Week 1

Columns = attributes
each row = tuple, record
each cell is atomic, no list, no object in the cell.

- Case insensitive, however 'Seattle' ≠ 'seattle'
  'abc' ✓ "abc" X

Select DISTINCT eliminates duplicates

---

electronics and toy category, china

```
select ---
from  Product, Company
wher  country = 'China' and
      category = 'toy' and
      cname = manu          and  cname in ( Select ---
      (company name) (product's manufacturer)      'electronics' )
```

without Intersect

Likes(drinker, beer)   Frequents(drinker, bar)   Serves(Bar, beer)

- For each bar, count # of drinkeers that are freq. to that bar and that like both 'heineken' and 'bud'

```
Select  x.bar, count(distinct x.drinker)
from    freq x, likes y, likes z
where   x.drinker = y.drinker and
        x.drinker = z.drinker and
        y.beer = 'hein' and
        z.beer = 'bud'
group by  x.bar
```

- For each bar that serve both 'heir' and 'bud', count # of drinkers that are freq. to bar.

```
Select  x.bar, count(distinct x.drinkers)
from    frequents x, serves y, serves z
where   x.bar = y.bar and
        x.bar = z.bar and
        y.beer = 'heir' and
        z.beer = 'bud'
group by x.bar
```

- For each bar that serve 'heir', count # of drinkers that freq. to bar and like 'bud'

```
Select  x.bar, count(distinct x.drinkers)
from    frequents x, serve y, likes z
where   x.bar = y.bar and
        x.drinker = z.drinker and
        y.beer = 'heir' and
        z.beer = 'bud'
group by x.bar
```

- Find <u>all</u> drinkers that are freq to <u>some bar</u> that serves <u>some</u> beer that they like

```
Select distinct x.drinkers
from    frequents x, serves y, likes z
where   x.drinkers = z.drinkers and
        x.bar = y.bar and
        y.beer = z.beer
```

all drinkers that frequent only bars that serve some beer that they like.

If a bar does not sell any beer that drinker like, ignore it.

$(p \Rightarrow q) = p' \vee q$

$\neg(p \Rightarrow q) = p \wedge q'$

$d \mid \forall bar,\ frequent(d, bar) \Rightarrow exist\ beer\ serves(bar, beer)$ and $likes(d, beer)$

For all bars, if a drinker frequents to a bar implies that there exist a beer in that bar that drinker likes

d|drinker —

exist frequent(d, bar) and not (exist beer serves(bar, beer) and likes(d, beer))

```
Select  x.drinker
from    frequents x
where   x.drinker not in
        (Select y.drinker
        from    freq y
        where   not exists
                (Select z.bar
                from    serves z, likes u
                where   y.bar = z.bar and
                        y.drinker = u.drinker and
                        z.beer = u.beer))
```

all drinkers that frequent some bar that serves only beer that they like.

If a bar serves a beer different then the drinker likes, drinker should not be present.

$\{d \mid \text{exists bar frequent}(d, \text{bar}) \text{ and}$
$\text{forall beer}(\text{serves}(\text{bar}, \text{beer}) \Rightarrow \text{likes}(d, \text{beer}))\}$

$p \Rightarrow q = p' \vee q = \neg(p \wedge q')$

$\{d \mid \text{exists bar frequent}(d, \text{bar}) \text{ and}$
$\text{not exist beer}(\text{serves}(\text{bar}, \text{beer}) \text{ and not likes}(d, \text{beer}))\}$

```
Select x.drinker
from freq x
where not exists
    ( select *
      from serves y
      where x.bar = y.bar and
            not exists ( select *
                         from likes z
                         where z.beer = y.beer and
                               z.drinker = x.drinker ) )
```

I

Koray	A
Ugur	B
Koray	C

L

Koray	Efes
Koray	Miller
Ugur	Bud
Ugur	Efes

S

A	Efes
B	Miller
B	Bud
C	Bud

- all drinkers that freq. some bar that serves some beer that they dont like.

Selan

$\{d \mid \text{exists frequent}(d, \text{bar}) \text{ and } \text{exist beer}(\text{serve}(\text{bar}, \text{beer}) \text{ and } \text{not like}(d, \text{beer}))\}$

```
Select x.drinker
from freq x, serve y
where x.bar = y.bar and
      not exists (select
                  from likes z
                  where z.beer = y.beer and
                        z.drinker = x.drinker)
```

- Find all drinkers that freq some bar that serve only beer that they dont like.

$\{d \mid \text{exists freq}(d, \text{bar}) \text{ and } \text{forall beer}(\text{serves}(\text{bar}, \text{beer}) \Rightarrow \text{not like}(d, \text{beer}))\}$

$p \Rightarrow q = p' \vee q = \neg(p \wedge q')$

$\{d \mid \text{exists freq}(d, \text{bar}) \text{ and } \text{not exists beer}(\text{serves}(\text{bar}, \text{beer}) \text{ and like}(d, \text{beer}))\}$

```
select x.drinker
from freq x
where not exists
      (Select *
      from serves y, likes z
      where y.bar = x.bar and
            y.beer = z.beer and
            x.drinker = z.drinker)
```

all drinkers that freq only bars that serve some beer that they don't like.

$\{d \mid \text{forall } freq(d, bar) \Rightarrow$
exists beer (serves(bar, beer) and not like(d, beer))$\}$

$p \Rightarrow q = p' \vee q = \neg(p \wedge q')$

$\{d \mid freq(d, bar)\} -$

$\{d \mid \text{exist } freq(d, bar) \text{ and } d$
not exists (serves (bar, beer) and not like (d, beer))$\}$

```
select  x.drinker
from    freq x
where x.drinker notin
    ( select y.drinker
      from   freq y
      where not exists
          ( select *
            from serves z
            where y.bar = z.bar and
                  not exists ( select *
                               from   likes u
                               where y.drinker = u.drinker and
                                     u.beer = z.beer ) ) )
```

all drinkers that freq only bars that serve only beer that they don't like.

{d | forall bar frequent(d,bar) ⇒
forall beer (serves(bar,beer) ⇒ not like(d,beer))}

$p \Rightarrow q = p' \vee q = \neg(p \wedge q')$

{d | forall bar freq(d,bar) ⇒
not exist beer (serves(bar,beer) and like(d,beer))}

{d | ~~exists~~ freq(d,bar)} −

{d | exists freq(d,bar) and
exist beer (serves(bar,beer) and like(d,beer))}

```
select x.drinker
from   freq x
where  x. not in
       (select y.drinker
       from freq y, serve z, like u
       where  y.drinker = x.drinker and
              y.bar = z.bar and
              z.beer = u.beer)
```