1 Task

1. Retrieve the title and the creator name of all artifacts with value over 10000 Euros.

$$Answer(name, title, id) := \pi_{name,id}(Artists) \bowtie \rho_{artistId \to id}(\pi_{title,artistId}(\sigma_{value>1000}(Artifacts)))$$

2. Name all exhibitions where paintings from the 'Dutch painters' collection were exhibited.

$$Art(id) := \pi_{id}(\sigma_{collectionTitle='DutchPaintings'}(Artifacts)) \cap \pi_{id}(ArtifactsPaintings)$$

$$Answer(exhibitionTitle) := \pi_{exhibitionTitle}(ExhibitedAt \bowtie Art)$$

3. Name artists who influenced others but had no influences.

$$Influencer(id) := \rho_{influencerId \to id}(\pi_{influencerId}(influencedBy)$$

$$Influencee(id) := \rho_{influenceeId \to id}(\pi_{influenceeId}(influencedBy))$$

$$Answer(name) := \pi_{name}((Influencer \setminus Influencee) \bowtie (Artists)))$$

4. Which newspapers have advertised exhibitions where paintings in oil canvas and marble sculptures were shown.
We assume the task is to display exhibitions where both Artifact types are advertised together.

$$Oil(artifactsId) := \rho_{id \to artifactsId}(\pi_{id}(\sigma_{canvas='oil'}(ArtifactsPaintings)))$$

$$Marble(artifactsId) := \rho_{id \to artifactsId}(\pi_{id}(\sigma_{material='marble'}(ArtifactsSculptures)))$$

$$Ex(exhibitionTitle) := \pi_{exhibitionTitle}(ExhibitedAt \bowtie Oil) \cap \pi_{exhibitionTitle}(ExhibitedAt \bowtie Marble)$$
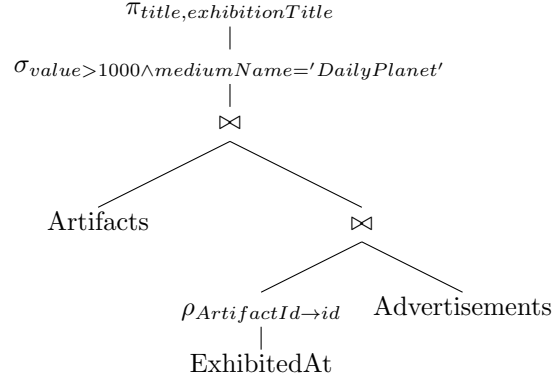
$$News(mediumName) := \rho_{name \to mediumName}(\pi_{name}(\sigma_{type='newspaper'}(Media)))$$

$$Answer(mediumName) := \pi_{mediumName}(Advertisements \bowtie Ex) \cap News$$

2 Task

a) Retrieve the artifactsname and exhibitionstitle of all artifacts with value over 1000 Euro that were part of an exhibition advertised on the 'Daily Planet'.

b)

$$\pi_{title,exhibitionTitle}$$
$$|$$
$$\sigma_{value>1000\wedge mediumName='DailyPlanet'}$$
$$|$$
$$\bowtie$$

Artifacts $\bowtie$

$\rho_{ArtifactId\rightarrow id}$ Advertisements
$|$
ExhibitedAt

c) start expression

$$\pi_{title,exhibitionTitle}(\sigma_{value>1000\wedge mediumname='DailyPlanet'}(Artifacts \bowtie (\rho_{artifactId\leftarrow id}(ExhibitedAt) \bowtie Advertisements)))$$

splitting sigma

$$\pi_{title,exhibitionTitle}(\sigma_{value>1000}(\sigma_{mediumname='DailyPlanet'}((Artifacts \bowtie (\rho_{artifactId\leftarrow id}(ExhibitedAt) \bowtie Advertisements))))$$

push selection down

$$\pi_{title,exhibitionTitle}(\sigma_{value>1000}(Artifacts) \bowtie (\rho_{artifactId\leftarrow id}(ExhibitedAt) \bowtie \sigma_{mediumname='DailyPlanet'}(Advertisements)))$$

order joins by size:

$$\pi_{title,exhibitionTitle}((\sigma_{value>1000}(Artifacts) \bowtie \rho_{artifactId\leftarrow id}(ExhibitedAt)) \bowtie \sigma_{mediumname='DailyPlanet'}(Advertisements))$$

cannot push projections down, because the join needs the other attributes and after the join we would have to project again

$$\pi_{title,exhibitionTitle}$$
$$|$$
$$\bowtie$$

$\bowtie$ $\sigma_{mediumName='DailyPlanet'}$
$|$
Advertisements

$\sigma_{value>1000}$ $\rho_{ArtifactId\rightarrow id}$
$|$ $|$
Artifacts   ExhibitedAt