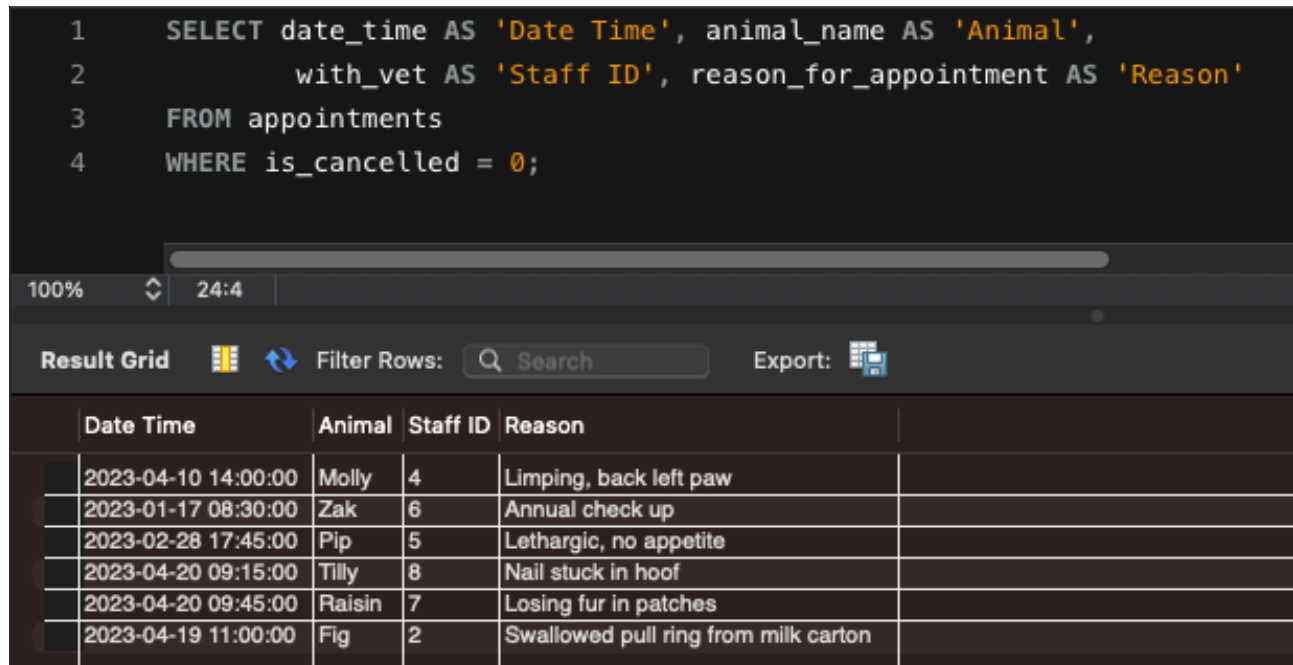


Rule 1 - Information Rule

Everything in a database must be stored in a table format. My database shows information in a table form. Example:

```
SELECT date_time AS 'Date Time', animal_name AS 'Animal',  
       with_vet AS 'Staff ID', reason_for_appointment AS 'Reason'  
FROM appointments  
WHERE is_cancelled = 0;
```



