WEEK 2

MAPPING WEAK ENTITIES AND MULTIVALUED ATTRIBUTES FROM AN ER DIAGRAM INTO A RELATIONAL DATABASE.

STUDENT OBJECTIVES

- Upon completion of this video, you should be able to:
  - Look at an ER Diagram with weak entities and represent the weak entities in the relational model.
  - Look at an ER Diagram with multivalued attributes and represent multivalued attributes in the relational model
  - List the seven rules that must be followed when mapping an ER diagram to a relational database.

REPRESENTING WEAK ENTITIES

Suppose now we add have the tables:

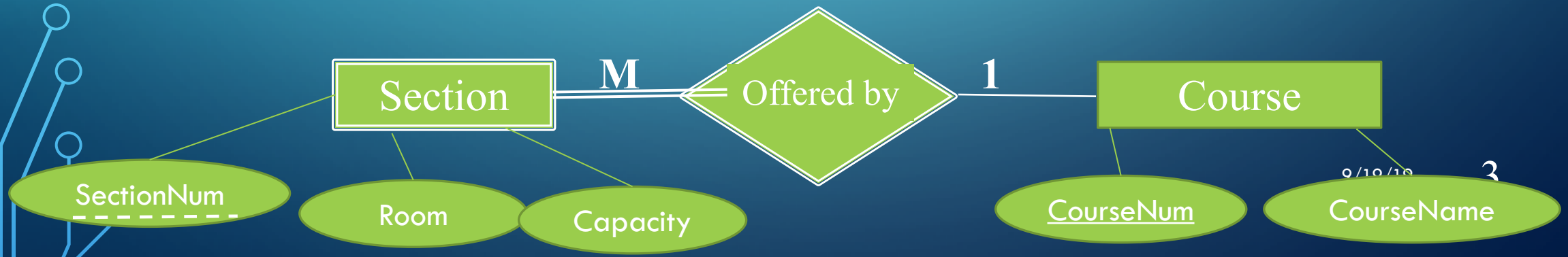
COURSE

CourseNumber	CourseName
CS3319	Intro to Databases
CS2210	Data Structures and Algorithms
CS1027	CS Fundamentals II
MA2222	Discrete Structures

SECTION

SectionNum	Room	Capacity	CourseNum *
001	MC110	300	CS3319
002	NS7	198	CS3319
001	MC110	300	MA2222
001	MC230	21	CS1027
002	MC230	21	CS1027
003	MC230	21	CS1027

And we have the following relationship:

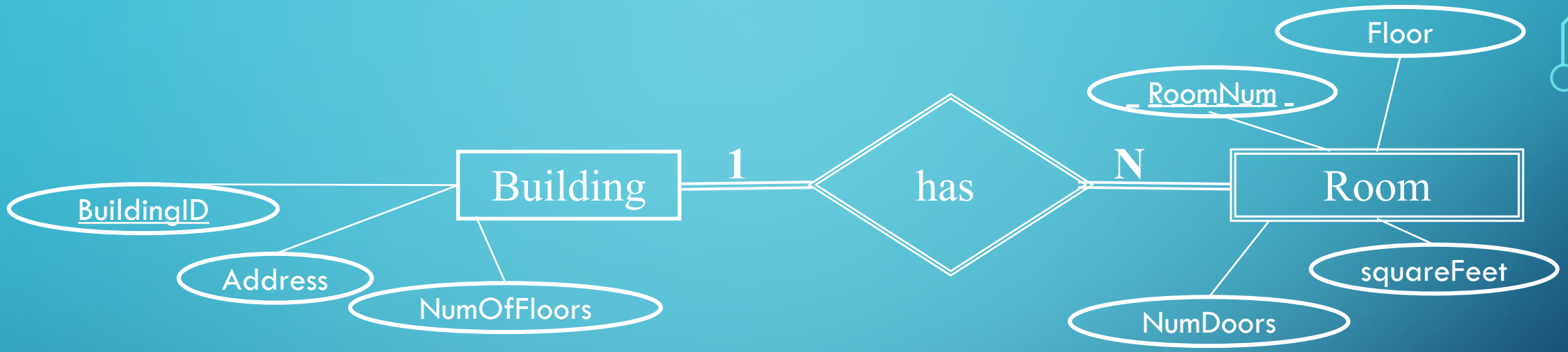


With WEAK entities, you bring the key from the owning entity as part of the key for the weak entity, so make the owning key a new column in the weak entity table and combine it with the weak key to make the new key.

