth, 1/2-in., 3x50	23	43.99
12	2232/QWE	B&D jigsaw, 8-in. blade	6	99.87
13	2232/QTY	B&D jigsaw, 12-in. blade	8	109.92
14	11QER/31	Power painter, 15 psi., 3-nozzle	8	109.99
15	WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	18	119.95
16	89-WRE-Q	Hicut chain saw, 16 in.	11	256.99

Sorting Results: The ORDER BY Clause

- Result

	P_Code	P_Descript	P_QOH	P_Price
1	54778-2T	Rat-tail file, 1/8-in. fine	43	4.99
2	PVC23DRT	PVC pipe, 3.5-in., 8-ft	188	5.87
3	SM-18277	1.25-in. metal screw, 25	172	6.99
4	SW-23116	2.5-in. wd. screw, 50	237	8.45
5	23109-HB	Claw hammer	23	9.95
6	23114-AA	Sledge hammer, 12 lb.	8	14.40
7	13-Q2/P2	7.25-in. pwr. saw blade	32	14.99
8	14-Q1/L3	9.00-in. pwr. saw blade	18	17.49
9	2238/QPD	B&D cordless drill, 1/2-in.	12	38.95
10	1546-QQ2	Hrd. cloth, 1/4-in., 2x50	15	39.95
11	1558-QW1	Hrd. cloth, 1/2-in., 3x50	23	43.99
12	2232/QWE	B&D jigsaw, 8-in. blade	6	99.87
13	2232/QTY	B&D jigsaw, 12-in. blade	8	109.92
14	11QER/31	Power painter, 15 psi., 3-nozzle	8	109.99
15	WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	18	119.95
16	89-WRE-Q	Hicut chain saw, 16 in.	11	256.99

Sorting Results: The ORDER BY Clause

- EMPLOYEE Table Contents

	EMP_LName	EMP_FName	EMP_Initial	EMP_AreaCode	EMP_Phone
1	Kolmycz	George	D	615	324-5456
2	Lewis	Rhonda	G	615	324-4472
3	Vandam	Rhett	NULL	901	675-8993
4	Jones	Anne	M	615	898-3456
5	Lange	John	P	901	504-4430
6	Williams	Robert	D	615	890-3220
7	Smith	Jeanine	K	615	324-7883
8	Diante	Jorge	D	615	890-4567
9	Wiesenbach	Paul	R	615	897-4358
10	Smith	George	K	901	504-3339
11	Genkazi	Leighla	W	901	569-0093
12	Washington	Rupert	E	615	890-4925
13	Johnson	Edward	E	615	898-4387
14	Smythe	Melanie	P	615	324-9006
15	Brandon	Marie	G	901	882-0845
16	Saranda	Hermine	R	615	324-5505
17	Smith	George	A	615	890-2984

Sorting Results: The ORDER BY Clause

- Cascading order sequence

```
SELECT EMP_LName, EMP_FName, EMP_Initial, EMP_AreaCode, EMP_Phone
FROM Employee
ORDER BY EMP_LName, EMP_FName, EMP_Initial
```

	EMP_LName	EMP_FName	EMP_Initial	EMP_AreaCode	EMP_Phone
1	Brandon	Marie	G	901	882-0845
2	Diante	Jorge	D	615	890-4567
3	Genkazi	Leighla	W	901	569-0093
4	Johnson	Edward	E	615	898-4387
5	Jones	Anne	M	615	898-3456
6	Kolmycz	George	D	615	324-5456
7	Lange	John	P	901	504-4430
8	Lewis	Rhonda	G	615	324-4472
9	Saranda	Hermine	R	615	324-5505
10	Smith	George	A	615	890-2984
11	Smith	George	K	901	504-3339
12	Smith	Jeanine	K	615	324-7883
13	Smythe	Melanie	P	615	324-9006
14	Vandam	Rhett	NULL	901	675-8993
15	Washington	Rupert	E	615	890-4925
16	Wiesenbach	Paul	R	615	897-4358
17	Williams	Robert	D	615	890-3220

Sorting Results: The ORDER BY Clause

- Descending order

```
SELECT P_Descript, V_Code, P_InDate, P_Price
FROM Product
WHERE P_InDate < '2018-01-21' AND P_Price <= 50.00
ORDER BY V_Code, P_Price DESC
```

	P_Descript	V_Code	P_InDate	P_Price
1	Sledge hammer, 12 lb.	NULL	2018-01-02	14.40
2	Claw hammer	21225	2018-01-20	9.95
3	9.00-in. pwr. saw blade	21344	2017-11-13	17.49
4	7.25-in. pwr. saw blade	21344	2017-01-13	14.99
5	Rat-tail file, 1/8-in. fine	21344	2017-12-15	4.99
6	Hrd. cloth, 1/2-in., 3x50	23119	2018-01-15	43.99
7	Hrd. cloth, 1/4-in., 2x50	23119	2018-01-15	39.95
8	B&D cordless drill, 1/2-in.	25595	2018-01-20	38.95

