

Weekly exercises DIGHEL4360 – Relational Databases and SQL

Relational databases (first week)

Exercise 1 – Prescriptions and regions

In the appendix of this document, three tables are listed.

- The table named `region` lists all regions in Norway, together with its name, area in square kilometers, and the health-region it is contained in.
- The table named `hospital` lists all the public hospitals in Norway, together with their name, the region it is contained in, the patient base, and the number of employees.
- The table named `primary_care_use` lists the use of primary care in total cases for each group of disorder (*mental* is short for *mental symptoms and disorders*, *cardiovascular* is short *cardiovascular disease* and *musculoskeletal* is short for *musculoskeletal system*) based on region and year.

Use the data in the tables to (manually) find:

1. the name of all regions in health region *Vest*.
2. the number of primary care use in the *mental*-category in *Agder* in *2020*.
3. the name of all regions with area greater than *40 000*.
4. the name and year of the regions having primary care cases in the cardiovascular category less than *25 000* in a year less than or equal to *2018*.
5. the name of all hospitals in health region *Nord*.
6. the total patientbase for all hospitals in *Oslo* and *Viken*.

Solution

1. Rogaland and Vestland
2. 50468
3. Innlandet, Trøndelag, Troms og Finnmark
4. Møre og Romsdal in the years 2015-2018, and Nordland in 2018 and Troms og Finnmark in 2017 and 2018.
5. Nordlandssykehuset, Nordlandssykehuset Gravdal, Nordlandssykehuset Vesterålen, Harstad Sykehus, Universitetssykehuset Nord-Norge, Narvik Sykehus, Finnmarkssykehuset, Helgelandssykehuset.
6. $40000 + 298000 + 160000 + 510000 + 600000 + 160000 + 80000 = 1848000$

Exercise 2 – Rooms and equipment

We want to extend the relational database above to also store information about rooms and equipment of *hospitals*. So make a collection of tables able to contain the following information:

1. Hospitals contain rooms, and each room is uniquely identified by a *room number* within that hospital (i.e. one needs to know both the hospital name and the room number to uniquely identify a room), and a number denoting the number of *beds* in that room.
2. Rooms may contain equipment, where each type of equipment is uniquely identified by an *equipment-id*, a *name*, and has the name of a *responsible employee* that is responsible for maintenance of the that type of equipment.
3. Note that the same type of equipment may be in multiple rooms and one room may contain multiple types of equipment. We do want to store the *number* of each equipment type there is in each room.

Below are some examples of the data that can be stored in the database:

1. The hospital with name `Oslo universitetssykehus` contains a room with *room number* 57 which has 2 *beds*; the same hospital also has a room with *room number* 92 with 4 *beds*.
2. The hospital with name `Haukeland universitetssykehus` contains a room with *room number* 7 which has 1 *beds*; the same hospital also has a room with *room number* 92 with 2 *beds*.

3. Equipment type with *equipment-id* e341 has *name* defibrillator and contact person *Ola Norman*.
4. Equipment type with *equipment-id* hp996 has *name* EKG Machine and contact person *Mari Nilsen*.
5. Room 57 at Oslo universitetssykehus contains 1 e341 and 3 hp996.
6. Room 7 at Haukeland universitetssykehus contains 2 hp996.

Create tables that can store the information given above. Structure the tables so that there is no data duplication (as described during the lecture). Also add the example data above into your tables.

It does not matter how/where you make the tables (e.g. draw them on paper or use a tool on your computer that can make tables).

Solution

room:

hospital	roomnr	num_beds
Oslo universitetssykehus	57	2
Oslo universitetssykehus	92	4
Haukeland universitetssykehus	7	1
Haukeland universitetssykehus	92	2

employee:

equipment_id	name	responsible_person
e341	defibrillator	Ola Norman
hp996	EKG machine	Mari Nilsen

contains:

hospital	roomnr	equipment	num
Oslo universitetssykehus	57	e341	1
Oslo universitetssykehus	57	hp996	3
Haukeland universitetssykehus	7	hp996	2

Exercise 3 – Stores

Given the following table about stores and the products they sell:

store:

address	chain	product_id	product_name	price
Gateveien 1a	Kiwi	2	Banana	5.79
Stedplassen 3c	Rema	2	Banana	4.99
Stedplassen 3c	Rema	5	Rice	38.99
Stedplassen 3c	Rema	9	Pasta	29.15
Bryggekaia 89	Coop	5	Rice	35.95
Bryggekaia 1	Rema	9	Pasta	28.15
Bryggekaia 89	Coop	11	Ice cream	28

We use the address to identify a store and the product's ID to identify a product. The table contains duplicate data. Create a collection of tables containing the same data but without data duplication.

