

Requirements Analysis and Entity Relationship Diagram

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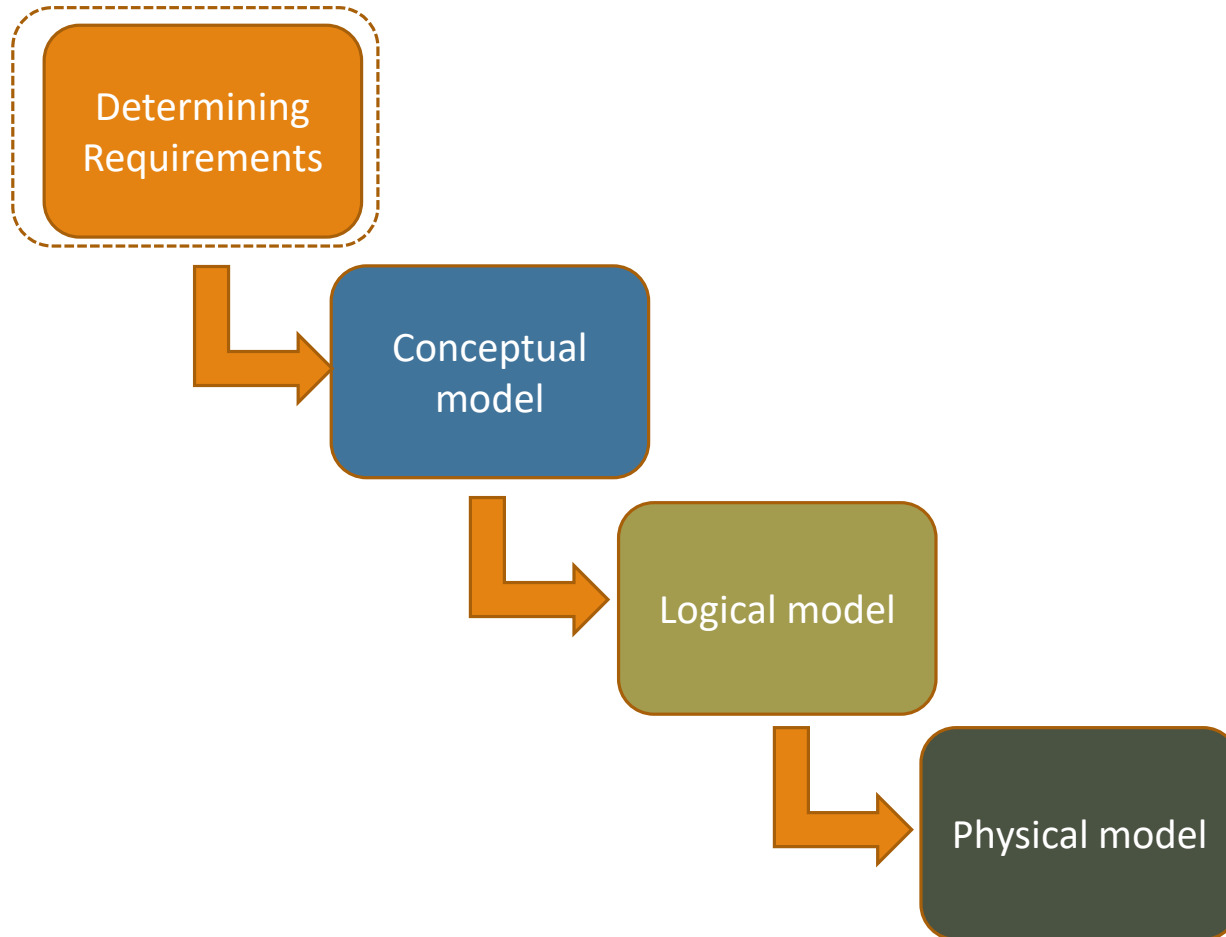
Example cases

Development of an information system

1. Hospital Information System
2. Library Information System
3. Shopping Center Information system

Database content and structure + Application to run on database

Development Stages



First Stage

Making a complete and accurate description of the system to be developed.

How?

- Defining the user group of the system
- Determining user requirements

Requirements

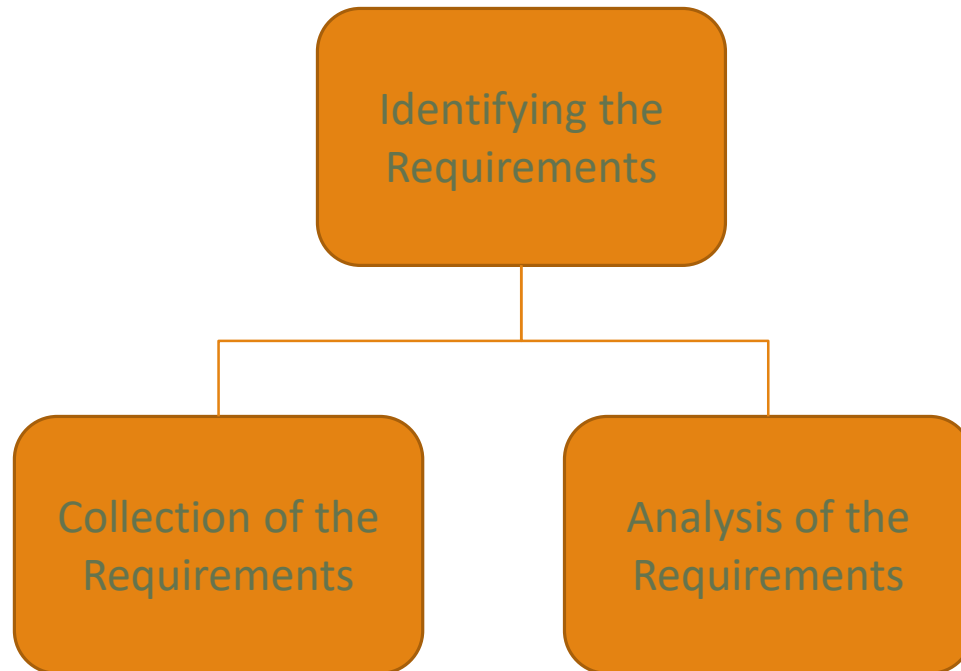
They are the properties that a system must have in order to perform the expected functions.

What are the Expected functions?

Methods used by users in the current system

- System structure
- business rules
- Troubles and problems

1. Identifying the Requirements



Collection of Requirements

Traditional Methods

- Surveys
- open-ended conversations
- Document analysis

Group Methods

- Brainstorming
- Prototyping

Requirement Analyst

Collection of Requirements

Requirements analyst

- He should guide the people well he meets/interviewed.
- Asking the right questions
- Revealing hidden and forgotten needs with questions
- Must address purpose, content and functions

Collection of Requirements

Incorrect or incompletely collected requirements lead to the development of systems that

- do undesirable jobs
- or do desired jobs incorrectly.

Requirements Analysis

It is the work of preparing the collected requirements for system design by grouping them according to their characteristics.

Entity Relation Diagrams

Sample

An e-exam system

User Groups

- Teachers
- Students
- System administrators

Sample

Method:

- Brainstorming
- one-on-one conversations
- Examination of the current exam system used

Sample

Questions are created

- Who will use the system?
- How many types of managers will there be? What will be the powers of the administrators?
- What information about teachers will be stored?
- What information about students will be stored?
- What will be the content of the questions?
- Will there be a certain time limit in the administration of the exams?

