

# Codd's Rules

## Codd's Rules #1

Information rule: All information in the relational database is represented in exactly one and only one way – by values/stored data in cells of tables.

Example from project:

```
CREATE TABLE SPECIALIST (  
    SPECIALIST_REFERENCE_NUMBER INT(11) NOT NULL,  
    SPECIALIST_NAME CHAR(50) NOT NULL,  
    PRACTICE_LOCATION CHAR(50) NOT NULL,  
    PRIMARY KEY (SPECIALIST_REFERENCE_NUMBER));
```

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 SPECIALIST_REFERENCE_NUMBER	int(11)			No	None			Change  Drop  More
<input type="checkbox"/>	2 SPECIALIST_NAME	char(50)	utf8mb4_general_ci		No	None			Change  Drop  More
<input type="checkbox"/>	3 PRACTICE_LOCATION	char(50)	utf8mb4_general_ci		No	None			Change  Drop  More

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 SPECIALIST_REFERENCE_NUMBER	int(11)			No	None			Change  Drop  More
<input type="checkbox"/>	2 SPECIALIST_NAME	char(50)	utf8mb4_general_ci		No	None			Change  Drop  More
<input type="checkbox"/>	3 PRACTICE_LOCATION	char(50)	utf8mb4_general_ci		No	None			Change  Drop  More

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 SPECIALIST_REFERENCE_NUMBER	int(11)			No	None			Change  Drop  More
<input type="checkbox"/>	2 SPECIALIST_NAME	char(50)	utf8mb4_general_ci		No	None			Change  Drop  More
<input type="checkbox"/>	3 PRACTICE_LOCATION	char(50)	utf8mb4_general_ci		No	None			Change  Drop  More

## Codd's Rule #2

Guaranteed Access Rule: Each and every value is guaranteed to be logically accessible by resorting to a combination of table name, primary key value, and column name.

Example from project:

```
SELECT DESCRIPTION from appointment where APPOINTMENT_REFERENCE_NUMBER=5;
```

DESCRIPTION
Broken tooth requires crown

## Codd's Rule #3

Systematic Treatment of NULL values: NULL values are supported in the fully relational DBMS for representing missing information in a systematic way, independent of data type. We must be able to use NULL values irrespective of data type. NULL values are distinct from empty character strings or zeros.

Example from project:

```
SELECT PATIENT_REFERENCE_NUMBER, PATIENT_NAME, EMAIL, LAST_VISIT_DATE FROM PATIENT WHERE  
LAST_VISIT_DATE IS NULL;
```

PATIENT_REFERENCE_NUMBER	PATIENT_NAME	EMAIL	LAST_VISIT_DATE
7	John Lyons	LYONSJ@GMAIL.COM	NULL

## Codd's Rule #4

Dynamic Online Catalog Based on the Relational Model: The database description is represented at the logical level in the same way as ordinary data, authorized users can apply the same relational language to its interrogation as they apply to regular data. The catalog must be governed by the same rules as the rest of the database. The same query language should be used on the catalog as used to query the database.

Example from project:

**SELECT \* FROM INFORMATION\_SCHEMA.TABLES;**

Showing rows 0 - 24 (215 total. Query took 0.1118 seconds.)

SELECT \* FROM INFORMATION\_SCHEMA.TABLES;

Profiling [ Edit view ] [ Edit ] [ Explain SQL ] [ Create PHP code ] [ Refresh ]

1 > >> Show all Number of rows: 25 Filter rows: Search this table

Options

TABLE_CATALOG	TABLE_SCHEMA	TABLE_NAME	TABLE_TYPE	ENGINE	VERSION	ROW_FORMAT	TABLE_ROWS	AVG_ROW_LENGTH	DATA_LENGTH	MAX_DATA_LENGTH	INDEX_LENGTH	DATA_FREE	AUTO_INCREMENT	CREATE_TIME	UPDATE_TIME	CHECK_TIME	TABLE_COLLATION	CHECKSUM	CREATE
def	information_schema	ALL_PLUGINS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	APPLICABLE_ROLES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	975	0	16691950	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	CHARACTER_SETS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	384	0	16434816	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	CHECK_CONSTRAINTS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	COLLATIONS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	231	0	16754765	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	COLLATION_CHARACTER_SET_APPLICABILITY	SYSTEM VIEW	MEMORY	11	Fixed	NULL	195	0	16357770	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	COLUMNS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	COLUMN_PRIVILEGES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	2893	0	16759149	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	ENABLED_ROLES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	387	0	16563213	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	ENGINES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	737	0	16663145	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	EVENTS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	FILES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	4022	0	16767718	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	GLOBAL_STATUS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	6340	0	16762960	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	GLOBAL_VARIABLES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	6340	0	16762960	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	KEYWORDS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	194	0	16273884	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	KEY_CACHES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	659	0	16665294	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	KEY_COLUMN_USAGE	SYSTEM VIEW	MEMORY	11	Fixed	NULL	4637	0	16762755	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	OPTIMIZER_TRACE	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	PARAMETERS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	PARTITIONS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	PLUGINS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	PROCESSLIST	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row
def	information_schema	PROFILING	SYSTEM VIEW	MEMORY	11	Fixed	NULL	308	0	16562884	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	REFERENTIAL_CONSTRAINTS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	4814	0	16767162	0	0	NULL	2022-04-24 19:17:39	NULL	NULL	utf8_general_ci	NULL	max_row
def	information_schema	ROUTINES	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	NULL	2022-04-24 19:17:39	2022-04-24 19:17:39	NULL	utf8_general_ci	NULL	max_row

