SQL: practicing queries

Practicing composing queries in SQL

In this document you will find per database practices two example questions for each kind of questions in the book ‘Databases and SQL’.
Along with each question the answer and the output is given.

The questions are categorised by paragraph of the book ‘Databases and SQL’. This makes it possible to first study the paragraph and then make te query.

Questions for paragraph 7.2 without join

SELECT/FROM/WHERE

1. Question division of labour
Give the functions of employees who work in the department ‘RECEPTION’.

Answer

```
SELECT FNAME
FROM EMPLOYEE
WHERE DEPARTMENT = 'RECEPTION'


FNAME
------------
ENTERTAINER
CLERK
ENTERTAINER
```

2. Question division of labour
Give the data of locations in the branch ‘CATERING’.

Answer

```
SELECT *
FROM LOCATION
WHERE BRANCH = 'CATERING'

LOCNAME     BRANCH     CITY
-------     -------    -------
FASTBITE    CATERING   KINGSTON
FONG        CATERING   KINGSTON
RHODOS      CATERING   LAKEWOOD
```

3. Question library
Give the borrowers from Shelton who were born before 1990.

Antwoord

```
SELECT *
FROM BORROWER
WHERE TOWN = 'SHELTON'
AND BTHDATE < '1990-01-01'

BNAME   BTHDATE      ADDRESS          TOWN
-----   ---------    ------------     -------
BENSON  1966-06-19   2 CHURCHHILL     SHELTON
HART    1956-03-21   34 KINGSROAD     SHELTON
SMITH   1988-08-13   79 HUDSONSTREET  SHELTON
```

4. Question library
Give the data of books in the categories ‘NOVEL’ and ‘SPORT’.

Answer

```
SELECT *
FROM BOOK
WHERE CATEGORY = 'NOVEL'
OR CATEGORY = 'SPORT'

BOOKNR   BOOKNAME         CATEGORY
------   -------------    ---------
1        SEA TRAVEL       NOVEL
2        AT THE LAKE      SPORT
3        DOCTOR X         NOVEL
4        FISHING          SPORT
6        SUMMER FOLLY     NOVEL
7        ADVENTURE        NOVEL
8        SAILING          SPORT
9        NURSE ANN        NOVEL
```

Questions for paragraph 7.2 with joins

SELECT/FROM/WHERE + JOIN

5. Question division of labour
Give the function names of employees from ‘BRENTWOOD’ AND ‘LAKEWOOD’.

Antwoord

```
SELECT DISTINCT FNAME
FROM EMPLOYEE, LOCATION
WHERE EMPLOYEE.LOCNAME = LOCATION.LOCNAME
AND CITY = 'BRENTWOOD'
OR CITY = 'LAKEWOOD'

FNAME
------------
CLERK
COOK
DIRECTOR
ENTERTAINER
SECRETARY
WAITER
```

Remark
Adding DISTINCT after SELECT removes double values in the outcome.

6. Question division of labour
Give the employee number and the name of every employee who can replace one or more of the other employees. In addition to that give the employee number and the name of the employee(s) who can be replaced by this employee.

Answer

```
SELECT A.ENR, A.ENAME, B.ENR, B.ENAME
FROM EMPLOYEE A, REPLACEMENT, EMPLOYEE B
WHERE A.ENR = SUBSTITUTE
AND REPLACED = B.ENR
```

```
ENR   ENAME      ENR   ENAME
---   --------   ---   --------
  5   DAVIS        1   AUSTIN
 13   NORRIS       2   BENSON
  2   BENSON       3   BRADFORD
 14   TAYLOR       4   COOPER
  9   JOHNSON      4   COOPER
  5   DAVIS        4   COOPER
  7   EDWARDS      5   DAVIS
 12   LEE          6   EDWARDS
 11   LEE          6   EDWARDS
 13   MOL          9   JOHNSON
  4   COOPER       9   JOHNSON
 14   TAYLOR      10   KEPLER
 11   LEE         10   KEPLER
 12   LEE         11   LEE
 11   LEE         12   LEE
```

7. Question library
Which books have a chapter called ‘INTRODUCTION’.

Answer

```
SELECT BOOK.*
FROM BOOK, BOOKSECTION
WHERE BOOK.BOOKNR = BOOKSECTION.INBOOKNR
AND SECTIONNAME = 'INTRODUCTION'
```

```
BOOKNR  BOOKNAME      CATEGORY
------  ------------  ---------
     5  AVIATION      TECHNICS
```

8. Question library
Is there a (or more) combination(s) of two copies of different books which are lent out on the same date and by the same borrower. Give the numbers and titels of these combinations of books and also the name of the borrower.