Aggregate Functions

- An aggregate function allows you to perform a calculation on a set of values to return a single scalar value

FUNCTION	OUTPUT
COUNT	The number of rows containing non-null values
MIN	The minimum attribute value encountered in a given column
MAX	The maximum attribute value encountered in a given column
SUM	The sum of all values for a given column
AVG	The arithmetic mean (average) for a specified column

- Syntax

```
aggregate_function (DISTINCT | ALL expression)
```

The contents of Product table

	P_Code	P_Descript	P_InDate	P_QOH	P_Min	P_Price	P_Discount	V_Code
1	11QER/31	Power painter, 15 psi., 3-nozzle	2017-11-03	8	5	109.99	0.00	25595
2	13-Q2/P2	7.25-in. pwr. saw blade	2017-01-13	32	15	14.99	0.05	21344
3	14-Q1/L3	9.00-in. pwr. saw blade	2017-11-13	18	12	17.49	0.00	21344
4	1546-QQ2	Hrd. cloth, 1/4-in., 2x50	2018-01-15	15	8	39.95	0.00	23119
5	1558-QW1	Hrd. cloth, 1/2-in., 3x50	2018-01-15	23	5	43.99	0.00	23119
6	2232/QTY	B&D jigsaw, 12-in. blade	2017-12-30	8	5	109.92	0.05	24288
7	2232/QWE	B&D jigsaw, 8-in. blade	2017-12-24	6	5	99.87	0.05	24288
8	2238/QPD	B&D cordless drill, 1/2-in.	2018-01-20	12	5	38.95	0.05	25595
9	23109-HB	Claw hammer	2018-01-20	23	10	9.95	0.10	21225
10	23114-AA	Sledge hammer, 12 lb.	2018-01-02	8	5	14.40	0.05	NULL
11	54778-2T	Rat-tail file, 1/8-in. fine	2017-12-15	43	20	4.99	0.00	21344
12	89-WRE-Q	Hicut chain saw, 16 in.	2018-02-07	11	5	256.99	0.05	24288
13	PVC23DRT	PVC pipe, 3.5-in., 8-ft	2018-02-20	188	75	5.87	0.00	NULL
14	SM-18277	1.25-in. metal screw, 25	2018-03-01	172	75	6.99	0.00	21225
15	SW-23116	2.5-in. wd. screw, 50	2018-02-24	237	100	8.45	0.00	21231
16	WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	2018-01-17	18	5	119.95	0.10	25595

Aggregate Functions

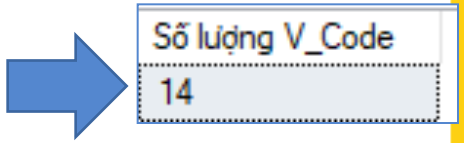
- COUNT
  - The default is ALL

COUNT() Function	Count Duplicates	Count NULL values
COUNT(*)	Yes	Yes
COUNT(DISTINCT column)	No	No
COUNT(ALL column)	Yes	No

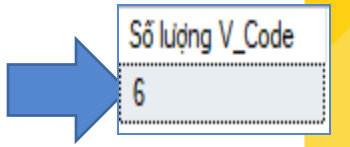
Aggregate Functions

COUNT

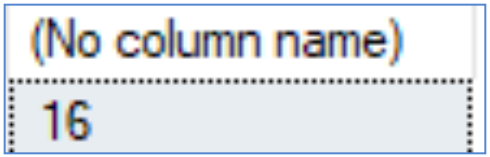
```
SELECT COUNT(V_Code) AS 'Số lượng V_Code'
FROM dbo.Product
```




```
SELECT COUNT( DISTINCT V_Code) AS 'Số lượng V_Code'
FROM dbo.Product
```




```
SELECT COUNT(*)
FROM dbo.Product
```

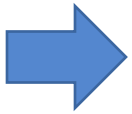


- COUNT(*) returns the number of total rows from the query, including the rows that contain nulls.