Solution

store:

address	chain
Gateveien 1a	Kiwi
Stedplassen 3c	Rema
Bryggekaia 1	Rema
Bryggekaia 89	Coop

product:

product_id	product_name
2	Banana
5	Rice
9	Pasta
11	Ice cream

sells:

address	product_id	price
Gateveien 1a	2	5.79
Stedplassen 3c	2	4.99
Stedplassen 3c	5	38.99
Stedplassen 3c	9	29.15
Bryggekaia 89	5	35.95
Bryggekaia 1	9	28.15
Bryggekaia 89	11	28

SQL (second week)

If you go to the following web-page:

<https://dbfiddle.uk/DP9PuyWC?hide=2>

you are taken to a webpage that has loaded all of the data from the tables you used in exercise 1 into a database, over which you can write SQL-queries. On the webpage there is already written a SQL-query (to the left) that find the number of primary care in the *mental* category in the year *2020* for each region. The result of this query is on the right-hand side of the page.

If you either edit the query directly, or click the pluss-button below it to get a new text-box where you can write a new query. Click the big "run"-button at the top of the page to run your query.

We will now use SQL to write queries that find the answers to some of the exercises from exercise 1, as well as some more complex queries. So write a SQL-query that finds:

1. all data in the `hospital`-table. (34)
2. the name of all regions in health region *Vest*. (2)
3. the number of primary care use in the *mental*-category in *Agder* in *2020*. (1)
4. the name of all regions with area greater than *40 000*. (3)
5. the name and year of the regions having primary care cases in the cardiovascular category less than *25 000* in a year less than or equal to *2018*. (7)
6. the name of all regions and the year when the number of primary care use in the `mental`-category was greater than double that of the `cardiovascular`-category. (3)

7. the total number of primary use for each category in the year *2020*. (1)
8. the average number of primary use in the **mental**-category in the year *2020*. (1)

Solution

1:

```
SELECT *  
FROM hospital;
```

2:

```
SELECT name  
FROM region  
WHERE health_region = 'Vest';
```

3:

```
SELECT mental  
FROM primary_care_use  
WHERE region = 'Agder' AND  
       year = '2020';
```

4:

```
SELECT name  
FROM region  
WHERE area > 40000;
```

5:

```
SELECT region, year  
FROM primary_care_use  
WHERE cardiovascular < 25000 AND  
       year <= 2018;
```

6:

```
SELECT region, year  
FROM primary_care_use  
WHERE mental > 2*cardiovascular;
```

7:

```
SELECT sum(mental) AS mental_sum,  
       sum(cardiovascular) AS cardio_sum,  
       sum(musculoskeletal) AS musculo_sum
```

```
FROM primary_care_use
WHERE year = 2020;
```

8:

```
SELECT avg(mental)
FROM primary_care_use
WHERE year = 2020;
```

Appendix: Tables

regions

name	area	health_region
Innlandet	52072	Sør-øst
Viken	24592	Sør-øst
Vestfold og Telemark	17465	Sør-øst
Oslo	454	Sør-øst
Agder	16434	Sør-øst
Rogaland	9377	Vest
Vestland	33870	Vest
Trøndelag	42201	Midt-Norge
Møre og Romsdal	14355	Midt-Norge
Nordland	38154	Nord
Troms og Finnmark	78829	Nord

