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## **Chapter 2: Data Modeling**

### **Multiple Choice**

1. The Entity-Relationship (E-R) model is \_\_\_\_\_.
  - a. a diagramming technique that describes record structures (i.e. the fields that make up the records of a file)
  - b. an alternative to indexing and hashing as a means for providing direct access in files
  - c. a diagramming technique that describes entities, their attributes, and the relationships between them
  - d. an alternative to file design in which attributes are used instead of fields
  - e. a diagramming technique that relates entities to each other, attributes to each other, and relationships to each other

Ans: c

Response: See page 20

2. An association between entities is a(n) \_\_\_\_\_.
  - a. entity type
  - b. entity occurrence
  - c. record
  - d. attribute
  - e. relationship

Ans: e

Response: See page 20

3. A binary relationship is a relationship between two \_\_\_\_\_.
  - a. entity types
  - b. attribute types
  - c. associations
  - d. files
  - e. cardinalities

Ans: a

Response: See page 20

4. The term “binary” in binary relationship indicates that the relationship is between

- a. two halves of an entity type
- b. two entity types
- c. two divisions of an entity's attributes
- d. two attributes
- e. two relationships

Ans: b

Response: See page 20

5. The cardinality of a relationship is \_\_\_\_.
- a. The minimum number of entities that can be involved in the relationship.
  - b. The maximum number of entities that can be involved in the relationship.
  - c. The minimum number of attributes that can be in the entity types in a relationship.
  - d. The maximum number of attributes that can be in the entity types in a relationship.
  - e. The minimum number of associations that can be involved in the relationship.

Ans: b

Response: See page 23

6. The modality of a relationship is \_\_\_\_.
- a. The minimum number of entities that can be involved in the relationship.
  - b. The maximum number of entities that can be involved in the relationship.
  - c. The minimum number of attributes that can be in the entity types in a relationship.
  - d. The maximum number of attributes that can be in the entity types in a relationship.
  - e. The minimum number of associations that can be involved in the relationship.

Ans: a

Response: See page 24

7. A one-to-one binary relationship \_\_\_\_.
- a. involves a single entity type
  - b. involves two entity types
  - c. allows an occurrence of one entity type to be associated with several occurrences of another entity type
  - d. allows an occurrence of one entity type to be associated with several occurrences of another entity type and vice versa
  - e. restricts the number of attributes that an entity has

Ans: b

Response: See page 23

8. A one-to-many binary relationship allows an occurrence of the entity type on the “one side” of the relationship to be associated with \_\_\_\_\_.  
a. a single occurrence of the same entity type  
b. multiple occurrences of the same entity type  
c. a single occurrence of the entity type on the “many side” of the relationship  
d. multiple occurrences of the entity type on the “many side” of the relationship  
e. multiple occurrences of the entity type on the “one side” of the relationship

Ans: d

Response: See page 23

9. A many-to-many binary relationship allows an occurrence of one entity type to be associated with \_\_\_\_\_.  
a. a single occurrence of the same entity type  
b. multiple occurrences of the same entity type  
c. a single occurrence of another entity type  
d. multiple occurrences of another entity type  
e. multiple occurrences of three entity types

Ans: d

Response: See page 24

10. A business school’s faculty parking lot has assigned parking spaces. Each professor is entitled to one parking space. This is an example of a \_\_\_\_\_ relationship.  
a. one-to-one binary  
b. one-to-many binary  
c. many-to-many binary  
d. one-to-one unary  
e. one-to-many unary

Ans: a

Response: See page 24

11. Each building on a university campus has several faculty offices. Each professor has one office. The relationship between campus buildings and professors is a \_\_\_\_\_ relationship.  
a. one-to-one binary  
b. one-to-many binary  
c. many-to-many binary  
d. one-to-one unary  
e. one-to-many unary

Ans: b

Response: See page 24

12. In a university, the relationship between courses and their sections can best be described as a \_\_\_\_\_ relationship.
- a. one-to-one binary
  - b. one-to-many binary
  - c. many-to-many binary
  - d. one-to-one unary
  - e. one-to-many unary

Ans: b

Response: See page 24

13. In a university setting, the relationship between students and the professors who have been their instructors is a \_\_\_\_\_ relationship.
- a. one-to-one binary
  - b. one-to-many binary
  - c. many-to-many binary
  - d. one-to-one unary
  - e. one-to-many unary

