SQL : Data Manipulation Language (DML)

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Query Basic Structure

Query SQL :

select A_1, A_2, ..., A_i from R_1, R_2, ..., R_i where P

- A_i : selected field (* means “all fields”)
- R_i : table name
- P : requirement condition

Sample

Account (**AcctNo**, CustId, Balance, Type)

Deposit (**TransactionId**, AcctNo, Date, Amount)

Check (**CheckNumber**, AcctNo, Date, Amount)

ATMWithDrawal(**TransactionID**, CustID, AcctNo, Amount, WithDrawDate)

Customer(**CustId**, Name, Phone, Address)

Sample

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Display **AcctNo** and Amount from table **ATMWithdrawal**

Sample

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

SELECT AcctNo, Amount

FROM ATMWithdrawal

Query Answer table

AcctNo	Amount
102	$25.00
102	$150.00
101	$40.00
100	$40.00
100	$200.00

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Display all attributes from table **ATMWithdrawal** which have **amount** less than **50**

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Selected fields

Table name

```
SELECT *
FROM ATMWithdrawal
WHERE Amount < 50;
```

Requirement condition

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Is Amount less than 50? **Yes**!

check condition for each row

Amount < 50

Query Answer table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Is Amount less than 50?
No !
This row is ignored

Check condition for each row

Amount < 50

Query Answer table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Is Amount less than 50?

Yes !

Check condition for each row

Amount < 50

Query Answer table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
3	2	101	$40.00	11/1/2000 10:05:00

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Is Amount less than 50? Yes!

Check condition for each row

Amount < 50

Query Answer table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00

Sample (with WHERE)

ATMWithdrawal table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
2	1	102	$150.00	11/10/2000 13:15:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00
5	2	100	$200.00	11/8/2000 14:14:00

Check condition for each row

Is Amount less than 50? No! This row is ignored

Amount < 50

Query Answer table

TransactionID	CustId	AcctNo	Amount	WithdrawDate
1	1	102	$25.00	11/1/2000 9:45:00
3	2	101	$40.00	11/1/2000 10:05:00
4	2	100	$40.00	11/1/2000 10:07:00

SQL Extensions

SELECT …

FROM …

WHERE …

Extension untuk SELECT

SELECT

SQL allows duplication in relation and query result.

Add keyword **DISTINCT** after **SELECT** to dismiss duplication

Sample :

- Retrieve Account, Amount from Deposit relation

  SELECT DISTINCT AcctNo, Amount FROM Deposit

- Keyword **ALL** : duplication is still happened

  SELECT ALL AcctNo, Amount FROM Deposit

SELECT

SELECT can contains arithmatic expression (+, –, □, /, and operation in certain attribute

Sample:

```
SELECT AcctNo, Amount*10
FROM ATMWithdrawal
WHERE Amount < 50;
```

Result : Amount value will be multiplied by 10

AcctNo	Amount
102	$250.00
101	$400.00
100	$400.00

SELECT

We can give new attribute with **AS**

Sample:

```
SELECT AcctNo AS Number, Amount*10 AS Amt
FROM ATMWithdrawal
WHERE Amount < 50;
```

Result :

Number	Amt
102	$250.00
101	$400.00
100	$400.00

Aggregate Function

We can use aggregate function in SELECT

- **avg:** average value
- **min:** minimum value
- **max:** maximum value
- **sum:** sum of values
- **count:** number of values

The value must be numeric

Sample :

```
SELECT MIN(Balance), MAX(Balance), AVG (Balance)
FROM Account;
```

Aggregate Function

Retrieve how many Customer

```
SELECT count(*) FROM Customer
```

Retrieve lowest balance of Account

```
SELECT min(Balance) FROM Account
```

Retrieve average amount of check which less than 50

```
SELECT avg(Amount) FROM Check
WHERE Amount < 50
```

SQL Extensions

SELECT …

FROM …

WHERE …  Extention for WHERE

WHERE

Define requirement condition

Use :

- Logical comparation : **and, or, not**

Logical Comparation

Retrieve **Number** and **CustID** for Account which have ‘checking’ type and balance more than 1000

101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

```
SELECT Number, CustID
FROM Account
WHERE Balance > 1000 AND TYPE = ‘checking’;
```

WHERE

Define requirement condition

Use :

- Logical comparation : **and, or, not**
- Comparation : =, >, >=, <, <=, <>

Comparation

Retrieve deposit data with Amount more than 2000

```
SELECT * FROM Deposit
WHERE Amount > 2000;
```

Retrieve ATM withdrawal after 1 April 2008

```
SELECT * FROM ATMWithdrawal
WHERE WithdrawDate > '2008-04-01';
```

Retrieve ATM withdrawal with Amount less than 50 but the transaction is not done by CustID 1

```
SELECT * FROM ATMWithdrawal
WHERE Amount < 50 AND CustID <> 1;
```