Sample

The answers to the questions are collected

If there are contradictory and inconsistent points in the views of the target audience, these views are agreed upon.

Sample

Data requirements are determined in line with the opinions obtained.

Requirement 1: Administrator, teacher and student will use the system

Requirement 2: There will be two types of managers. Main admin will have access to any kind of information in the system. Other admin will only be able to see information about creating exams.

Requirement 3: Teachers name, age, field, email information will be stored.

Sample

- The database development team should review the information obtained in line with the data requirements and group the relevant data requirements.
- They should remove the unnecessary requirements.

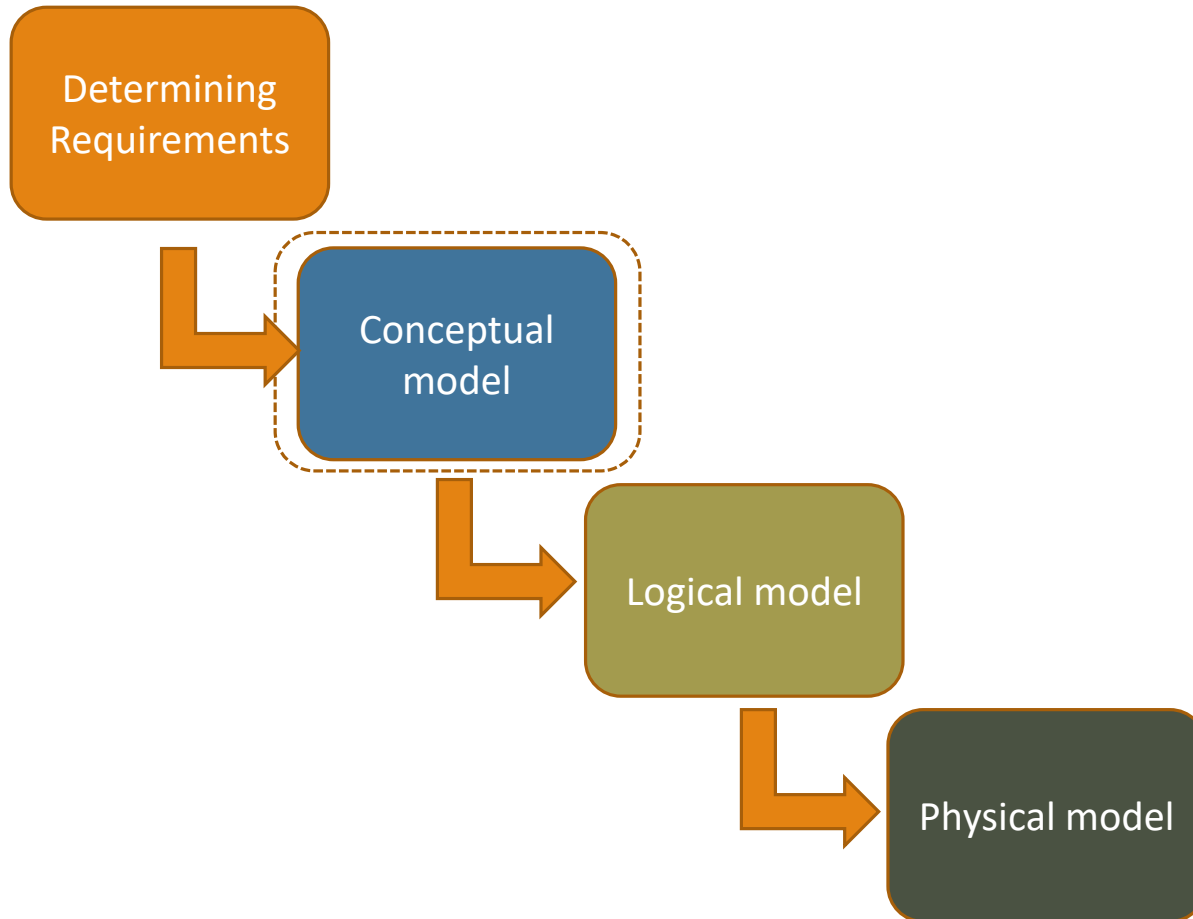
Sample

- The final report on the data requirements should be submitted to the approval of the users and the project owner,
- and the opinions of the users should be obtained by preparing samples for the forms, reports and menus.

Homework

1. Identifying a subject to develop an information system
2. Define the target audience that will use this system
3. Define data collection methods
4. Developing the data collection tool
5. Data collection
6. Sorting and grouping data requirements

Stages



Conceptual Model

The requirements model, which is prepared in a way that users and the project owner can understand, should be transformed into a model that can be used in database design by database experts,

This model is called the **Conceptual model**.

Example

In conceptual modeling, Entity Relation (E-R) Diagrams, which illustrates requirements analysis, are prepared.

Entity Relation Diagrams

- The entities that should be in the information system
- Attributes of entities
- Inter-entity relationships

Entity

Everything that has meaning on its own within the database system and can be separated from other entities.

