

Problem 1

Problem 1a query

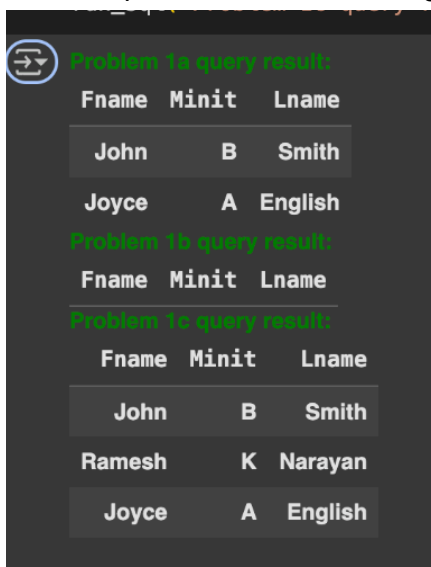
```
SELECT E.Fname, E.Minit, E.Lname
FROM Employee AS E
JOIN Work_on AS Wo ON E.Ssn = Wo.Essn
Join Project As P on Wo.Pno = P.Pnumber
WHERE E.Dno = 5 AND
      P.Pname = 'ProductX'
GROUP BY E.Ssn
HAVING SUM(Wo.Hours) > 10 ;
```

Problem 1b query

```
SELECT E.Fname, E.Minit, E.Lname
FROM Employee AS E
JOIN Dependent AS Dp ON E.Ssn = DP.Essn
WHERE E.Fname = Dp.Dependent_name;
```

Problem 1c query

```
SELECT E.Fname, E.Minit, E.Lname
FROM Employee AS E
JOIN Employee AS Supervisor
ON E.Super_ssn = Supervisor.Ssn
WHERE Supervisor.Fname = 'Franklin'
AND Supervisor.Lname = 'Wong';
```



The screenshot shows a database query result interface with a dark background. It displays three tables of employee data, each preceded by a green label 'Problem 1a query result:', 'Problem 1b query result:', and 'Problem 1c query result:' respectively. Each table has three columns: Fname, Minit, and Lname. The first table (Problem 1a) contains two rows: John B Smith and Joyce A English. The second table (Problem 1b) contains one row: John B Smith. The third table (Problem 1c) contains three rows: John B Smith, Ramesh K Narayan, and Joyce A English.

| Fname | Minit | Lname |
|-------|-------|---------|
| John | B | Smith |
| Joyce | A | English |

Problem 1b query result:

| Fname | Minit | Lname |
|-------|-------|-------|
| John | B | Smith |

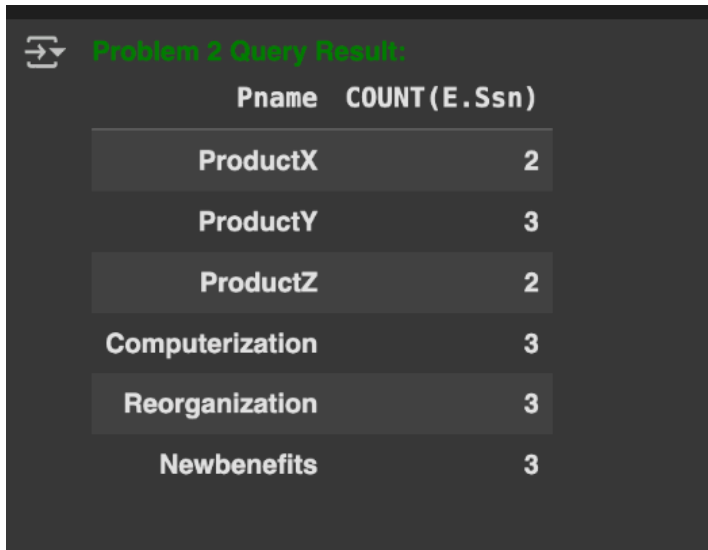
Problem 1c query result:

| Fname | Minit | Lname |
|--------|-------|---------|
| John | B | Smith |
| Ramesh | K | Narayan |
| Joyce | A | English |

Problem 2

Problem 2 Query

```
SELECT P.Pname, COUNT(E.Ssn)
FROM Project AS P
JOIN Work_on AS Wo ON Wo.Pno = P.Pnumber
JOIN Employee AS E ON Wo.Essn = E.Ssn
GROUP BY P.Pnumber
HAVING AVG(E.Salary) > 27000;
```