WHERE

Define requirement condition

Use :

- Logical comparation : **and, or, not**
- Comparation : =, >, >=, <, <=, <>
- Empty checking : IS NULL, IS NOT NULL

Empty Checking

Retrieve Customer data which his address is empty

```
SELECT * FROM Customer
WHERE Address IS NULL;
```

Retrieve Customer data which telephone number is not empty

```
SELECT * FROM Customer
WHERE Phone IS NOT NULL;
```

WHERE

Define requirement condition

Use :

- Logical comparation : **and, or, not**
- Comparation : =, >, >=, <, <=, <>
- Empty checking : IS NULL, IS NOT NULL
- String operator : LIKE, %, _

String Operator

Retrieve Customer name with prefix ‘Fr’

```
SELECT * FROM Customer
WHERE Name LIKE ‘Fr%’;
```

Retrieve Customer name which contains ‘re’

```
SELECT * FROM Customer
WHERE Name LIKE ‘%re%’;
```

Retrieve Customer name with prefix ‘Fr’, follow by 2 character and ‘re’

```
SELECT * FROM Customer
WHERE Name LIKE ‘%Fr__re’;
```

WHERE

Define requirement condition

Use :

- Logical comparation : **and, or, not**
- Comparation : =, >, >=, <, <=, <>
- Empty checking : IS NULL, IS NOT NULL
- String operator : LIKE, %, _
- Other operator : IN, BETWEEN

Operator IN, BETWEEN

Retrieve Deposit data for Account number 102 or 104

```
SELECT * FROM Deposit
WHERE AcctNo = '102' or AcctNo = '104';
```

or

```
SELECT * FROM Deposit
WHERE AcctNo IN ('102','104');
```

Menampilkan ATM withdrawal data from 1 April 2008 to 15 April 2008

```
SELECT * FROM ATMWithdrawal
WHERE WithdrawDate > '2008-04-01' AND
    WithdrawDate < '2008-04-15'
```

or

```
SELECT * FROM ATMWithdrawal
WHERE WithdrawDate BETWEEN '2008-04-01' AND '2008-04-15'
```

SQL Extensions

SELECT …

FROM …

WHERE …

FROM Extension

FROM – SQL Query with Two Tables

Define relations which involved in query

Result : combination from defined relations

Sample:

SELECT * FROM Account, Deposit

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

SQL Query with Two Tables

Result :

Number	Owner	Balance	Type	Account	T-id	Date	Amount
101	J. Smith	1000.00	checking	102	1	10/22/00	500.00
101	J. Smith	1000.00	checking	102	2	10/29/00	200.00
101	J. Smith	1000.00	checking	104	3	10/29/00	1000.00
101	J. Smith	1000.00	checking	105	4	11/2/00	10,000.00
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00
102	W. Wei	2000.00	checking	104	3	10/29/00	1000.00
102	W. Wei	2000.00	checking	105	4	11/2/00	10,000.00

.... etc

SQL Query with Two Tables

```
SELECT A.Owner, A.Balance
FROM Account A, Deposit D
WHERE D.Account = A.Number and D.Balance > 1000;
```

What is the result ?

We must check every combination of every row in Account and every row in Deposit !

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

Number	Owner	Balance	Type	Account	T-id	Date	Amount

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE     D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
e							
es							

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

Yes! Input in result section.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

Yes! Input in result section.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	Checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	Checking
105	H. Martin	10,000.00	checking

All combination is fault!

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Igone.
Why?

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Ignore.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

No! Three data is fault.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00

SQL Query with Two Tables

Account

Number	Owner	Balance	Type
101	J. Smith	1000.00	checking
102	W. Wei	2000.00	checking
103	J. Smith	5000.00	savings
104	M. Jones	1000.00	checking
105	H. Martin	10,000.00	checking

Yes! Input in result section.

Deposit

Account	T-id	Date	Amount
102	1	10/22/00	500.00
102	2	10/29/00	200.00
104	3	10/29/00	1000.00
105	4	11/2/00	10,000.00

```
WHERE    D.Account = A.Number and A.Balance > 1000;
```

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00
105	H. Martin	10,000.00	checking	105	4	11/2/00	10,000.00

SQL Query with Two Tables

Temporary Result

Number	Owner	Balance	Type	Account	T-id	Date	Amount
102	W. Wei	2000.00	checking	102	1	10/22/00	500.00
102	W. Wei	2000.00	checking	102	2	10/29/00	200.00
105	H. Martin	10,000.00	checking	105	4	11/2/00	10,000.00

```
SELECT A.Owner, A.Balance
FROM Account A, Deposit D
WHERE D.Account = A.Number and
A.Balance > 1000;
```

End result become :

Owner	Balance
W. Wei	**2000.00**
W. Wei	**2000.00**
H. Martin	10,000.00

Thanks!

Do you have any questions?