E.g

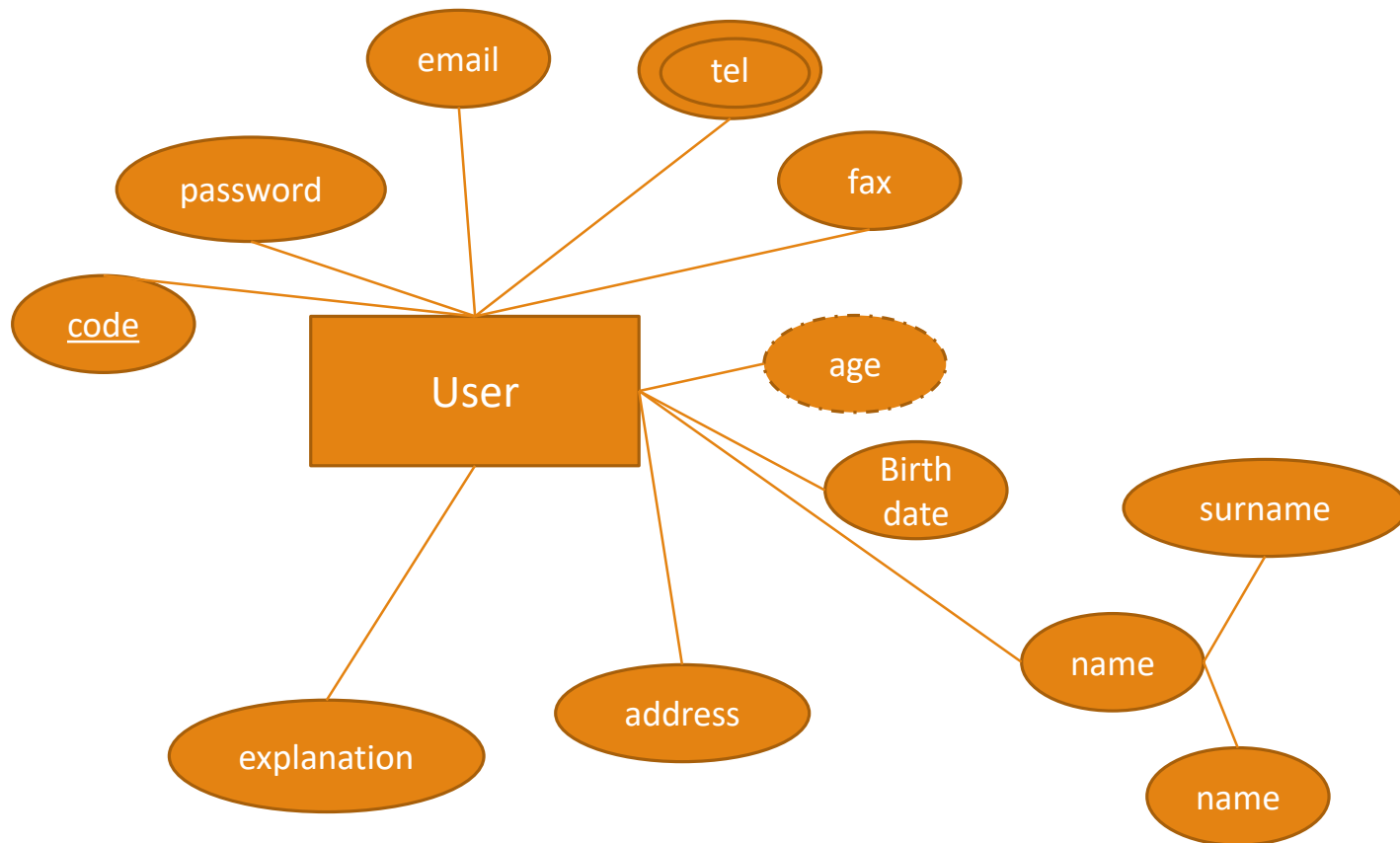
- User
- exams

Entity-Attributes

Entities are defined with one or more attributes that determine their properties.

Every entity must have a primary key attribute.

Entity-Attributes



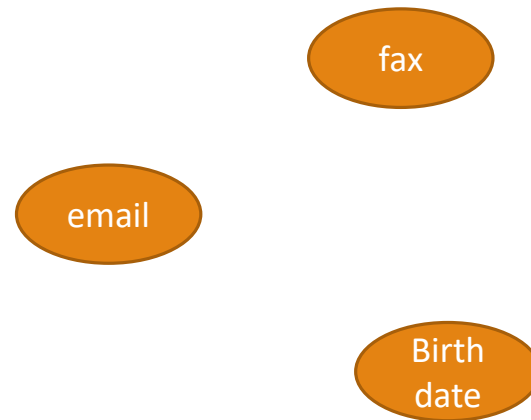
Example

Attributes could be

- Core
- Unified
- derived
- can take multiple values

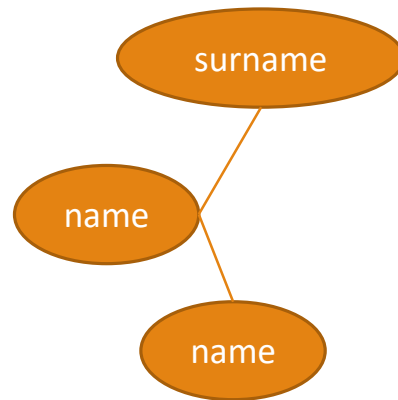
Example

Cores are attributes that cannot be further subdivided.



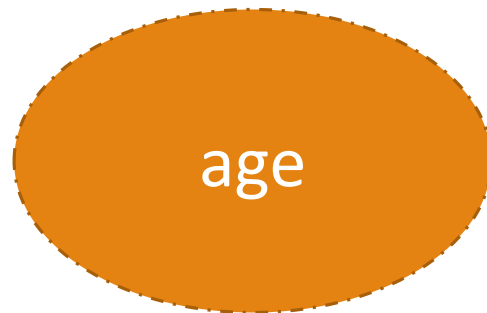
Example

Unified attributes are attributes formed by the combination of more than one core attribute.



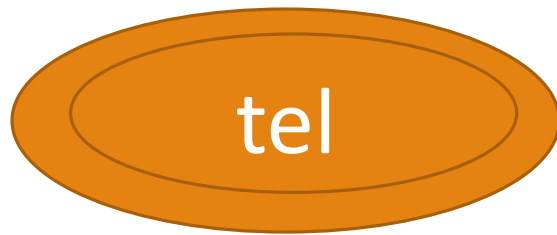
Example

Derived attributes are attributes that are not actually stored as a value in the database, but are calculated using other existing attributes.

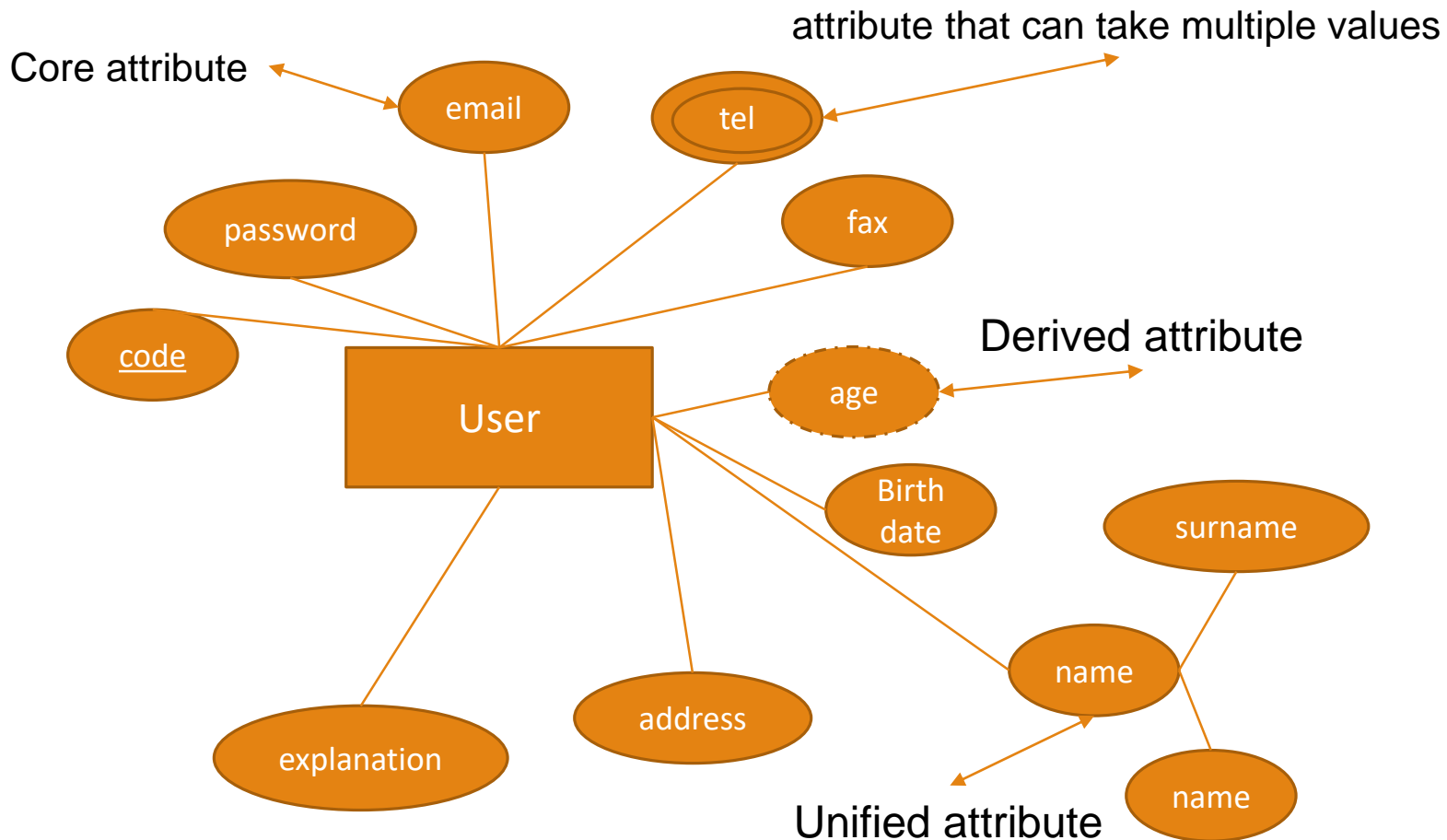


Example

Multi-valued attributes are attributes that can take more than one value in the database.

