SQL EXERCISES

Using the following Table Descriptions to Solve the Problems given in this chapter.

1st Table: DEPARTMENT

Column Name	Data Type	Nulls allowed
DEPTNO	CHAR(3)	N
DEPTNAME	VARCHAR(25)	N
MGRNO	CHAR(6)	Y
ADMRDEPT	CHAR(3)	N
LOCATION	CHAR(5)	Y

2nd Table :EMPLOYEE

Column Name	Data Type	Nulls allowed
EMPNO	CHAR(6)	N
FIRSTNME	VARCHAR(15)	N
MIDINIT	CHAR(1)	N
LASTNAME	VARCHAR(10)	N
WORKDEPT	CHAR(4)	Y
PHONENO	CHAR(10)	Y
HIREDATE	DATE	Y
JOB	CHAR(8)	Y
EDLEVEL	SMALLINT	Y
SEX	CHAR(1)	N
BIRTHDATE	DATE	Y
SALARY	DECIMAL(9,2)	Y
BONUS	DECIMAL(9,2)	Y
COMM	DECIMAL(9,2)	Y

3rd TABLE : PROJECT

Column Name	Data Type	Nulls allowed
PROJNO	CHAR(6)	N
PROJNAME	VARCHAR(25)	N
DEPTNO	CHAR(3)	N
RESPEMP	CHAR(6)	N
PRSTAFF	DECIMAL(5,2)	Y
PRSTDATE	DATE	Y
PRENDATE	DATE	Y
MAJPROJ	CHAR(6)	Y

4th TABLE : EMPL_ACT

Column Name	Data Type	Nulls allowed
EMPNO	CHAR(6)	N
PROJNO	CHAR(6)	N
ACTNO	SMALLINT	N
EMPTIME	DECIMAL(5,2)	Y
EMSTDATE	DATE	Y
EMENDATE	DATE	Y

Simple SQL Queries:

Problems:

1. List employee number, last name, date of birth and salary for all employees. The employees should be ordered by decreasing salaries.

2. List last name, first name and the department number for all employees. The Listing should be ordered by decreasing department numbers. Within the same department, the last names should be sorted in descending order.

3. List the different education levels in the company in descending order.

4. List all employees (employee number) and the projects (project number) performed by them.

5. List last name, salary and bonus of all male employees.

6. List last name, salary and commission of all employees with a salary higher than $20,000 and hired after 1979.

7. List last name, salary, bonus and commission of all employees with a salary Higher than $20,000 and a bonus of $400 or of all employees with a bonus of $500 and a commission higher than $2,000. The list should be ordered by last names.

8. List last name, salary, bonus and commission of all employees with a salary higher than $20,000, a bonus of $400 or $500 and a commission higher than $2,000. The list should be ordered by the last names.

9. For all ‘AD’ projects (projects number starts with ‘AD’) with activities 10, 80, and 180, list the following:
    - Project number
    - Activity number
    - Starting date for activity
    - Ending date for activity

   The list should be sorted by project number and activity number.

10. List manager number and department number for all departments to which a manager has been assigned.
    The list should be ordered by manager numbers.

11. List employee number, last name, salary and bonus of all employees having a bonus from $800 to $1,000.
    The lowest bonus should appear first.

12. List employee number, last name, salary and department number of all employees of departments A00 through C01.
    The listing should be ordered by ascending last names.

13. List all projects (ordered by the project number) for which ‘ROLL’ is a part of their name.

14. List all departments with a ‘1’ as middle character of their department number. Order the list by department numbers.

