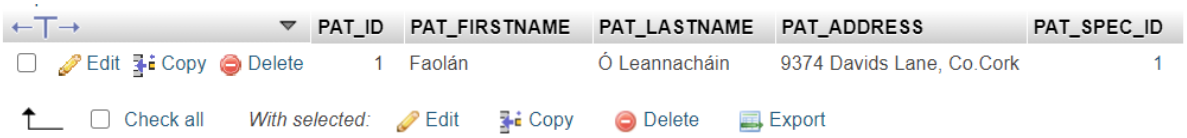
Codds' Rules

Rule 1: The Information Rule

– using primary key (pat_id), one row returned. This returns the first patient from the *patients* table**.**

Select * from patients where pat_id = 1;



	PAT_ID	PAT_FIRSTNAME	PAT_LASTNAME	PAT_ADDRESS	PAT_SPEC_ID
Edit Copy Delete	1	Faolán	Ó Leannacháin	9374 Davids Lane, Co.Cork	1

Check all With selected: Edit Copy Delete Export

Rule 2: The Guaranteed Access Rule:

Data from a *patients* table can be accessed to field level using primary key (pat_id) and column name (pat_firstname, pat_lastname).

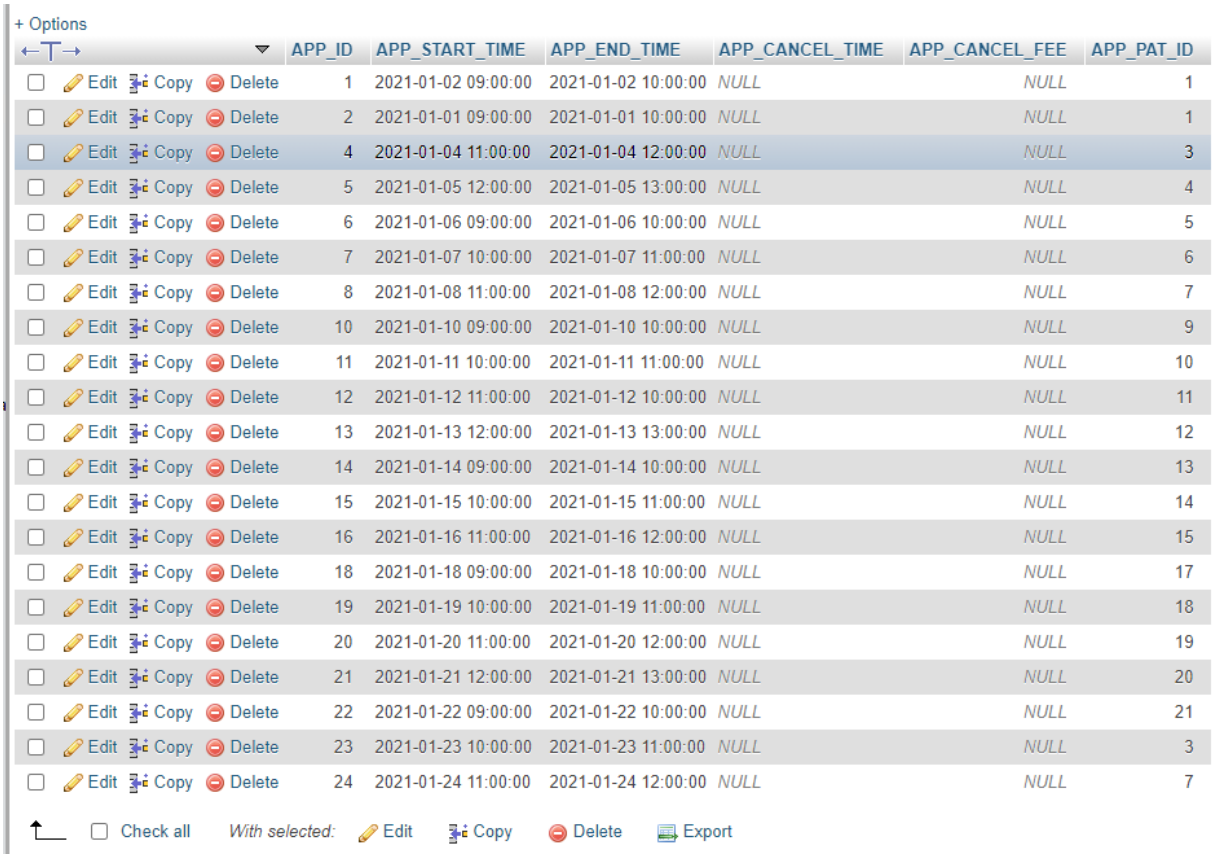
Select pat_firstname, pat_lastname from patients where pat_id = 21;