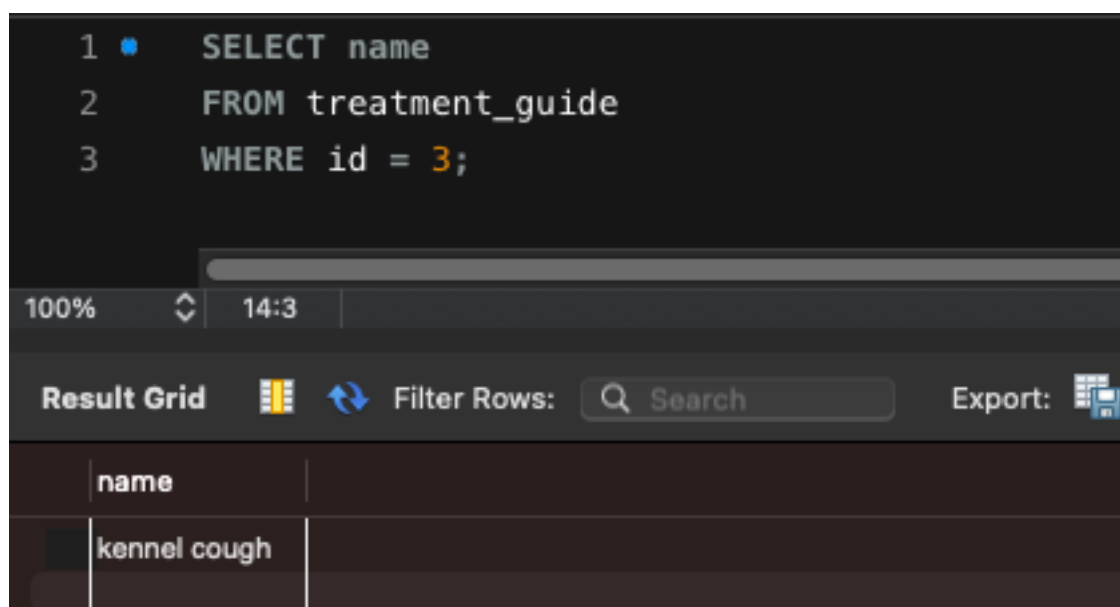
```
1 SELECT date_time AS 'Date Time', animal_name AS 'Animal',  
2       with_vet AS 'Staff ID', reason_for_appointment AS 'Reason'  
3 FROM appointments  
4 WHERE is_cancelled = 0;
```

	Date Time	Animal	Staff ID	Reason	
	2023-04-10 14:00:00	Molly	4	Limping, back left paw	
	2023-01-17 08:30:00	Zak	6	Annual check up	
	2023-02-28 17:45:00	Pip	5	Lethargic, no appetite	
	2023-04-20 09:15:00	Tilly	8	Nail stuck in hoof	
	2023-04-20 09:45:00	Raisin	7	Losing fur in patches	
	2023-04-19 11:00:00	Fig	2	Swallowed pull ring from milk carton	

Rule 2 - Guaranteed Access

Any piece of data can be accessed with the table name, primary key and column name. No other method can be used to access the data. Select column from table where pk = x. This can be explained in simpler terms by “each row needs a unique primary key”. Example:

```
SELECT name  
FROM treatment_guide  
WHERE id = 3;
```



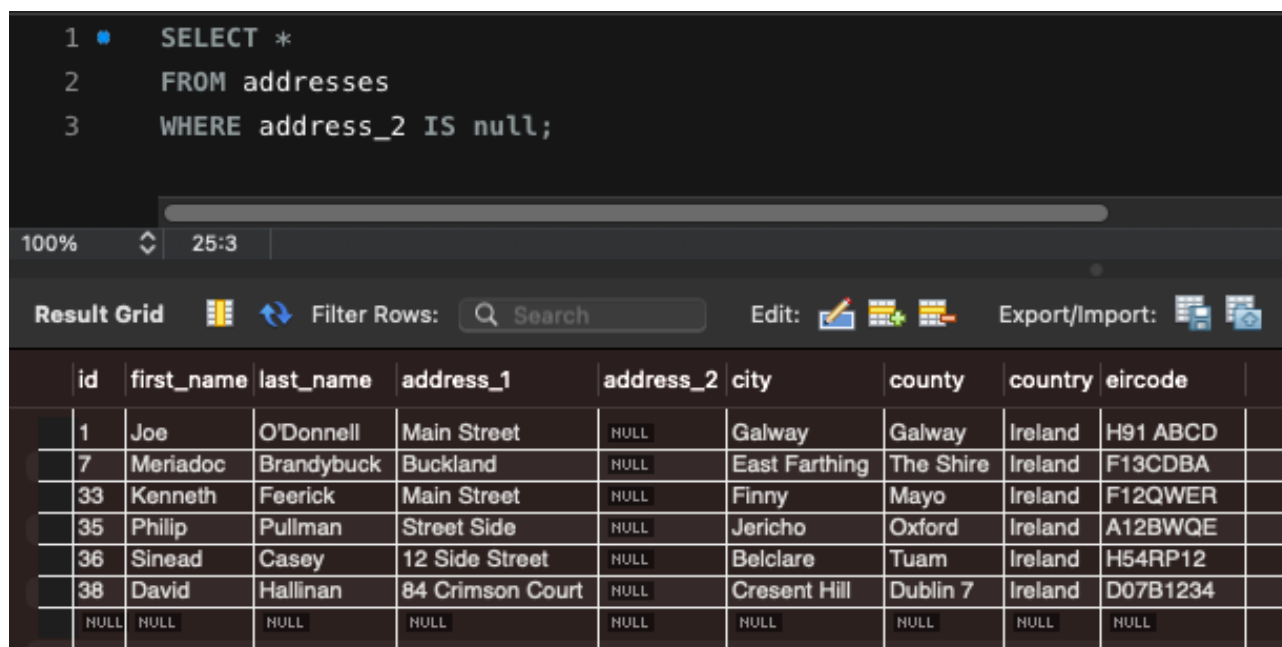
```
1 SELECT name  
2 FROM treatment_guide  
3 WHERE id = 3;
```