## Codd's Rule #5

**Comprehensive Data Sublanguage Rule:** A relational system must support at least one relational language that has a linear syntax, can be used interactively and within application programs, supports data definition operations, data manipulation operations, security and integrity constraints, and transaction management operations.

Example from project:

```
UPDATE PATIENT SET EMAIL = 'AARONTALTY@LIVE.COM' WHERE PATIENT_NAME = 'AARON TALTY';
```

PATIENT_NAME	PHONE	OUTSTANDING_BALANCE	ADDRESS	LAST_VISIT_DATE	DOB	EMAIL
Aaron Talty	0851234567	0.00	46 College Green Clonroadmore Ennis Co.Clare	17-NOV-2021	06-JULY-92	AARONTALTY@LIVE.COM

## Codd's Rule #6

**View Updating Rule:** Views are the virtual tables created by using queries to show the partial view of the table. These partial table views contain few rows and columns, and are also able to be updated.

Example from project:

```
CREATE VIEW PublicPatientInfo AS SELECT PATIENT_NAME, PHONE, ADDRESS, EMAIL FROM PATIENT WHERE  
OUTSTANDING_BALANCE > 150.00;
```



	PATIENT_NAME	PHONE	ADDRESS	EMAIL
<input type="checkbox"/> Edit Copy Delete	David Normoyle	0861234567	21 Fergus Manor Ennis Co.Clare	DNORMOYLE@GMAIL.COM
<input type="checkbox"/> Edit Copy Delete	Winston McCall	0857654321	145 Cloon and Commons Castleconnell Co.Limerick	WMCCALL@GMAIL.COM
<input type="checkbox"/> Edit Copy Delete	LJ O Rahilly	0872345678	Carrig Rua Upper Rochestown Co.Cork	LJORAHILLY@GMAIL.COM
<input type="checkbox"/> Edit Copy Delete	Yan Xiaonan	0882345678	06 Cluain Cregg Carrick-on-Suir Co.Tipperary	XIAONANYAN@GMAIL.COM

```
CREATE OR REPLACE VIEW publicpatientinfo AS SELECT PATIENT_NAME, ADDRESS, PATIENT_REFERENCE_NUMBER  
FROM PATIENT WHERE OUTSTANDING_BALANCE > 150.00;
```

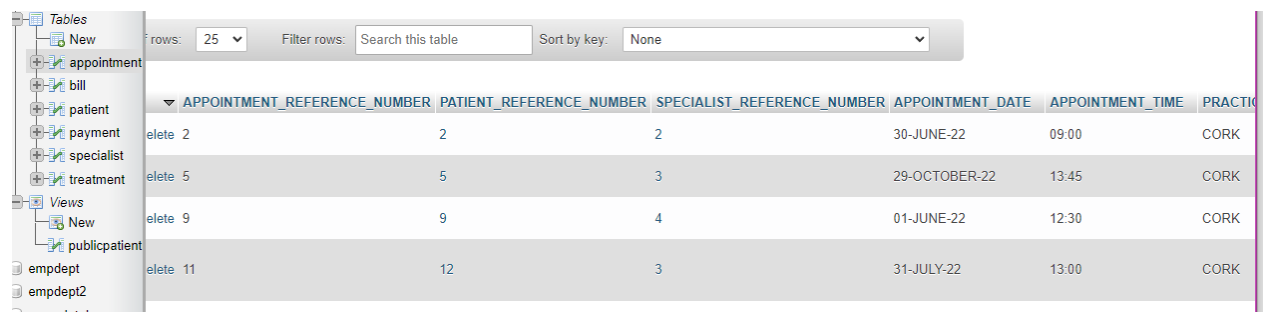
	PATIENT_NAME	ADDRESS	PATIENT_REFERENCE_NUMBER
<input type="checkbox"/> Edit Copy Delete	David Normoyle	21 Fergus Manor Ennis Co.Clare	2
<input type="checkbox"/> Edit Copy Delete	Winston McCall	145 Cloon and Commons Castleconnell Co.Limerick	6
<input type="checkbox"/> Edit Copy Delete	LJ O Rahilly	Carrig Rua Upper Rochestown Co.Cork	13
<input type="checkbox"/> Edit Copy Delete	Yan Xiaonan	06 Cluain Cregg Carrick-on-Suir Co.Tipperary	14

## Codd's Rule #7

High level INSERT, UPDATE, and DELETE: There must be INSERT, DELETE, UPDATE, operations at each level of relations.

