CS 338 – Winter 2014
Solutions to Assignment #1

Example solution for question 1

```
SELECT c_name
FROM CUSTOMER
WHERE c_acctbal > 9000 AND c_mktsegment = 'HOUSEHOLD';
```

Example solution for question 2

```
SELECT DISTINCT n_name
FROM LINEITEM, ORDERS, CUSTOMER, SUPPLIER, NATION
WHERE l_orderkey = o_orderkey AND o_custkey = c_custkey AND c_nationkey = n_nationkey
AND l_suppkey = s_suppkey
AND s_nationkey = c_nationkey
AND TIMESTAMPDIFF(day, l_shipdate, l_receiptdate) > 29
```

Example solution for question 3

```
SELECT DISTINCT p_partkey, p_name
FROM PART, PARTSUPP, SUPPLIER, NATION, REGION
WHERE p_partkey = ps_partkey AND ps_suppkey = s_suppkey AND s_nationkey = n_nationkey
AND n_regionkey = r_regionkey AND r_name = 'MIDDLE EAST'
ORDER BY p_partkey;
```

(MORE ADVANCED)

Example solution for question 4

```
SELECT p_partkey, p_name
FROM PART
WHERE p_partkey NOT IN
        (SELECT p_partkey
        FROM PART, PARTSUPP, SUPPLIER, NATION, REGION
        WHERE ps_suppkey = s_suppkey AND s_nationkey = n_nationkey AND n_regionkey =
        r_regionkey AND r_name = 'EUROPE')
```

Using Except:

```
(SELECT p_partkey, p_name FROM PART WHERE p_partkey )
EXCEPT
(SELECT p_partkey, p_name
FROM PART, PARTSUPP, SUPPLIER, NATION, REGION
WHERE ps_suppkey = s_suppkey AND s_nationkey = n_nationkey AND n_regionkey = r_regionkey AND
r_name = 'EUROPE')
```

Example solution for question 5

```
SELECT COUNT(DISTINCT ps_partkey)
FROM PARTSUPP, SUPPLIER, NATION, REGION
WHERE ps_suppkey = s_suppkey AND s_nationkey = n_nationkey AND n_regionkey = r_regionkey AND
r_name = 'EUROPE'
```

Example solution for question 6

```
SELECT DISTINCT c_name, c_phone, r_name
FROM CUSTOMER, NATION, REGION ,
        (SELECT c_custkey
        FROM CUSTOMER
        WHERE c_custkey NOT IN
                (SELECT c_custkey
                FROM LINEITEM, ORDERS, CUSTOMER, SUPPLIER, NATION nc, NATION ns
                WHERE l_orderkey = o_orderkey AND o_custkey = c_custkey AND c_nationkey =
                nc.n_nationkey
                AND nc.n_regionkey <> ns.n_regionkey AND l_suppkey = s_suppkey AND s_nationkey =
                ns.n_nationkey)
        ) AS custkeys
WHERE custkeys.c_custkey = CUSTOMER.c_custkey AND c_nationkey = n_nationkey AND n_regionkey =
r_regionkey
```

Using Except:

```
WITH custkeys AS (
        (SELECT c_custkey FROM CUSTOMER)
        EXCEPT
        (SELECT c_custkey
        FROM lineitem, orders, CUSTOMER, SUPPLIER, NATION nc, NATION ns
        WHERE l_orderkey = o_orderkey AND o_custkey = c_custkey AND c_nationkey = nc.n_nationkey
        AND nc.n_regionkey <> ns.n_regionkey AND l_suppkey = s_suppkey AND s_nationkey =
        ns.n_nationkey)
)

SELECT DISTINCT c_name, c_phone, r_name
FROM custkeys, CUSTOMER, NATION, REGION
WHERE custkeys.c_custkey = CUSTOMER.c_custkey AND c_nationkey = n_nationkey AND n_regionkey =
r_regionkey
```

Example solution for question 7

```
SELECT MAX(l_extendedprice)
FROM LINEITEM
```

```
WHERE l_discount > l_tax
```

Example solution for question 8

```
SELECT COUNT(orderkey)
FROM (
        SELECT DISTINCT o_orderkey AS orderkey
        FROM ORDERS WHERE o_orderkey NOT IN (
                SELECT DISTINCT l_orderkey AS orderkey
                FROM LINEITEM
                WHERE TIMESTAMPDIFF(day, l_shipdate, l_receiptdate) > 14)
) AS timelyorders;
```