	name	
	kennel cough	

Rule 3 - Treatment of null values

Null values have specific use cases. They represent missing data; it is not the same as a zero, nothing or missing data. Example below shows on the address table that some parts of an address like line 2 are not always required or exist:

```
SELECT *  
FROM addresses  
WHERE address_2 IS null;
```

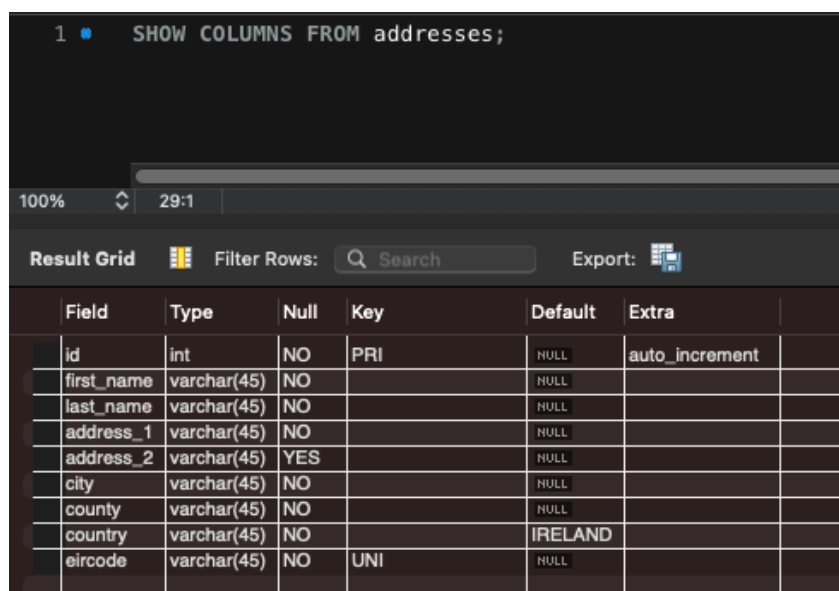


	id	first_name	last_name	address_1	address_2	city	county	country	eircode	
	1	Joe	O'Donnell	Main Street	NULL	Galway	Galway	Ireland	H91 ABCD	
	7	Meriadoc	Brandybuck	Buckland	NULL	East Farthing	The Shire	Ireland	F13CDBA	
	33	Kenneth	Feerick	Main Street	NULL	Finny	Mayo	Ireland	F12QWER	
	35	Philip	Pullman	Street Side	NULL	Jericho	Oxford	Ireland	A12BWQE	
	36	Sinead	Casey	12 Side Street	NULL	Belclare	Tuam	Ireland	H54RP12	
	38	David	Hallinan	84 Crimson Court	NULL	Crescent Hill	Dublin 7	Ireland	D07B1234	
	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	

Rule 4 - On-line catalog

This describes the database contents, it's data about the database. This is called meta data or the data dictionary. It is accessible by *describing* a table or looking at its Data Dictionary. Example:

```
DESC addresses;  
or  
SHOW COLUMNS FROM addresses
```



	Field	Type	Null	Key	Default	Extra	
	id	int	NO	PRI	NULL	auto_increment	
	first_name	varchar(45)	NO		NULL		
	last_name	varchar(45)	NO		NULL		
	address_1	varchar(45)	NO		NULL		
	address_2	varchar(45)	YES		NULL		
	city	varchar(45)	NO		NULL		
	county	varchar(45)	NO		NULL		
	country	varchar(45)	NO		IRELAND		
	eircode	varchar(45)	NO	UNI	NULL		

Rule 5 - Comprehensive data sublanguage

A database can only be accessed by a language that supports data definition (DDL) and data manipulation (DML). SQL is the language that matches this rule. Here are some examples showing DDL, DML and creating views in the database:

DDL - Data Definition language

Create table treatments

```
(id INT NOT NULL,  
animalID INT NOT NULL,  
appointmentID INT NOT NULL,  
description varchar(45));
```

DML - Data Manipulation Language

```
INSERT INTO `addresses` (`firstName`, `lastName`, `address_1`, `address_2`, `city`, `county`,  
`country`, `eircode`)  
VALUES ('Jane', 'Doe', 'Main Street', '', 'Charlestown', 'Sligo', 'Ireland', 'xxxx xxxx');
```

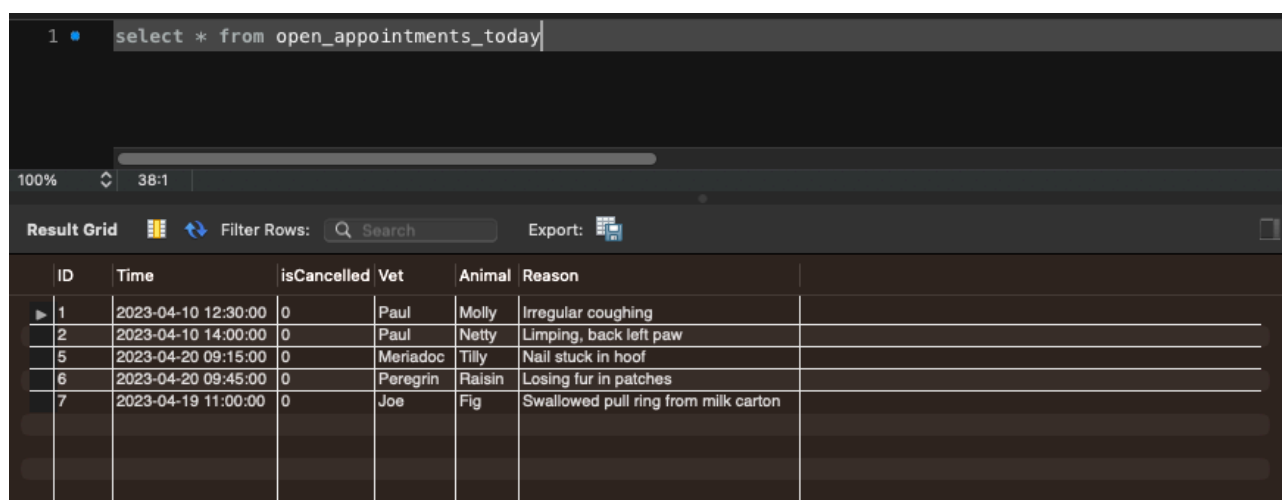
Create view

```
CREATE OR REPLACE VIEW today AS  
SELECT t1.id AS "ID", t1.dateTime AS "Time", t1.isCancelled, t2.firstName AS "Vet", t3.name AS  
"Animal", t1.reasonForAppointment AS "Reason"  
FROM appointments AS t1  
INNER JOIN staff AS t2 ON t1.withVet = t2.idstaff  
INNER JOIN animals AS t3 ON t1.animalID = t3.id  
WHERE t1.isCancelled = 0
```

Rule 6 - View updating

If you update the contents of a view, it will update the data in the table itself. Updating a view must update the source of that data in the corresponding table. Example:

open_appointments_today view before update



The screenshot shows a database client interface. At the top, a SQL query is entered: `select * from open_appointments_today`. Below the query, a progress bar indicates 100% completion. The results are displayed in a table grid with the following columns: ID, Time, isCancelled, Vet, Animal, Reason, and an empty column. The data rows are as follows:

ID	Time	isCancelled	Vet	Animal	Reason	
1	2023-04-10 12:30:00	0	Paul	Molly	Irregular coughing	
2	2023-04-10 14:00:00	0	Paul	Netty	Limping, back left paw	
5	2023-04-20 09:15:00	0	Meriadoc	Tilly	Nail stuck in hoof	
6	2023-04-20 09:45:00	0	Peregrin	Raisin	Losing fur in patches	
7	2023-04-19 11:00:00	0	Joe	Fig	Swallowed pull ring from milk carton	

```
1  UPDATE open_appointments_today  
2  SET   isCancelled = 1  
3  WHERE id = 1;
```