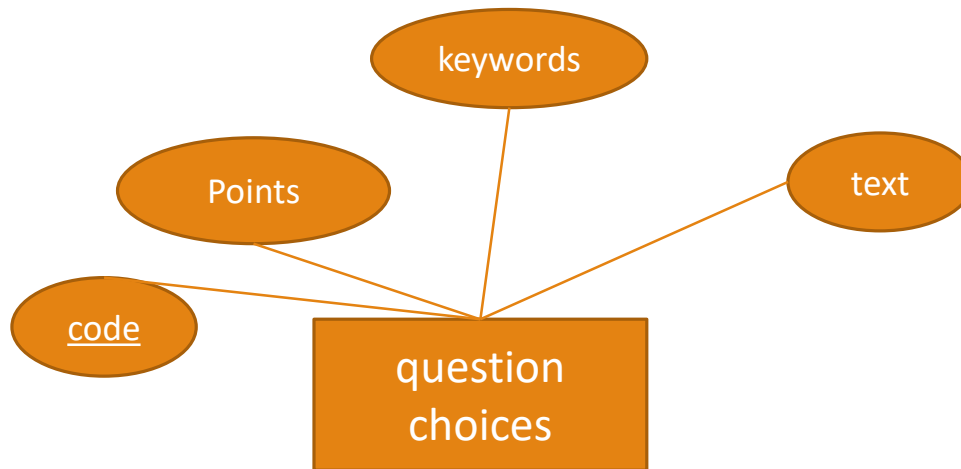


Attribute types



Weak Entities

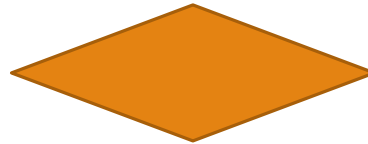
They are entities dependent on another entity that cannot stand alone in the system.



Relationships Between Entities

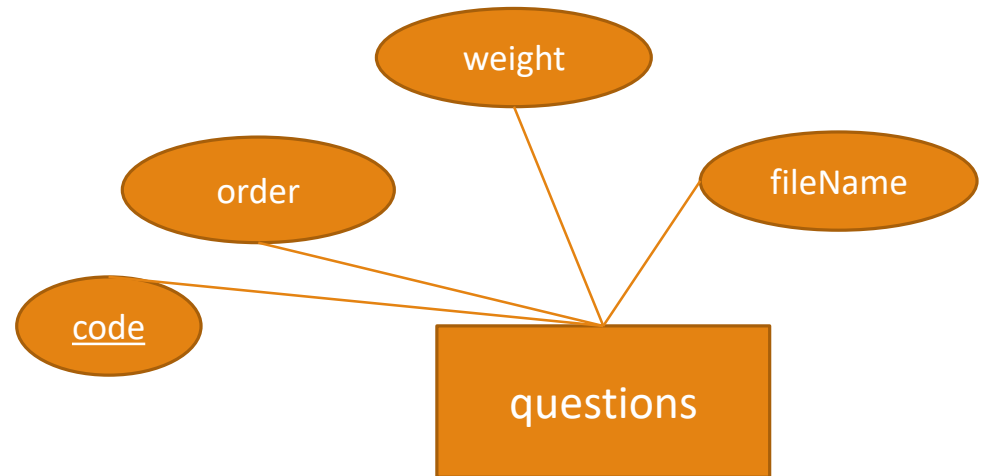
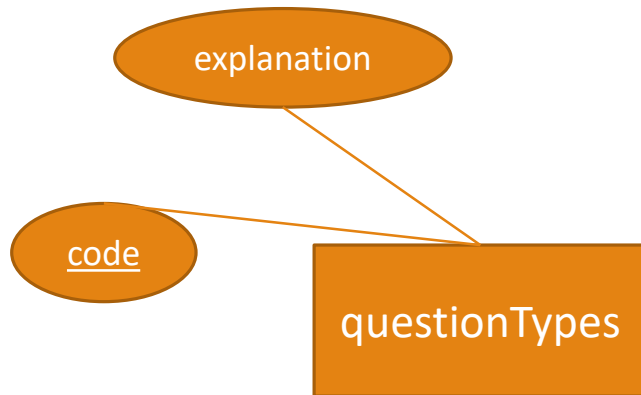
Entities in the database can be related to each other.

Relationships are represented by diamond shape in Entity Relationship Diagrams.

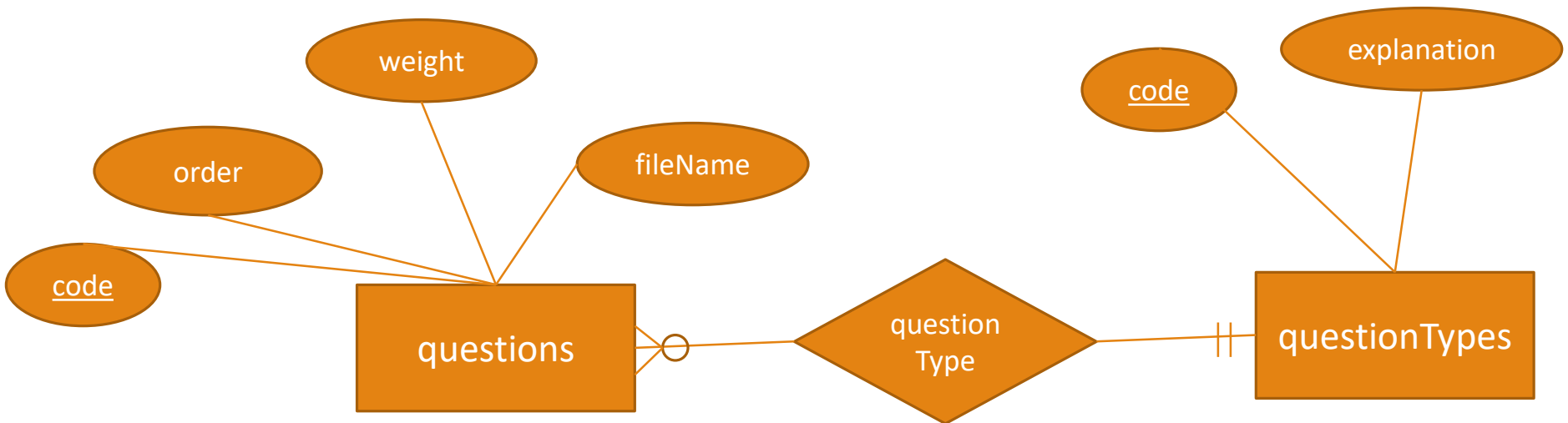


Each relation is given a short and meaningful name.

