Advanced SQL Methods

- SQL can be used for sorting and joining database tables

PRODUCT : Table

P_CODE	P_DESCRIPT	P_INDATE	P_ONHAND	P_MIN	P_PRICE	P_DISCOUNT	V_CODE
11QER/31	Power painter, 15 psi., 3-nozzle	02-Dec-1996	8	5	$109.99	0.00	25595
13-Q2/P2	7.25-in. pwr. saw blade	12-Nov-1996	32	15	$14.99	0.05	21344
14-Q1/L3	9.00-in. pwr. saw blade	12-Nov-1996	18	12	$17.49	0.00	21344
1546-QQ2	Hrd. cloth, 1/4-in., 2x50	14-Aug-1996	15	8	$39.95	0.00	23119
1558-QW1	Hrd. cloth, 1/2-in., 3x50	14-Aug-1996	23	5	$43.99	0.00	23119
2232/QTY	B&D jigsaw, 12-in. blade	29-Oct-1996	8	5	$109.92	0.05	24288
2232/QWE	B&D jigsaw, 8-in. blade	23-Sep-1996	6	5	$99.87	0.05	24288
2238/QPD	B&D cordless drill, 1/2-in.	19-Oct-1996	12	5	$38.95	0.05	25595
23109-HB	Claw hammer	19-Nov-1996	23	10	$5.95	0.10	21225
23114-AA	Sledge hammer, 12 lb.	01-Dec-1996	8	5	$14.40	0.05	
54778-2T	Rat-tail file, 1/8-in. fine	14-Jun-1996	43	20	$4.99	0.00	21344
89-WRE-Q	Hicut chain saw, 16 in.	06-Jul-1996	11	5	$256.99	0.05	24288
PVC23DRT	PVC pipe, 3.5-in., 8-ft	19-Dec-1996	188	75	$5.87	0.00	
SM-18277	1.25-in. metal screw, 25	28-Nov-1996	172	75	$6.99	0.00	21225
SW-23116	2.5-in. wd. screw, 50	23-Sep-1996	237	100	$8.45	0.00	21231
WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	16-Nov-1996	18	5	$119.95	0.10	25595
			0	0	$0.00	0.00	

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SQL Ordering a Listing (Sorting)

- ORDER BY <attributes>
  - Ascending order is the default
  - Descending order is specified with DESC

```
SELECT P_CODE, P_DESCRIPT, P_INDATE,
P_PRICE FROM PRODUCT ORDER BY P_PRICE;
```

P_CODE	P_DESCRIPT	P_INDATE	P_PRICE
54778-2T	Rat-tail file, 1/8-in. fine	14-Jun-1996	$4.99
23109-HB	Claw hammer	19-Nov-1996	$5.95
SM-18277	1.25-in. metal screw, 25	28-Nov-1996	$6.99
SW-23116	2.5-in. wd. screw, 50	23-Sep-1996	$8.45
13-Q2/P2	7.25-in. pwr. saw blade	12-Nov-1996	$14.99
14-Q1/L3	9.00-in. pwr. saw blade	12-Nov-1996	$17.49
2238/QPD	B&D cordless drill, 1/2-in.	19-Oct-1996	$38.95
1546-QQ2	Hrd. cloth, 1/4-in., 2x50	14-Aug-1996	$39.95
1558-QW1	Hrd. cloth, 1/2-in., 3x50	14-Aug-1996	$43.99
2232/QWE	B&D jigsaw, 8-in. blade	23-Sep-1996	$99.87
2232/QTY	B&D jigsaw, 12-in. blade	29-Oct-1996	$109.92
11QER/31	Power painter, 15 psi., 3-nozzle	02-Dec-1996	$109.99
WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	16-Nov-1996	$119.95
89-WRE-Q	Hicut chain saw, 16 in.	06-Jul-1996	$256.99

