

## Relation Algebra Example Question

### Relations:

Note: **Bold text** represents primary key, wavy line represents foreign key.

*Branch*(**bid**, address, city, manager\_name, opening\_hours, has\_atm)

*Customer*(**cid**, first\_name, last\_name, address, date\_joined)

*Loan*(**loan\_id**, amount, date, term, cid, bid)

*Account*(balance, cid, bid) 2 foreign keys as primary key

### Questions:

1. The names of all branch managers in Vancouver:

$\pi_{manager\_name}(\sigma_{city=Vancouver}(Branch))$

2. The dates of all loans by customers with the name 'Anita Borg'

$R_{customerloans} = Loan \bowtie Customer$

$\pi_{date}(\sigma_{first\_name='Anita' \wedge last\_name='Borg'}(R_{customerloans}))$

3. The names of all people who have loans of more than \$10,000

$\pi_{first\_name, last\_name}(\sigma_{amount > 10,000}(R_{customerloans}))$

Note:  $R_{customerloans}$  is from above

4. The names of all people who have accounts in Toronto and loans of more than \$5,000

$R_{toronto\_loans} = (Branch \bowtie_{city=Toronto} Loan) \bowtie Customer$

$\pi_{first\_name, last\_name}(\sigma_{amount > 5,000}(R_{toronto\_loans}))$

5. The names of all people who have accounts in Toronto but do not have any loans

$R_{toronto\_accounts} = (\sigma_{city=Toronto}(Branch)) \bowtie Customers \bowtie Account$

$\pi_{first\_name, last\_name}(\sigma_{cid}(R_{toronto\_accounts}) - \sigma_{cid}(Loan))$

6. The names of all people who have a loan of more than \$10,000 and a loan of less than \$1,000

$R_{loan\_10,000} = Customer \bowtie_{Customer.cid = Loan.cid} (\sigma_{amount > 10,000} Loan)$

$R_{loan\_1,000} = Customer \bowtie_{Customer.cid = Loan.cid} (\sigma_{amount < 1,000} Loan)$

$\pi_{first\_name, last\_name}(R_{loan\_1,000} \wedge R_{loan\_10,000})$