

Normal forms - again

Why?

- **To free the collection of relations from undesirable insertion, update and deletion dependencies.**
- To reduce the need for restructuring the collection of relations, as new types of data are introduced, and thus increase the life span of application programs.
- To make the relational model more informative to users.
- To make the collection of relations neutral to the query statistics, where these statistics are liable to change as time goes by.
 - Codd (1970)

1NF

Remove multi-valued attributes

Why?

id	name	classes
1	Fred	113, 151
2	Ginger	113, 151, 231, 223



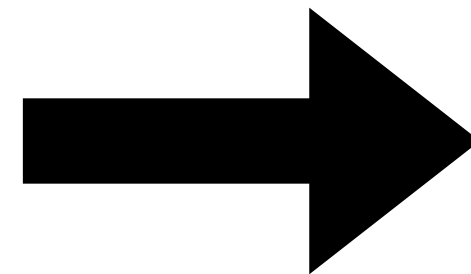
id	name	Class
1	Fred	113
2	Ginger	113
1	Fred	151
2	Ginger	151
2	Ginger	231
2	Ginger	223

2NF

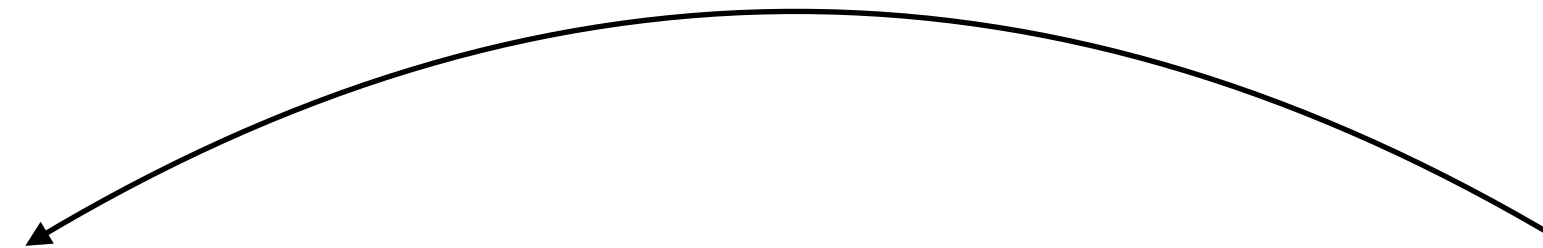
1NF and all items depend only on primary key

Why?

id (Primary)	name	Year	classes
1	Fred	1	113
1	Fred	2	151
2	Ginger	1	113
2	Ginger	1	151
2	Ginger	2	231
2	Ginger	3	223



id (Primary)	name	Year (Composite)	id (Composite)	classes
		1	1	113
		2	1	151
1	Fred	1	2	113
		1	2	151
		2	2	231
2	Ginger	2	3	223



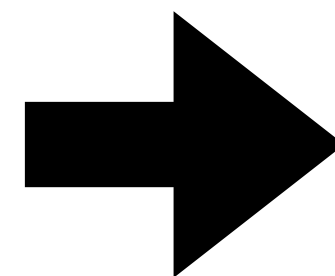
3NF

2NF and No transitive dependencies

Why?