USING EXCEPT:

```
WITH timelyorders AS (
        (SELECT DISTINCT o_orderkey AS orderkey FROM orders)
        EXCEPT
        (SELECT DISTINCT l_orderkey AS orderkey
        FROM lineitem
        WHERE TIMESTAMPDIFF(day, l_shipdate, l_receiptdate) > 14)
)

SELECT COUNT(orderkey) FROM timelyorders;
```

Example solution for question 9

```
SELECT COUNT(*) FROM
(
        SELECT c_custkey
        FROM CUSTOMER
        WHERE c_custkey NOT IN
                (SELECT DISTINCT o_custkey
                FROM LINEITEM, ORDERS, SUPPLIER, NATION
                WHERE l_orderkey = o_orderkey AND l_suppkey = s_suppkey AND s_nationkey =
                n_nationkey AND n_name = 'UNITED STATES')
)  AS requiredCustomers;
```

USING EXCEPT:

```
WITH requiredCustomers AS (
        (SELECT c_custkey FROM CUSTOMER)
        EXCEPT
        (SELECT DISTINCT o_custkey
        FROM lineitem, orders, SUPPLIER, NATION
        WHERE l_orderkey = o_orderkey AND l_suppkey = s_suppkey AND s_nationkey = n_nationkey
```

```
        AND n_name = 'UNITED STATES')
)

SELECT COUNT(*) FROM requiredCustomers;
```

Example solution for question 10

```
SELECT n_name
FROM CUSTOMER, NATION
WHERE c_acctbal = (
        SELECT MAX(c_acctbal) FROM CUSTOMER
        )
        AND c_nationkey = n_nationkey;
```

CHINOOK

Example solution for question 11

```
SELECT c.FirstName, c.LastName, c.country
FROM Customer c, Employee e
WHERE c.supportRepId = e.employeeId AND TIMESTAMPDIFF(YEAR, birthdate, hiredate)  < 35
```

Note: If concatenation was required:

```
SELECT CONCAT_WS(" ", c.FirstName, c.LastName) as Name, c.country
FROM Customer c, Employee e
WHERE c.supportRepId = e.employeeId AND TIMESTAMPDIFF(YEAR, birthdate, hiredate)  < 35
```

Example solution for question 12

```
SELECT Title
FROM Artist, Album
WHERE Artist.ArtistId=Album.ArtistId AND Name='Aerosmith'
```

Example solution for question 13

```
SELECT DISTINCT Playlist.PlaylistId, Playlist.Name
FROM Artist, Album, Track, PlaylistTrack, Playlist
WHERE Artist.Name = 'Aerosmith'
  AND Artist.ArtistId = Album.ArtistId
  AND Album.AlbumId = Track.AlbumId
  AND PlaylistTrack.TrackId = Track.TrackId
  AND Playlist.PlaylistId = PlaylistTrack.PlaylistId
```

Example solution for question 14

```
SELECT Name, Composer
FROM Track
WHERE Name LIKE 'Black%'
  AND Name <> 'Black Sabbath'
  AND Name <> 'Black Diamond'
```

Example solution for question 15

```
SELECT Name, Milliseconds/1000
FROM Track
WHERE Name LIKE 'Black%'
```

Example solution for question 16

```
 (
 SELECT Track.Name
 FROM Artist, Album, Track
 WHERE Artist.Name = 'Aerosmith'
   AND Artist.ArtistId = Album.ArtistId
   AND Album.AlbumId = Track.AlbumId
)
UNION
(
 SELECT Track.Name
 FROM Track, PlaylistTrack, Playlist
 WHERE PlaylistTrack.TrackId = Track.TrackId
    AND Playlist.PlaylistId = PlaylistTrack.PlaylistId
    AND Playlist.Name = 'Heavy Metal Classic'
)
```

(More advanced)

Example solution for question 17

```
SELECT artistId, name
FROM Artist
WHERE artistId NOT IN
          (SELECT Album.artistId FROM Album)
```

Example solution for question 18

```
SELECT artistId, name
FROM Artist
WHERE artistId NOT IN (
        SELECT Album.artistId
        FROM Album, Track, Genre
        WHERE Album.albumId = Track.albumId
          AND Track.genreId = Genre.genreId
          AND Genre.name = 'Latin')
```