Answer

```
SELECT A.BOOKNR, A.BOOKNAME, C.BOOKNR,
       C.BOOKNAME, B.BNAME
FROM BOOK A, COPY B, BOOK C, COPY D
WHERE A.BOOKNR <> C.BOOKNR
AND A.BOOKNR = B.BOOKNR
AND C.BOOKNR = D.BOOKNR
AND B.LOANDATE = D.LOANDATE
AND B.BNAME = D.BNAME
```

```
A.BOOKNR  A.BOOKNAME    C.BOOKNR  C.BOOKNAME   BNAME
--------  ------------  --------  -----------  -------
       4  FISHING              2  AT THE LAKE  BURTUN
       2  AT THE LAKE          4  FISHING      BURTUN
      10  UNDER REPAIR         5  AVIATION     GRAY
       5  AVIATION            10  UNDER REPAIR GRAY
```

Remark
Note that every combination shows up twice in the result. The second mirrors the first.
Between < and > no space is allowed. <> has the meaning ‘not equal to’.

Questions for paragraph 8.1

SELECT/FROM/WHERE + JOIN + FUNCTIONS

9. Question division of labour
In how many cases an employee has a name that is the same as that of another employee?

Answer

```
SELECT COUNT(*) - COUNT(DISTINCT ENAME)
FROM EMPLOYEE
```

```
COUNT(*)-COUNT(DISTINCT ENAME)
------------------------------
                             2
```

Remark
Although the query is correct, it cannot be executed with Access. Access does not accept DISTINCT in the COUNT function.

10. Question division of labour
How often a director has a replacement who is also a director?

Answer

```
SELECT COUNT(A.ENR)
FROM EMPLOYEE A, REPLACEMENT, EMPLOYEE B
WHERE A.ENR = REPLACEMENT.REPLACED
AND REPLACEMENT.SUBSTITUTE = B.ENR
AND A.FNAME = 'DIRECTOR'
AND B.FNAME = 'DIRECTOR'
```

```
COUNT(A.ENR)
------------

           1
```

11. Question library
How many (copies of) books about sport have been purchased.

Answer

```
SELECT COUNT(*)
FROM BOOK, COPY
WHERE BOOK.BOOKNR = COPY.BOOKNR
AND CATEGORY = 'SPORT'
```

```
COUNT(*)
--------
       5
```


12. Question library
How many (copies of) books are there and how many of them are out on loan?

Answer

```
SELECT COUNT(*), COUNT(LOANDATE)
FROM COPY

COUNT(*)      COUNT(LOANDATE)
--------      -------------
      21                 11
```

Questions for paragraph 8.2

SELECT/FROM/WHERE + GROUP BY

13. Question division of labour
How much does each branch spend on salary.

Answer

```
SELECT BRANCH, SUM(SALARY)
FROM EMPLOYEE, LOCATION
WHERE EMPLOYEE.LOCNAME = LOCATION.LOCNAME
GROUP BY BRANCH

BRANCH      SUM(SALARY)
--------    -----------
CATERING          19373
HOTEL             60800
```

14. Question division of labour
Give of employees with replacements their employee number, name and how many replacements he or she has.

Answer

```
SELECT ENR, ENAME, COUNT(*)
FROM EMPLOYEE, REPLACEMENT
WHERE EMPLOYEE.ENR = REPLACEMENT.REPLACED
GROUP BY ENR, ENAME

ENR  ENAME       COUNT(*)
---  -------     --------
  1  AUSTIN             1
  2  BENSON             1
  3  BRADFORD           1
  4  COOPER             3
  5  DAVIS              1
  6  EDWARDS            2
  9  JOHNSON            2
 10  KEPLER             2
 11  LEE                1
 12  LEE                1
```

Remark
Adding the column ENAME after GROUP BY has no influence on the composition of the groups that are formed by GROUP BY. For every value of the column ENR there is only one name. The column ENAME has been added because otherwise the column ENAME cannot be printed.

15. Question library
Give of every borrowing borrower the name and how many (copies) books he or she borrows.

Answer

```
SELECT BNAME, COUNT(*)
FROM COPY
GROUP BY BNAME

BNAME     COUNT(*)
-------   --------
BENSON           2
BURTON           3
EATON            1
GRAY             3
HART             1
WOLFF            1
                10
```

Remark
Note that in the outcome a row is present without a name of a borrower and the number is 10. This concerns books that are not out on loan. If we want to avoid this, then we have to add to the query 'WHERE BNAME IS NOT NULL'.