Solutions:

1. SELECT EMPNO, LASTNAME, BIRTHDATE, SALARY
   FROM EMPLOYEE
   ORDER BY SALARY DESC

2. SELECT LASTNAME, FIRSTNME, WORKDEPT
   FROM EMPLOYEE
   ORDER BY WORKDEPT DESC, LASTNAME DESC

3. SELECT DISTINCT EDLEVEL
   FROM EMPLOYEE
   ORDER BY EDLEVEL DESC

4. SELECT DISTINCT EMPNO, PROJNO
   FROM EMPL_ACT

5. SELECT LASTNAME, SALARY, BONUS
   FROM EMPLOYEE
   WHERE SEX = 'M'

6. SELECT LASTNAME, SALARY, COMM
   FROM EMPLOYEE
   WHERE HIREDATE >= '1980-01-01'
   AND SALARY > 20000

7. SELECT LASTNAME, SALARY, BONUS, COMM
   FROM EMPLOYEE
   WHERE SALARY >20000 AND BONUS = 400
   OR BONUS = 500 AND COMM > 2000
   ORDER BY LASTNAME

8. SELECT LASTNAME, SALARY, BONUS, COMM
   FROM EMPLOYEE
   WHERE SALARY > 20000
   AND (BONUS = 400 OR BONUS =500)
   AND COMM >2000
   ORDER BY LASTNAME

9. SELECT PROJNO, ACTNO, EMSTDATE, EMENDATE
   FROM EMPL_ACT
   WHERE ACTNO IN (10, 80, 180)
   AND PROJNO LIKE 'AD%'
   ORDER BY PROJNO, ACTNO

10. SELECT MGRNO, DEPTNO
    FROM DEPARTMENT
    WHERE MGRNO IS NOT NULL
    ORDER BY MGRNO

11. SELECT EMPNO, LASTNAME, SALARY, BONUS
    FROM EMPLOYEE
    WHERE BONUS BETWEEN 800 AND 1000
    ORDER BY BONUS

12. SELECT EMPNO, LASTNAME, SALARY, WORKDEPT
    FROM EMPLOYEE
    WHERE WORKDEPT BETWEEN 'A00' AND 'C01'
    ORDER BY LASTNAME

13. SELECT PROJNO, PROJNAME
    FROM PROJECT
    WHERE PROJNAME LIKE '%ROLL%'
    ORDER BY PROJNO

14. SELECT DEPTNO, DEPTNAME
    FROM DEPARTMENT
    WHERE DEPTNO LIKE '_1_'
    ORDER BY DEPTNO

Retrieving Data from Multiple Tables

Problems:

1. For all projects (project number) beginning with 'PA', list project number, project name and activity number. List identical rows once. Order the list by project number and project number.

2. Which employees did participate in project 'MA3311'. List employee number, last name and project number. Order the list by employee number and project number.

3. Which of the activities have been started on '1992-01-01'. List employee number of the person performing the activity, project number, project name, activity number and starting date of the activity. Order the list by project number, employee number and activity number.

4. List department number, manager number and last name of the managers of departments 'A00' and 'B01'.
   Sort the list by department number.

5. List department number, last name, project name and activity number for Activities performed by the employees of department 'A00'.
   The list should be sorted by project name and activity number.

6. List department number, last name, project name and activity number for all employees. Suppress identical rows.

   Sort the list by department number, last name and activity number.

7. The second line managements need information on activities, which started on 1992-08-15 or thereafter.

   For these activities, list activity number, manager number responsible for the department performing the project, the starting date for the activity, project number and last name of the employee performing the activity.

   The list should be ordered by activity number and activity starting date.

8. Which employees of department ‘A00’ were hired before their manager.

   List department number, manager’s last name, employee’s last name, hiring dates of the manager and employee.

   Order the list by employee last name.

SOLUTIONS:

1. SELECT DISTINCT A.PROJNO, PROJNAME, ACTNO
   FROM PROJECT P,
   EMPL_ACT A
   WHERE P.PROJNO = A.PROJNO
   AND A.PROJNO LIKE 'PA%'
   ORDER BY A.PROJNO, ACTNO

2. SELECT DISTINCT A.EMPNO, LASTNAME, PROJNO
   FROM EMPOYEE E,
   EMPL_ACT A
   WHERE A.EMPNO = E.EMPNO
   AND A.PROJNO = 'MA3311'
   ORDER BY A.EMPNO, PROJNO

3. SELECT A.EMPNO, A.PROJNO, PROJNAME, ACTNO, EMSTDATE
   FROM PROJECT P,
   EMPL_ACT A
   WHERE A.PROJNO = P.PROJNO
   AND EMSTDATE = '1992-01-01'
   ORDER BY A.PROJNO, A.EMPNO, ACTNO