Relationships Between Entities



Relationships Between Entities



Data Integrity

In its broadest use, “data integrity” refers to **the accuracy and consistency of data stored in a database.**

In relational database models, data integrity is the consistency of the data distributed in different tables and to prevent the storage of incorrect or unrelated data in the database in various ways,.

Integrity Constraints

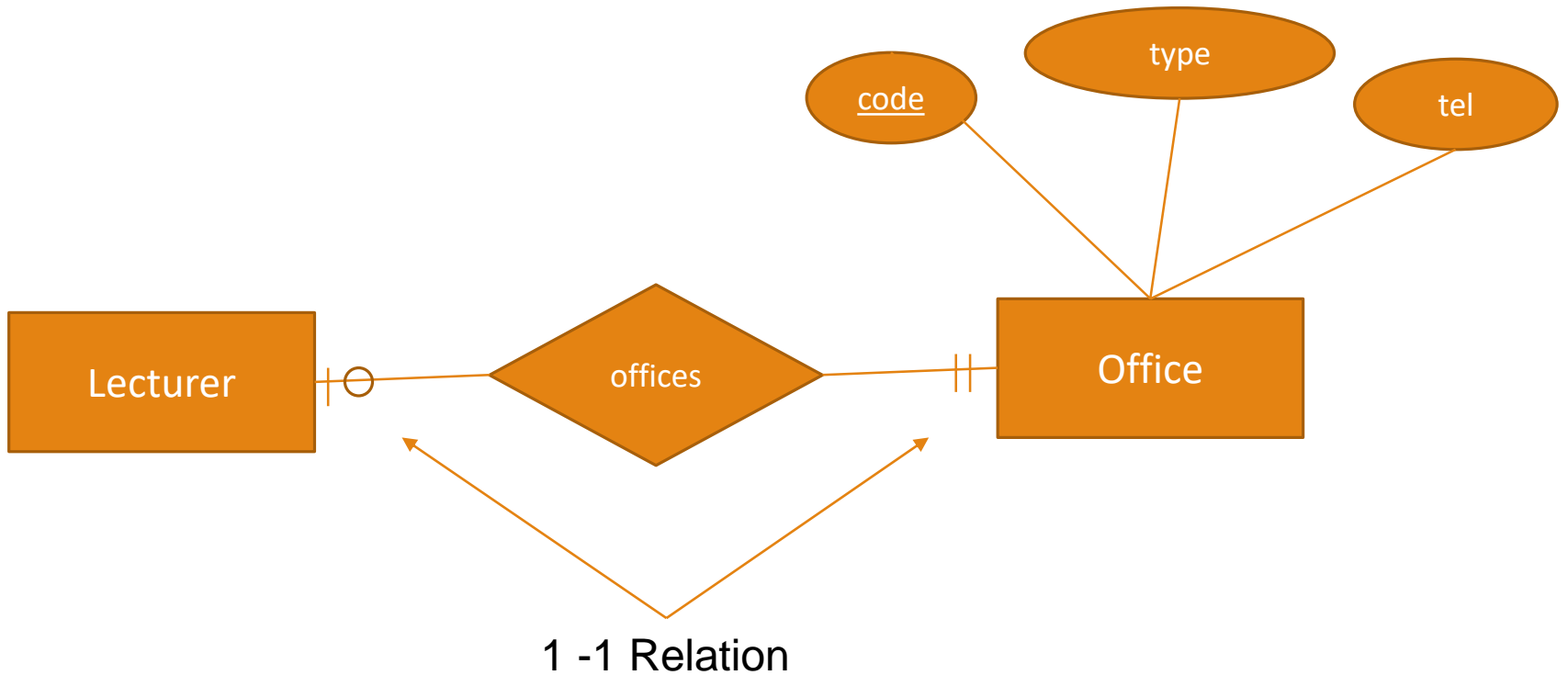
- When defining relationships between entities, the integrity constraints of the relationship should also be defined.
 1. Number of Elements Integrity Constraints
 2. Participation integrity constraint

Number of Elements Integrity Constraints

One-to-One Relation (1-1)

- An element in one entity must correspond to an element in another entity.
- For example, Lecturer and office entities.
- A constraint is that a lecturer can only have one office.

Relationships Between Entities

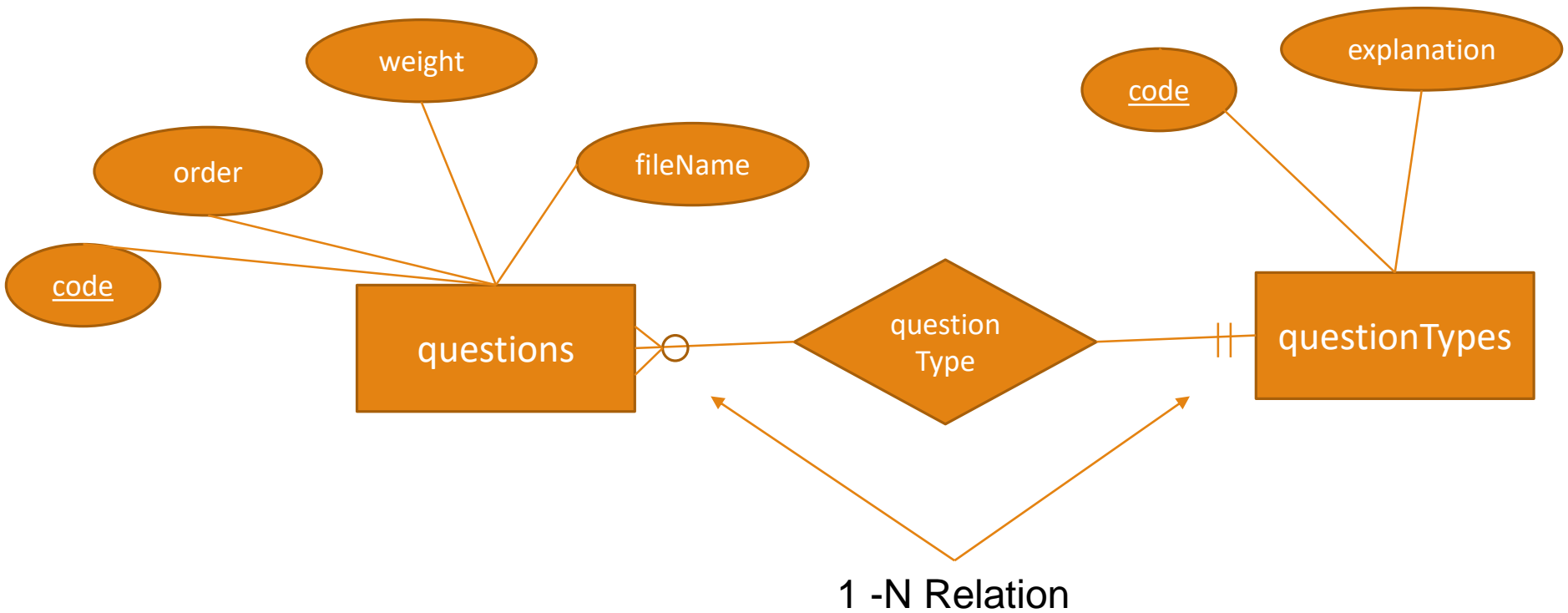


Number of Elements Integrity Constraints

One-to-Many Relations (1-N)

- An element in one entity can match more than one element in another entity.
- For example, Questions and question types entities.
- A question type can match more than one question.

