TU München, Fakultät für Informatik
Lehrstuhl III: Datenbanksysteme
Prof. Alfons Kemper, Ph.D.

TUM

Database System Concepts for Non-Computer Scientist – **WiSe 20/21**
Alexander van Renen (renen@in.tum.de)
http://db.in.tum.de/teaching/ws2021/DBSandere/?lang=en

Sheet 08

Exercise 1

Answer the following questions on our university database using SQL:

a) Each assistants works in a certain area. Figure out how many assistants work in each area.

b) Determine the number of areas a professor is interested in. A professor is interested in an area if one of their assistants works in this area. Professors who do not have an assistant do not need to be included in the result.

Solution:

a) Each assistants works in a certain area. Figure out how many assistants work in each area.

```
select a.area, count(*)
from Assistants a
group by a.area
```

b) Determine the number of areas a professor is interested in. A professor is interested in an area if one of their assistants works in this area. Professors who do not have an assistant do not need to be included in the result.

```
select p.persNr, p.name, count(distinct a.area)
from Professors p, Assistants a
where p.persNr = a.boss
group by p.persNr, p.name
```

Exercise 2

Write a query that determines the kind of degree a student is pursuing. In our database, we assume that this can be deduced from the student's semester in the following way: A student who has not reached her 7th semester yet is still considered a "bachelor student". Once in the 7th semester, she should be categorized as a "master student". Starting in the 11th semester, we label her as a "phd student".

Solution:

```
select s.studNr, s.name,
   case
      when s.semester < 7 then 'bachelor student'
      when s.semester < 11 then 'master student'
      else 'phd student'
   end) as degree
from Students s
```

Exercise 3

Answer the following questions on our university database using SQL:

a) Find all foundation lectures (lectures that don't depend on another lecture).

b) "Lonely Students" Are there any students that are attending a lecture on their own?

c) "Industrial Students" List all students that are attending all lectures. Hint: [1] [2]

Solution:

a) Query:

```
select *
from lectures l
where not exists (
select *
from require r
where l.lecturenr = r.successor)
```

b) Solution using a sub query:

```
select distinct s.studNr, name
from Students s, attend a
where s.studNr = a.studNr
and not exists(
select *
from attend a2
where a2.lecturenr = a.lecturenr
and a2.studnr <> a.studnr
)
```

Solution using `group by` and `having`:

```
select distinct min(s.studNr), min(name)
from Students s, attend a
where s.studNr = a.studNr
group by a.lectureNr
having count(*) = 1
```

---

[1] The task can be rephrased as: List all students, where there is no lecture with no attend record of the student.
[2] Alternatively, you could also try counting how many lectures a student is attending.

c) Solution using a double negative: "Find all students where there is no lecture that they did not attend." or "Find all students where there is no lecture, for which there is no entry in attend."

```
select *
from Students s
where not exists
      (select *
       from lectures l
       where not exists(
             select *
             from attend a
             where l.lecturenr = a.lecturenr
             and a.studnr = s.studnr
      )
)
```

Alternatively, we can simply count how many lectures there are in one sub query and then use a second sub query to count how many lectures a student is attending. If the two numbers match (e.g., if there are 5 lectures at a university and a student is attending 5 lectures) then the student is attending all lectures.

```
select *
from Students s
where (select count(*)
        from lectures)
    = (select count(*)
        from attend a
        where a.studNr = s.studNr)
```