4. SELECT DEPTNO, MGRNO, LASTNAME
   FROM EMPLOYEE E, DEPARTMENT D
   WHERE E.EMPNO = D.MGRNO
   AND DEPTNO IN ('A00', 'B01')
   ORDER BY DEPTNO

```
5. SELECT WORKDEPT, LASTNAME, PROJNAME, ACTNO
      FROM EMPLOYEE E, PROJECT P, EMPL_ACT A
     WHERE E.EMPNO = A.EMPNO
       AND A.PROJNO = P.PROJNO
      AND WORKDEPT = 'A00'
         ORDER BY PROJNAME, ACTNO

6. SELECT DISTINCT WORKDEPT, LASTNAME, PROJNAME, ACTNO
         FROM EMPLOYEE E, PROJECT P, EMPL_ACT A
       WHERE E.EMPNO = A.EMPNO
       AND   A.PROJNO = P.PROJNO
       ORDER BY WORKDEPT, LASTNAME, ACTNO

7.  SELECT ACTNO, D.MGRNO, EMSTDATE, P.PROJNO, LASTNAME
     FROM DEPARTMENT D, EMPLOYEE E, PROJECT P, EMPL_ACT A
      WHERE E.EMPNO  = A.EMPNO
         AND A.PROJNO = P.PROJNO
        AND   E.WORKDEPT = D.DEPTNO
        AND   A.EMSTDATE  >= '1992-08-15'
      ORDER BY ACTNO, EMSTDATE

8. SELECT DEPTNO, M.LASTNAME, E.LASTNAME, M.HIREDATE,
                                                  E.HIREDATE
           FROM EMPLOYEE M, EMPLOYEE E, DEPARTMENT D
         WHERE D.MGRNO    = M.EMPNO
          AND       E.WORKDEPT = D.DEPTNO
          AND       M.HIREDATE    > E.HIREDATE
           AND     E.WORKDEPT  =  'A00'
       ORDER BY E.LASTNAME
```

Scalar functions and arithmetic

PROBLEMS:

1. For employees whose salary, increased by 5 percent, is less than or equal to $20000, list the following:
    - Last name
    - Salary
    - Salary increased by 5 percent
    - Monthly salary increased by 5 percent

   Sort the listing by salary.

2. For all employees with an education level of 18 or 20, the salary will be increased by $1,200 and the bonus will be halved. List last name, education level, the new salary and new bonus for these employees.

   Employees with an education level of 20 should be listed first. For employees with same education level, sort the list by salary.

3. The salary will be decreased by $1,000 for all employees matching the following criteria.
    - They belong to department ‘D11’
    - Their salary is more than or equal to 80 percent of $20,000.
    - Their salary is less than or equal to 120 percent of $20,000.

   List department number, last name, salary and decreased salary. Sort the result by salary.

4. We need a list for all employees of department ‘D11’ with an income (sum of salary, commission and bonus) that is higher than their salary increased by 10 percent List department number, last name and income. Sort the result in descending order by income.

5. List all departments, which have no manager, assigned. List department number and department name.

6. List project number and major project number of all projects whose project number contains 'AD' in position 1 and 2. If the major project number is unknown, display the text 'MAIN PROJECT'.
7. List all employees who were younger than 25 when they joined the company.

   List their employee number, last name and age in years.

   Sort the result by age of employee when joining the company and employee number.

8. We need a list of all projects, which ended on 2002-03-31. Display year and month of the estimated starting date and project number. Sort the result by the project number.

9. List project number and duration of all 'MA' projects (project number starts with MA) in weeks. The duration should be rounded and displayed with one decimal position.

   Order the list by the project number.

10. For projects of region MA (i.e., for projects whose project number starts with 'MA'), list project number, estimated ending dates and expected ending dates, if the duration will exceed the estimated by 10 percent.

    Order the list by project number.

11. How many days are there until the year 2003. (The expected result was produced on 2002-03-26 and therefore, will not match your result).

You may use an arbitrary table. Specify a predicate selecting a single row.

For OS/390 you may use SYSIBM.SYSDUMMY1 table which contains a single row.

