

a. Find all coffeehouses frequented by at least one customer under the age of 18.

$\pi_{\text{coffeehouse}}(\sigma_{\text{age}} < 18 (\text{Customer}) \bowtie \text{Frequents})$

b. Find the customer names of all females who drink either Cappuccino or Flat White coffee (or both).

$\pi_{\text{c_name}}(\sigma_{\text{sex}} = 'F' \wedge (\text{coffee} = 'Cappuccino' \vee \text{coffee} = 'Flat White') (\text{Customer}) \bowtie \text{Drinks})$

c. Find the customer names of all females who drink both Cappuccino and Flat White coffee.

$\pi_{\text{c_name}}(\sigma_{\text{sex}} = 'F' (\text{Customer}) \bowtie (\sigma_{\text{coffee}} = 'Cappuccino' (\text{Drinks}) \bowtie \sigma_{\text{coffee}} = 'Flat White' (\text{Drinks})))$

d. Find all coffeehouses that serve at least one coffee that Magda drinks for less than 10 PLN.

$\pi_{\text{coffeehouse}}(\sigma_{\text{c_name}} = 'Magda' \wedge \text{price} < 10 (\text{Drinks} \bowtie \text{Serves}))$

e. Find all coffeehouses that are frequented by only females or only males.

$(\pi_{\text{coffeehouse}}(\sigma_{\text{sex}} = 'F' (\text{Customer} \bowtie \text{Frequents}))) - \pi_{\text{coffeehouse}}(\sigma_{\text{sex}} = 'M' (\text{Customer} \bowtie \text{Frequents}))$

f. For each customer, find all coffee the customer drinks that are not served by any coffeehouse the customer frequents. Return all such customer (name) / coffee pairs.

$(\pi_{\text{c_name}}, \text{coffee}(\text{Drinks})) - (\pi_{\text{c_name}}, \text{coffee}((\text{Customer} \bowtie \text{Frequents}) \bowtie \text{Serves}))$

g. Find the names of all customers who frequent only coffeehouses serving at least one coffee they drink.

$\pi_{\text{c_name}}((\text{Customer} \bowtie \text{Frequents} \bowtie \text{Serves}) \bowtie \text{Drinks}) - \pi_{\text{c_name}}(((\text{Customer} \bowtie \text{Frequents} \bowtie \text{Serves}) - \text{Drinks}) \bowtie \text{Customer})$

h. Find the names of all customers who frequent every coffeehouse serving at least one coffee they drink.

$\pi_{\text{c_name}}((\text{Customer} \bowtie \text{Frequents} \bowtie \text{Serves}) \bowtie \text{Drinks}) * \pi_{\text{c_name}}(((\text{Customer} \bowtie \text{Frequents} \bowtie \text{Serves}) - \text{Drinks}) \bowtie \text{Customer})$

i. Find the coffeehouse serving the cheapest Flat White coffee. In the case of limitations, return all of the cheapest- Flat White coffeehouses.

$\pi_{\text{coffeehouse}}(\sigma_{\text{coffee}} = 'Flat White' \wedge \text{price} = \gamma_{\text{min}}(\text{price})(\sigma_{\text{coffee}} = 'Flat White' (\text{Serves})))$
(Serves))