Aggregate Functions

❑MAX/MIN

```
SELECT MAX(P_Price) AS 'Max Price'
FROM dbo.Product
```



Max Price
256.99

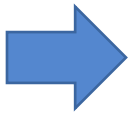
```
SELECT P_Code, P_Descript, P_Price
FROM Product
WHERE P_Price = (SELECT MAX(P_Price) FROM Product)
```

P_Code	P_Descript	P_Price
89-WRE-Q	Hicut chain saw, 16 in.	256.99

Aggregate Functions

SUM

```
SELECT SUM(P_QOH * P_Price) AS TOTVALUE
FROM Product
```



TOTVALUE
15084.52

Aggregate Functions

❑AVERAGE

```
SELECT  AVG(P_Price) AS AveragePrice
FROM Product
```

AveragePrice
56.421250

```
SELECT P_Descript,P_QOH, P_Price, V_Code
FROM Product WHERE P_Price > (SELECT AVG(P_Price)FROM Product)
ORDER BY P_Price DESC
```

P_Descript	P_QOH	P_Price	V_Code
Hicut chain saw, 16 in.	11	256.99	24288
Steel matting, 4'x8'x1/6", .5" mesh	18	119.95	25595
Power painter, 15 psi., 3-nozzle	8	109.99	25595
B&D jigsaw, 12-in. blade	8	109.92	24288
B&D jigsaw, 8-in. blade	6	99.87	24288

GROUP BY Clause

- GROUP BY is particularly useful when paired with aggregate functions.
- The GROUP BY clause allows you to arrange the rows returned by SELECT statement in groups. The groups are determined by the columns that you specify in the GROUP BY clause.
- Syntax:

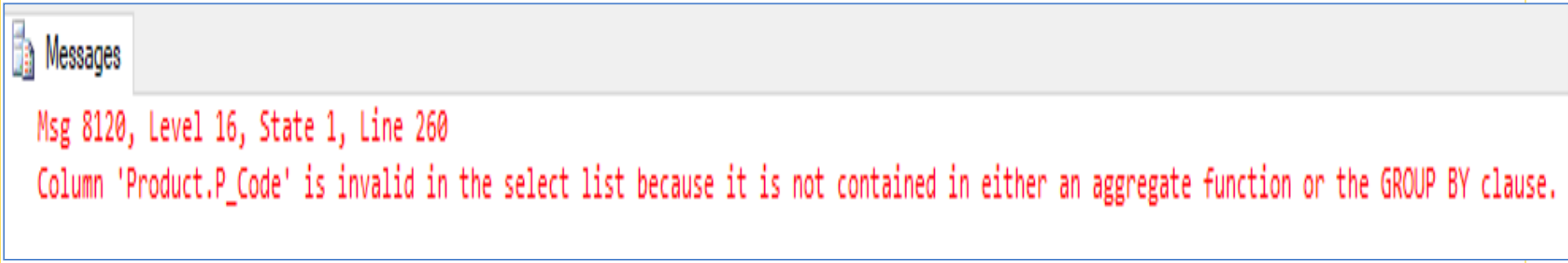
```
SELECT      columnlist
FROM        tablelist
[WHERE      conditionlist ]
[GROUP BY   columnlist ]
[HAVING     conditionlist ]
[ORDER BY   columnlist [ASC | DESC] ];
```

GROUP BY Clause

- The GROUP BY clause is **valid** only **when used in conjunction with one of the SQL aggregate functions**: COUNT, MIN, MAX, AVG, SUM

```
SELECT V_Code, P_Code
FROM Product
GROUP BY V_Code
```

- The above command will result an error:



GROUP BY Clause

- The command will should be written

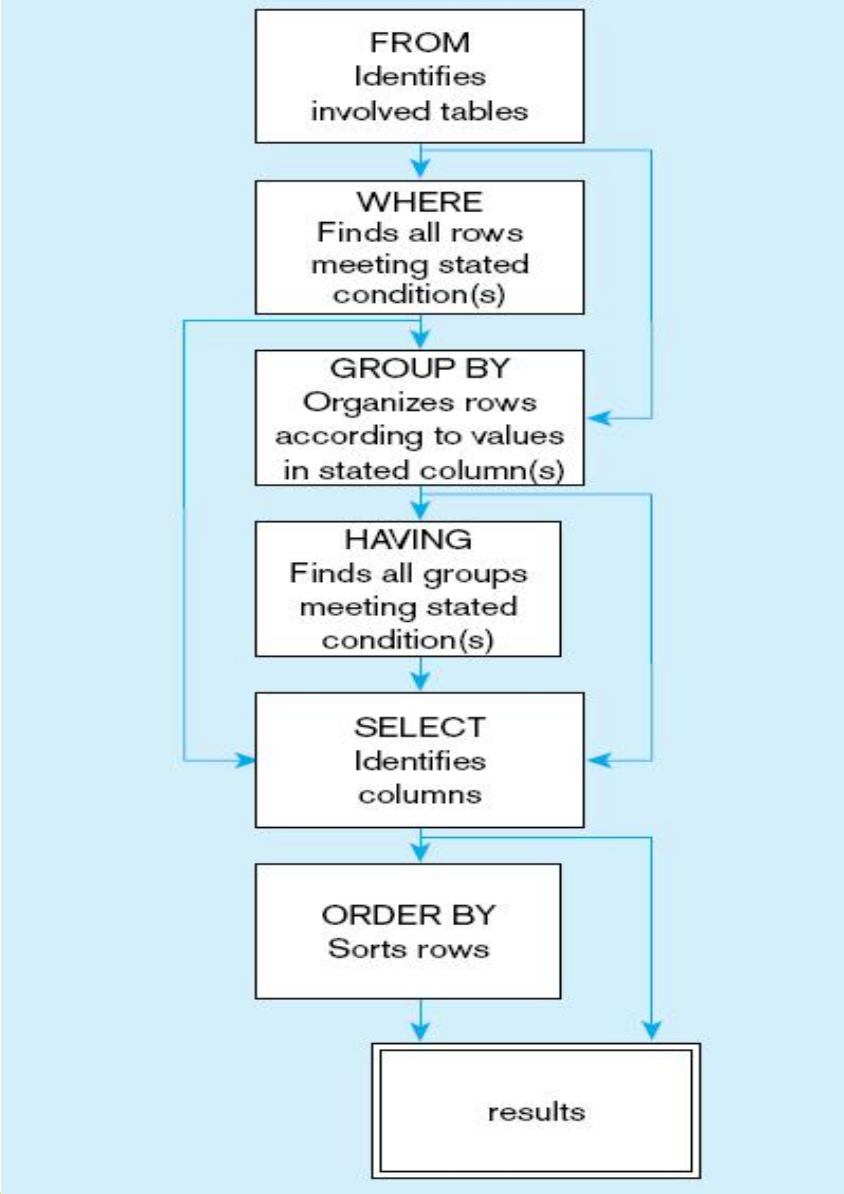
```
SELECT V_Code, COUNT(P_Code) AS Quantity
FROM Product
GROUP BY V_Code
ORDER BY Quantity
```

V_Code	Quantity
21231	1
NULL	2
21225	2
23119	2
24288	3
25595	3
21344	3

HAVING Clause

- The HAVING clause is often used with the GROUP BY clause in the SELECT statement to filter group of rows based on a specified condition.
- The WHERE clause is used to restrict the rows that you select. But the HAVING clause is used to restrict groups.

SQL statement processing order



HAVING Clause

- With HAVING clause

```
SELECT V_Code,COUNT(P_Code),AVG(P_Price)
FROM Product
GROUP BY V_Code
```

	V_Code	(No column name)	(No column name)
1	NULL	2	10.135000
2	21225	2	8.470000
3	21231	1	8.450000
4	21344	3	12.490000
5	23119	2	41.970000
6	24288	3	155.593333
7	25595	3	89.630000

```
SELECT V_Code,COUNT(P_Code),AVG(P_Price)
FROM Product
GROUP BY V_Code
HAVING AVG(P_Price)<10
```

	V_Code	(No column name)	(No column name)
1	21225	2	8.470000
2	21231	1	8.450000

Virtual Tables: View

- View: provides users controlled access to tables
  - It is a virtual table based on a SELECT query
  - Logical table exists only in memory
  - Can be treated as though it were a real table

```
CREATE VIEW Price50 AS
      SELECT P_Code, P_Descript, P_QOH, P_Price
      FROM dbo.Product
      WHERE P_PRICE > 50.00
      WITH CHECK OPTION
```

```
SELECT * FROM Price50
```

P_Descript	P_QOH	P_Price
Power painter, 15 psi., 3-nozzle	8	109.99
B&D jigsaw, 12-in. blade	8	109.92
B&D jigsaw, 8-in. blade	6	99.87
Hicut chain saw, 16 in.	11	256.99
Steel matting, 4'x8'x1/6", .5" mesh	18	119.95

Virtual Tables: View

❑WITH CHECK OPTION

- will cause UPDATE or INSERT statements on that view to be rejected when those statements would cause updated or inserted rows to be removed from the view.
- This option can be used only with updateable views.

```
UPDATE Price50
SET P_Price = 20.5
WHERE P_Code = '11QER/31'
```

```
Will result an error
message due to CHECK
OPTION constraint.
```

Virtual Tables: View

- Advantages/Disadvantages of Views

Positive Aspects	Negative Aspects
Simplify query commands	Use processing time re-creating the view each time it is referenced
Help provide data security and confidentiality	May or may not be directly updateable
Improve programmer productivity	
Contain most current base table data	
Use little storage space	
Provide a customized view for a user	
Establish physical data independence	

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Thank You !