Example from project:

**DELETE FROM** APPOINTMENT **WHERE** SPECIALIST\_REFERENCE\_NUMBER=1;



	APPOINTMENT_REFERENCE_NUMBER	PATIENT_REFERENCE_NUMBER	SPECIALIST_REFERENCE_NUMBER	APPOINTMENT_DATE	APPOINTMENT_TIME	PRACTICE
delete 2	2	2	2	30-JUNE-22	09:00	CORK
delete 5	5	5	3	29-OCTOBER-22	13:45	CORK
delete 9	9	9	4	01-JUNE-22	12:30	CORK
delete 11	11	12	3	31-JULY-22	13:00	CORK

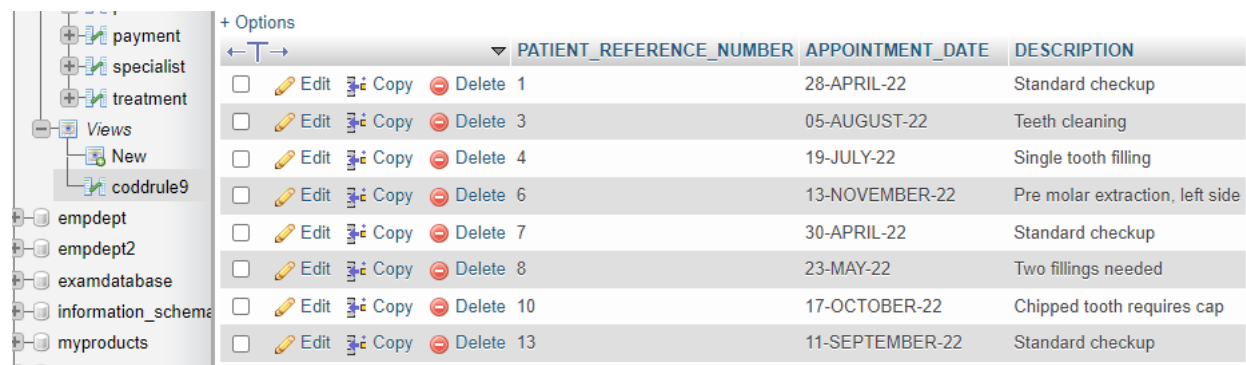
## Codd's Rule #8 not required

## Codd's Rule #9

Logical Data Independence: The ability to change the conceptual schema without having to change the next higher level external schema. Insulation of application programs and terminal users from the negative effects of information-preserving changes of the logical database schema.

Example from project:

**CREATE VIEW** CoddRule9 **AS SELECT** PATIENT\_REFERENCE\_NUMBER, APPOINTMENT\_DATE, DESCRIPTION **FROM** APPOINTMENT **WHERE** SPECIALIST\_REFERENCE\_NUMBER=1;



	PATIENT_REFERENCE_NUMBER	APPOINTMENT_DATE	DESCRIPTION
<input type="checkbox"/> Edit Copy Delete	1	28-APRIL-22	Standard checkup
<input type="checkbox"/> Edit Copy Delete	3	05-AUGUST-22	Teeth cleaning
<input type="checkbox"/> Edit Copy Delete	4	19-JULY-22	Single tooth filling
<input type="checkbox"/> Edit Copy Delete	6	13-NOVEMBER-22	Pre molar extraction, left side
<input type="checkbox"/> Edit Copy Delete	7	30-APRIL-22	Standard checkup
<input type="checkbox"/> Edit Copy Delete	8	23-MAY-22	Two fillings needed
<input type="checkbox"/> Edit Copy Delete	10	17-OCTOBER-22	Chipped tooth requires cap
<input type="checkbox"/> Edit Copy Delete	13	11-SEPTEMBER-22	Standard checkup