Example solution for question 19

```
SELECT playlistId, name
FROM Playlist
WHERE PlaylistId NOT IN
        (SELECT pt.playlistId
        FROM PlaylistTrack pt, Track t, Genre g
        WHERE pt.trackId = t.trackId AND t.genreId = g.genreId AND g.name = 'Latin')
```

Example solution for question 20

```
SELECT playlistId, name
FROM Playlist
WHERE playlistId NOT IN (
        SELECT pt.playlistId
        FROM PlaylistTrack pt, Track t, Album b, Artist a
        WHERE pt.trackId = t.trackId AND t.albumId = b.albumId AND b.artistId = a.artistId
          AND (a.name = 'Black Sabbath'  OR a.name = 'Chico Buarque')
        )
```

Example solution for question 21

```
SELECT t.trackId, t.name
FROM Track t, MediaType m
WHERE milliseconds = (
        SELECT MAX(milliseconds)
        FROM Track t, MediaType m
        WHERE t.mediaTypeId  = m.mediaTypeId AND m.name LIKE '%video%')
AND t.mediaTypeId  = m.mediaTypeId AND m.name LIKE '%video%'
```

Example solution for question 22

```
SELECT firstname, lastname
```

```
FROM Customer
WHERE city = (
        SELECT city FROM Employee WHERE reportsTo IS NULL
        )
```

Example solution for question 23

```
SELECT employeeId, firstname, lastname
FROM Employee e
WHERE e.employeeId IN (
        SELECT DISTINCT reportsTo
        FROM Employee, Customer
        WHERE employeeId = supportRepId AND Customer.country = 'Brazil')
```

Example solution for question 24

```
SELECT COUNT(t.trackId), SUM(l.unitprice)
FROM InvoiceLine l, Invoice i, Customer c, Track t, MediaType m
WHERE l.invoiceId = i.invoiceId AND i.customerId = c.customerId AND c.country = 'Germany'
AND l.trackId = t.trackId AND t.mediaTypeId = m.mediaTypeId AND m.name  LIKE '%audio%'
```

Example solution for question 25

```
SELECT SUM(bytes), SUM(unitprice)
FROM Playlist p, PlaylistTrack pt, Track t
WHERE p.name = 'Grunge' AND p.playListId = pt.playListId AND pt.trackId = t.trackId
```

Relational Algebra Expressions

Q12

$$\text{RESULT} \leftarrow \pi_{\text{title}}\Big(\sigma_{\text{name='Aerosmith'}}(\text{Artist} \bowtie \text{Album})\Big)$$

Q13

$$\begin{aligned}
\text{AerosmithAlbums} &\leftarrow \pi_{\text{AlbumId}}\Big(\sigma_{\text{Name='Aerosmith'}}(\text{Artist} \bowtie \text{Album})\Big)\\
\text{AerosmithTracks} &\leftarrow \pi_{\text{TrackId}}(\text{T1} \bowtie \text{Track})\\
\text{RESULT} &\leftarrow \pi_{\text{PlaylistId,Name}}\Big(\text{Playlist} \bowtie \big(\text{PlaylistTrack} \bowtie \text{AerosmithTracks}\big)\Big)
\end{aligned}$$

Q1

$$\text{RESULT} \leftarrow \pi_{\text{c\_name}}\Big(\sigma_{\text{acctbal=9000 AND mktSegment='HOUSEHOLD'}}(\text{CUSTOMER})\Big)$$

Q2

$$\begin{aligned}
\text{T1} &\leftarrow \text{LINEITEM} \bowtie_{\text{l_orderkey=o_orderkey}} \text{ORDERS}\\
\text{T2} &\leftarrow \text{T1} \bowtie_{\text{o_custkey=c_custkey}} \text{CUSTOMER}\\
\text{T3} &\leftarrow \text{T2} \bowtie_{\text{o_custkey=c_custkey}} \text{SUPPLIER}\\
\text{T4} &\leftarrow \text{T3} \bowtie_{\text{s_nationkey=n_nationkey}} \text{NATION}\\
\text{RESULT} &\leftarrow \pi_{\text{n_name}}\big(\sigma_{\text{DATEDIFF(day,l_shipdate,l_receiptdate)>29 AND cnationkey=snationkey}}(\text{T4})\big)
\end{aligned}$$