Ans: b

Response: See page 24

14. Intersection data \_\_\_\_\_.
- a. is an attribute of the entity on the “one side” of a one-to-many relationship
  - b. is an attribute of the entity on the “many side” of a one-to-many relationship
  - c. describes the relationship between two entities in a many-to-many relationship
  - d. describes one of the entities in a many-to-many relationship
  - e. describes one of the entities in a ternary relationship

Ans: c

Response: See page 25

15. Each student at a university takes many courses; each course is taken by many students. The semester that a student took a course and the grade that the student received in the course is called \_\_\_\_\_ data.
- a. index
  - b. key
  - c. pointer
  - d. direct access

- e. intersection

Ans: e

Response: See page 25

16. An associative entity is an alternate way of expressing a(n) \_\_\_\_.
- a. one-to-one binary relationship
  - b. one-to-many binary relationship
  - c. many-to-many binary relationship
  - d. entity that has no attributes other than the unique identifier or key
  - e. entity that has no unique identifiers or keys

Ans: c

Response: See page 27

17. Depending on the attributes and circumstances present, the unique identifier of an associative entity could be any of the following, except \_\_\_\_.
- a. the combination of the unique identifiers of the entities in the many-to-many relationship consisting of exactly one field from each entity
  - b. the combination of the unique identifiers of the entities in the many-to-many relationship consisting of several fields
  - c. the combination of the unique identifiers of the entities in the many-to-many relationship plus one or more additional fields that express times or dates
  - d. a single field that is associated with the associative entity and provides unique values
  - e. a unique combination of fields from one of the two entities in the many-to-many relationship

Ans: e

Response: See page 28

18. A one-to-one unary relationship \_\_\_\_.
- a. involves a single entity type
  - b. involves two entity types
  - c. allows an occurrence of one entity type to be associated with several occurrences of another entity type
  - d. allows an occurrence of one entity type to be associated with several occurrences of another entity type and vice versa
  - e. allows an occurrence of one entity type to be associated with several occurrences of the same entity type

Ans: a

Response: See page 28

19. A one-to-many unary relationship allows an occurrence of the entity type on the “one side” of the relationship to be associated with \_\_\_\_\_.  
a. a single occurrence of the same entity type  
b. multiple occurrences of the same entity type  
c. a single occurrence of the different entity type on the “many side” of the relationship  
d. multiple occurrences of the different entity type on the “many side” of the relationship  
e. multiple occurrences of the different entity type on the “one side” of the relationship

Ans: b

Response: See page 29

20. A many-to-many unary relationship allows an occurrence of one entity type to be associated with \_\_\_\_\_.  
a. a single occurrence of the same entity type  
b. multiple occurrences of the same entity type  
c. a single occurrence of another entity type  
d. multiple occurrences of another entity type  
e. multiple occurrences of three entity types

Ans: b

Response: See page 29

21. A ternary relationship allows an occurrence of one entity type to be associated with \_\_\_\_\_.  
a. a single occurrence of the same entity type  
b. multiple occurrences of the same entity type  
c. a single occurrence of only one other entity type  
d. multiple occurrences of only one other entity type  
e. multiple occurrences of two other entity types

Ans: e

Response: See page 31

22. In a university setting, each student is paired with another student for the purpose of getting assignments and turning in work for the other if he is out of school for any reason. This is a \_\_\_\_\_ relationship.  
a. one-to-one binary  
b. one-to-many binary

- c. many-to-many binary
- d. one-to-one unary
- e. one-to-many unary

Ans: d

Response: See page 29

23. In a university setting, every professor reports to another professor who is the department chair. This is a \_\_\_\_\_ relationship.

- a. one-to-one binary
- b. one-to-many binary
- c. many-to-many binary
- d. one-to-one unary
- e. one-to-many unary

Ans: e

Response: See page 29

24. A university wants to keep track of which professor taught which subject to which student. This is a \_\_\_\_\_ relationship.