id (Primary)	name
1	Fred
2	Ginger

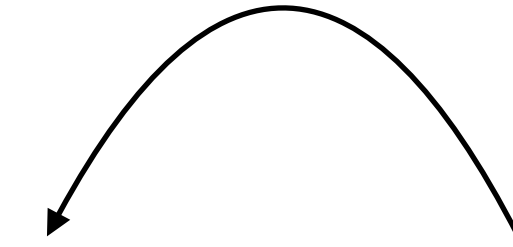
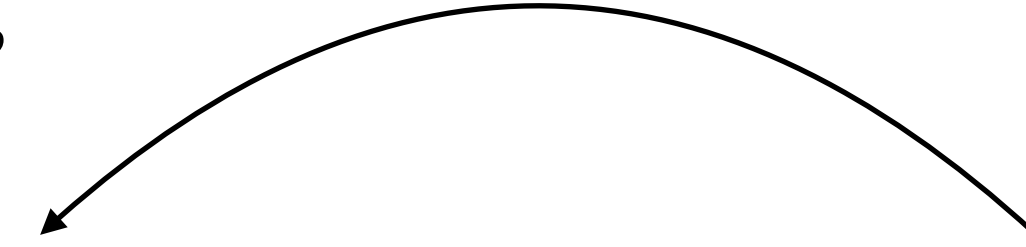
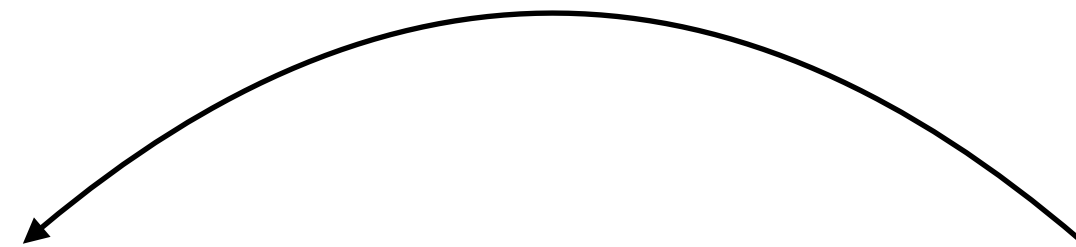
Year (Com)	id (Com)	classes	title
1	1	113	Intro
2	1	151	DS
1	2	113	Intro
1	2	151	DS
2	2	231	DM
2	3	223	SP



id (Primary)	name
1	Fred
2	Ginger

Year (Comp)	id (Comp)	classes_ID
1	1	cs113
2	1	cs151
1	2	cs113
1	2	cs151
2	2	cs231
2	3	cs223