**ALTER TABLE** APPOINTMENT ADD CoddNULL **VARCHAR**(40);

DESCRIPTION	CoddNULL
Standard checkup	NULL
Route canal operation	NULL
Teeth cleaning	NULL
Single tooth filling	NULL
Broken tooth requires crown	NULL
Pre molar extraction, left side	NULL
Standard checkup	NULL
Two fillings needed	NULL
Specialist consultation	NULL
Chipped tooth requires cap	NULL
Wisdom teeth extraction, left top and bottom	NULL
Standard checkup	NULL

payment

specialist

treatment

Views

New

coddrule9

empdept

empdept2

examdatabase

information\_schema

myproducts

mysql

performance\_schema

phpmyadmin

test

+ Options

← →

▼ PATIENT\_REFERENCE\_NUMBER APPOINTMENT\_DATE DESCRIPTION

<input type="checkbox"/>				1	28-APRIL-22	Standard checkup
<input type="checkbox"/>				3	05-AUGUST-22	Teeth cleaning
<input type="checkbox"/>				4	19-JULY-22	Single tooth filling
<input type="checkbox"/>				6	13-NOVEMBER-22	Pre molar extraction, left side
<input type="checkbox"/>				7	30-APRIL-22	Standard checkup
<input type="checkbox"/>				8	23-MAY-22	Two fillings needed
<input type="checkbox"/>				10	17-OCTOBER-22	Chipped tooth requires cap
<input type="checkbox"/>				13	11-SEPTEMBER-22	Standard checkup

↑

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Number of rows: 25 ▼

Filter rows:

Search this table

Query results operations

Print

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Export

Display chart

Create view

Bookmark this SQL query

Label:

☐ Let every user access this bookmark

Bookmark this SQL query

Console

Bookmarks Options History Close

```

> SELECT * FROM `appointment`

> CREATE VIEW CoddRule9 AS SELECT PATIENT_REFERENCE_NUMBER, APPOINTMENT_DATE, DESCRIPTION FROM APPOINTMENT WHERE SPECIALIST_REFERENCE_NUMBER=1;

> SELECT * FROM `coddrule9`

> SELECT * FROM `appointment`

```

The new row was added and the integrity of the table and the view remain intact.

## Codd's Rule #10

Integrity Independence: The database should be able to enforce its own integrity rather than using other programs. No records can have NULL in their PRIMARY KEY attribute.

Example from project:

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 BILL_REFERENCE_NUMBER	int(11)			No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	2 TOTAL_COST	float(8,2)			No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	3 PAYDATE	varchar(25)	utf8mb4_general_ci		Yes	NULL			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>
<input type="checkbox"/>	4 PAYKEY	varchar(25)	utf8mb4_general_ci		No	None			<a href="#">Change</a> <a href="#">Drop</a> <a href="#">More</a>

ALTER TABLE PAYMENT MODIFY COLUMN BILL\_REFERENCE\_NUMBER FLOAT(8,3);

+ Options

←

→

↺

↻

Copy

Delete

	BILL_REFERENCE_NUMBER	TOTAL_COST	PAYDATE	PAYKEY	AMOUNT_PAID
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 1	62.00	17-NOVEMBER-21	P000001	62.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 2	602.00	16-JANUARY-22	P000002	300.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 3	512.00	19-AUGUST-22	P000003	500.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 4	92.00	30-SEPTEMBER-21	P000004	92.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 5	122.00	11-MARCH-22	P000005	122.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 6	1512.00	19-MARCH-22	P000006	500.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 7	212.00	23-DECEMBER-22	P000007	212.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 8	62.00	28-APRIL-22	P000008	62.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 9	172.00	30-APRIL-22	P000009	172.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 10	162.00	01-MAY-22	P000010	162.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 13	362.00	15-JUNE-22	P000013	162.000
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> 14	562.00	19-AUGUST-22	P000014	362.000

☐ Check all   With selected: [Edit](#) [Copy](#) [Delete](#) [Export](#)

☐ Show all   Number of rows: 25   Filter rows:  Search this table   Sort by key: None

Query results operations

[Print](#) [Copy to clipboard](#) [Export](#) [Display chart](#) [Create view](#)

Bookmark this SQL query

Label:  ☐ Let every user access this bookmark

Bookmark this SQL query

Error

SQL query: [Copy](#)

MODIFY COLUMN BILL\_REFERENCE\_NUMBER FLOAT(8,3);

MySQL said: [Help](#)

#1832 - Cannot change column 'BILL\_REFERENCE\_NUMBER': used in a foreign key constraint 'payment\_ibfk\_1'

Console

=ALTER TABLE PAYMENT ALTER COLUMN AMOUNT\_PAID FLOAT(8,3);  
>ALTER TABLE PAYMENT MODIFY COLUMN AMOUNT\_PAID FLOAT(8,3);  
>SELECT \* FROM `payment`  
=ALTER TABLE PAYMENT MODIFY COLUMN BILL\_REFERENCE\_NUMBER FLOAT(8,3);

### Codd's Rule #11

Distribution Independence: A database should work properly regardless of its distribution across a network. Even if a database is geographically distributed, with data stored in pieces, the end user should get an impression that it is stored at the same place. The data manipulation sub-language of a relational DBMS must enable application programs and terminal activities to remain logically unimpaired.

### Codd's Rule #12

Non-Subversion Rule: If a low level access is given to a system it should not be able to subvert or bypass integrity rules to change the data. The system must not have features that allow this bypassing of the security.