	pat_firstname	pat_lastname
Edit Copy Delete	Preston	Hopkins

Rule 3: Systematic Treatment of Null Values:

this query returns appointment data even if app_cancel_time value is null.

select * from appointments where app_cancel_time is null;



+ Options

	APP_ID	APP_START_TIME	APP_END_TIME	APP_CANCEL_TIME	APP_CANCEL_FEE	APP_PAT_ID
Edit Copy Delete	1	2021-01-02 09:00:00	2021-01-02 10:00:00	NULL	NULL	1
Edit Copy Delete	2	2021-01-01 09:00:00	2021-01-01 10:00:00	NULL	NULL	1
Edit Copy Delete	4	2021-01-04 11:00:00	2021-01-04 12:00:00	NULL	NULL	3
Edit Copy Delete	5	2021-01-05 12:00:00	2021-01-05 13:00:00	NULL	NULL	4
Edit Copy Delete	6	2021-01-06 09:00:00	2021-01-06 10:00:00	NULL	NULL	5
Edit Copy Delete	7	2021-01-07 10:00:00	2021-01-07 11:00:00	NULL	NULL	6
Edit Copy Delete	8	2021-01-08 11:00:00	2021-01-08 12:00:00	NULL	NULL	7
Edit Copy Delete	10	2021-01-10 09:00:00	2021-01-10 10:00:00	NULL	NULL	9
Edit Copy Delete	11	2021-01-11 10:00:00	2021-01-11 11:00:00	NULL	NULL	10
Edit Copy Delete	12	2021-01-12 11:00:00	2021-01-12 10:00:00	NULL	NULL	11
Edit Copy Delete	13	2021-01-13 12:00:00	2021-01-13 13:00:00	NULL	NULL	12
Edit Copy Delete	14	2021-01-14 09:00:00	2021-01-14 10:00:00	NULL	NULL	13
Edit Copy Delete	15	2021-01-15 10:00:00	2021-01-15 11:00:00	NULL	NULL	14
Edit Copy Delete	16	2021-01-16 11:00:00	2021-01-16 12:00:00	NULL	NULL	15
Edit Copy Delete	18	2021-01-18 09:00:00	2021-01-18 10:00:00	NULL	NULL	17
Edit Copy Delete	19	2021-01-19 10:00:00	2021-01-19 11:00:00	NULL	NULL	18
Edit Copy Delete	20	2021-01-20 11:00:00	2021-01-20 12:00:00	NULL	NULL	19
Edit Copy Delete	21	2021-01-21 12:00:00	2021-01-21 13:00:00	NULL	NULL	20
Edit Copy Delete	22	2021-01-22 09:00:00	2021-01-22 10:00:00	NULL	NULL	21
Edit Copy Delete	23	2021-01-23 10:00:00	2021-01-23 11:00:00	NULL	NULL	3
Edit Copy Delete	24	2021-01-24 11:00:00	2021-01-24 12:00:00	NULL	NULL	7

Check all With selected: Edit Copy Delete Export

Rule 4: Dynamic Online Catalog based on the relational model:

returns the information about the tables.