hospital

name	region	patientbase	employees
Nordlandssykehuset Gravdal	Nordland	24000	
Nordlandssykehuset	Nordland	78000	
Stavanger universitetssjukehus	Rogaland	369000	7800
Molde sjukehus	Møre og Romsdal	60000	
Kongsberg sykehus	Viken	40000	1000
Sykehuset Telemark	Vestfold og Telemark	170000	4000
Nordlandssykehuset Vesterålen	Nordland	52000	
Sykehuset Innlandet	Innlandet	305000	
Haugesund sjukehus	Rogaland	180000	
Helgelandssykehuset	Nordland	76000	
Akershus universitetssykehus	Innlandet	75000	
Harstad sykehus	Nordland	35000	
Volda sjukehus	Møre og Romsdal	45000	
Voss sjukehus	Vestland	30000	
Sykehuset Levanger	Trøndelag	95000	
Sykehuset Østfold	Viken	298000	5400
Kristiansund sjukehus	Møre og Romsdal	60000	
Bærum sykehus	Viken	160000	2000
Haukeland universitetssykehus	Vestland	380000	12000
Finmarkssykehuset	Troms og Finnmark	75000	
Oslo universitetssykehus	Oslo	510000	23000
Sykehuset i Vestfold	Vestfold og Telemark	240000	5200
Førde sentralsjukehus	Vestland	110000	
Universitetssykehuset Nord-Norge	Nordland	130000	6000
St. Olavs hospital	Trøndelag	310000	11000
Sørlandet sykehus	Agder	255000	
Flekkefjord sykehus	Agder	40000	
Stord sjukehus	Vestland	50000	
Akershus universitetssykehus	Viken	600000	9000
Narvik sykehus	Nordland	30000	
Drammen sykehus	Viken	160000	3000
Ålesund sjukehus	Møre og Romsdal	100000	
Ringerike sykehus	Viken	80000	1000
Sykehuset Namsos	Trøndelag	45000	

primary_care_use

region	year	mental	cardiovascular	musculoskeletal
Oslo	2015	87335	48951	167467
Oslo	2016	91228	49844	170339
Oslo	2017	92022	47364	169705
Oslo	2018	94967	46961	170354
Oslo	2019	99394	46686	172010
Oslo	2020	102563	47028	166926
Viken	2015	164007	124983	352826
Viken	2016	168905	126186	360084
Viken	2017	170649	123127	363453
Viken	2018	174744	122427	366855
Viken	2019	183881	122412	376215
Viken	2020	185886	121691	358327
Innlandet	2015	53896	44348	116010
Innlandet	2016	55065	44787	117702
Innlandet	2017	56312	44362	118344
Innlandet	2018	56976	43016	119081
Innlandet	2019	59274	42437	121601
Innlandet	2020	58803	41460	114993
Vestfold og Telemark	2015	62870	42747	121400
Vestfold og Telemark	2016	65244	43858	125375
Vestfold og Telemark	2017	64231	41392	123691
Vestfold og Telemark	2018	64619	40756	124297
Vestfold og Telemark	2019	67185	40443	126176
Vestfold og Telemark	2020	66612	39941	119069
Agder	2015	45177	28960	87336
Agder	2016	47033	28781	88626
Agder	2017	47861	27568	89652
Agder	2018	49017	26604	89638
Agder	2019	50740	26612	92862
Agder	2020	50468	26026	89765
Rogaland	2015	60661	43111	136714
Rogaland	2016	62436	44078	137460
Rogaland	2017	63892	42219	137481
Rogaland	2018	66387	41786	138900
Rogaland	2019	67870	41459	141022
Rogaland	2020	69834	42099	137634
Vestland	2015	81197	59999	172948
Vestland	2016	83990	60948	174093
Vestland	2017	80354	54940	168238
Vestland	2018	81205	53874	167998
Vestland	2019	82614	52742	169202
Vestland	2020	83201	52254	161643
Møre og Romsdal	2015	33815	24540	81981
Møre og Romsdal	2016	34845	24831	83420
Møre og Romsdal	2017	35791	24060	83698

Møre og Romsdal	2018	36259	23875	83710
Møre og Romsdal	2019	37753	23982	84710
Møre og Romsdal	2020	37581	23950	81023
Trøndelag	2015	61439	41158	138287
Trøndelag	2016	64048	41841	140896
Trøndelag	2017	66729	41483	141578
Trøndelag	2018	68381	41289	141057
Trøndelag	2019	70809	40900	142202
Trøndelag	2020	72381	40800	138620
Nordland	2015	33558	25499	76332
Nordland	2016	33725	25633	76073
Nordland	2017	34196	25107	76260
Nordland	2018	35326	24698	76619
Nordland	2019	36861	24275	77517
Nordland	2020	37158	23735	74174
Troms og Finnmark	2015	33465	25350	74884
Troms og Finnmark	2016	33809	25373	74695
Troms og Finnmark	2017	34806	24857	74634
Troms og Finnmark	2018	35473	24625	74885
Troms og Finnmark	2019	36670	24082	75502
Troms og Finnmark	2020	37081	23456	71986