id	Title
cs113	Intro
cs151	DS
cs231	DM
cs223	SP





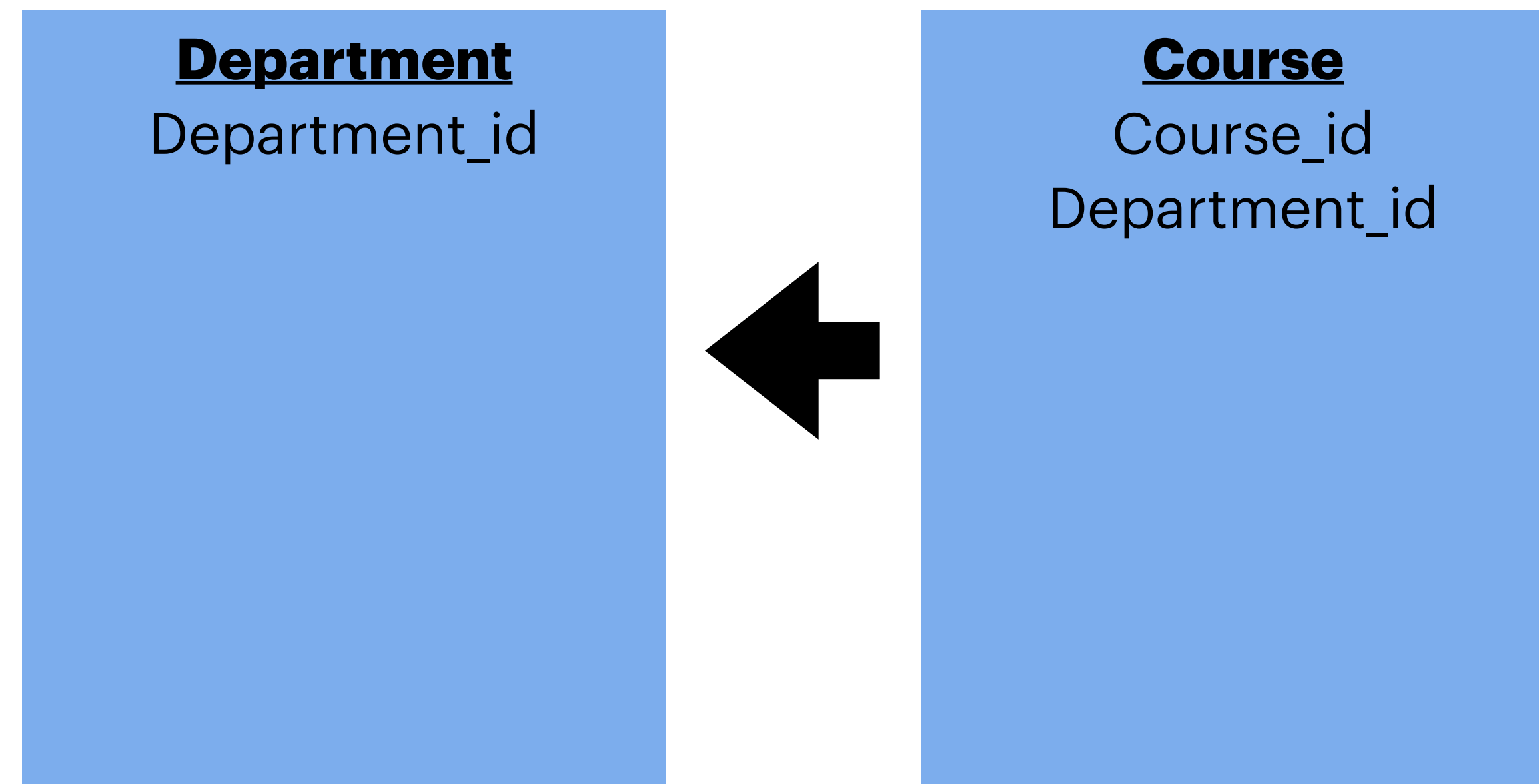
One-to-One Relationship

- one-to-one relationship between a person's first name and last name
- one-to-one often should just be in a single table.
- are there any tables in the univ database that have a one-one relation??



One-to-Many Relationship

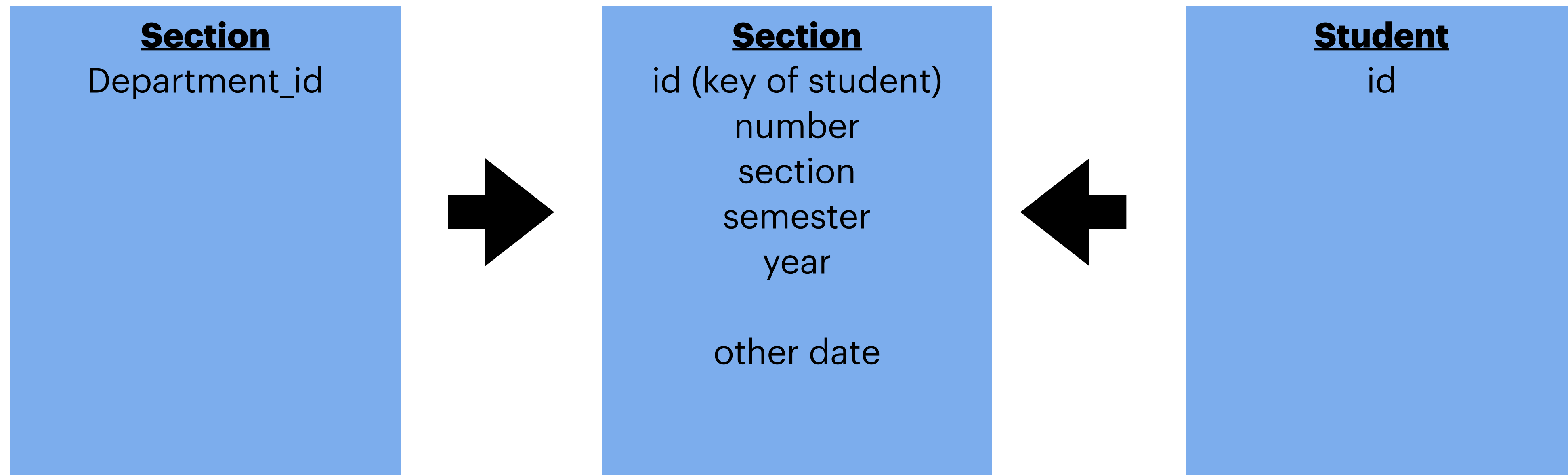
- one-to-many relationship between an *course* and a *department*
- *A course is associated with a single department*
 - *a department may have several courses.*





Many-to-Many Relationship

- An section is associated with many students (possibly 0) via takes
- A student is associated with several (possibly 0) sections via takes





Choice of Primary key for Binary Relationships

- Many-to-Many relationships. The union of the primary keys is a minimal key is thus the primary key.
- One-to-Many relationships . The primary key of the “Many” side is a minimal key and is used as the primary key.
- One-to-one relationships. The primary key of either one of the participating entity sets forms a minimal key, and either one can be chosen as the primary key.