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## ***INTEGRITY RULES***

Relational database integrity rules are very important to good database design. Many (but by no means all) RDBMS enforce integrity rules automatically. Those rules are:

### **1- ENTITY INTEGRITY**

All primary key entries are unique, and no part of primary key may be null. Each row will have a unique identity, and foreign key values can properly reference primary key values, for example... No invoice can have a duplicate number, nor can it be null. In short, all invoices are uniquely identified by their invoice number.

### **2- REFERENTIAL INTEGRITY**

A foreign key may have either a null entry, as long as it is not a part of its table's primary key, or an entry that matches the primary key value in a table to which it is related.(every non –null foreign key value must reference an existing primary key value).It is possible for an attribute not to have corresponding value, but it will be impossible to have an invalid entry. for example, A Customer might not yet have an assigned sales representative(number),but it will be impossible to have an invalid sales representative(number).as in figure below:

<b>Table name: CUSTOMER</b>					
<b>Primary key: CUS_CODE</b>					
<b>Foreign key: AGENT_CODE</b>					
<b>CUS_CODE</b>	<b>CUS_LNAME</b>	<b>CUS_FNAME</b>	<b>CUS_INITIAL</b>	<b>CUS_RENEW_DATE</b>	<b>AGENT_CODE</b>
10010	Ramas	Alfred	A	05-Apr-2012	502
10011	Dunne	Leona	K	16-Jun-2012	501
10012	Smith	Kathy	W	29-Jan-2013	502
10013	Olowski	Paul	F	14-Oct-2012	
10014	Orlando	Myron		28-Dec-2012	501
10015	O'Brian	Amy	B	22-Sep-2012	503
10016	Brown	James	G	25-Mar-2013	502
10017	Williams	George		17-Jul-2012	503
10018	Farriss	Anne	G	03-Dec-2012	501
10019	Smith	Olette	K	14-Mar-2013	503

<b>Table name: AGENT (only five selected fields are shown)</b>				
<b>Primary key: AGENT_CODE</b>				
<b>Foreign key: none</b>				
<b>AGENT_CODE</b>	<b>AGENT_AREACODE</b>	<b>AGENT_PHONE</b>	<b>AGENT_LNAME</b>	<b>AGENT_YTD_SLS</b>
501	713	228-1249	Alby	132735.75
502	615	882-1244	Hahn	138967.35
503	615	123-5589	Okon	127093.45

To avoid nulls, some designers use special codes, known as flags, to indicate the absence of some value.

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AGENT_CODE	AGENT_AREACODE	AGENT_PHONE	AGENT_LNAME	AGENT_YTD_SALES
-99	000	000-0000	None	\$0.00

Other integrity rules that can be enforced in the relational model are the NOT NULL and UNIQUE constraints. The NOT NULL constrain can be placed on a column to ensure that every row in the table has a value for that column the UNIQUE constraint is a restriction placed on a column to ensure that no duplicate values exist for that column.

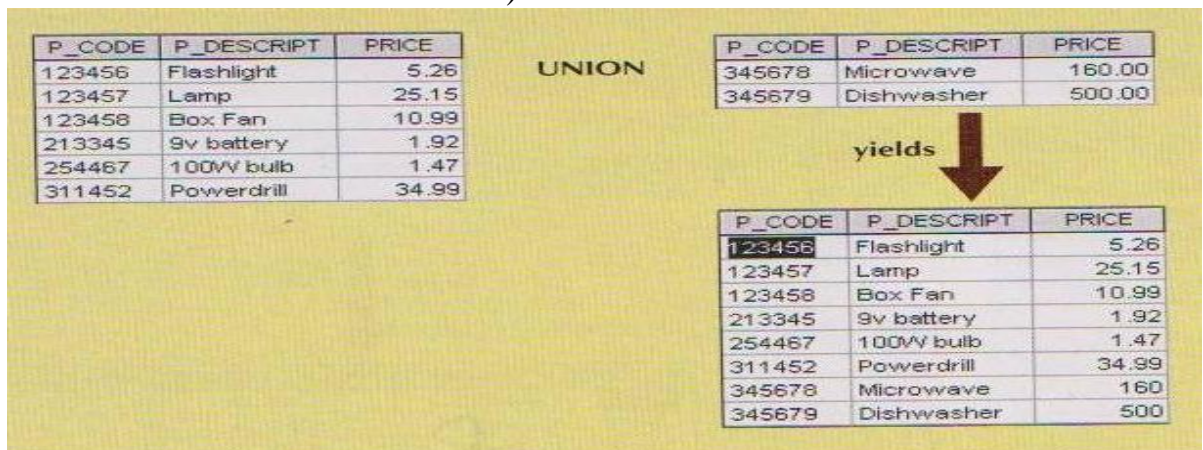
### Relational set operators

The data in relational tables are of limited value unless can be manipulated to generate useful information. This section describes the basic data manipulation capabilities of the relational model. **Relational algebra** defines the theoretical way of manipulating table contents using the following operators:

#### 1. UNION

Combines all rows from tow tables, excluding duplicate rows.

