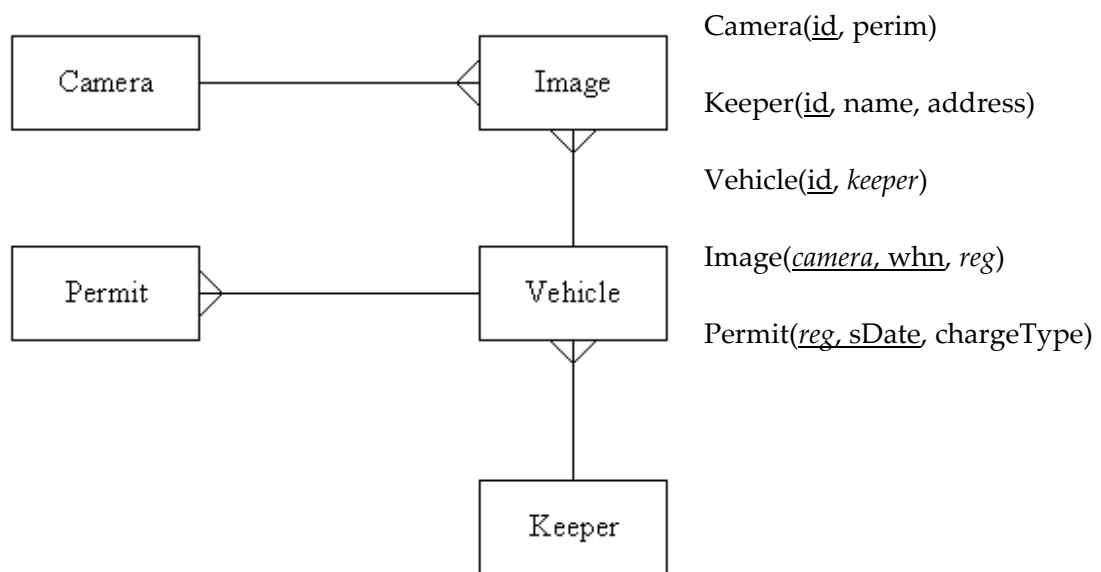


PS 6: SQL Querying Practice

Sample Database: **Congestion Charging**

ER diagram for the Congestion Charging database:



[Courtesy of SQLZOO and Napier University, <http://sqlzoonet>]

DATABASE and TABLE CREATION MYSQL CODES:

```
CREATE DATABASE CONGESTION_CHARGING;  
USE CONGESTION_CHARGING;
```

```
CREATE TABLE camera (  
    id INTEGER NOT NULL,  
    perim VARCHAR(3),  
    PRIMARY KEY (id)  
);
```

```
CREATE TABLE keeper (  
    id INTEGER NOT NULL PRIMARY KEY,  
    name VARCHAR(20),  
    address VARCHAR(25)  
);
```

```
CREATE TABLE vehicle (  
    id VARCHAR(10) NOT NULL PRIMARY KEY,  
    keeper INTEGER,  
    FOREIGN KEY(keeper) REFERENCES keeper(id)  
);
```

```
CREATE TABLE image (  
    camera INTEGER NOT NULL,  
    whn DATETIME NOT NULL,  
    reg VARCHAR(10),  
    PRIMARY KEY (camera,whn),  
    FOREIGN KEY (camera) REFERENCES camera(id),  
    FOREIGN KEY (reg) REFERENCES vehicle(id)  
);
```

```
CREATE TABLE permit (  
    reg VARCHAR(10) NOT NULL,  
    sDate DATETIME NOT NULL,  
    chargeType VARCHAR(10),  
    PRIMARY KEY (reg,sDate),  
    FOREIGN KEY (reg) REFERENCES vehicle(id)  
);
```

CREATING TABLE CONTENTS:

```
insert into camera values (1,'IN');
```

```
insert into keeper values (1,'Ambiguous, Arthur','Absorption Ave.');
```

Table Camera:

id	perim
1	IN
2	IN
3	IN
4	IN
5	IN
6	IN
7	IN
8	IN
9	OUT
10	OUT
11	OUT
12	OUT
13	OUT
14	OUT
15	OUT
16	OUT
17	NULL
18	NULL
19	NULL

19 rows in set (0.00 sec)

Table keeper:

id	name	address
1	Ambiguous, Arthur	Absorption Ave.
2	Inconspicuous, Iain	Interception Rd.
3	Contiguous, Carol	Circumscription Close
4	Strenuous, Sam	Surjection Street
5	Assiduous, Annie	Attribution Alley
6	Incongruous, Ingrid	Irresolution Pl.