Number of Elements Integrity Constraints

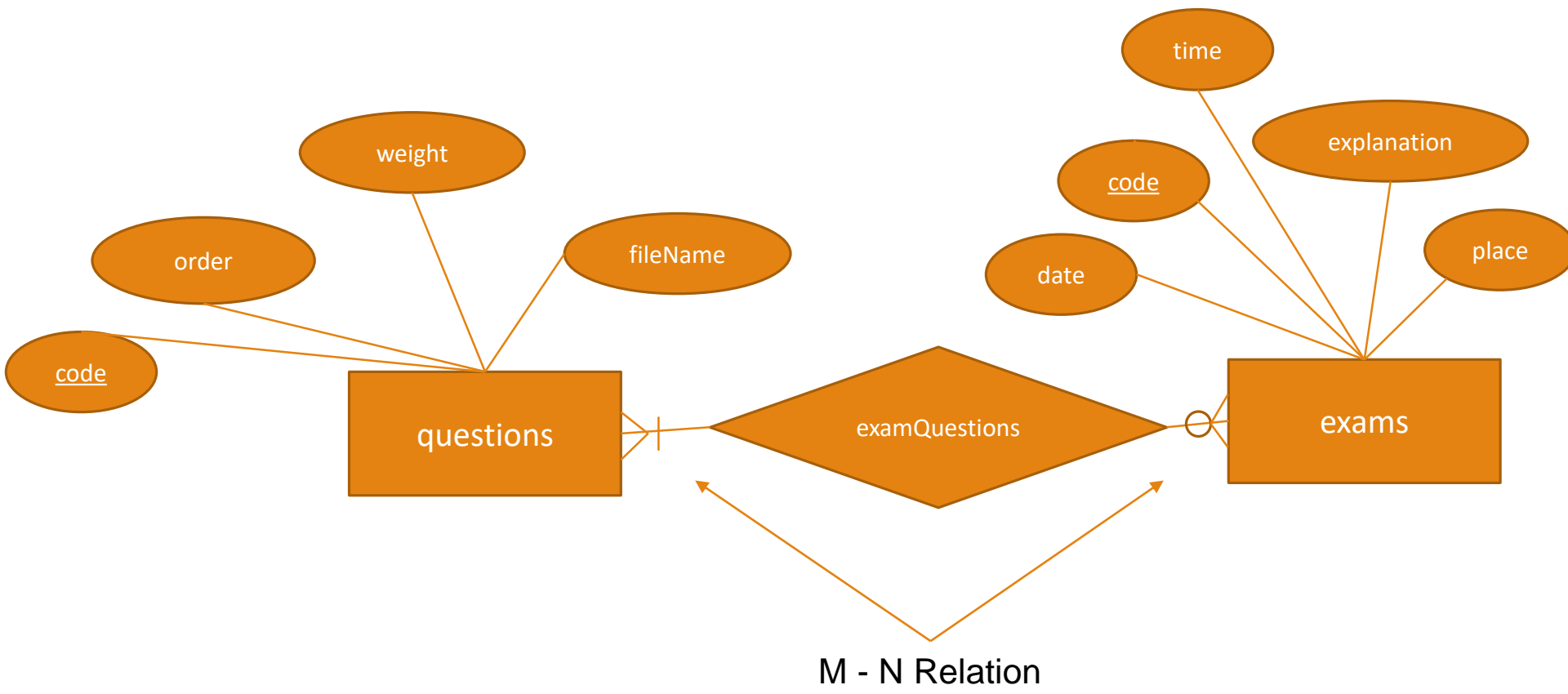


Number of Elements Integrity Constraints

Many Many Relation (M-N)

- Multiple elements in one entity can match more than one element in another entity.
- For example, the Questions and exam types entities.
- A question may appear in more than one exam, an exam contains more than one question.

Number of Elements Integrity Constraints

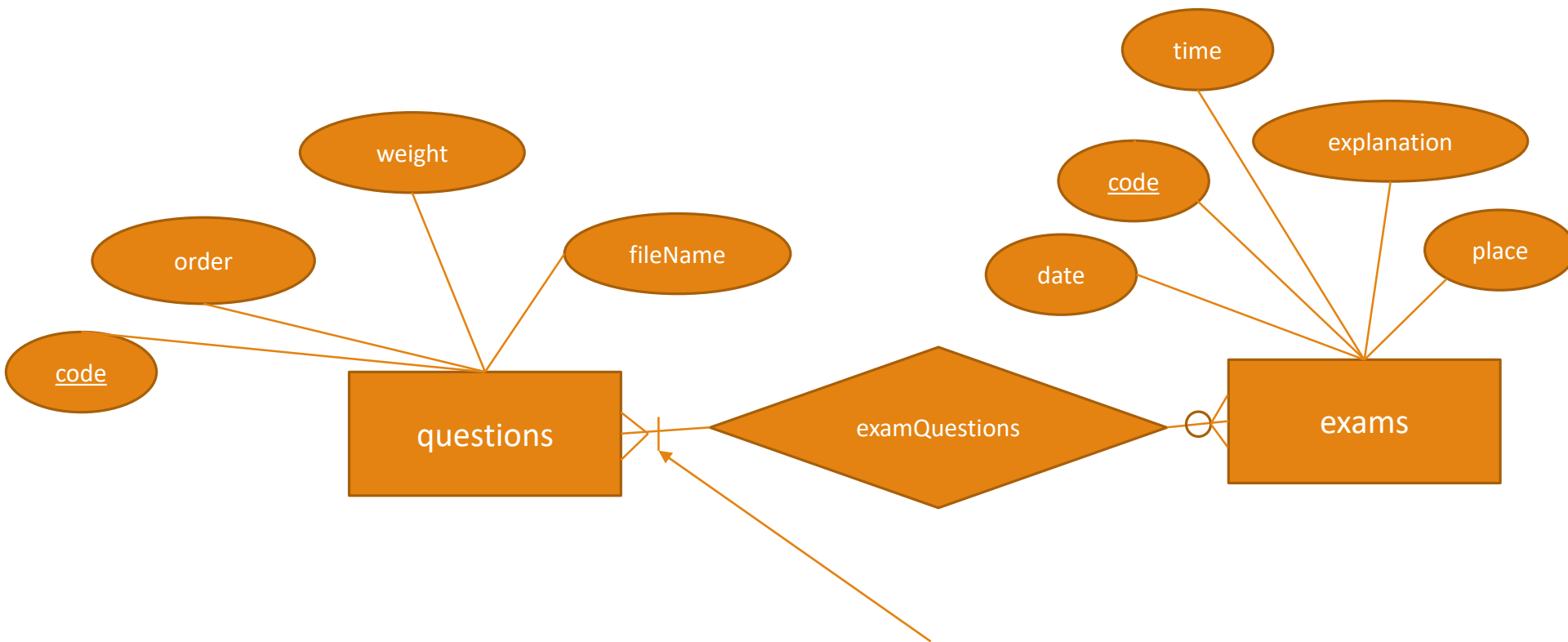


Participation Integrity Constraints

All (Mandatory) Participation

- It is the constraint that entities must participate in a relation.
- This obligation is expressed by the straight line placed in the asset part.
- For example, a constraint can be created in the exam system that there must be at least one question in each exam.