The tables must have the same attribute characteristics (the columns and domains must be identical) to be used in UNION.



#### 2. INTERSECT

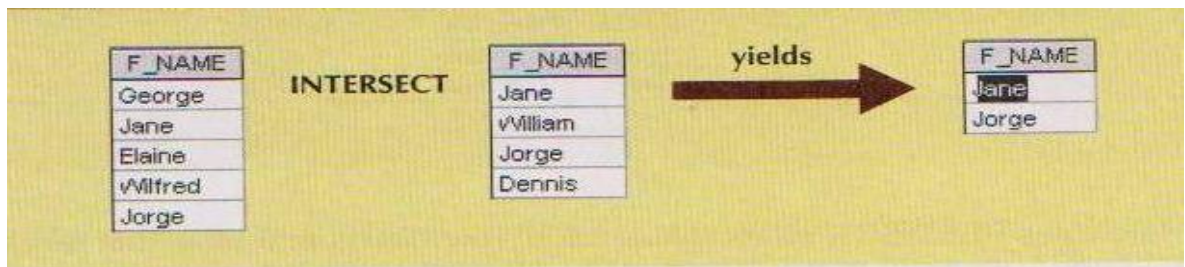
Yields only the rows that appear in both tables. Was

True in the case of UNION, the tables must be union-compatible to yield valid results.



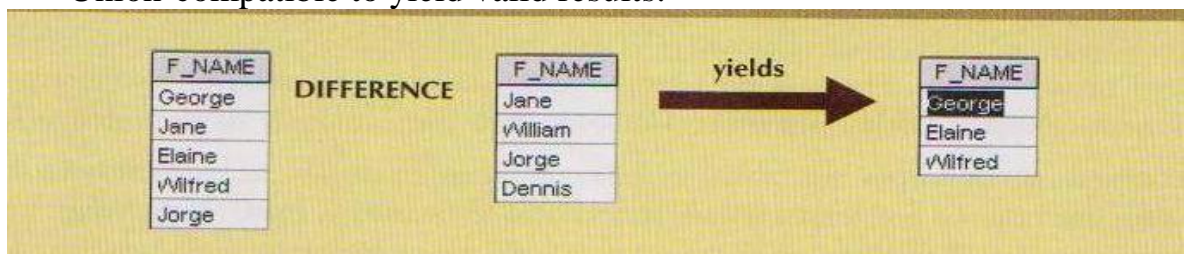
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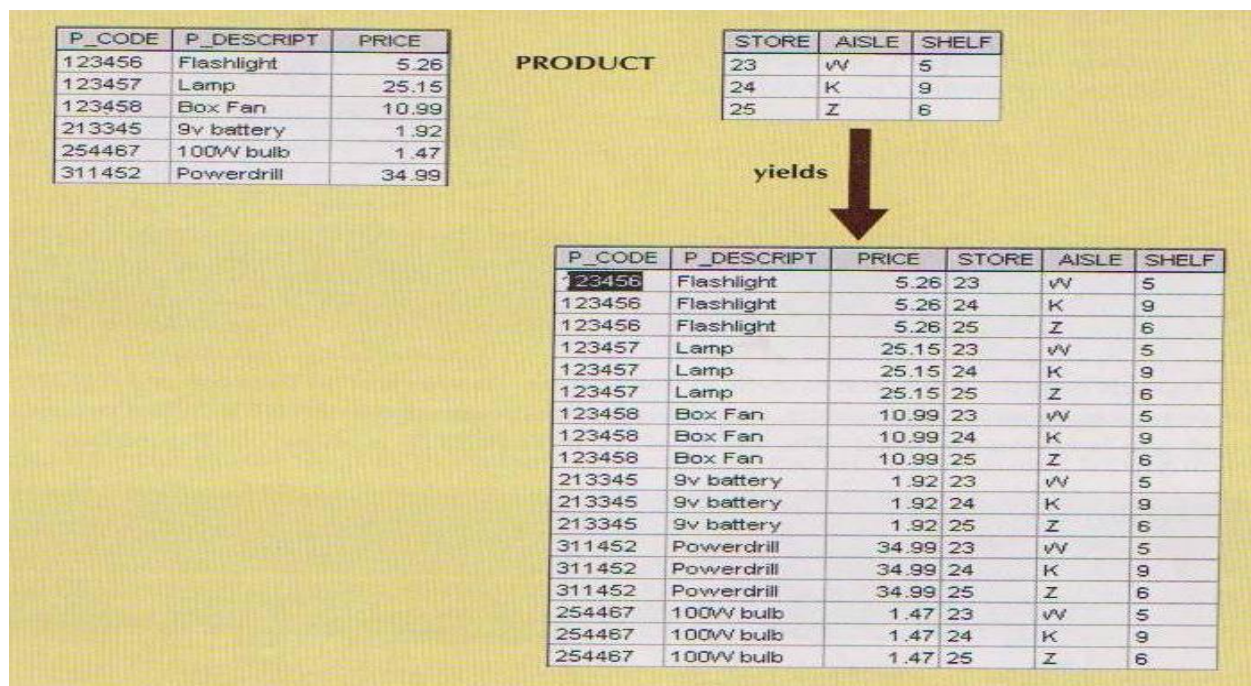
### 3. DIFFERENCE

