Exercise 1 (Datalog and RA). Consider the following relational schema for managing a theater database:

- **Play**: `[[ ID, Title, Genre, Stage, Direction ]]`
- **Stage**: `[[ Name, Places ]]`
- **Cast**: `[[ PID, Play, Part ]]`
- **Show**: `[[ Date, Time, Play ]]`
- **Guest**: `[[ GID, Name, Forename, Salary ]]`
- **Member**: `[[ MID, Name, Forename, Salary ]]`

The attribute *Genre* of relation *Play* provides information whether the play is a comedy, drama etc. The attribute *Direction* is used to store the personnel ID of a guest or a member who directed the corresponding play. A *Part* can be played by a guest or a member of the theater. **Assume that the IDs stored in GID and MID are disjoint!!**

Formulate the following queries in relational algebra and Datalog:

a) What plays are offered by the given theaters?
b) How much is the salary of the member Ralf Meier?
c) Which plays have been performed on stages with more than 500 places?
d) What actors (member or guests) are employed by the stored theaters?
e) What actors have already played a role in a play?
f) What members have already played in at least two different plays at a theater?
g) Who directed a drama with ‘Kenneth Branagh’?
h) Is there a director who also played a part in his play?
i) What actors have played in all plays?
j) Is there a guest and a member who have the same name?
k) What members have performed in at most one play or never performed at all so far?
l) Which stage has the highest number of places?
m) How many plays are offered by each theater?