Update view to cancel appointment ID 1

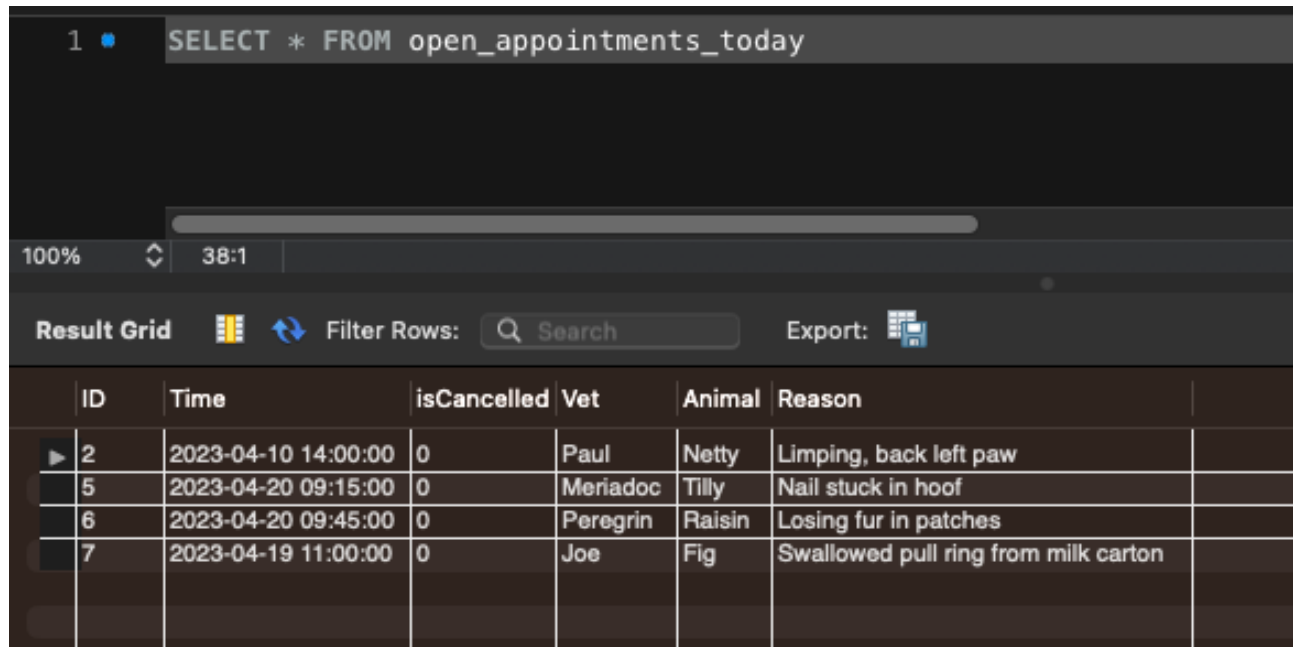
Query:

```
UPDATE open_appointments_today
```

```
SET isCancelled = 1
```

```
WHERE id = 1;
```

open_appointments_today view after update



	ID	Time	isCancelled	Vet	Animal	Reason	
▶	2	2023-04-10 14:00:00	0	Paul	Netty	Limping, back left paw	
	5	2023-04-20 09:15:00	0	Meriadoc	Tilly	Nail stuck in hoof	
	6	2023-04-20 09:45:00	0	Peregrin	Raisin	Losing fur in patches	
	7	2023-04-19 11:00:00	0	Joe	Fig	Swallowed pull ring from milk carton	

Rule 7 - High level Insert, Update, Delete

A database must be able to do high level Create, Update, Read, Delete data using SQL. It must be able to support joins, intersections and updating of table data. Example:

Create

```
INSERT INTO `addresses` (`firstName`, `lastName`, `address_1`, `address_2`, `city`, `county`, `country`, `eircode`)
```

```
VALUES ('Jane', 'Doe', 'Main Street', '', 'Charlestown', 'Sligo', 'Ireland', 'xxxx xxxx'),
```

```
('John', 'Eod', 'First Street', 'Long Road', 'Ballina', 'Mayo', 'Ireland', 'xxxx xxxx'),
```

```
('Imogen', 'Connor', 'Friars Walk', 'Scion Hill', 'Dunmore', 'Galway', 'Ireland', 'xxxx xxxx');
```

Update

```
UPDATE appointments
```

```
SET isCancelled = 1
```

```
WHERE id = 4;
```

