

**Problem 1**

$$\begin{aligned}
type\_list &\leftarrow \Pi_{type\_id}(game\_type) \\
completed &\leftarrow \Pi_{person\_id, person\_name, type\_id}(geezer \bowtie game\_score \bowtie game) \\
&\quad completed \div type\_list
\end{aligned}$$

**Problem 2**

$$\begin{aligned}
person\_count &\leftarrow_{type\_id} \mathcal{G}_{count-distinct}(person\_id) \text{ as } person\_count (game \bowtie game\_score) \\
&\Pi_{game\_id, type\_id, type\_name, person\_count}(game\_type \bowtie game \bowtie person\_count)
\end{aligned}$$

**Problem 3**

$$\begin{aligned}
game\_score &\leftarrow game\_score - \sigma_{type\_name="pinochle"}(\Pi_{game\_id, person\_id, score}(game\_type \bowtie game\_score)) \\
game &\leftarrow game - \sigma_{type\_name="pinochle"}(\Pi_{game\_id, type\_id, game\_date}(game\_type \bowtie game)) \\
game\_type &\leftarrow game\_type - \sigma_{type\_name="pinochle"}(game\_type)
\end{aligned}$$

**Problem 4**

$$\begin{aligned}
works &\leftarrow \Pi_{game\_id, person\_id, (score+30)}(\sigma_{person\_name="Ted Codd"}(game\_score \bowtie geezer)) \cup \\
&\Pi_{game\_id, person\_id, score}(\sigma_{person\_name \neq "Ted Codd"}(game\_score \bowtie geezer))
\end{aligned}$$

**Problem 5**

$$\begin{aligned}
new\_game\_id &\leftarrow \Pi_{(game\_id+1)}(\mathcal{G}_{max}(game\_id) \text{ as } game\_id (game)) \\
insert\_type\_id &\leftarrow \Pi_{type\_id}(\sigma_{type\_name="dominoes"}(game\_type)) \\
game &\leftarrow game \cup (new\_game\_id \times insert\_type\_id \times \{('2012-01-15 15:30:00.000')\}) \\
game\_score &\leftarrow game\_score \cup (new\_game\_id \times \{(987)\} \times \{(332)\}) \\
game\_score &\leftarrow game\_score \cup (new\_game\_id \times \{(227)\} \times \{(457)\})
\end{aligned}$$

**Problem 6**

$$\begin{aligned}
person\_counts &\leftarrow_{game\_id} \mathcal{G}_{count-distinct}(person\_id) \text{ as } person\_count (game\_score) \\
&\Pi_{game\_id}(\sigma_{(person\_count \text{ IS NULL }) \vee (person\_count < min\_players)} \vee \\
&((max\_players \text{ IS NOT NULL } \wedge person\_count > max\_players))((game\_type \bowtie game) \bowtie person\_counts))
\end{aligned}$$

**Problem 7**

$$\begin{aligned}
game\_counts &\leftarrow_{person\_id, type\_id} \mathcal{G}_{count-distinct}(game\_id) \text{ as } num\_times (game \bowtie game\_score) \\
max\_counts &\leftarrow_{type\_id} \mathcal{G}_{max}(game\_count) \text{ as } max\_count (game\_counts) \\
max\_people &\leftarrow \sigma_{num\_times=max\_count}(game\_counts \bowtie max\_counts) \\
&\Pi_{person\_id, person\_name, type\_id, type\_name, num\_times}(geezer \bowtie game\_type \bowtie max\_people)
\end{aligned}$$