# Example

Relational Expressions

# Schema

Computer(Model, HD, Speed, Ram, Price)

Producer(Name, Model)

Store(Address, Model, SalePrice)

# Write a relational expression that list all producers with more than two models!

**Analysis**: The information can be extracted from the Producer relation.

**How can we get it**? If we create a relation with the producer name and two attributes (model1 and model2) then the relation should contain all the producers for the answer.

**So, the answer is**

$$\pi_{name}\ (\sigma_{model1 \neq model2 \text{ and } name=name1}\ (Producer[Name,Model1] \times Producer[Name1,Model2]))$$

# Write a relational expression that list all producers with more than two models!

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**A simpler version of the answer**

$$\pi_{name}\ (\sigma_{model1 \neq model2}\ (Producer[Name,Model1] \bowtie Producer[Name,Model2]))$$

# Write a relational expression that list the computers that are faster than some computers!

**Analysis**: The information can be extracted from the Computer relation.

**This is so simple ☺ and the answer is**

$$\pi_{model}\ (\sigma_{speed > speed1}\ (Computer \quad x \quad Computer[Model1, HD1, Speed1, Ram1, Price1]))$$

**Question: Is this correct?**

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**Question: Is this correct? Not quite! What happens if we have only one computer! How do we do it? Oh, it is not so simple …**

# Write a relational expression that list the computers that are faster than some computers!

**Analysis**: The information can be extracted from the Computer relation.

**Different idea: What we can do is**

- **find those computers that are the slower than some others in the same way that we did before**
- **Take the compliment of the above set**

**I leave the writing for you ☺**

| Model | Speed |
|---|---|
| 10001 | 100 |

Set of computers that are slower than some others will be empty.

The set difference will give us the correct answer.

| Model | Speed |
|---|---|
| 10001 | 100 |
| 10002 | 200 |

Set of computers that are slower than some others will contain the model (10001)

The set difference will give us the correct answer.

Is it correct?

# The idea does not always work though!

| Model | Speed |
|---|---|
| 10001 | 100 |
| 10002 | 200 |
| 10003 | 300 |

Set of computers that are slower than some others will contain the model (10001,10002)

The set difference will give us the incorrect answer.

# Different idea …

- Can we get the answer by
  - listing the computers that are faster than some as previously
  - Adding to it the complement of the list of computers that slower than some others
- The answer is

$$\pi_{model}\,(\sigma_{speed > speed1}\,(C1 \times C2))$$
$$\cup\,(\pi_{model}\,(C1) -$$
$$\pi_{model}\,(\sigma_{speed < speed1}\,(C1 \times C2)))$$

where $C1 = C2 = \pi_{model,speed}\,(Computer)$

# Write a relational expression that list the fastest computers!

**Analysis**: The information can be extracted from the Computer relation.

**How can we get it**? It will be easy if we can order the relation but we do not have this operator. But we can

- find the computers that are faster than some others (R1) and
- find the computers that are slower than some computer (R2)
- take away models in the second set from the first one (R1 – R2)

**Note**: R1 is computed as in the (complicated way) last page and R2 should be computed using the simpler way (similarly to page 6)

# Write a relational expression that list the stores that sale all models!

**Analysis**: The information can be extracted from the Producer (P) and Store (S) relation.

**How can we get it**? This is a typical **division** problem. We can

- find all computers: R1 = $\pi_{model}$ (P) and
- use division: S / R1