Yields all rows in one table that are not found in the other Table; that is subtracts one table from the other, the tables must be Union-compatible to yield valid results.



### 4. PRODUCT

Yields all possible pairs of rows from two tables also known as the Cartesian product.

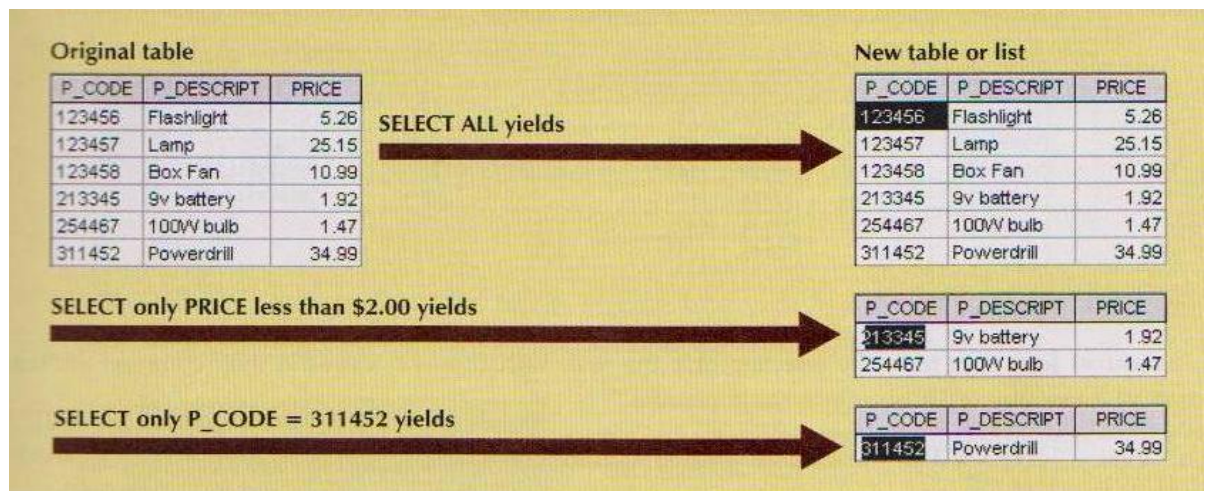




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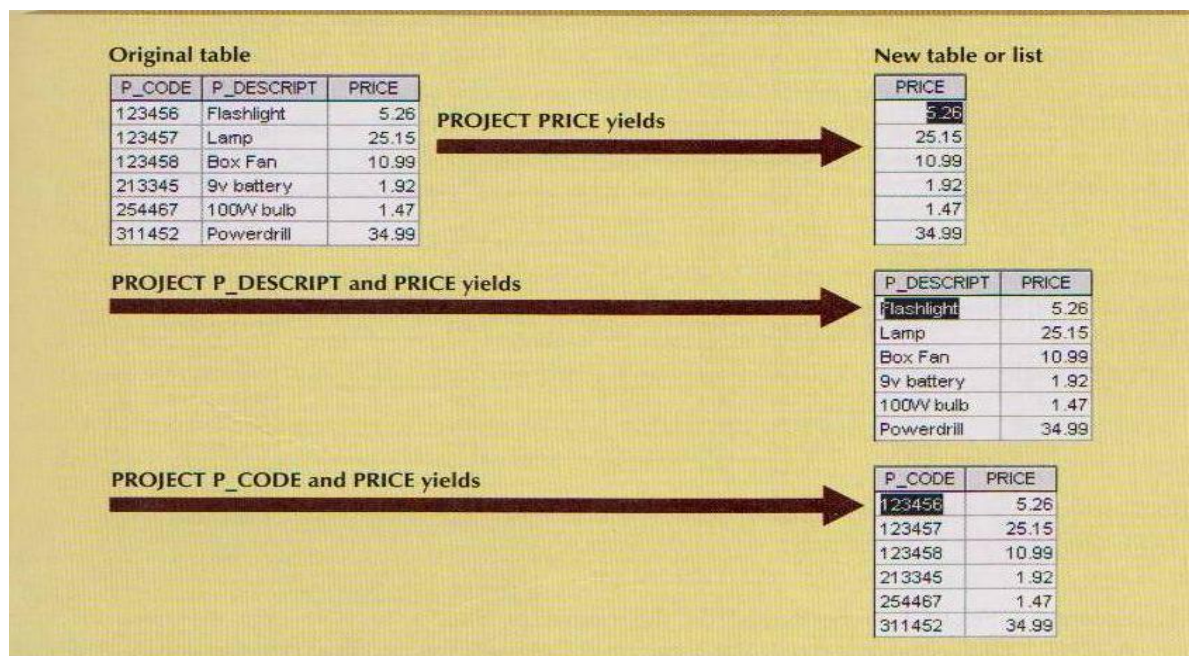
**5. SELECT**