Q3

$$\begin{aligned}
\text{T1} &\leftarrow \text{PART} \bowtie_{\text{p_partkey=ps_partkey}} \text{PARTSUPP}\\
\text{T2} &\leftarrow \text{T1} \bowtie_{\text{ps_suppkey=s_suppkey}} \text{SUPPLIER}\\
\text{T3} &\leftarrow \text{T2} \bowtie_{\text{s_nationkey=n_nationkey}} \text{NATION}\\
\text{T4} &\leftarrow \text{T3} \bowtie_{\text{n_regionkey=n}} \text{REGION}\\
\text{RESULT} &\leftarrow \pi_{\text{p_partkey,p_name}}\Big(\sigma_{\text{r_name='MIDDLEEAST'}}(\text{T4})\Big)
\end{aligned}$$

Q4

$$\begin{aligned}
\text{T1} &\leftarrow \text{PART} \bowtie_{\text{p_partkey=ps_partkey}} \text{PARTSUPP}\\
\text{T2} &\leftarrow \text{T1} \bowtie_{\text{ps_suppkey=s_suppkey}} \text{SUPPLIER}\\
\text{T3} &\leftarrow \text{T2} \bowtie_{\text{s_nationkey=n_nationkey}} \text{NATION}\\
\text{T4} &\leftarrow \text{T3} \bowtie_{\text{n_regionkey=n}} \text{REGION}\\
\text{RESULT} &\leftarrow \pi_{\text{p_partkey,p_name}}(\text{PART}) - \pi_{\text{p_partkey,p_name}}\Big(\sigma_{\text{r_name='EUROPE'}}(\text{T4})\Big)
\end{aligned}$$

Q6

$$\begin{aligned}
\text{T1} &\leftarrow \text{CUSTOMER} \bowtie_{\text{c_nationkey=nc.n_nationkey}} \rho_{\text{nc}}(\text{NATION})\\
\text{T2} &\leftarrow \text{SUPPLIER} \bowtie_{\text{s_nationkey=ns.n_nationkey}} \rho_{\text{ns}}(\text{NATION})\\
\text{T3} &\leftarrow \text{T1} \bowtie_{\text{c_custkey=o_custkey}} \text{ORDERS} \bowtie_{\text{o_orderkey=l_orderkey}} \text{LINEITEM} \bowtie_{\text{l_suppkey=s_suppkey}} \text{T2}\\
\text{T4} &\leftarrow \pi_{\text{c_custkey}}(\text{CUSTOMER}) - \pi_{\text{c_custkey}}\Big(\sigma_{\text{nc.n_regionkey}\neq\text{ns.n_nationkey}}(\text{T3})\Big)\\
\text{RESULT} &\leftarrow \pi_{\text{c_name,c_phone,r_name}}\Big(\text{T4} \bowtie \text{CUSTOMER} \bowtie_{\text{c_nationkey=n_nationkey}} \text{NATION} \bowtie_{\text{n_regionkey=r_regionkey}} \text{REGION}\Big)
\end{aligned}$$

Q11

$$\text{T1} \leftarrow \rho_{\text{c}}(\text{Customer}) \bowtie_{\text{c.supportRepId=e.employeeId}} \rho_{\text{e}}(\text{Employee})$$
$$\text{RESULT} \leftarrow \pi_{\text{c.firstname,c.lastname,c.country}}\Big(\sigma_{\text{DATEDIFF(year,e.birthdate,e.hiredate)<35}}(\text{T1})\Big)$$

Q17

$$\text{RESULT} \leftarrow \pi_{\text{artistId,name}}(\text{Artist}) - \pi_{\text{artistId,name}}(\text{Artist} \bowtie \text{Album})$$

Q22

$$\text{T1} \leftarrow \text{Customer} \bowtie_{\text{Customer.city=Employee.city}} \text{Employee}$$
$$\text{RESULT} \leftarrow \pi_{\text{Customer.firstname,Customer.lastname}}\Big(\sigma_{\text{reportsTo = NULL}}(\text{T1})\Big)$$

Q23

$$\text{T1} \leftarrow \pi_{\text{reportsTo}}\big(\sigma_{\text{Customer.country='Brazil'}}(\text{Customer} \bowtie_{\text{supportRepId=employeeId}} \text{Employee})\big)$$
$$\text{RESULT} \leftarrow \pi_{\text{employeeId,firstname,lastname}}\big(\text{Employee} \bowtie_{\text{employeeId=T1.reportsTo}} \text{T1}\big)$$