16. Question library
Give for each category the name, how many copies have been purchased and the date that the first copy in that category has been purchased.

Answer

```
SELECT CATEGORY, COUNT(*), MIN(PURCHDATE)
FROM BOOK, COPY
WHERE BOOK.BOOKNR = COPY.BOOKNR
GROUP BY CATEGORY

CATEGORY    COUNT(*)   MIN(PURCHDATE)
---------   --------   --------------
NOVEL              9   2017-01-12
SPORT              5   2017-01-20
TECHNICS           7   2017-01-20
```

Questions for paragraph 8.3

SELECT/FROM/WHERE + GROUP BY + HAVING

17. Question division of labour
How often does a certain salary occur when this salary occurs more than once.

Answer

```
SELECT SALARY, COUNT(*)
FROM EMPLOYEE
GROUP BY SALARY
HAVING COUNT(*) > 1

SALARY     COUNT(*)
------     --------
   800            2
  8000            3
  9000            2
```


18. Question division of labour
Give the average salary, the highest salary, the lowest salary and how many employees are employed for functions for which at least 2 employees are employed and where the difference between the average and the highest salary is at least 1000.

Answer

```
SELECT FNAME, AVG(SALARY), MAX(SALARY),
          MIN(SALARY), COUNT(*)
FROM EMPLOYEE
GROUP BY FNAME
HAVING MAX(SALARY)-MIN(SALARY)>=1000
AND COUNT(*)>1
```

```
FNAME          AVG        MAX        MIN       COUNT(*)
             (SALARY)   (SALARY)   (SALARY)
------------  --------- ---------  ---------  --------
COOK              1991       4500        673         3
DIRECTOR          6840       9000       1200         5
ENTERTAINER      12000      18000       6000         2
```

19. Question library
In case a borrower borrows on a specific date more than one (copy of a) book, give the start date of the borrowing, the name of the borrower and how many (copies of) books the borrower has borrowed.

Answer

```
SELECT LOANDATE, BNAME, COUNT(*)
FROM COPY
WHERE LOANDATE IS NOT NULL
GROUP BY LOANDATE, BNAME
HAVING COUNT(*) > 1
```

```
LOANDATE     BNAME     COUNT(*)
----------   -------   --------
2017-04-28   BURTON           2
2017-04-28   GRAY             2
```

20. Question library
Give the purchase dates of books on which copies have been purchased of more than one book title. Give the total number of copies that have been purchased on such a date and also how many different titles of books were purchased on that date.

Answer

```
SELECT PURCHDATE, COUNT(*), COUNT(DISTINCT BOOKNR)
FROM COPY
GROUP BY PURCHDATE
HAVING COUNT(DISTINCT BOOKNR) > 1
```

```
PURCHDATE    COUNT(*)  COUNT(DISTINCT BOOKNR)
----------   --------  ----------------------
2017-01-20          8                       8
2017-02-23          4                       2
```

Remark
Although the query is correct, it cannot be executed with Access. Access does not accept DISTINCT in the COUNT function.

Qestions for paragraph 9.2

SELECT/FROM/WHERE + NON CORRELATED SUBQUERY

21. Question division of labour
Give the number, the name, the function and the location of employees who have a function that does not occur in location 'OKOTEL'.

Answer

```
SELECT ENR, ENAME, FNAME, LOCNAME
FROM EMPLOYEE
WHERE FNAME NOT IN
      (SELECT FNAME
       FROM EMPLOYEE
       WHERE LOCNAME = 'OKOTEL')
```

```
ENR   ENAME      FNAME           LOCNAME
---   -------    ------------    ---------
  2   BENSON     ENTERTAINER     SEAVIEW
  7   EDWARDS    SECRETARY       MADISON
 10   KEPLER     COOK            RHODOS
 11   LEE        COOK            FONG
 12   LEE        COOK            FONG
 13   NORRIS     ENTERTAINER     MADISON
 14   TAYLOR     WAITER          RHODOS
```

Remark
In the subquery the condition 'AND FNAME IS NOT NULL' is not needed. That is because for every employee a function is present.

22. Question labour division
Give the numbers and names of employees who have a replacement, who him- or herself does not have a replacement.