Also known RESTRICT, yields values for all rows found in a table that satisfy a given condition.



**6. PROJECT**

Yields all values for selected attributes. In other words, PROJECT yields a vertical subset of a table.



**7. JOIN**

Allows information to be combined from two or more tables, there are several type of JOIN:



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- **natural join** links tables by selecting only the rows with common values in their common attributes .It is the result of a three- stage process:

a- PRODUCT

Table name: CUSTOMER

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE
1132445	vWalker	32145	231
1217782	Adares	32145	125
1312243	Rakowski	34129	167
1321242	Rodriguez	37134	125
1542311	Smithson	37134	421
1657399	Vanloo	32145	231

Table name: AGENT

AGENT_CODE	AGENT_PHONE
125	6152439887
167	6153426778
231	6152431124
333	9041234445

CUS_CODE	CUS_LNAME	CUS_ZIP	CUSTOMER.AGENT_CODE	AGENT.AGENT_CODE	AGENT_PHONE
1132445	vWalker	32145	231	125	6152439887
1132445	vWalker	32145	231	167	6153426778
1132445	vWalker	32145	231	231	6152431124
1132445	vWalker	32145	231	333	9041234445
1217782	Adares	32145	125	125	6152439887
1217782	Adares	32145	125	167	6153426778
1217782	Adares	32145	125	231	6152431124
1217782	Adares	32145	125	333	9041234445
1312243	Rakowski	34129	167	125	6152439887
1312243	Rakowski	34129	167	167	6153426778
1312243	Rakowski	34129	167	231	6152431124
1312243	Rakowski	34129	167	333	9041234445
1321242	Rodriguez	37134	125	125	6152439887
1321242	Rodriguez	37134	125	167	6153426778
1321242	Rodriguez	37134	125	231	6152431124
1321242	Rodriguez	37134	125	333	9041234445
1542311	Smithson	37134	421	125	6152439887
1542311	Smithson	37134	421	167	6153426778
1542311	Smithson	37134	421	231	6152431124
1542311	Smithson	37134	421	333	9041234445
1657399	Vanloo	32145	231	125	6152439887
1657399	Vanloo	32145	231	167	6153426778
1657399	Vanloo	32145	231	231	6152431124
1657399	Vanloo	32145	231	333	9041234445

b. SELECT on output of step a

CUS_CODE	CUS_LNAME	CUS_ZIP	CUSTOMER.AGENT_CODE	AGENT.AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	125	6152439887
1321242	Rodriguez	37134	125	125	6152439887
1312243	Rakowski	34129	167	167	6153426778
1132445	vWalker	32145	231	231	6152431124
1657399	Vanloo	32145	231	231	6152431124

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- c. A PROJECT on the result of step b yield a single copy of each attribute, thereby eliminating duplicate columns.

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124

**-equi join**

Links tables on the basis of an equality condition that compares specified columns of each table. the outcome of the equi join does not eliminate duplicate columns, and the condition or criterion use to join the tables must be explicitly defined.

**-outer join**

**a- left outer join**

yields all of the rows in the CUSTOMER table, including those that do not have a matching value in the AGENT table.

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124
1542311	Smithson	37134	421	

**b- right outer join**

yields all of the rows in the AGENT table, including those that do not have a matching value in the CUSTOMER table .

CUS_CODE	CUS_LNAME	CUS_ZIP	AGENT_CODE	AGENT_PHONE
1217782	Adares	32145	125	6152439887
1321242	Rodriguez	37134	125	6152439887
1312243	Rakowski	34129	167	6153426778
1132445	Walker	32145	231	6152431124
1657399	Vanloo	32145	231	6152431124
			333	9041234445

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8. DIVID

Table 1 is divided by table 2 to produce table 3. Table 1 and 2 both contain CODE but do not share LOC.

To be included in the table 3, a value in the unshared column (LOC) must be associated (in the dividing table 2) with every value in the table 1.

The only value associated with both A and B is 5.

