

Nested queries

Subqueries in SELECT

```
SELECT DISTINCT C.cname, (SELECT count(*)  
                           FROM Product P  
                           WHERE P.cid=C.cid)  
FROM Company C
```

Subqueries in FROM

```
SELECT X.pname  
FROM (SELECT * FROM Product AS Y WHERE price > 20) as X  
WHERE X.price < 500
```

Subqueries in WHERE

```
SELECT DISTINCT C.cname  
FROM Company C  
WHERE EXISTS (SELECT *  
              FROM Product P  
              WHERE C.cid = P.cid and P.price < 200)
```

subqueries in WHERE

- SELECT WHERE EXISTS (sub);
- SELECT WHERE NOT EXISTS (sub);
- SELECT WHERE attribute IN (sub);
- SELECT WHERE attribute NOT IN (sub);
- SELECT WHERE attribute > ANY (sub);
- SELECT WHERE attribute > ALL (sub);

Likes(drinker, beer)

Frequents(drinker, bar)

Serves(bar, beer)

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

$$\exists y. \text{Frequents}(x, y) \wedge \forall z. (\text{Serves}(y, z) \Rightarrow \text{Likes}(x, z))$$

Find drinkers that frequent only bars that serve only beer they like.

$$\forall y. \text{Frequents}(x, y) \Rightarrow \forall z. (\text{Serves}(y, z) \Rightarrow \text{Likes}(x, z))$$

$$\exists u \text{ Frequents}(x, u) \wedge \text{not } (\exists y \exists z \text{ Frequents}(x, y) \wedge \text{Serves}(y, z) \wedge \text{not Likes}(x, z))$$

Likes(drinker, beer)

Frequents(drinker, bar)

Serves(bar, beer)

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

$$\exists y. \text{Frequents}(x, y) \wedge \forall z. (\text{Serves}(y, z) \Rightarrow \text{Likes}(x, z))$$

```
SELECT F.drinker
FROM Frequents F
WHERE NOT EXISTS (SELECT * FROM Serves S
                  WHERE S.bar = F.bar AND
                  NOT EXISTS (SELECT * FROM Likes L
                              WHERE L.beer = S.beer AND L.drinker = F.drinker));
```

Find drinkers that frequent only bars that serve only beer they like.

$$\forall y. \text{Frequents}(x, y) \Rightarrow \forall z. (\text{Serves}(y, z) \Rightarrow \text{Likes}(x, z))$$
$$\exists u \text{ Frequents}(x, u) \wedge \text{not } (\exists y \exists z \text{ Frequents}(x, y) \wedge \text{Serves}(y, z) \wedge \text{not Likes}(x, z))$$

```
SELECT F2.drinker
FROM Frequents F2
WHERE NOT EXISTS (SELECT * FROM Serves S, Frequents F
                  WHERE S.bar = F.bar AND F.drinker = F2.drinker AND
                  NOT EXISTS (SELECT * FROM Likes L
                              WHERE L.beer = S.beer AND L.drinker = F.drinker));
```