Read

```
SELECT name, breed
```

```
FROM animals
```

Delete

```
DELETE FROM owners
```

```
Where addressID = 6;
```

Delete from address

where id = 6;

Rule 8 - Physical Data Independence

The user is unaware of physical storage details. The storage location of the database can be changed without it affecting the performance of the database. You can create, alter and delete indexes with it affecting the performance of the database. Example:

```
CREATE INDEX appt_id ON payments(appointment_id);  
SHOW INDEXES FROM payments;  
DROP INDEX appt_id ON payments;
```

Rule 9 - Logical Data independence

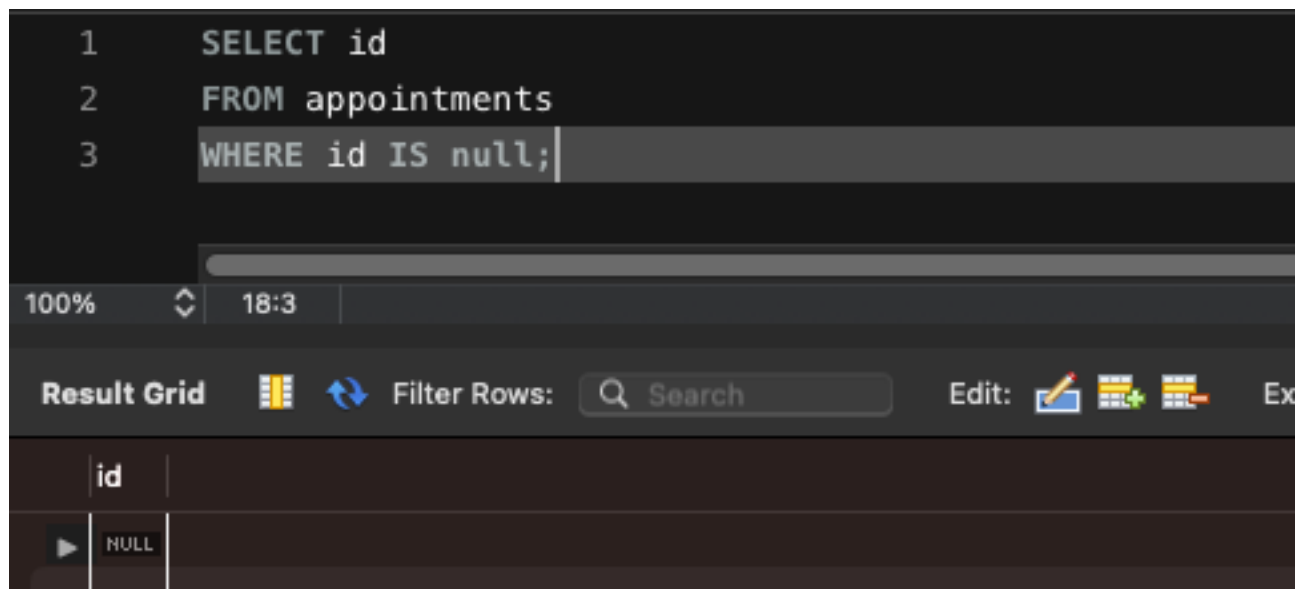
This is information preservation, changing one part of schema doesn't affect other parts. Eg. Deleting a row or column or splitting a single table into two won't be noticed or affect the overall performance of the database. Example:

```
Drop type  
From payments;  
CREATE TABLE treatment_guide;
```

Rule 10 - Integrity Independence

A Primary Key can't have null values. Every row in a table has a primary key and each Foreign Key relates to a Primary Key. Example, no results returned because every row has an ID:

```
SELECT id  
FROM appointments  
WHERE id IS null;
```



An example showing the joining of data using Primary and Foreign Keys:

```
SELECT t1.id, t1.fullName, t2.id, t2.name  
FROM owners t1  
INNER JOIN animals t2 ON t1.animalID = t2.id
```

Rule 11 - Distribution Independence

Data should appear to be stored on one computer even if it is stored on many. The contents of a database can be stored on a distributed storage system. For example, part of my database could be stored on a cloud server and another on a local storage device and is easily accessed by anyone. The difference in storage locations isn't known or noticed by the user.

Rule 12 - Non-subversion

A low level language shouldn't be able to get around constraints of the database. There should be no work around for the database or DBMS rules. It's also known as the no cheating rule.