Participation Integrity Constraints

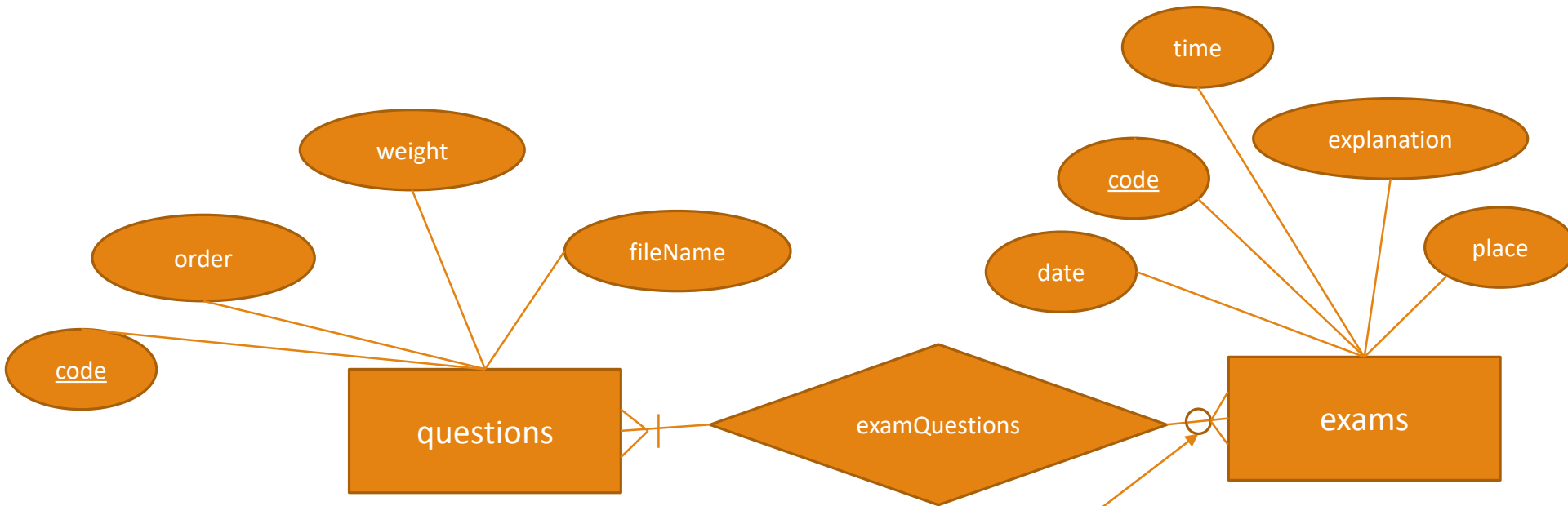


Mandatory Participation

Participation Integrity Constraints

- Partial Participation is created if entity participation is optional in a correlation definition.
- This requirement is expressed by the round sign.
- For example, in the exam system, not every question may be used in an exam.

Participation Integrity Constraints



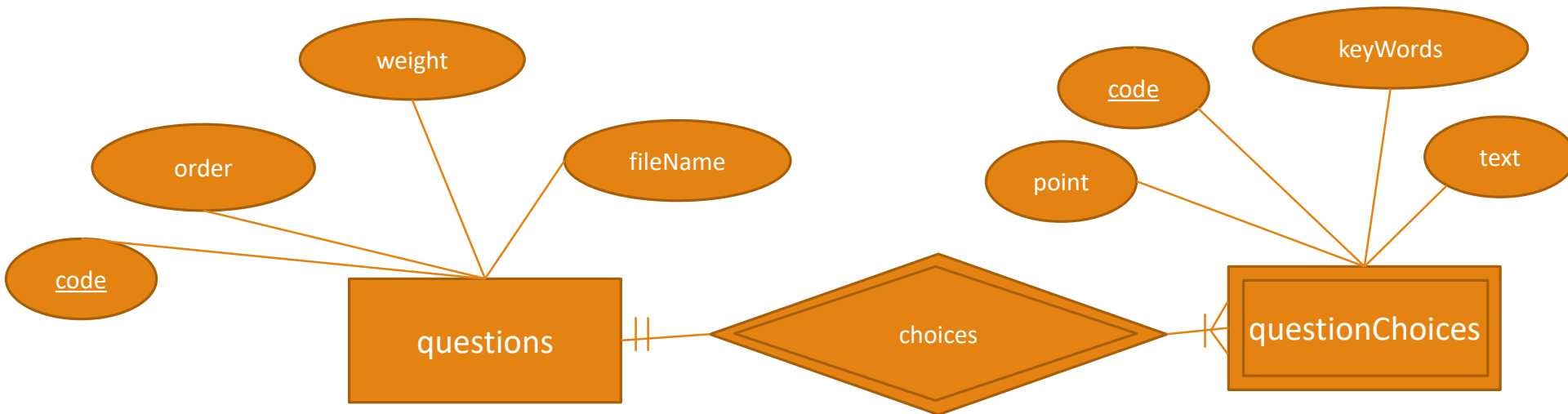
Partial Participation

Existence relationship

There must be a correlation of existence between the weak entity and the entity or entities that enable the weak entity to exist in the system.

The correlation between the weak entity and the other entity is shown with a double-lined diamond.

Existence relation



Recursive relation

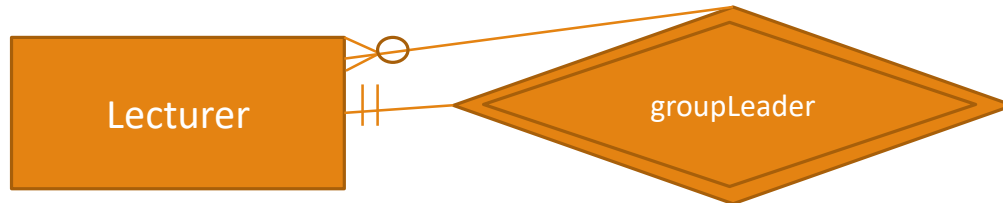
Özyineli bağıntı varlığın kendi içinde oluşturulur.

Örneğin öğretmenler varlığındaki her öğretmenin bir zümre başkanı olması gerekliyse ve zümre başkanı da yine bir öğretmense özyineli bağıntı kurulur.

The recursive relation is created within the entity itself.

For example, if every teacher in the teachers entity is required to be a group leader and the group leader is also a teacher, a recursive relation is established.

