Database Technology

Topic 2: Relational Databases

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Relations

Relational Model Concepts

- Relational database: represent data as a collection of *relations*
- Example relation:

STUDENT

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

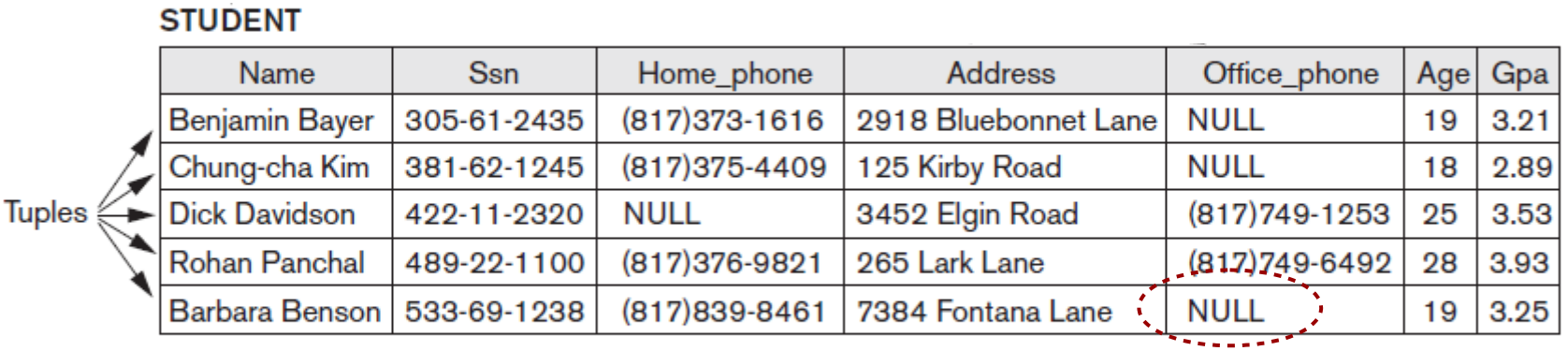
- **Quiz:** each of these things is called a …

  A) record / B) tuple / C) row

  … in the relation data model.

Quiz (NULL Values)

- Notice the value NULL that the Barbara Benson tuple has for the Office_phone attribute



- What can this value mean?
  - A) Barbara Benson doesn't have an office phone.
  - B) Barbara Benson has an office phone but we don't know the number (perhaps withheld).
  - C) Any of the previous two.

Quiz

- A *relation schema* consists of:

A) relation name, attribute names and domains, and tuples;

or

B) relation name, attribute names and domains, and restrictions;

or

C) relation name, tuples, and NULL values.

Quiz

- A relation schema consists of:

A) relation name, attribute names and domains, and tuples;

or

B) relation name, attribute names and domains, and ~~restrictions;~~ integrity constraints

or

C) relation name, tuples, and NULL values.

Integrity Constraints

Uniqueness, Keys, and Superkeys

Quiz

- Consider the following relation and assume a uniqueness constraint has been defined for the attribute set {Code, Year}

Course

Code	Title	Year	Leader
TDDD12	Database Technology	2020	49
TDDD12	Database Technology	2021	49
TDDE49	Databases and Information Security	2021	49
TDDD43	Advanced Databases and Data Models	2020	31
753A01	Sports Analytics	2021	31

- Suppose we want to insert the following tuple

TDDD43	Advanced Databases	2021	31

- Would this be a violation of the uniqueness constraint?

A) yes B) no C) it depends

Activity

- Consider the following relation and assume a uniqueness constraint has been defined for the attribute set {Code, Year}

Course

Code	Title	Year	Leader
TDDD12	Database Technology	2020	49
TDDD12	Database Technology	2021	49
TDDE49	Databases and Information Security	2021	49
TDDD43	Advanced Databases and Data Models	2020	31
753A01	Sports Analytics	2021	31

- Specify a superkey for this relation that is not a key

Activity

- Consider the following relation and assume a uniqueness constraint has been defined for the attribute set {Code, Year}

Course

Code	Title	Year	Leader
TDDD12	Database Technology	2020	49
TDDD12	Database Technology	2021	49
TDDE49	Databases and Information Security	2021	49
TDDD43	Advanced Databases and Data Models	2020	31
753A01	Sports Analytics	2021	31

- Specify a superkey for this relation that is not a key
- Each of the following sets of attributes is a possible answer
  - { Code, Year, Title }
  - { Code, Year, Leader }
  - { Code, Year, Title, Leader }

Activity

- Which set of attributes could be a key for the following relation?