6 rows in set (0.02 sec)

Table vehicle:

```
+-----+-----+
| id      | keeper |
+-----+-----+
| SO 02 MUP | NULL |
| SO 02 NUP | NULL |
| SO 02 OUP | NULL |
| SO 02 PUP | NULL |
| SO 02 QUP | NULL |
| SO 02 ASP | 1 |
| SO 02 ATP | 1 |
| SO 02 CSP | 1 |
| SO 02 CTP | 1 |
| SO 02 ESP | 1 |
| SO 02 RSP | 1 |
| SO 02 BTP | 2 |
| SO 02 HTP | 2 |
| SO 02 ITP | 2 |
| SO 02 JSP | 2 |
| SO 02 LSP | 2 |
| SO 02 MSP | 2 |
| SO 02 SSP | 2 |
| SO 02 BSP | 3 |
| SO 02 DTP | 3 |
| SO 02 FSP | 3 |
| SO 02 KTP | 3 |
| SO 02 DSP | 4 |
| SO 02 FTP | 4 |
| SO 02 JTP | 4 |
| SO 02 NSP | 4 |
| SO 02 PSP | 4 |
| SO 02 ETP | 5 |
| SO 02 GTP | 5 |
| SO 02 HSP | 5 |
| SO 02 KSP | 5 |
| SO 02 GSP | 6 |
| SO 02 ISP | 6 |
| SO 02 OSP | 6 |
| SO 02 QSP | 6 |
| SO 02 TSP | 6 |
+-----+-----+
36 rows in set (0.02 sec)
```

Table image:

+-----+-----+-----+			
camera whn		reg	
+-----+-----+-----+			
1	2003-02-25 06:10:13	SO 02 ASP	
9	2003-02-25 06:26:04	SO 02 ASP	
17	2003-02-25 06:20:01	SO 02 ASP	
18	2003-02-25 06:23:40	SO 02 ASP	
8	2003-02-25 07:35:41	SO 02 CSP	
8	2003-02-25 07:48:10	SO 02 CSP	
10	2003-02-25 07:45:11	SO 02 CSP	
11	2003-02-25 07:58:01	SO 02 CSP	
12	2003-02-25 07:04:31	SO 02 CSP	
17	2003-02-25 06:57:31	SO 02 CSP	
17	2003-02-25 07:00:40	SO 02 CSP	
18	2003-02-25 07:39:04	SO 02 CSP	
18	2003-02-25 07:42:30	SO 02 CSP	
18	2003-02-25 07:55:11	SO 02 CSP	
19	2003-02-25 07:51:10	SO 02 CSP	
9	2003-02-25 18:54:30	SO 02 DSP	
18	2003-02-25 16:29:11	SO 02 DSP	
19	2003-02-25 16:31:01	SO 02 DSP	
19	2003-02-25 17:42:41	SO 02 DSP	
3	2003-02-25 17:16:11	SO 02 ESP	
10	2003-02-25 18:08:40	SO 02 ESP	
11	2003-02-25 18:08:00	SO 02 FSP	
5	2003-02-25 07:10:00	SO 02 GSP	
12	2003-02-25 18:08:13	SO 02 GSP	
16	2003-02-25 07:13:00	SO 02 GSP	
9	2003-02-25 16:45:04	SO 02 HSP	
9	2003-02-25 16:48:11	SO 02 HSP	
9	2003-02-25 16:51:30	SO 02 HSP	
9	2003-02-25 16:58:01	SO 02 ISP	
12	2003-02-25 17:01:13	SO 02 ISP	
3	2003-02-25 17:07:00	SO 02 JSP	
3	2003-02-25 17:17:03	SO 02 JSP	
18	2003-02-25 17:10:43	SO 02 JSP	
19	2003-02-25 17:14:11	SO 02 JSP	
10	2003-02-25 18:23:11	SO 02 MUP	
11	2003-02-25 18:26:13	SO 02 NUP	
12	2003-02-25 18:29:01	SO 02 OUP	
3	2003-02-25 18:33:10	SO 02 PUP	
3	2003-02-25 18:39:10	SO 02 PUP	
15	2003-02-25 18:36:31	SO 02 PUP	
9	2003-02-25 16:39:10	SO 02 RSP	
18	2003-02-25 16:38:31	SO 02 RSP	
9	2003-02-25 16:31:01	SO 02 SSP	
18	2003-02-25 16:28:40	SO 02 SSP	
2	2003-02-25 07:20:01	SO 02 TSP	
10	2003-02-26 05:13:30	SO 02 TSP	
19	2003-02-25 07:23:00	SO 02 TSP	
19	2003-02-25 07:26:31	SO 02 TSP	
19	2003-02-25 07:29:00	SO 02 TSP	
+-----+-----+-----+			
49 rows in set (0.00 sec)			