Recursive relation



Relation Degree

Relationships can also be established between more than two entities.

| Bağıntı Tipi | Derecesi |
|-------------------------------|----------|
| Öz yineli | 1-li |
| İki varlık arasındaki | 2-li |
| Üç varlık arasındaki | 3-lü |
| Üçten fazla varlık arasındaki | N-li |

Third Order Relation

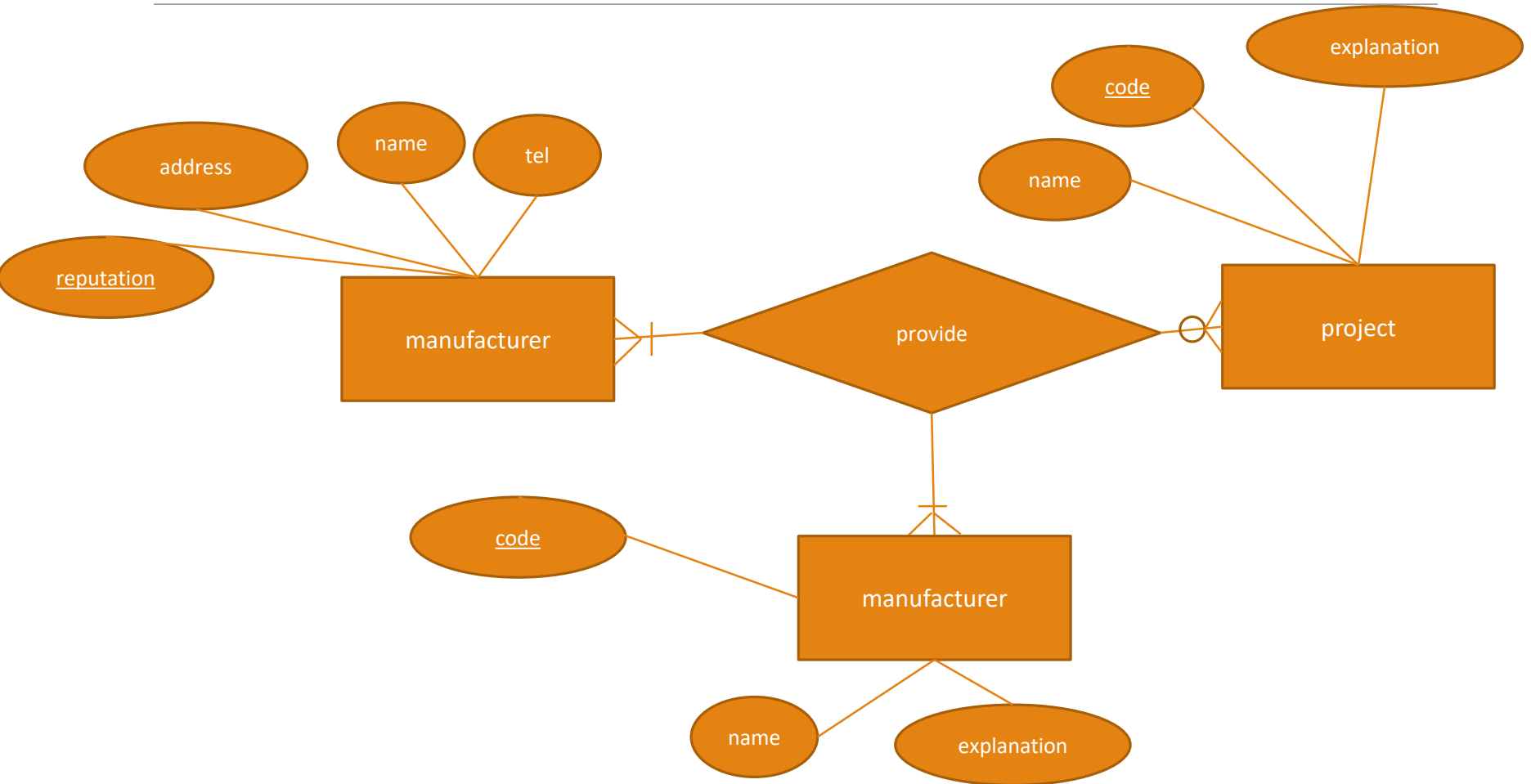
Projects

Materials

Manufacturer

Which company provided which material for which project?

Third Order Relation

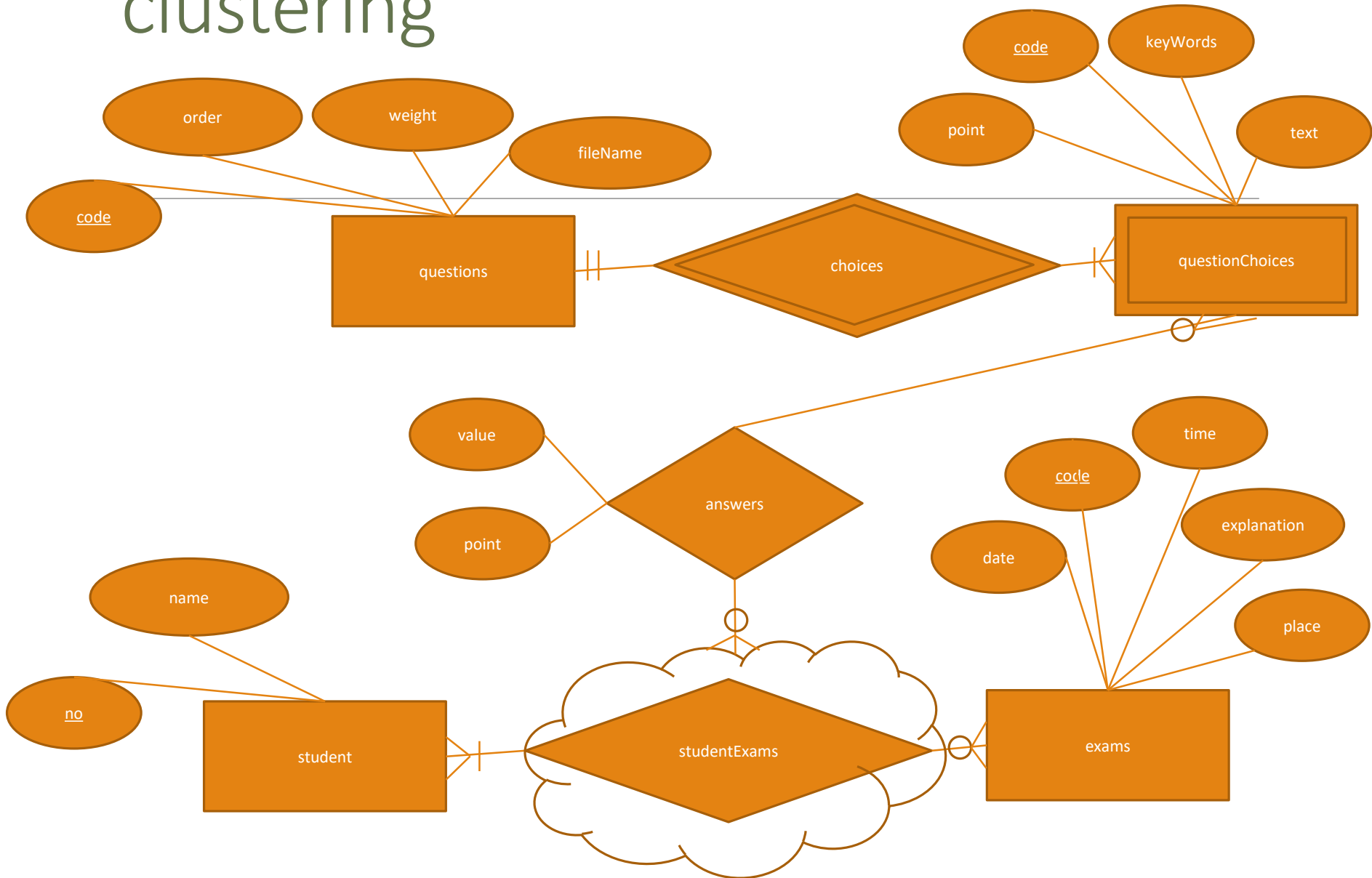


clustering

Question bank

- Students
- exams
- Which option did he tick, time taken the exam, date, total score, etc.

clustering



References

Tokdemir, G. ve Çağıltay, N. E. (2010). *Veritabanı Sistemleri Dersi*. Seçkin yayıncılık, Ankara.