Part 1

Without Joins

```
WITH directors AS
    (SELECT id, pid FROM crew
     WHERE crewtype = 'director'),
 main_roles AS
     (SELECT id, pid FROM roles
      WHERE roletype = 'actor' OR roletype = 'actress')
 SELECT count(*) FROM main_roles AS mr
 WHERE EXISTS
     (SELECT id, pid FROM directors AS d
        WHERE d.pid = mr.pid AND d.id = mr.id
     );
```

Relational Algebra

$$directors = \pi_{id,pid}(\sigma_{crewtype=director}(crew))$$
$$main\_roles = \pi_{id,pid}\left(\sigma_{roletype=actor \lor roletype=actress}(roles)\right)$$
$$\gamma_{count(*)}(\sigma_{Exists(\sigma_{d.pid=mr.pid \ \land \ d.id=mr.id}(directors\rightarrow d)}(main\_roles \rightarrow mr)$$

With Joins

```
SELECT COUNT(*) FROM crew AS c
    JOIN roles AS r ON c.pid = r.pid AND c.id = r.id
    WHERE c.crewtype = 'director'
    AND (r.roletype = 'actor' OR r.roletype = 'actress')
```

Relational Algebra

$$\gamma_{count(*)}\left(\sigma_{c.crewtype=director\land(r.roletype=actress \lor r.roletype=actor)}(crew \rightarrow c \bowtie_{c.pid=r.pid \ \land c.id=r.id} roles \rightarrow r\right)$$