

Key Points

A *data model* is a notation (concepts) for describing data or information.

- describes structure of the data
- describes constraints on the data
- provides operations on the data (queries and modifications)
- relational model
 - supported by relational databases
- ER-to-relational mapping
 - model data requirements using a conceptual model because it is higher-level and closer to normal language
 - translate ER model to relational model for database implementation

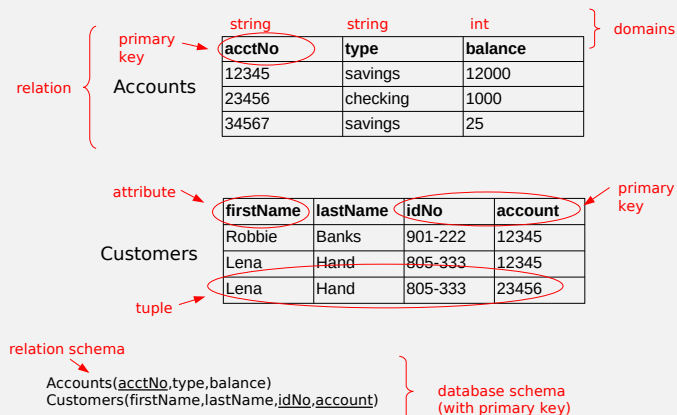
ER Model

- structure
 - *entities*
 - *relationships* between entities
 - *attributes* of entities and relationships
- constraints
 - attributes
 - *key* – set of attributes which together uniquely identify an entity
 - relationships
 - *cardinality ratio* defines maximum number of relationship instances a given entity can participate in
 - *participation* defines the minimum number of relationship instances that a given entity must participate in

Relational Model

- structure
 - *relations* (tables)
 - *attributes* (columns)
 - *tuples* (rows)
- constraints
 - *domain* – attribute data type
 - *NOT NULL* – attribute is required (value cannot be NULL)
 - *primary key* – a set of attributes which together distinguish tuples
 - *entity integrity constraint*
 - primary key attributes cannot be NULL
 - *referential integrity constraint*
 - requires that values for attribute A for tuples in relation R appear in attribute B for some tuple in relation R

The Relational Model: Structure



The Relational Model: Terminology

Choose matching items on the right so that "[left thing] is an example of [right thing]" is true. Use the following relation schema.

```

Accounts(acctNo, type, balance)
Customers(firstName, lastName, idNo, account)
    
```

```

Accounts.acctNo
Customers.account -> Accounts.acctNo
Customers.account in Customers.account -> Accounts.acctNo
Customers.firstName, Customers.lastName, Customers.idNo
Accounts.acctNo, Accounts.type | Accounts.balance is a number
Customer.account cannot be NULL
    
```

superkey
referential
integrity
constraint
domain
constraint
schematic
constraint
foreign key
entity integrity
constraint
primary key
none of these

The Relational Model: Terminology

Accounts(acctNo, type, balance)
Customers(firstName, lastName, idNo, account)

Accounts.acctNo	Customers.account → Accounts.acctNo
Customers.account in Customers.account → Accounts.acctNo	
Customers.firstName, Customers.lastName, Customers.idNo	
Accounts.acctNo, Accounts.type	Accounts.balance is a number
Customer.account cannot be NULL	
superkey	
referential integrity constraint	
domain constraint	
schematic constraint	
foreign key	
entity integrity constraint	
primary key	
none of these	

The Relational Model: Terminology

Accounts(acctNo, type, balance)
Customers(firstName, lastName, idNo, account)

Accounts.acctNo	Customers.account → Accounts.acctNo
Customers.account in Customers.account → Accounts.acctNo	
Customers.firstName, Customers.lastName, Customers.idNo	
Accounts.acctNo, Accounts.type	Accounts.balance is a number
Customer.account cannot be NULL	
superkey	
referential integrity constraint	
domain constraint	
schematic constraint	
foreign key	
entity integrity constraint	
primary key	
none of these	

The Relational Model: Terminology

Accounts(acctNo, type, balance)
Customers(firstName, lastName, idNo, account)

Accounts.acctNo	Customers.account → Accounts.acctNo
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Customers.firstName, Customers.lastName, Customers.idNo	
Accounts.acctNo, Accounts.type	Accounts.balance is a number
Customer.account cannot be NULL	
superkey	
referential integrity constraint	
domain constraint	
schematic constraint	
foreign key	
entity integrity constraint	
primary key	
none of these	

The Relational Model: Structure

True or false?

The following are different relations.

acctNo	type	balance	acctNo	type	balance
12345	savings	12000	23456	checking	1000
23456	checking	1000	12345	savings	12000
34567	savings	25	34567	savings	25

- false – tuples in a relation are not ordered. (Relations are sets of tuples.)

The following are different relations.

acctNo	type	balance	acctNo	balance	type
12345	savings	12000	12345	12000	savings
23456	checking	1000	23456	1000	checking
34567	savings	25	34567	25	savings

- false – attributes in a relation are not ordered. (Though for practical purposes we consider them in the order listed in the schema.)

The Relational Model: Structure

True or false?

The following are different relations.

acctNo	type	balance	acctNo	type	balance
12345	savings	12000	12345	savings	12000
23456	checking	1000	23456	checking	1000
34567	savings	25	34567	savings	25
			45678	checking	2050

- true – relations are sets of tuples, and these have different tuples. (But the relation schemas are the same.)

The Relational Model: Constraints

True or false?

Given the relation schema

Accounts (acctNo, type, balance)

the following is a legal relation.

acctNo	type	balance
12345	savings	12000
23456	checking	1000
34567	savings	12000

the following is a legal relation.

acctNo	type	balance
12345	savings	12000
12345	checking	1000
34567	savings	25

- true – it is possible for two tuples in the same relation to have the same value for an attribute (or group of attributes) doesn't constitute a key.
- false – duplicate values are not allowed for a key attribute.

The Relational Model: Constraints

True or false?

Given the relation schema

Accounts (acctNo, type, balance)

the following is a legal relation.

acctNo	type	balance
12345	savings	12000
12345	checking	1000
34567	savings	25

- true – it is possible for two tuples in the same relation to have the same value for an attribute as long as that attribute (or group of attributes) doesn't constitute a key.

The Relational Model: Constraints

Given the relation schema

Accounts (acctNo, type, balance)

the following is a legal relation.

acctNo	type	balance
12345	savings	12000
23456	NULL	1000
34567	savings	25

Given the relation schema

Accounts (acctNo, type, balance)

the following is a legal relation.

acctNo	type	balance
12345	savings	12000
23456	checking	1000
34567	savings	NULL

- false – entity integrity constraint means that key attributes cannot have NULL values
- true – for non-key attributes, any NOT NULL constraint must be specified separately