Exercise 01:

- Find the names of the suppliers who supply some red part:

  $\pi_{\text{Sname}}(\pi_{\text{Sid}}((\pi_{\text{pid}}\sigma_{\text{color = 'red'}}\text{Parts}) \bowtie \text{Catalog}) \bowtie \text{Suppliers})$

- Find the sids of the suppliers who supply some red or green part:

  $\pi_{\text{Sid}}((\pi_{\text{pid}}\sigma_{\text{color = 'red' V color = 'green'}}\text{Parts}) \bowtie \text{Catalog})$

- Find the sids of the suppliers who are red or are at 221 packer street:

  $\rho(\text{R1}, \pi_{\text{Sid}}((\pi_{\text{pid}}\sigma_{\text{color = 'red'}}\text{Parts}) \bowtie \text{Catalog}))$

  $\rho(\text{R2}, (\pi_{\text{sid}}\sigma_{\text{address = '221 packer street'}}\text{Suppliers}))$

  $\text{R1} \cup \text{R2}$

- Find the sids of the suppliers who supply some red part and some green part:

  $\rho(\text{R1}, \pi_{\text{Sid}}((\pi_{\text{pid}}\sigma_{\text{color = 'red'}}\text{Parts}) \bowtie \text{Catalog}))$

  $\rho(\text{R2}, \pi_{\text{Sid}}((\pi_{\text{pid}}\sigma_{\text{color = 'green'}}\text{Parts}) \bowtie \text{Catalog}))$

  $\text{R1} \cap \text{R2}$

- Find the sids of the suppliers who supply every part:

  $(\pi_{\text{Pid, Sid}} \bowtie \text{Catalog}) / (\pi_{\text{pid}}\text{Parts})$

- Find the sids of the suppliers who supply every red part:

  $(\pi_{\text{Pid, Sid}} \bowtie \text{Catalog}) / (\pi_{\text{pid}}\sigma_{\text{color = 'red'}}\text{Parts})$

- Find the sids of the suppliers who supply every red or green part:

  $(\pi_{\text{Pid, Sid}} \bowtie \text{Catalog}) / (\pi_{\text{pid}}\sigma_{\text{color = 'red' V color = 'green'}}\text{Parts})$

- Find the sids of the suppliers who supply every red or supply every green part:

  $\rho(R1, (\pi_{Sid, Pid} \triangleright\triangleleft Catalog)/ (\pi_{Pid}\ \sigma_{color = \text{'red'}} Parts)\ \ )$

  $\rho(R2, (\pi_{Sid, Pid} \triangleright\triangleleft Catalog)/ (\pi_{Pid}\ \sigma_{color = \text{'green'}} Parts)\ \ )$

  $R1 \cup R2$

- Find pairs of sids such that the supplier with the first sid charges more for some part than the supplier with the second sid:

  $\rho(R1, Catalog)$

  $\rho(R2, Catalog)$

  $\pi_{R1.sid, R2.sid}\ (\sigma_{R1.sid != R2.sid \wedge R1.pid = R2.pid \wedge R1.cost > R2.cost}(R1xR2)\ )$

- Find the pids of parts supplied by at least two different suppliers

  $\pi_{R1.pid}\ (\sigma_{R1.sid != R2.sid \wedge R1.pid = R2.pid}(R1xR2)\ )$