Table permit:

reg	sDate	chargeType
SO 02 ASP	2002-01-21 00:00:00	Weekly
SO 02 ATP	2003-01-21 00:00:00	Daily
SO 02 ATP	2003-01-22 00:00:00	Daily
SO 02 BSP	2002-01-30 00:00:00	Weekly
SO 02 BTP	2002-01-30 00:00:00	Daily
SO 02 BTP	2002-01-31 00:00:00	Daily
SO 02 BTP	2003-02-03 00:00:00	Daily
SO 02 BTP	2003-02-04 00:00:00	Daily
SO 02 BTP	2003-02-05 00:00:00	Daily
SO 02 BTP	2003-02-06 00:00:00	Daily
SO 02 BTP	2003-02-07 00:00:00	Daily
SO 02 CSP	2003-01-21 00:00:00	Weekly
SO 02 CTP	2003-01-21 00:00:00	Daily
SO 02 CTP	2003-01-22 00:00:00	Daily
SO 02 DSP	2003-01-30 00:00:00	Weekly
SO 02 DTP	2003-01-30 00:00:00	Daily
SO 02 DTP	2003-01-31 00:00:00	Daily
SO 02 ESP	2003-02-21 00:00:00	Weekly
SO 02 ETP	2003-02-21 00:00:00	Daily
SO 02 ETP	2003-02-22 00:00:00	Daily
SO 02 FSP	2003-02-25 00:00:00	Weekly
SO 02 FTP	2003-02-25 00:00:00	Daily
SO 02 FTP	2003-02-26 00:00:00	Daily
SO 02 GSP	2003-02-28 00:00:00	Weekly
SO 02 GTP	2003-02-28 00:00:00	Daily
SO 02 GTP	2003-03-01 00:00:00	Daily
SO 02 HSP	2002-01-21 00:00:00	Monthly
SO 02 HTP	2002-01-21 00:00:00	Daily
SO 02 HTP	2002-01-22 00:00:00	Daily
SO 02 ISP	2002-01-30 00:00:00	Monthly
SO 02 ITP	2002-01-30 00:00:00	Daily
SO 02 ITP	2002-01-31 00:00:00	Daily
SO 02 JSP	2003-01-21 00:00:00	Monthly
SO 02 JTP	2003-01-21 00:00:00	Daily
SO 02 JTP	2003-01-22 00:00:00	Daily
SO 02 KSP	2003-01-30 00:00:00	Monthly
SO 02 KTP	2003-01-30 00:00:00	Daily
SO 02 KTP	2003-01-31 00:00:00	Daily
SO 02 LSP	2003-02-21 00:00:00	Monthly
SO 02 MSP	2003-02-25 00:00:00	Monthly
SO 02 NSP	2003-02-28 00:00:00	Monthly
SO 02 OSP	2002-01-21 00:00:00	Monthly
SO 02 PSP	2002-01-30 00:00:00	Monthly
SO 02 QSP	2003-01-21 00:00:00	Annual
SO 02 RSP	2003-01-30 00:00:00	Annual
SO 02 SSP	2003-02-21 00:00:00	Annual
SO 02 TSP	2003-02-25 00:00:00	Annual

47 rows in set (0.00 sec)

1. List the vehicles for which 'Strenuous, Sam' is the registered keeper.

The link between Keepers and Vehicles is via the foreign key specified in the CREATE TABLE Vehicle statement.

```
select Vehicle.id from Vehicle, Keeper where Vehicle.keeper = Keeper.id
and Keeper.name = 'Strenuous, Sam'
```

```
+-----+
| id      |
+-----+
| SO 02 DSP |
| SO 02 FTP |
| SO 02 JTP |
| SO 02 NSP |
| SO 02 PSP |
+-----+
```

2. Show the name and address of the keeper of vehicle SO 02 PSP.

```
select name, address from keeper,vehicle
where vehicle.keeper = keeper.id
and vehicle.id='SO 02 PSP'
```

```
+-----+-----+
| name      | address      |
+-----+-----+
| Strenuous, Sam | Surjection Street |
+-----+-----+
```