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VENDOR : Table

V_CODE	V_NAME	V_CONTACT	V_AREACODE	V_PHONE	V_STATE	V_ORDER
21225	Bryson, Inc.	Smithson	615	223-3234	TN	Y
21226	SuperLoo, Inc.	Flushing	904	215-8995	FL	N
21231	D&E Supply	Singh	615	228-3245	TN	Y
21344	Gomez Bros.	Ortega	615	889-2546	KY	N
22567	Dome Supply	Smith	901	678-1419	GA	N
23119	Randsets Ltd.	Anderson	901	678-3998	GA	Y
24004	Brackman Bro	Browning	615	228-1410	TN	N
24288	ORDVA, Inc.	Hakford	615	898-1234	TN	Y
25443	B&K, Inc.	Smith	904	227-0093	FL	N
25501	Damal Supplie	Smythe	615	890-3529	TN	N
25595	Rubicon Sis.	Orton	904	456-0092	FL	Y

```
SELECT V_NAME, V_CONTACT, V_AREACODE, V_PHONE, V_STATE
FROM VENDOR ORDER BY V_CONTACT, V_STATE DESC;
```

V_NAME	V_CONTACT	V_AREACODE	V_PHONE	V_STATE
Randsets Ltd.	Anderson	901	678-3998	GA
Brackman Bros	Browning	615	228-1410	TN
SuperLoo, Inc.	Flushing	904	215-8995	FL
ORDVA, Inc.	Hakford	615	898-1234	TN
Gomez Bros.	Ortega	615	889-2546	KY
Rubicon Sis.	Orton	904	890-3529	TN
D&E Supply	Singh	615	228-3245	TN
Dome Supply	Smith	901	678-1419	GA
B&K, Inc.	Smith	904	227-0093	FL
Bryson, Inc.	Smithson	615	223-3234	TN
Damal Supplies	Smythe	615	890-3529	TN

SQL Distinct (Unique) Values

- DISTINCT finds unique values in field

```
SELECT DISTINCT V_CODE FROM PRODUCT;
```

V_COD
21225
21231
21344
23119
24288
25595

V_STATE
FL
GA
KY
TN

```
SELECT DISTINCT V_STATE FROM VENDOR;
```

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SQL - Joining Database Tables

❖**Creating Links Through Foreign Keys**

```
SELECT P_DESCRIPT, P_PRICE, V_NAME,
V_CONTACT, V_AREACODE, V_PHONE FROM PRODUCT,
VENDOR WHERE PRODUCT.V_CODE = VENDOR.V_CODE
ORDER BY P_PRICE;
```

P_DESCRIPT	P_PRICE	V_NAME	V_CONTAC	V_AREACODE	V_PHONE
Rat-tail file, 1/8-in. fine	$4.99	Gomez Bros.	Ortega	615	889-2546
Claw hammer	$5.95	Bryson, Inc.	Smithson	615	223-3234
1.25-in. metal screw, 25	$6.99	Bryson, Inc.	Smithson	615	223-3234
2.5-in. wd. screw, 50	$8.45	D&E Supply	Singh	615	228-3245
7.25-in. pwr. saw blade	$14.99	Gomez Bros.	Ortega	615	889-2546
9.00-in. pwr. saw blade	$17.49	Gomez Bros.	Ortega	615	889-2546
B&D cordless drill, 1/2-in.	$38.95	Rubicon Sis.	Orton	904	456-0092
Hrd. cloth, 1/4-in., 2x50	$39.95	Randsets Ltd	Anderson	901	678-3998
Hrd. cloth, 1/2-in., 3x50	$43.99	Randsets Ltd	Anderson	901	678-3998
B&D jigsaw, 8-in. blade	$99.87	ORDVA, Inc.	Hakford	615	898-1234
B&D jigsaw, 12-in. blade	$109.92	ORDVA, Inc.	Hakford	615	898-1234
Power painter, 15 psi., 3-nozzle	$109.99	Rubicon Sis.	Orton	904	456-0092
Steel matting, 4'x8'x1/6", .5" mesh	$119.95	Rubicon Sis.	Orton	904	456-0092
Hicut chain saw, 16 in.	$256.99	ORDVA, Inc.	Hakford	615	898-1234

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SQL Join with Relational Operator

❖**Create Link Through Foreign Keys**

```
SELECT P_DESCRIPT, P_PRICE, V_NAME,
V_CONTACT, V_AREACODE, V_PHONE,
P_INDATE
FROM PRODUCT, VENDOR
WHERE PRODUCT.V_CODE = VENDOR.V_CODE
AND P_INDATE > #11/15/1996#
ORDER BY P_INDATE;
```