The screenshot shows a database query result titled "Problem 2 Query Result:". The result is a table with two columns: "Pname" and "COUNT(E.Ssn)". The table contains six rows of data, each representing a project and the number of employees associated with it. The projects are ProductX, ProductY, ProductZ, Computerization, Reorganization, and Newbenefits. The employee counts are 2, 3, 2, 3, 3, and 3 respectively.

| Pname | COUNT(E.Ssn) |
|-----------------|--------------|
| ProductX | 2 |
| ProductY | 3 |
| ProductZ | 2 |
| Computerization | 3 |
| Reorganization | 3 |
| Newbenefits | 3 |

Problem 3

Problem 3a query

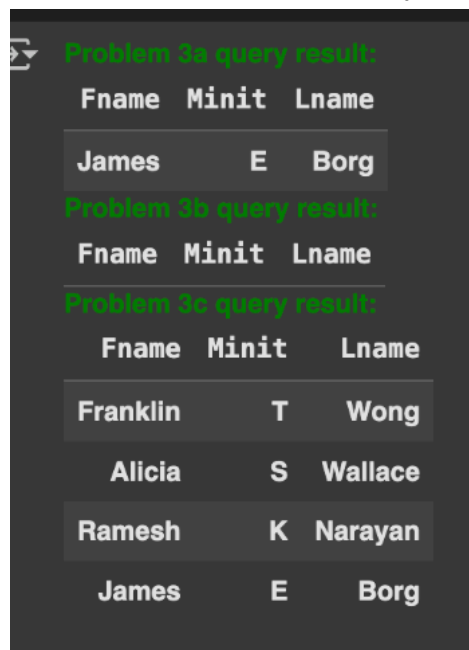
```
SELECT E.Fname, E.Minit, E.Lname
FROM Employee AS E
WHERE E.Salary >= (SELECT MAX(E2.Salary)
                   FROM Employee AS E2);
```

Problem 3b query

```
SELECT E.Fname, E.Minit, E.Lname
FROM Employee AS E
WHERE E.Super_Ssn in (SELECT E2.Ssn
                     FROM Employee AS E2
                     WHERE E2.Super_Ssn = '123456789');
```

Problem 3c query

```
SELECT E.Fname, E.Minit, E.Lname
FROM Employee AS E
WHERE E.Salary - 10000 >= (SELECT MIN(E2.Salary)
                          FROM Employee AS E2);
```



The screenshot shows the results of three SQL queries in a dark-themed interface. Each query result is preceded by a green label: 'Problem 3a query result:', 'Problem 3b query result:', and 'Problem 3c query result:'. The results are displayed as tables with three columns: Fname, Minit, and Lname.

Problem 3a query result:

| Fname | Minit | Lname |
|-------|-------|-------|
| James | E | Borg |

Problem 3b query result:

| Fname | Minit | Lname |
|-------|-------|-------|
|-------|-------|-------|

Problem 3c query result:

| Fname | Minit | Lname |
|----------|-------|---------|
| Franklin | T | Wong |
| Alicia | S | Wallace |
| Ramesh | K | Narayan |
| James | E | Borg |

Problem 4

Problem 4a Query

```
SELECT S.Name
FROM Student AS S
WHERE NOT EXISTS(
    SELECT *
    FROM Grade_report AS Gr
    WHERE S.Student_number = Gr.Student_number
    AND Gr.Grade != 'A'
);
```

Problem 4b Query

```
SELECT S.Name
FROM Student AS S
WHERE EXISTS(
    SELECT *
    FROM Grade_report AS Gr
    WHERE S.Student_number = Gr.Student_number
    AND Gr.Grade = 'A'
);
```

Problem 4a query result

Name

Problem 4b query result

Name

Brown

Problem 5

Problem 5 Solution

a)

user id - int (4 byte)

user name - varchar (100 byte), assuming that a name is always less than 100 characters

item id int - int (4 byte)

item name - varchar (100 byte), assuming that a name is always less than 100 characters

transaction id - long (8 byte) (big int)

amount of money (\$) for the transaction (e.g. \$7.81, \$470.80, etc) - float(4 byte)

b. The size of each row is 220 byte maximum.

c. If there is 1 trillion transaction, the database will have about 220 TB of data