- a. one-to-many unary
- b. many-to-many unary
- c. one-to-many binary
- d. many-to-many binary
- e. ternary

Ans: e

Response: See page 31

25. A dependent entity \_\_\_\_\_.

- a. is the same as an associative entity
- b. can only exist as part of a many-to-many binary relationship
- c. can only be present if the entity it depends on is present
- d. requires intersection data if it is part of a many-to-many binary relationship
- e. requires intersection data if it is part of a ternary relationship

Ans: c

Response: See page 32

### True/False

1. The Entity-Relationship (E-R) model is designed to diagram entity types that are independent of each other.

Ans: False

Response: See Page 20

2. The Entity-Relationship (E-R) model is designed to diagram entity types and the relationships between them.

Ans: True

Response: See Page 20

3. A binary relationship is one in which each entity occurrence is associated with exactly two other entity occurrences.

Ans: False

Response: See Page 20

4. A binary relationship is a relationship between two entity types.

Ans: True

Response: See Page 20

5. A one-to-one binary relationship involves a single entity type.

Ans: False

Response: See Page 23

6. A one-to-one binary relationship associates one occurrence of an entity type with one occurrence of another entity type.

Ans: True

Response: See Page 23

7. The cardinality of a relationship is the maximum number of entity occurrences that can be involved in it.

Ans: True

Response: See Page 23



8. The cardinality of a relationship is the maximum number of entity types that can be involved in it.

Ans: False

Response: See Page 23

9. In a one-to-many binary relationship an occurrence of one entity type can be associated with many occurrences of the same entity type.

Ans: False

Response: See Page 24

10. In a one-to-many binary relationship an occurrence of one entity type can be associated with many occurrences of another entity type.

Ans: True

Response: See Page 24

11. In a one-to-many binary relationship an occurrence of one entity type can be associated with many occurrences of another entity type while each occurrence of the second entity can be associated with only one occurrence of the first.

Ans: True

Response: See Page 24

12. In a many-to-many binary relationship an occurrence of one entity type can be associated with many occurrences of another entity type while each occurrence of the second entity type can be associated with only one occurrence of the first.

Ans: False

Response: See Page 24

13. In a many-to-many binary relationship an occurrence of one entity type can be associated with many occurrences of another entity type while each occurrence of the second entity type can be associated with many occurrences of the first.

Ans: True

Response: See Page 24

14. The modality of a relationship is the minimum number of entity occurrences that can be involved in a relationship.

Ans: True

Response: See Page 24

15. Intersection data describes the many-to-many relationship between two entities.

Ans: True

Response: See Page 25

16. Intersection data is associated with one of the two entities in a many-to-many relationship.

Ans: False

Response: See Page 25

17. An associative entity is an alternate way of describing a one-to-one binary relationship.

Ans: False

Response: See Page 27

18. An associative entity is an alternate way of describing a many-to-many binary relationship.

Ans: True

Response: See Page 27

19. It is possible to have a many-to-many binary relationship without intersection data.

Ans: True

Response: See Page 27

20. It is not necessary to have an associative entity describe a many-to-many binary relationship if there is not intersection data.

Ans: False

Response: See Page 27

21. A one-to-one unary relationship involves a single entity type.

Ans: True

Response: See Page 28

22. A one-to-one unary relationship associates one occurrence of an entity type with one occurrence of another entity type.

Ans: False

Response: See Page 28

23. In a one-to-many unary relationship an occurrence of one entity type can be associated with many occurrences of the same entity type.

Ans: True

Response: See Page 29

24. In a one-to-many unary relationship an occurrence of one entity type can be associated with many occurrences of another entity type while each occurrence of the second entity can be associated with only one occurrence of the first.

Ans: False

Response: See Page 29

25. In a many-to-many unary relationship an occurrence of one entity type can be associated with many occurrences of another entity type while each occurrence of the second entity type can be associated with only one occurrence of the first.

Ans: False

Response: See Page 29

26. In a many-to-many unary relationship an occurrence of one entity type can be associated with many occurrences of another entity type while each occurrence of the second entity type can be associated with many occurrences of the first.

Ans: False

Response: See Page 29

27. In a many-to-many unary relationship an occurrence of one entity type can be associated with many occurrences of the same entity type.

Ans: True

Response: See Page 29

28. A ternary relationship involves three different entity types.

Ans: True

Response: See Page 31

29. In a ternary relationship, an occurrence of one entity type is associated with exactly three occurrences of another entity type.

Ans: False

Response: See Page 31

30. A dependent entity would be of no use to a business environment if the entity that it depends on is no longer of use.

