

A decorative graphic on the left side of the slide, consisting of a network of white lines and circles on a blue gradient background, resembling a circuit board or a neural network.

WEEK 2

TERMINOLOGY FOR RELATIONS AND THE RELATIONAL DATABASE

CS3319

STUDENT OBJECTIVES

- Upon completion of this video, you should be able to:
 - Define the following terms that are used when describing relational databases: Domain, Relation, Table, Attribute, Column, Row, Tuple
 - Given two or more sets of values over given domains, give the Cartesian Product of the sets.

- **A Domain D** is a set of atomic values. Example: USA_Phone_Numbers, Employee_Ages, Department IDs
 - Set of 10 digit phone numbers valid in Canada
 - Possible ages of employees *all possible values the attribute could take*
 - A data type is specified for each domain like 10 char string or positive integer
- **A Relation Schema R** denoted by $R(A_1, A_2, \dots, A_n)$ is made up of a relation name and a list of attributes. Each attribute A_i is the name of a role played by some domain D in the relation schema R .
- **A Relation (or relation state)** *i.e. Student (SN, ID, First, Last, ...)*
 - *first student* r of a relation schema $R(A_1, A_2, \dots, A_n)$ also denoted by $r(R)$ is a set of n -tuples $r = \{t_1, t_2, \dots, t_m\}$. Each n -tuple *normal data* t is an order list of n values $t = \langle v_1, v_2, \dots, v_n \rangle$, where each value v_i , $1 \leq i \leq n$, is an element of $\text{dom}(A_i)$ or a special null value. *value*
- R is called the name of the relation schema *Student*.
- **Attribute** is a named column in a relation schema
- **Tuple** is a row of a relation *instance in relation*.
- **Degree of a relation** is the number of attributes it contains
- **Cardinality of a relation** is the number of tuples it contains

Relation and Cardinality of the Relation

Domain for this Attribute is

Domain for

Tuple is a row

Tuple 1 is <“To Kill A Mockingbird”, A781, “Harper Lee”, 1960, “Warner Books”>

Cardinality of Relation Book is 4

Scribner

BOOK

Title	ISBN	Author	YearPublished	Publisher
To Kill A Mockingbird	A781	Harper Lee	1960	Warner Books
The Hunger Games	B765	Suzanne Collins	2008	Scholastic Press
Harry Potter and the Sorcerer's Stone	B123	J.K. Rowlings	1997	Scholastic Press
All The Light We Cannot See	A777	Anthony Doerr	2014	Scribner

tuple.

attribute.

domain:
integers.
from ----

Relation Schema: Book (title, ISBN, Author, YearPublished,
Publisher)

Relation: $\{t_1, t_2, t_3, t_4\}$ where

t_1 is $\langle \text{"To..."}, A781, \text{"H.L"}, 1960, \text{"W.B"} \rangle$

t_2

All these tuples form $r(\text{Book})$.

Degree = 5. Cardinality = 4.

• **Mathematical Relations:**

- Suppose we have 2 set $D1 = \{2,4\}$ and $D2 = \{1,3,5\}$. The Cartesian product $D1 \times D2$ represents all possible ordered pairs:

tuples : • $\{(2,1), (2,3), (2,5), (4,1), (4,3), (4,5)\}$

Any subset of $D1 \times D2$ represents a relation →

$$R = \{(2,5), (4,1)\}$$

- We could have three sets: $D1$, $D2$ and $D3$ and build a relation on $D1 \times D2 \times D3$

QUESTION: If we have:

- $D1 = \{\text{Simpson, Flanders, Smithers}\}$
 - $D2 = \{\text{Homer, Ned}\}$
 - $D3 = \{40, 30\}$
- A relation R is any possible combination of these tuples.*

What would $D1 \times D2 \times D3$ give us:

$D1 \times D2 \times D3$ is:

$\{(\text{Simpson, Homer, 40}), (\text{Simpson, Homer, 30}), (\text{Simpson, Ned, 40}), (\text{Simpson, Ned, 30}), (\text{Flanders, Homer, 40}), (\text{Flanders, Homer, 30}), (\text{Flanders, Ned, 40}), (\text{Flanders, Ned, 30}), (\text{Smithers, Homer, 40}), (\text{Smithers, Homer, 30}), (\text{Smithers, Ned, 40}), (\text{Smithers, Ned, 30})\}$

A Relation R is any possible
 $R2$ could be:

$\{(\text{Simpson, Homer, 40}),$
 $(\text{Simpson, Ned, 30}),$
 $(\text{Flanders, Ned, 40}),$
 $(\text{Flanders, Homer, 40}),$
 $(\text{Smithers, Ned, 40}) \}$
 $(\text{Flanders, Homer, 40}), \}$

D1	D2	D3
Simpson	Homer	40
Simpson	Ned	30
Flanders	Ned	40
Flanders	Homer	40
Smithers	Ned	40

REVIEW

- Relation \rightarrow table
- Attribute \rightarrow column
- Tuple \rightarrow row
- Cartesian Product \rightarrow all POSSIBLE tuples that can be produced with all possible attributes over the whole domain for each attribute.