12. List the first name initial and last name of all employees whose last name starts with 'A'. The initial should be separated from the last name by means of a period.

13. For all employees with an employee number from '000010' to '000110', display the following data, thereby, replacing some values by a more readable text:

- Employee number
- The first two characters of the project number replace by the following text (use column name PROJNO and name it PROJ):
  AD = ADMIN
  IF = SUP
  MA = DEV
  OP = OPER
  PL = PLAN
- Activity number replace by the following text (use column name ACTNO and name it ACT):
  10 = MANAGE
  20 = COST ESTIMATE
  30 = DEFINE SPECS

  If activity number is not 10, 20 or 30 display 'OTHER'.
- Activity starting date
- Activity ending date

Display only those activities, which ended before 2002-10-01.

Sort the result by employee number, PROJ column, activity-starting date, ACT column and activity ending date.

SOLUTIONS:

1. SELECT LASTNAME, SALARY
   SALARY*1.05 AS “INC-Y-SALARY”,
   SALARY*1.05/12 AS “INC-M-SALARY”
   FROM EMPLOYEE
   WHERE SALARY*1.05 <= 20000
   ORDER BY SALARY

2. SELECT LASTNAME, EDLEVEL,
   SALARY+1200 AS “NEW-SALARY”,
   BONUS*0.5 AS “NEW-BONUS”
   FROM EMPLOYEE
   WHERE EDLEVEL =18 OR EDLEVEL = 20
   ORDER BY EDLEVEL DESC, 3

3. SELECT WORKDEPT, LASTNAME, SALARY,
   SALARY-1000 AS “DECR-SALARY”
   FROM EMPLOYEE
   WHERE SALARY BETWEEN 20000*0.80 AND 20000*1.20
   AND WORKDEPT = ‘D11’
   ORDER BY SALARY

4. SELECT WORKDEPT, LASTNAME, SALARY+COMM+BONUS AS INCOME
   FROM EMPLOYEE
   WHERE SALARY+COMM+BONUS >1.1*SALARY
   AND WORKDEPT = ‘D11’
   ORDER BY 3 DESC

5. SELECT DEPTNO, DEPTNAME
   FROM DEPARTMENT
   WHERE MGRNO IS NULL

6. SELECT PROJNO,
   COALESCE (MAJPROJ, ‘MAIN PROJECT’) AS “MAJOR PROJECT”
   FROM PROJECT

```
    WHERE SUBSTR (PROJNO, 1, 2) = 'AD'
```

7.
```
SELECT EMPNO, LASTNAME, YEAR (HIREDATE – BIRTHDATE) AS
    AGE    FROM EMPLOYEE
       WHERE YEAR (HIREDATE – BIRTHDATE) < 25
    ORDER BY 3, EMPNO
```

8.
```
SELECT YEAR (PRSTDATE) AS YEAR, MONTH (PRSTDATE) AS
  MONTH, PROJNO
    FROM PROJECT
  WHERE PRENDATE = '2002-03-31'
     ORDER BY PROJNO
```

9.
```
SELECT PROJNO,
    DECIMAL ((DAYS (PRENDATE) – DAYS (PRSTDATE)) /7 + 0.05,8,1) AS
    WEEKS FROM PROJECT
    WHERE PROJNO LIKE 'MA%'
        ORDER BY PROJNO
```

10.
```
SELECT PROJNO, PRENDATE AS ESTIMATED, PRSTDATE +
    ((DAYS (PRENDATE) – DAYS (PRSTDATE)*1.1) DAYS
        AS EXPECTED
    FROM PROJECT
        WHERE PROJNO LIKE 'MA%'
     ORDER BY PROJNO
```