SELECT * FROM INFORMATION_SCHEMA.tables;

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	AU
def	information_schema	ALL_PLUGINS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	APPLICABLE_ROLES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	979	0	16691950	0	0	
def	information_schema	CHARACTER_SETS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	384	0	16434816	0	0	
def	information_schema	CHECK_CONSTRAINTS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	2311	0	16768616	0	0	
def	information_schema	COLLATIONS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	231	0	16704765	0	0	
def	information_schema	COLLATION_CHARACTER_SET_APPLICABILITY	SYSTEM VIEW	MEMORY	11	Fixed	NULL	195	0	16357770	0	0	
def	information_schema	COLUMNS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	COLUMN_PRIVILEGES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	2893	0	16759149	0	0	
def	information_schema	ENABLED_ROLES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	387	0	16563213	0	0	
def	information_schema	ENGINES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	731	0	16663145	0	0	
def	information_schema	EVENTS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	FILES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	4022	0	16767718	0	0	
def	information_schema	GLOBAL_STATUS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	6340	0	16762960	0	0	
def	information_schema	GLOBAL_VARIABLES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	6340	0	16762960	0	0	
def	information_schema	KEY_CACHES	SYSTEM VIEW	MEMORY	11	Fixed	NULL	659	0	16650294	0	0	
def	information_schema	KEY_COLUMN_USAGE	SYSTEM VIEW	MEMORY	11	Fixed	NULL	4637	0	16762755	0	0	
def	information_schema	OPTIMIZER_TRACE	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	PARAMETERS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	PARTITIONS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	PLUGINS	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	PROCESSLIST	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	PROFILING	SYSTEM VIEW	MEMORY	11	Fixed	NULL	308	0	16562084	0	0	
def	information_schema	REFERENTIAL_CONSTRAINTS	SYSTEM VIEW	MEMORY	11	Fixed	NULL	4814	0	16767162	0	0	
def	information_schema	ROUTINES	SYSTEM VIEW	Aria	11	Page	NULL	0	8192	4503599627288576	8192	0	
def	information_schema	SCHEMATA	SYSTEM VIEW	MEMORY	11	Fixed	NULL	3464	0	16738048	0	0	

Rule 5: The Comprehensive Data Sub Language Rule:

Example of DDL

```
CREATE TABLE `appointments` (
  `APP_ID` int(11) NOT NULL,
  `APP_START_TIME` datetime DEFAULT NULL,
  `APP_END_TIME` datetime DEFAULT NULL,
  `APP_CANCEL_TIME` datetime DEFAULT NULL,
  `APP_CANCEL_FEE` decimal(9,2) DEFAULT '10.00',
  `APP_PAT_ID` int(11) DEFAULT NULL,
  PRIMARY KEY (`APP_ID`),
  KEY `APP_PAT_ID_idx` (`APP_PAT_ID`)
);
```

Example of DML

Delete from appointments; (would run if there are no active constraints)

Rule 6: The View Updating Rule:

Data in the view is updated at table level. Creating a view to list all the customers where address contains Cork.

```
CREATE VIEW Cork_Patients AS
SELECT * FROM Patients
```

WHERE pat_address like '%Cork%';

Run → Select * from Cork_Patients;

PAT_ID	PAT_FIRSTNAME	PAT_LASTNAME	PAT_ADDRESS	PAT_SPEC_ID
1	Faolán	Ó Leannacháin	9374 Davids Lane, Co.Cork	1
18	Emelia	Jarvis	91893 Stroud Rd, Cork	1
19	Jonah	Calhoun	2995 Southend Avenue, Cork	1
20	Shelby	Porter	7163 Petworth Rd, Cork	1
21	Preston	Hopkins	2771 Netherpark Crescent,Cork	1

UPDATE Cork_Patients SET pat_address = 'Galway' where pat_address like '%Cork%'; commit;