QUESTION: What is the primary key of table SECTION? SectionNum and CourseNum

What are the foreign key(s) of the table SECTION? CourseNum

ANOTHER EXAMPLE OF WEAK ENTITIES



Building

BuildingID	Address	NumberOfFloors

Room

RoomNum	NumDoors	SquareFeet	Floor	BuildingID*

MULTIVALUED ATTRIBUTES

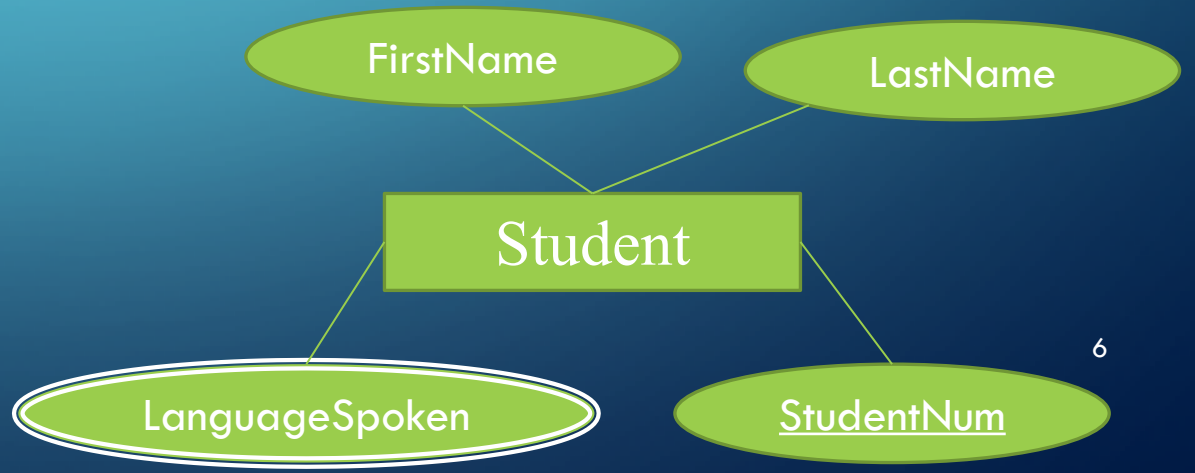
We want to show that Homer speaks English and Spanish, Marg speaks English and Arabic and Lisa speaks English, French and Spanish.

LANGUAGESPOKEN

StudentNum*	Language
251012345	English
251012345	Spanish
251012333	English
251012333	Spanish
251012333	French
251044444	English
251044444	Arabic

STUDENT

StudentNum	FirstName	LastName
251012345	Homer	Simpson
251044444	Marg	Flanders
251012333	Lisa	Griffin



With MULTIVALUED attributes, you create a new table and bring the key from the entity as part of the key together with the multivalued attribute and combine them to create the new key for the new table. Do NOT include the multivalued attribute in the original entity anymore.

QUESTION: What is the primary key of table LANGUAGESPOKEN
StudentNum and Language ?

What are the foreign key(s) of the table LANGUAGESPKEN? StudentNum

MAPPING ER DIAGRAMS TO RELATIONAL DATABASES → THE SEVEN RULES!

- **Step 1:** For each ***regular entity type E*** in the ER schema, create a relation R that includes all simple attributes of E. Include only the simple component attributes of a composite attribute. Choose one of the key attributes of E as primary key for R. If the chosen key of E is composite, the set of simple attributes that form it will together form the primary key of R.

- **Step 2:** For each ***weak entity type W*** in the ER schema with owner entity type E, create a relation R, and include all simple attributes (or simple components of composite attributes) of W as attributes of R. In addition, include as foreign key attributes of R the primary key attribute(s) of the relation(s) that correspond to the owner entity type(s); The primary key of R is the combination of the primary key(s) of the owner(s) and the partial key of the weak entity type W, if any.

- **Step 3:** For each ***binary 1:1 relationship type R*** in the ER schema, identify the relations S and T that correspond to the entity types participating in R. Choose one of the relations S, say and include as foreign key in S the primary key of T. It is better to choose an entity type with total participation in R in the role of S. Include all the simple attributes (or simple components of composite attributes) of the 1:1 relationship type R as attributes of S.

- **Step 4:** For each ***regular (non weak) binary 1:N relationship type R***, identify the relation S that represents the participating entity type at the N-side of the relationship type. Include as foreign key in S the primary key of the relation T that represents the other entity type participating in R; this is because each entity instance on the N-side is related to at most one entity instance on the 1-side of the relationship type. Include any simple attributes (or simple components of composite attributes) of the 1:N relationship type as attributes of S.

- **Step 5:** For each ***binary M:N relationship type R,***create a new relation S to represent R. Include as foreign key in S the primary keys of the relations that represent the participating entity types; their combination will form the primary key of S. Also include any simple attributes (or simple components of composite attributes) of the M:N relationship type as attributes of S.

- **Step 6:** For each ***multivalued attribute A***, create a new relation R that includes an attribute corresponding to A plus the primary key attribute K (as a foreign key in R) of the relation that represents the entity type or relationship type that has A as an attribute. The primary key of R is the combination of A and K. IF the multivalued attribute is composite, we include the simple components.

- **Step 7:** For each ***n-ary relationship type R, n > 2,*** create a new relation S to represent R. Include as foreign key in S the primary keys of the relations that represent the participating entity types; their combination will form the primary key of S. Also include any simple attributes (or simple components of composite attributes) of the n-ary relationship type as attributes of S.