

Q1 (1 point). Find all the persons under the age of 18.

$$\pi_{\text{name}}(\sigma_{\text{age} < 18}(\text{Person}))$$

Q2. (2 points) Find all the pizzerias that serve at least one pizza that Amy eats for less than \$10.00. Print out the pizzeria name, pizza, and price.

$$\pi_{\text{pizzeria}, \text{pizza}, \text{price}}(\sigma_{\text{name} = \text{'Amy'}} \text{ and } \text{price} < 10 (\text{Eats} \bowtie_{\text{pizza}} \text{Serves}))$$

Q3. (2 points) Find all the pizzerias frequented by at least one person under the age of 18. Print out the pizzeria name, person's name, and person's age.

$$\pi_{\text{pizzeria}, \text{name}, \text{age}}(\sigma_{\text{age} < 18}(\text{Person} \bowtie_{\text{name}} \text{Frequents}))$$

Q4. (2 points) Find all the pizzerias frequented by at least one person under the age of 18 and at least one person over the age of 30. Print out only the pizzeria name.

$$\delta(\pi_{(X.\text{pizzeria})}(\sigma_{(X.\text{age} < 18 \text{ and } Y.\text{age} > 30) \text{ and } (X.\text{pizzeria} = Y.\text{pizzeria})}(((\rho_{X(\text{name}, \text{age}, \text{gender}, \text{pizzeria})}(\text{Person} \bowtie_{\text{name}} \text{Frequents})) \times (\rho_{Y(\text{name}, \text{age}, \text{gender}, \text{pizzeria})}(\text{Person} \bowtie_{\text{name}} \text{Frequents}))))))$$

Q5. (2 points) Find all pizzerias frequented by at least one person under the age of 18 and at least one person over the age of 30. Print out all the quintuples (pizzeria, person1, age1, person2, age2), where person1 and person2 are persons who frequent the pizzeria, and person1 is under the age of 18 and person2 is over the age of 30.

$$\pi_{X.\text{pizzeria} \rightarrow \text{pizzeria}, X.\text{name} \rightarrow \text{person1}, X.\text{age} \rightarrow \text{age1}, Y.\text{name} \rightarrow \text{person2}, Y.\text{age} \rightarrow \text{age2}}(\sigma_{(X.\text{age} < 18 \text{ and } Y.\text{age} > 30) \text{ and } (X.\text{pizzeria} = Y.\text{pizzeria})}(((\rho_{X(\text{name}, \text{age}, \text{gender}, \text{pizzeria})}(\text{Person} \bowtie_{\text{name}} \text{Frequents})) \times (\rho_{Y(\text{name}, \text{age}, \text{gender}, \text{pizzeria})}(\text{Person} \bowtie_{\text{name}} \text{Frequents}))))$$

Q6. (2 points) For each person, find how many types of pizzas he/she eats. Show only those people who eat at least two types of pizzas. Sort in descending order of the number of types of pizzas they eat.

$$\pi_{\text{Person.name}, \text{count}(\text{pizza})}(\tau_{\text{count}(\text{pizza}) \text{ desc}}(\sigma_{\text{count}(\text{pizza}) \geq 2}(\gamma_{\text{Person.name}}(\text{Person} \bowtie_{\text{Person.name} = \text{Eats.name}} \text{Eats}))))$$

Q7. (2 points) For each type of pizza, find its average price. Sort descending by average price.

$$\pi_{\text{pizza}, \text{avg}(\text{price})}(\tau_{\text{avg}(\text{price}) \text{ desc}}(\gamma_{\text{pizza}}(\text{Serves})))$$