3. Show the number of cameras that take images for incoming vehicles.

```
select count(*) from camera where perim='IN'
```

```
+-----+
| count(*) |
+-----+
|      8 |
+-----+
1 row in set (0.00 sec)
```

4. List the image details (date and reg) taken by Camera 10 before 26 Feb 2003.

```
SELECT whn, reg
FROM image
WHERE camera =10
AND whn < '2003-02-26'
```

```
+-----+-----+
| whn          | reg    |
+-----+-----+
| 2003-02-25 07:45:11 | SO 02 CSP |
| 2003-02-25 18:08:40 | SO 02 ESP |
| 2003-02-25 18:23:11 | SO 02 MUP |
+-----+-----+
3 rows in set (0.00 sec)
```

5. List the number of images taken by each camera. Your answer should show how many images have been taken by camera 1, camera 2 etc. The list must NOT include the images taken by camera 15, 16, 17, 18 and 19.

```
select camera,count(*) from image where camera<15 group by camera
```

```
+-----+-----+
| camera | count(*) |
+-----+-----+
| 1      | 1        |
| 2      | 1        |
| 3      | 5        |
| 5      | 1        |
| 8      | 2        |
| 9      | 8        |
| 10     | 4        |
| 11     | 3        |
| 12     | 4        |
+-----+-----+
9 rows in set (0.00 sec)
```

6. A number of vehicles have permits that start on 30th Jan 2003. List the name and address for each keeper in alphabetical order without duplication.


```

select distinct name,address from vehicle,keeper,permit
where sDate='2003-01-30'
and permit.reg=vehicle.id
and keeper.id=vehicle.keeper
order by name

```

```

+-----+-----+
| name      | address      |
+-----+-----+
| Ambiguous, Arthur | Absorption Ave. |
| Assiduous, Annie | Attribution Alley |
| Contiguous, Carol | Circumscription Close |
| Strenuous, Sam | Surjection Street |
+-----+-----+
4 rows in set (0.01 sec)

```

7. List the owners (name and address) of Vehicles caught by camera 1 or 18 without duplication.

```

select distinct name, address
from image as i, vehicle as v, keeper as k
where i.reg = v.id and
      v.keeper = k.id and
      (i.camera = 1 or i.camera = 18)

```

```

+-----+-----+
| name      | address      |
+-----+-----+
| Ambiguous, Arthur | Absorption Ave. |
| Inconspicuous, Iain | Interception Rd. |
| Strenuous, Sam | Surjection Street |
+-----+-----+
3 rows in set (0.00 sec)

```

8. Show keepers (name and address) who have more than 5 vehicles.

```
select k.name, k.address, count(v.id) from keeper as k, vehicle as v
where v.keeper= k.id
group by k.name, k.address
having count(v.id) > 5
```

```
+-----+-----+-----+
| name          | address      | count(v.id) |
+-----+-----+-----+
| Ambiguous, Arthur | Absorption Ave. | 6 |
| Inconspicuous, Iain | Interception Rd. | 7 |
+-----+-----+-----+
2 rows in set (0.00 sec)
```

9. For each vehicle show the number of current permits (suppose today is the 1st of Feb 2003). The list should include the vehicle's registration and the number of permits. Current permits can be determined based on charge types, e.g. for weekly permit you can use the date after 24 Jan 2003 and before 02 Feb 2003.

```
select v.id , count(v.id) from vehicle as v, permit as p
where v.id = p.reg and(
    (p.chargeType = 'Daily' and p.sDate = '2003-02-01') or
    (p.chargeType = 'Weekly' and p.sDate > '2003-01-24') or
    (p.chargeType = 'Monthly' and p.sDate > '2003-01-01') or
    (p.chargeType = 'Annual' and p.sDate > '2002-02-01') ) group by v.id
```

```
+-----+-----+
| id      | count(p.reg) |
+-----+-----+
| SO 02 DSP | 1 |
| SO 02 ESP | 1 |
| SO 02 FSP | 1 |
| SO 02 GSP | 1 |
| SO 02 JSP | 1 |
| SO 02 KSP | 1 |
| SO 02 LSP | 1 |
| SO 02 MSP | 1 |
| SO 02 NSP | 1 |
| SO 02 QSP | 1 |
| SO 02 RSP | 1 |
| SO 02 SSP | 1 |
| SO 02 TSP | 1 |
+-----+-----+
13 rows in set (0.00 sec)
```