P_DESCRIPT	P_PRICE	V_NAME	V_CONTAC	V_AREACODE	V_PHONE	P_INDATE
Steel matting, 4'x8'x1/6", .5" mesh	$119.95	Rubicon Sis.	Orton	904	456-0092	16-Nov-1996
Claw hammer	$5.95	Bryson, Inc.	Smithson	615	223-3234	19-Nov-1996
1.25-in. metal screw, 25	$6.99	Bryson, Inc.	Smithson	615	223-3234	28-Nov-1996
Power painter, 15 psi., 3-nozzle	$109.99	Rubicon Sis.	Orton	904	456-0092	02-Dec-1996

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SQL Aggregate Functions

FUNCTION	OUTPUT
COUNT	The number of rows containing the specified attribute.
MIN	The minimum attribute value encountered.
MAX	The maximum attribute value encountered.
AVG	The arithmetic mean (average) for the specified attribute.
SUM	The sum of all values for a selected attribute.

❖**What is the most expensive item?**

- **SELECT MAX(P_PRICE) FROM PRODUCT;**

❖**How many products in product table?**

- **SELECT COUNT(P_CODE) FROM PRODUCT;**

◆**What is the average price of a product?**

- **SELECT AVG(P_PRICE) FROM PRODUCT;**

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SQL Join with Relational Operator

❖**What is the inventory value?**

- **SELECT SUM(P_ONHAND*P_PRICE) FROM PRODUCT;**
- **$14,992.52**

Expr1000
$14,992.52

❖**How many different vendors in product table?**

- **This will require nesting one query in another**
- **SELECT DISTINCT V_CODE FROM PRODUCT;**
- **This is saved as "prodDistinctVendors" Query**
- **SELECT Count([prodDistinctVendors].V_CODE) AS CountOfV_CODE FROM prodDistinctVendors;**
- **"prodDistinctVendors" and "CountOfV_CODE are simply identifiers (No Mystery)**

V_COD
21225
21231
21344
23119
24288
25595

CountOfV_COI
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SQL Sub-Query

- Inner query is used as a constraint to evaluate the outer query
- The outer query contains all fields to be displayed as results
- Sub-query application to determine which product has the MAX discount:
  - `SELECT P_DESCRIPT, P_DISCOUNT FROM PRODUCT WHERE P_DISCOUNT = (SELECT MAX(P_DISCOUNT) FROM PRODUCT);`

P_DESCRIPT	P_DISCOUNT
Claw hammer	0.10
Steel matting, 4'x8'x1/6",	0.10

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SQL Sub-Query

- Sub-Query approach applied to SQL function and table JOIN.
- Sub-query application to determine which vendor receives the MAX discount for which product:
  - `SELECT V_NAME, P_DESCRIPT, P_DISCOUNT FROM PRODUCT1, VENDOR1 WHERE PRODUCT1.V_CODE = VENDOR1.V_CODE AND P_DISCOUNT = (SELECT MAX(P_DISCOUNT) FROM PRODUCT1);`

V_NAME	P_DESCRIPT	P_DISCOUNT
Bryson, Inc.	Claw hammer	0.10
Rubicon Sis.	Steel matting, 4'x8'x1/6",	0.10

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Procedural SQL

- SQL shortcomings
  - Doesn't support execution of stored procedures based on logical condition
  - Fails to support conditional and looping operations
- Solutions
  - Embedded SQL can be called from within procedural programming languages
  - Procedural SQL (PL/SQL) stored within the database, executed by DBMS, and invoked by the end user
    - PL/SQL functions
    - Triggers
    - Stored procedures
    - MS Access uses Visual Basic for PL/SQL
    - Oracle utilizes SQL*Plus for PL/SQL
    - Java utilizes JDBC for PL/SQL

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Triggers

- Procedural SQL code invoked before or after data row is selected, inserted, or updated
- Associated with a database table
- Table may have multiple triggers
- Executed as part of transaction
- Can enforce particular constraints
- Automate critical actions and provide warnings for remedial action
- Can update values, insert records, and call procedures
- Adds processing power to a RDBMS

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