11.
```
SELECT DAYS ('2002-12-31') – DAYS (CURRENT_DATE) AS DAYS
    FROM SYSIBM.SYSDUMMY1
```

12.
```
SELECT SUBSTR (FIRSTNME, 1, 1) CONCAT '.' CONCAT LASTNAME
        AS NAME
```

```
    FROM EMPLOYEE
       WHERE LASTNAME LIKE 'A%'.

13. SELECT DISTINCT EMPNO,
            CASE SUBSTR (PROJNO, 1, 2)
            WHEN 'AD' THEN 'ADMIN.'
            WHEN 'IF'   THEN 'SUP.'
            WHEN 'MA' THEN 'DEV.'
            WHEN 'OP' THEN 'OPER.'
            WHEN 'PL'   THEN 'PLAN.'
            END AS PROJ,
            CASE
            WHEN ACTNO = 10 THEN 'MANAGE'
            WHEN ACTNO = 20 THEN 'COST ESTIMATE'
            WHEN ACTNO = 30 THEN 'DEFINE SPECS'
            ELSE 'OTHER'
            END AS ACT,
            EMSTDATE, EMENDATE
      FROM EMPL_ACT
    WHERE EMENDATE <= '2002-10-01'
            AND EMPNO BETWEEN '000010' AND '000110'
            ORDER BY EMPNO, PROJ, EMSTDATE, ACT, EMENDATE
```

Column Functions and Grouping

PROBLEMS:

1. For all departments, display department number and the sum of all salaries.

2. For all departments, display the department number and the number of employees.

3. Display the departments, which have more than 3 employees.

4. For all departments with at least one designer, display their number of designers (and department number)

5. For each department and each sex, display the average salary, the average bonus, the average commission and number of persons if the sex group contains at least two persons. The average should truncated (no rounding) after two decimal positions.

6. Display average bonus and average commission for all departments with an average bonus higher than $500 and an average commission higher than $2,000.

SOLUTIONS:

1.
```
SELECT WORKDEPT, SUM (SALARY) AS SUM_SALARY
      FROM EMPLOYEE
   GROUP BY WORKDEPT
```

2. SELECT WORKDEPT, COUNT (*) AS EMP_COUNT
   FROM EMPLOYEE
   GROUP BY WORKDEPT

3. SELECT WORKDEPT
   FROM EMPLOYEE
   GROUP BY WORKDEPT
   HAVING COUNT (*) > 3

4. SELECT COUNT (*) AS DESIGNER, WORKDEPT
   FROM EMPLOYEE
   WHERE JOB = 'DESIGNER'
   GROUP BY WORKDEPT

5. SELECT WORKDEPT, SEX, DECIMAL (AVG (SALARY), 8, 2)
   AS "AVG-SALARY",
   DECIMAL (AVG (BONUS), 8, 2)
   AS "AVG-BONUS",
   DECIMAL (AVG (COMM), 8, 2)
   AS "AVG-COMM",
   COUNT (*) AS COUNT
   FROM EMPLOYEE
   GROUP BY WORKDEPT, SEX
   HAVING COUNT (*) > 1

6. SELECT WORKDEPT, AVG (BONUS) AS "AVG-BONUS",
   AVG (COMM) AS "AVG-COMM"
   FROM EMPLOYEE
   GROUP BY WORKDEPT
   HAVING AVG (BONUS) > 500 AND AVG (COMM) > 2000

Union

PROBLEMS:

1. List the salaries of all employees of department 'A00'. As last line, display the sum of all salary of the department.

2. For departments A00, B01 and C01, list the projects they perform and the employees of the department. The output should consist of up to three lines for each department as follows:
   First line
   - Department number
   - Text: DEPARTMENT
   - Department name

   Second line (if data available):
   - Department number
   - Project number
   - Project name

   Subsequent line (if data available):
   - Department number
   - Employee number
   - Last name

3. For all projects (project number) beginning with 'IF', list the following:
   First line:
   - Text: PROJECT
   - Project number
   - Employee number responsible for the project
   - Estimated starting date
   - Estimated ending date

   Subsequent line:
   - Project number
   - Employee number performing the activity
   - Activity starting date
   - Activity ending date

   Display the projects in ascending sequence of their project number and employee number.