10. Obtain a list of every vehicle passing camera 10 on 25th Feb 2003. Show the time, the registration and the name of the keeper if available.

```
select whn, reg, name
from   image as i, vehicle as v left outer join keeper as k on v.keeper = k.id
where  i.reg = v.id and
       Date(i.whn) = '2003-02-25' and
       i.camera = 10
```

```
+-----+-----+-----+
| whn          | reg    | name          |
+-----+-----+-----+
| 2003-02-25 07:45:11 | SO 02 CSP | Ambiguous, Arthur |
| 2003-02-25 18:08:40 | SO 02 ESP | Ambiguous, Arthur |
| 2003-02-25 18:23:11 | SO 02 MUP | NULL           |
+-----+-----+-----+
3 rows in set (0.02 sec)
```

11. List the keepers who have more than 4 vehicles and one of them must have more than 2 permits. The list should include the names and the number of vehicles.

```
select  k.name, count(v.id)
from    vehicle as v, keeper as k, permit as p
where   v.keeper = k.id and p.reg = v.id
group by k.name
having  count(v.id) > 4 and count(p.reg) > 2
```

```
+-----+-----+
| name                | count(v.id) |
+-----+-----+
| Ambiguous, Arthur   | 8 |
| Assiduous, Annie    | 6 |
| Contiguous, Carol   | 6 |
| Incongruous, Ingrid | 5 |
| Inconspicuous, Iain | 15 |
| Strenuous, Sam      | 7 |
+-----+-----+
6 rows in set (0.00 sec)
```

12. There are four types of permit. The most popular type means that this type has been issued the highest number of times. Find out the most popular type, together with the total number of permits issued.

```
select * from (
    select chargeType, Count(*) as ToplamAdet from permit group by chargeType
) as D
order by ToplamAdet desc
limit 1
```

```
+-----+-----+
| chargeType | ToplamAdet |
+-----+-----+
| Daily      | 27         |
+-----+-----+
1 row in set (0.00 sec)
```

13. For each of the vehicles caught by camera 19 - show the registration, the earliest time at camera 19 and the time and camera at which it left the zone.

```
select i.reg, regs.earlyCaught, c.id as leftCamera, whn
from image as i, camera as c,
    (select i.reg , min(i.whn) as earlyCaught from image as i
     where i.camera = 19
     group by reg
    ) as regs
where regs.reg = i.reg and
      i.camera = c.id and
      regs.earlyCaught < i.whn and
      c.perim = 'OUT'
```

```
+-----+-----+-----+-----+
| reg      | earlyCaught      | leftCamera | whn              |
+-----+-----+-----+-----+
| SO 02 CSP | 2003-02-25 07:51:10 | 11         | 2003-02-25 07:58:01 |
| SO 02 DSP | 2003-02-25 16:31:01 | 9          | 2003-02-25 18:54:30 |
| SO 02 TSP | 2003-02-25 07:23:00 | 10         | 2003-02-26 05:13:30 |
+-----+-----+-----+-----+
3 rows in set (0.02 sec)
```

14. For all 19 cameras - show the position as IN, OUT or INTERNAL and the busiest hour for that camera.

```
select  c.id, IFNULL(c.perim, 'INTERNAL'), Hour from  camera as c,
        (select i.camera, Hour(whn) as Hour, count(*) as imagesTaken
         from   image as i
         group by i.camera, Hour(whn)
         order by i.camera, Hour, imagesTaken desc
        ) as Hours,
        (select CamHour.camera, Max(imagesTaken) as MaxImages
         from
            (select i.camera, Hour(whn) as Hour, count(*) as imagesTaken
             from   image as i
             group by i.camera, Hour(whn)
             order by i.camera, Hour, imagesTaken desc
            ) as CamHour
        group by CamHour.camera
        ) as busiest
where  Hours.imagesTaken = busiest.MaxImages and
       Hours.camera = busiest.camera and
       c.id = Hours.camera
```

```
+---+-----+-----+
| id | IFNULL(c.perim, 'INTERNAL') | Hour |
+---+-----+-----+
| 1 | IN          | 6 |
| 2 | IN          | 7 |
| 3 | IN          | 17 |
| 5 | IN          | 7 |
| 8 | IN          | 7 |
| 9 | OUT         | 16 |
| 10 | OUT         | 18 |
| 11 | OUT         | 18 |
| 12 | OUT         | 18 |
| 15 | OUT         | 18 |
| 16 | OUT         | 7 |
| 17 | INTERNAL    | 6 |
| 18 | INTERNAL    | 7 |
| 18 | INTERNAL    | 16 |
| 19 | INTERNAL    | 7 |
+---+-----+-----+
15 rows in set (0.03 sec)
```