CAR

License_number	Engine_serial_number	Make	Model	Year
Texas ABC-739	A69352	Ford	Mustang	02
Florida TVP-347	B43696	Oldsmobile	Cutlass	05
New York MPO-22	X83554	Oldsmobile	Delta	01
California 432-TFY	C43742	Mercedes	190-D	99
California RSK-629	Y82935	Toyota	Camry	04
Texas RSK-629	U028365	Jaguar	XJS	04

Activity

- Which set of attributes could be a key for the following relation?

CAR

License_number	Engine_serial_number	Make	Model	Year
Texas ABC-739	A69352	Ford	Mustang	02
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California RSK-629	Y82935	Toyota	Camry	04
Texas RSK-629	U028365	Jaguar	XJS	04

- The following two keys are possible
  - { License_number }
  - { Engine_serial_number }
- Remember that we call each of them a *candidate key*, and we have to select one of them to be the *primary key*

Integrity Constraints

Referential Integrity Constraints (Foreign Keys)

Quiz

- Consider the following two relation schemas

Course

Code	**Title**	**Year**	**Leader**

CourseLeader

PN	**FullName**	**Office**	**Mentor**

- Let's make sure that, for every course leader mentioned in the Course relation, data about that course leader is present in CourseLeader
- What do we have to do?

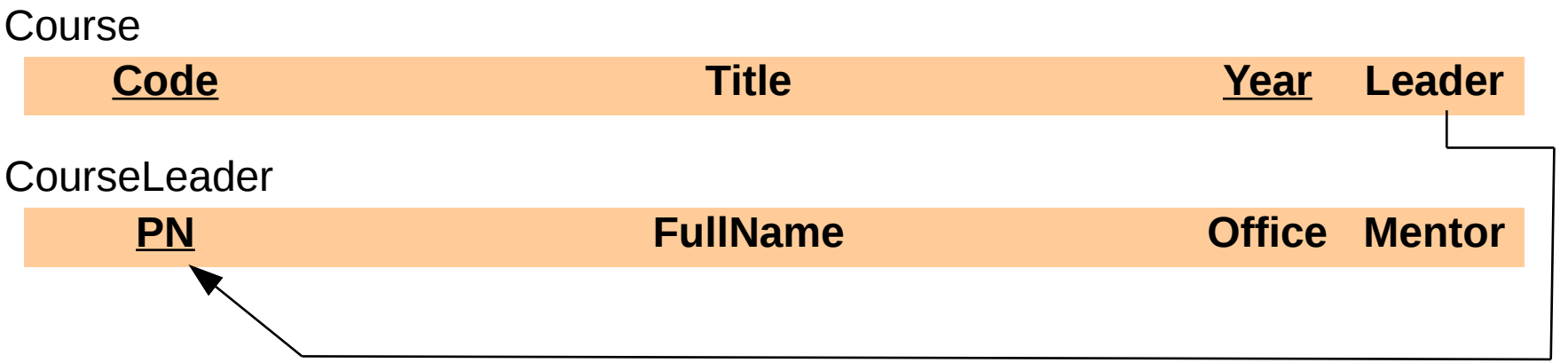
A) Define the attribute PN to be a foreign key that refers to the attribute Leader.

B) Define the attribute Leader to be a foreign key that refers to the attribute PN.

C) Define that the attributes Leader and PN form a foreign key.

Quiz

- Consider the following two relation schemas



- Let's make sure that, for every course leader mentioned in the Course relation, data about that course leader is present in CourseLeader
- What do we have to do?

A) Define the attribute PN to be a foreign key that refers to the attribute Leader.

B) Define the attribute Leader to be a foreign key that refers to the attribute PN.