Answer

```
SELECT ENR, ENAME
FROM EMPLOYEE
WHERE ENR IN
     (SELECT REPLACED
      FROM REPLACEMENT
      WHERE SUBSTITUTE NOT IN
              (SELECT REPLACED
               FROM REPLACEMENT))
```

```
ENR  ENAME
---  -------
  2  BENSON
  4  COOPER
  5  DAVIS
  9  JOHNSON
 10  KEPLER
```


23. Question library
Give the number, the title, the loan date and the name of the borrower of (the copy of) the book that has been the latest to be borrowed.

Answer

```
SELECT A.BOOKNR, A.BOOKNAME, B.LOANDATE, B.BNAME
FROM BOOK A, COPY B
WHERE A.BOOKNR = B.BOOKNR
AND LOANDATE =
    (SELECT MAX(LOANDATE)
     FROM COPY)
```

```
BOOKNR  BOOKNAME      LOANDATE    BNAME
------  -----------  ----------  -------
    11  ELECTRONICS  2017-05-22  GRAY
    11  ELECTRONICS  2017-05-22  BENSON
```

Remark
It is valid for both copies of book title 11. Both copies are out on loan starting from the most recent loan date.

24. Question library
Give the data of books in which there are chapters with (sub)paragraphs.

Answer

```
SELECT *
FROM BOOK
WHERE BOOKNR IN
      (SELECT INBOOKNR
       FROM BOOKSECTION
       WHERE PARTNR IN
             (SELECT INPARTNR
              FROM BOOKSECTION))
```

```
BOOKNR   BOOKNAME        CATEGORY
------   ------------   ---------
     5   AVIATION        TECHNICS
    10   UNDER REPAIR    TECHNICS
```

Questions for paragraph 9.3

SELECT/FROM/WHERE + CORRELATED SUBQUERIES

25. Question division of labour
Give the number, the name, the function and the salary of employees who earn the highest salary of everybody working in the same function as the function in which they work.

Answer

```
SELECT ENR, ENAME, FNAME, SALARY
FROM EMPLOYEE A
WHERE SALARY =
     (SELECT MAX(SALARY)
      FROM EMPLOYEE B
      WHERE A.FNAME = B.FNAME)
```

```
ENR  ENAME      FNAME            SALARY
---  -------    ------------    -------
  2  BENSON     ENTERTAINER       18000
  7  EDWARDS    SECRETARY          9000
  8  HUNT       DIRECTOR           9000
  9  JOHNSON    CLERK              1600
 11  LEE        COOK               4500
 14  TAYLOR     WAITER             3200
```

26. Question division of labour
Give of employees the number, the name, the function and the location where the employee works, but only in case the employee has more than one replacement who works in a different location.

Answer

```
SELECT ENR, ENAME, FNAME, LOCNAME
FROM EMPLOYEE A
WHERE 1 < (SELECT COUNT(*)
           FROM REPLACEMENT, EMPLOYEE B
           WHERE REPLACEMENT.SUBSTITUTE = B.ENR
           AND A.LOCNAME < > B.LOCNAME
           AND A.ENR = REPLACEMENT.REPLACED)
```

or

```
SELECT ENR, ENAME, FNAME, LOCNAME
FROM EMPLOYEE A
WHERE ENR IN
     (SELECT REPLACED
      FROM REPLACEMENT, EMPLOYEE B
      WHERE REPLACEMENT.SUBSTITUTE = B.ENR
      AND A.LOCNAME < > B.LOCNAME
      GROUP BY REPLACED
      HAVING COUNT(*)>1)
```

```
ENR  ENAME      FNAME        LOCNAME
---  -----      ---------    -------
  4  COOPER     CLERK        OKOTEL
  6  EDWARDS    DIRECTOR     FASTBITE
```

Remark
Between < and > no space is allowed. <> has the meaning ‘not equal to’.

27. Question library
Give the names of borrowers who borrow more (copies of) books than the books (copies) borrowed together by all other borrowers from their home town.

Answer

```
SELECT A.BNAME
FROM BORROWER A, COPY B
WHERE A.BNAME = B.BNAME
GROUP BY A.BNAME, A.TOWN
HAVING COUNT(*) >
       (SELECT COUNT(*)
        FROM BORROWER C, COPY D
        WHERE C.BNAME = D.BNAME
        AND A.BNAME <> C.BNAME
        AND A.TOWN = C.TOWN)
```


```
BNAME
-------
BENSON
BURTON
GRAY
```

Remark
After GROUP BY the column A.TOWN is added. This column is not needed for the formation of the groups. The layout of these groups does not alter as a consequence of adding this column (the reason being that for a 'borrower name' there is only one name of the home town). The reason for adding this column (A.TOWN) lies in the correlation with the subquery that is part of the HAVING-clause. This subquery counts the number of borrowed books by other borrowers from the same town the investigated borrower (in the main query) is from.