SOLUTIONS:

```
1. SELECT WORKDEPT, EMPNO, SALARY
          FROM EMPLOYEE
        WHERE WORKDEPT = 'A00'
         UNION ALL
   SELECT WORKDEPT, 'SUM', SUM (SALARY)
```

```
 FROM EMPLOYEE
WHERE WORKDEPT = 'A00'
GROUP BY WORKDEPT
ORDER BY 1, 2 DESC
```

2.
```
SELECT DEPTNO, 'DEPARTMENT' AS INFO, DEPTNAME, 1
   FROM DEPARTMENT
WHERE DEPTNO IN ('A00', 'B01', 'C01')
   UNION ALL
SELECT DEPTNO, PROJNO AS INFO, PROJNAME, 2
   FROM PROJECT
   WHERE DEPTNO IN ('A00', 'B01', 'C01')
   UNION ALL
SELECT WORKDEPT AS DEPTNO, EMPNO AS INFO, LASTNAME, 3
   FROM EMPLOYEE
   WHERE WORKDEPT IN ('A00', 'B01', 'C01')
   ORDER BY DEPTNO, 4
```

3.
```
SELECT 'PROJECT', PROJNO, RESPEMP, PRSTDATE, PRENDATE
   FROM PROJECT
WHERE PROJNO LIKE 'IF%'
 UNION ALL
 SELECT ' ', PROJNO, EMPNO, EMSTDATE, EMENDATE
   FROM EMPL_ACT
WHERE PROJNO LIKE 'IF%'
 ORDER BY 2, 1 DESC, 3, 4
```

Using Subqueries

PROBLEMS:

1. List those employees that have a salary, which is $5,000 higher than the average salary of all employees.

Display department number, employee number, last name and salary. Sort the list by the department number and employee number.

2. List employee number and last name of all employees not assigned to projects. This means that table EMPL_ACT does not contain a row with their employee number.

3. List all employees whose salary is higher than the average salary of all of the departments A00, B01 and C01.

   Display employee number, last name and salary.

4. List all employees whose salary is higher than the average salary of at least one of the departments A00, B01 and C01.

   Display employee number, last name and salary.

5. List project number and duration (in days) of the project with the shortest duration.

6. List department number, department name, last name and first name of all employees of departments with only male employees.

SOLUTIONS:

1.
```
SELECT WORKDEPT, EMPNO, LASTNAME, SALARY
   FROM EMPLOYEE
    WHERE SALARY >=
                (SELECT AVG (SALARY)+5000 FROM EMPLOYEE)
          ORDER BY WORKDEPT, EMPNO
```

2. SELECT EMPNO, LASTNAME
   FROM EMPLOYEE
   WHERE EMPNO NOT IN (SELECT EMPNO FROM EMPL_ACT)

3. SELECT EMPNO, LASTNAME, SALARY
   FROM SALARY
   WHERE SALARY > ALL
   (SELECT AVG (SALARY) FROM EMPLOYEE
   WHERE WORKDEPT IN ('C01', 'B01', 'A00')
   GROUP BY WORKDEPT)

4. SELECT EMPNO, LASTNAME, SALARY
   FROM EMPLOYEE
   WHERE SALARY > ANY
   (SELECT AVG (SALARY) FROM EMPLOYEE
   WHERE WORKDEPT IN ('C01', 'B01', 'A00')
   GROUP BY WORKDEPT)

5. SELECT PROJNO, MIN (DAYS (PRENDATE) – DAYS (PRSTDATE) AS
   DAYS FROM PROJECT
   GROUP BY PROJNO
   HAVING MIN (DAYS (PRENDATE) – DAYS (PRSTDATE)) =
   (SELECT MIN (DAYS (PRENDATE) – DAYS (PRSTDATE) FROM
   PROJECT)

or

```
SELECT PROJNO, MIN (DAYS (PRENDATE) – DAYS (PRSTDATE) AS
    DAYS FROM PROJECT
     WHERE DAYS (PRENDATE) – DAYS (PRSTDATE)  =
          (SELECT MIN (DAYS (PRENDATE) – DAYS (PRSTDATE)) FROM
               PROJECT)
       GROUP BY PROJNO
```

6.
```
SELECT DEPTNO, DEPTNAME, LASTNAME, FIRSTNME
    FROM DEPARTMENT, EMPLOYEE
    WHERE DEPTNO = WORKDEPT
    AND DEPTNO NOT IN
          (SELECT WORKDEPT
             FROM EMPLOYEE
              WHERE SEX ='F')
```