The view now returns no rows and the data in patient table has been changed

PAT_ID	PAT_FIRSTNAME	PAT_LASTNAME	PAT_ADDRESS ▲ 1	PAT_SPEC_ID
20	Shelby	Porter	Galway	1
19	Jonah	Calhoun	Galway	1
18	Emelia	Jarvis	Galway	1
1	Faolán	Ó Leannacháin	Galway	1
21	Preston	Hopkins	Galway	1

Rule 7: High Level Insert Update and Delete Rule:

Example of bulk inserts:

insert into treatment values (1, 'Routine Examination/Check-up', 30);

insert into treatment values (2, 'Consultation (Exam, diagnosis and treatment plan)', 60);

insert into treatment values (3, 'Prescription', 30);

insert into treatment values (4, 'Composite filling', 200);

insert into treatment values (5, 'Scaling + polishing', 70);

insert into treatment values (6, 'PRSI Scaling + polishing', 15);

insert into treatment values (7, 'Scaling + sandblasting', 90);

insert into treatment values (8, 'PRSI Scaling + sandblasting', 40);

insert into treatment values (9, 'Teeth whitening', 300);

insert into treatment values (10, 'X-ray', 30);

insert into treatment values (11, 'Cancelation fee', 10);

Example of bulk update:

Data before update: select * from treatment;

TREAT_ID	TREAT_DESC	TREAT_PRICE
1	Routine Examination/Check-up	30.00
2	Consultation (Exam, diagnosis and treatment plan)	60.00
3	Prescription	30.00
4	Composite filling	200.00
5	Scaling + polishing	70.00
6	PRSI Scaling + polishing	15.00
7	Scaling + sandblasting	90.00
8	PRSI Scaling + sandblasting	40.00
9	Teeth whitening	300.00
10	X-ray	30.00
11	Cancelation fee	10.00

Data after bulk update: update treatment set treat_price = treat_price + 5; commit;

TREAT_ID	TREAT_DESC	TREAT_PRICE
1	Routine Examination/Check-up	35.00
2	Consultation (Exam, diagnosis and treatment plan)	65.00
3	Prescription	35.00
4	Composite filling	205.00
5	Scaling + polishing	75.00
6	PRSI Scaling + polishing	20.00
7	Scaling + sandblasting	95.00
8	PRSI Scaling + sandblasting	45.00
9	Teeth whitening	305.00
10	X-ray	35.00
11	Cancelation fee	15.00

Example of bulk delete: this would delete all the data from specialist table if there are no active constraints.

Delete from specialist;

Rule 9: Logical Data Independence:

select * from specialist; is returning the same data before and after patients table is created.

Select* from specialist;

SPEC_ID	SPEC_FIRSTNANE	SPEC_LASTNAME	SPEC_ADDRESS
1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
2	Michael	Murphy	Oak Street, Cork town, Co.Cork
3	Emma	Watson	Farm Street, Fermoy, Co.Cork

Create table patients;

```
CREATE TABLE `patients` (
 `PAT_ID` int(11) NOT NULL,
 `PAT_FIRSTNAME` varchar(45) NOT NULL,
 `PAT_LASTNAME` varchar(45) NOT NULL,
 `PAT_ADDRESS` varchar(90) NOT NULL,
 `PAT_SPEC_ID` int(11) NOT NULL,
 PRIMARY KEY (`PAT_ID`),
 KEY `PAT_SPEC_ID_idx` (`PAT_SPEC_ID`),
 CONSTRAINT `PAT_SPEC_ID` FOREIGN KEY (`PAT_SPEC_ID`) REFERENCES `specialist` (`SPEC_ID`)
);
```

Select * from specialist; - it returns exact same data.