C) Define that the attributes Leader and PN form a foreign key.

Another Example

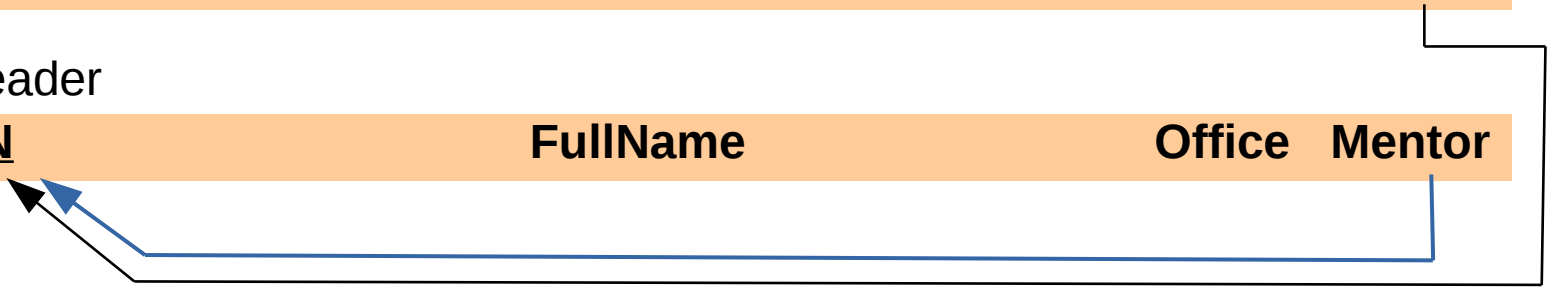
- Consider the following two relation schemas

Course

Code	Title	Year	Leader

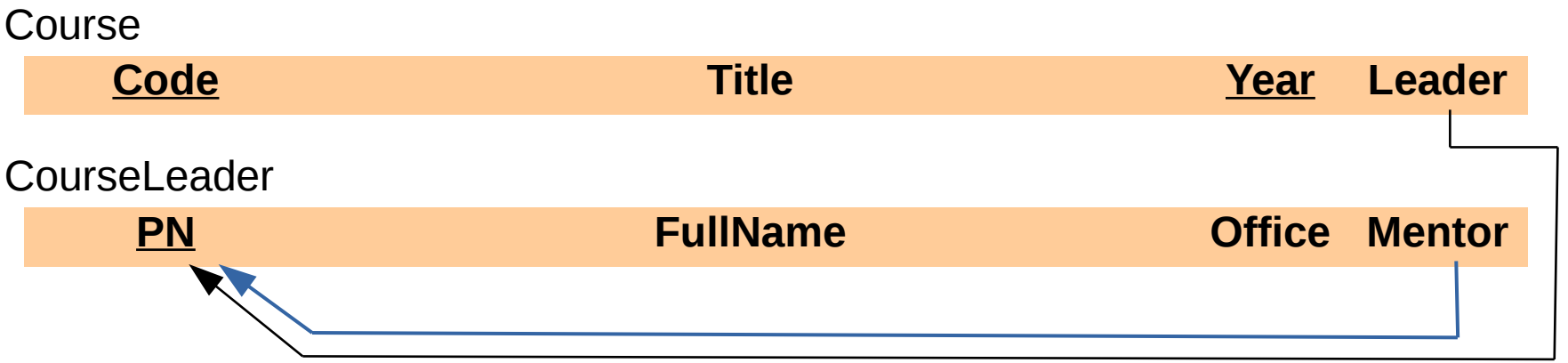
CourseLeader

PN	FullName	Office	Mentor



Question

- Consider the following two relation schemas



- Assume we want to record for every course leader the course that is her/his favorite course, which we may do by adding a foreign key from the CourseLeader relation to the Course relation.
- To do so, we might have to attributes to the CourseLeader relation. How many attributes?

A) 2 B) 1 C) 0 (i.e., the existing attributes can be used)

Feedback

- How difficult/easy did find the quizzes and exercise today in general?

A) quite difficult (most of them)

B) just right (most of them)

C) too easy (most of them)

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