28. Question library
Give the data of borrowers who borrow books in a category no one else from their home town borrows books from.

```
SELECT *
FROM BORROWER A
WHERE BNAME IN
         (SELECT BNAME
          FROM COPY B, BOOK C
          WHERE B.BOOKNR = C.BOOKNR
          AND CATEGORY NOT IN
                  (SELECT CATEGORY
                   FROM COPY D, BOOK E, BORROWER F
                   WHERE D.BOOKNR = E.BOOKNR
                   AND D.BNAME = F.BNAME
                   AND A.TOWN = F.TOWN))

no rows selected
```

Questions for paragraph 10.2

SELECT/FROM/WHERE + NOT EXISTS FOR GROUP-GROUP COMPARISONS

29. Question division of labour
In which branches all kinds of departments are present that are present in the branch 'CATERING'.

Answer

```
SELECT DISTINCT BRANCH
FROM LOCATION A
WHERE NOT EXISTS
         (SELECT *
          FROM EMPLOYEE B, LOCATION C
          WHERE B.LOCNAME = C.LOCNAME
          AND BRANCH = 'CATERING'
          AND DEPARTMENT NOT IN
                  (SELECT DEPARTMENT
                   FROM EMPLOYEE D, LOCATION E
                   WHERE D.LOCNAME = E.LOCNAME
                   AND A.BRANCH = E.BRANCH))
```

```
BRANCH
-------
CATERING
```

Remark
So, there is no other branch than catering itself for which this is valid. That is not that strange with only two branches in the database. Or course, catering itself complies with the question.

30. Question division of labour
Give the data of locations where exactly the same functions are present (so not one more or one less) as in location 'OKOTEL'.

Answer

```
SELECT *
FROM LOCATION
WHERE NOT EXISTS
     (SELECT *
      FROM EMPLOYEE
      WHERE LOCNAME = 'OKOTEL'
      AND FNAME NOT IN
              (SELECT FNAME
               FROM EMPLOYEE
               WHERE LOCATION.LOCNAME = LOCNAME))
AND NOT EXISTS
     (SELECT *
      FROM EMPLOYEE
      WHERE LOCATION.LOCNAME = LOCNAME
      AND FNAME NOT IN
              (SELECT FNAME
               FROM EMPLOYEE
               WHERE LOCNAME = 'OKOTEL'))

LOCNAME    BRANCH     CITY
-------    -------    ---------
OKOTEL     HOTEL      BRENTWOOD
```

Remarks
- so there are no other locations in which exactly the same set of functions as in OKOTEL is present
- in group-group comparisons there is always a check whether one collection (functions in Okotel) is a subset or an equal set (equal to the functions of the set under investigation). So it gives already a true in case it is a subset. For solving the question that requires the sets to be exactly the same, we have to demand:
  - that the functions in Okotel are a subset of the functions of the location under investigation
  - that the functions in the location under investigation are a subset of the functions in Okotel.

  By demanding that both these requirements are present only the situation can be true that the sets are exactly the same.

31. Question library
Which borrowers borrow at least all the books that borrower 'BENSON' borrowes?

Answer

```
SELECT *
FROM BORROWER
WHERE NOT EXISTS
     (SELECT *
      FROM COPY
      WHERE BNAME = 'BENSON'
      AND BOOKNR NOT IN
              (SELECT BOOKNR
               FROM COPY
               WHERE BORROWER.BNAME = BNAME))

BNAME     BTHDATE      ADDRESS         TOWN
-------   ----------   ------------    -------
BENSON    1966-06-19   2 CHURCHHILL    SHELTON
GRAY      1994-04-16   58 TOLLROAD     MILFORD
```

32. Question library
In which home town the borrowers together borrow at least books in the same catagories as in 'SHELTON'.

Answer

```
SELECT DISTINCT TOWN
FROM BORROWER Q
WHERE NOT EXISTS
         (SELECT *
          FROM COPY A, BOOK B, BORROWER C
          WHERE A.BOOKNR = B.BOOKNR
          AND A.BNAME = C.BNAME
          AND C.TOWN = 'SHELTON'
          AND B.CATEGORY NOT IN
                  (SELECT CATEGORY
                   FROM COPY D, BOOK E, BORROWER F
                   WHERE D.BOOKNR = E.BOOKNR
                   AND D.BNAME = F.BNAME
                   AND F.TOWN = Q.TOWN))

TOWN
--------
HAMDEN
SHELTON
```