SPEC_ID	SPEC_FIRSTNANE	SPEC_LASTNAME	SPEC_ADDRESS
1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
2	Michael	Murphy	Oak Street, Cork town, Co.Cork
3	Emma	Watson	Farm Street, Fermoy, Co.Cork

Rule 10: Integrity Independence:

Patient and specialist table is linked via foreign key constraint.

```
CREATE TABLE `patients` (
 `PAT_ID` int(11) NOT NULL,
 `PAT_FIRSTNAME` varchar(45) NOT NULL,
 `PAT_LASTNAME` varchar(45) NOT NULL,
 `PAT_ADDRESS` varchar(90) NOT NULL,
 `PAT_SPEC_ID` int(11) NOT NULL,
```

PRIMARY KEY (`PAT_ID`),

KEY `PAT_SPEC_ID_idx` (`PAT_SPEC_ID`),

CONSTRAINT `PAT_SPEC_ID` FOREIGN KEY (`PAT_SPEC_ID`) REFERENCES `specialist` (`SPEC_ID`)

);

Pat_spec_id in patients table is referencing spec_id in specialist table. We can join both tables on this column.

Select * from patients

Inner join specialist

On pat_spec_id = spec_id;

+ Options

PAT_ID	PAT_FIRSTNAME	PAT_LASTNAME	PAT_ADDRESS	PAT_SPEC_ID	SPEC_ID	SPEC_FIRSTNANE	SPEC_LASTNAME	SPEC_ADDRESS
1	Faolán	Ó Leannacháin	Galway	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
2	Madison	Petersen	4460 Harrogate Road, Naas Co.Kildare	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
3	Jorge	Guthrie	7547 Felix Lane SHORNE, Dublin1	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
4	Lia	Lang	2418 Lincoln Green Lane, Dublin 2	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
5	Hanna	Anderson	383 Ermin Street, Dublin 3	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
6	Arya	Cooley	855 Harrogate Road, Dublin 4	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
7	Annabell	Hammond	2976 Victoria Road, Dublin 5	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
8	Katie	Fletcher	1900 Park End St BROOK, Dublin 6	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
9	Kayla	Patrick	9079 Duckpit Lane UPPER POPPLETON Dublin 7	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
10	Cason	Beard	9688 Church Way BRADLEY GREEN, Dublin 8	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
11	Angelique	Crawford	6809 Brackley Road, Dublin 9	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
12	Kelly	Winters	5208 Pendwyallt Road, Dublin 10	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
13	Krystal	Mooney	7866 Bishopgate Street, Dublin 11	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
14	Valentin	Contreras	5553 Newmarket Road, Dublin 12	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
15	Kailyn	Wooten	5208 Ermin Street, Dublin 13	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
16	Sabrina	Leblanc	195 Prestwick Road, Dublin 14	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
17	Rashad	Sparks	1207 Ockham Road, Dublin 15	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
18	Emelia	Jarvis	Galway	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
19	Jonah	Calhoun	Galway	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
20	Shelby	Porter	Galway	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork
21	Preston	Hopkins	Galway	1	1	Mary	Mulcahy	Main Street, Ballycotton, Co.Cork

If we want to delete specialist data, an error would be thrown because there is foreign key constraint and thus the data from the specialists table would have to be deleted first.

Rule 11: Distributed Independence:

The distribution of the parts of any database to different sites/locations should be invisible to the end users. That is, like in distributed database it should give a centralized effect to the end users who access it.

Also, the existing applications are able to continue their operations when the database is distributed or redistributed.

This way of execution provides parallelism in handling transactions.[1]

Rule 12 Non Subversion Rule:

If a relational system has or supports a low-level (single-record-at-a-time) language, that low-level language cannot be used to subvert or bypass the integrity rules or constraints expressed in the higher-level (multiple-records-at-a-time) relational language. This means that users can't violate the rules of the database in any way.[2]

[1] https://www.exploredatabase.com/2015/03/codds-twelve-rules-rule-11-distribution-independence-rule.html

[2] https://link.springer.com/content/pdf/bbm%3A978-1-4302-0867-9%2F1.pdf