Ans: True

Response: See Page 32

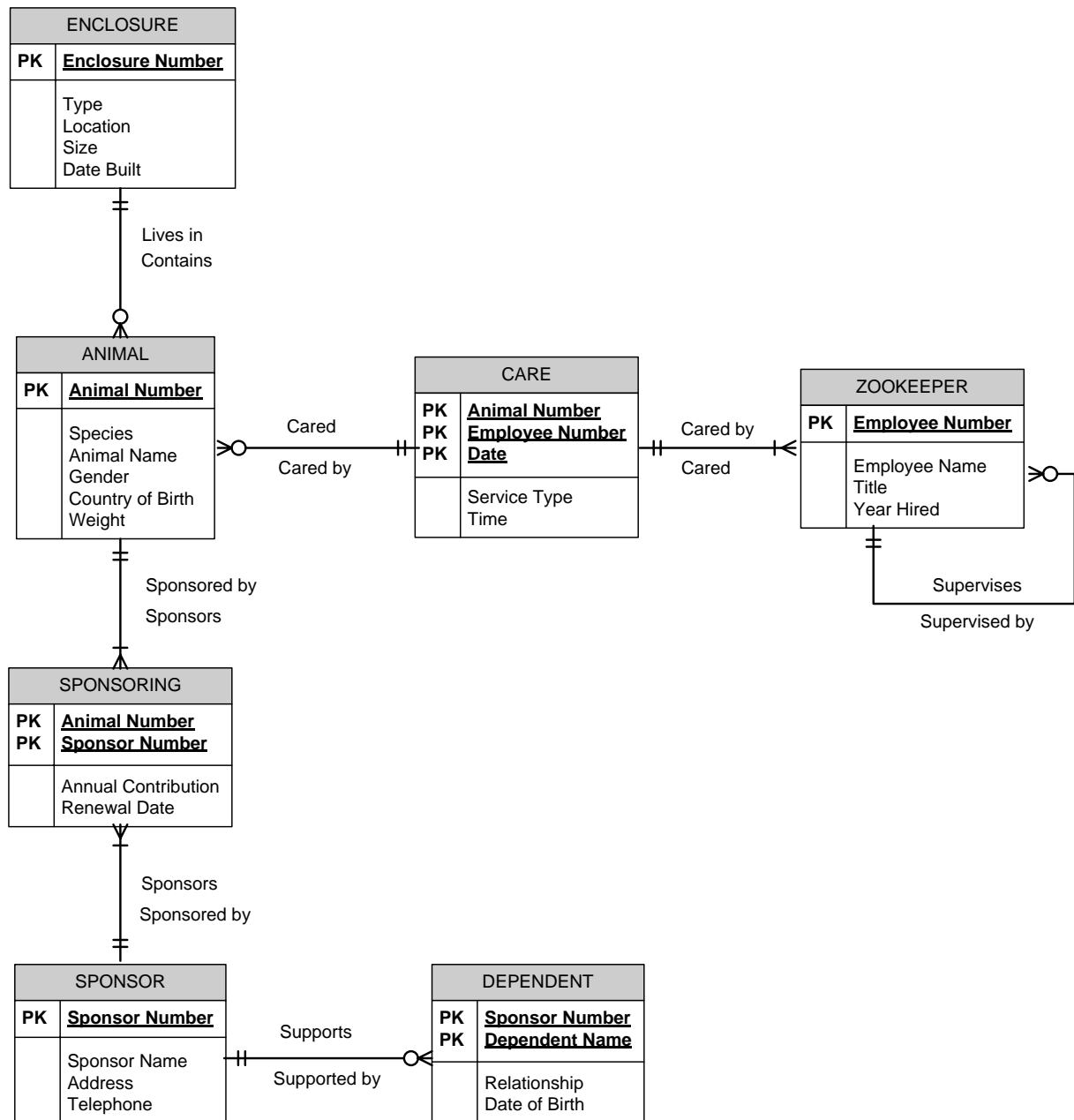
## Problems

1. Draw an entity-relationship diagram that describes the following business environment.

Central Zoo wants to maintain information about its animals, the enclosures in which they live, and its zookeepers and the services they perform for the animals. In addition, Central Zoo has a program by which people can be sponsor of animals. Central Zoo wants to track its sponsors, their dependents, and associated data.

Each animal has a unique animal number, species, name (Jumbo, Fred, etc.), gender, country of birth, and weight. Enclosures have a unique enclosure number, type (cage, fenced field, etc.), location, size, and date built. An animal can live in only one enclosure. An enclosure can have several animals in it or it can be currently empty. A zookeeper has a unique employee number, employee name, title, and year hired. Some zookeepers supervise other zookeepers. Every animal has been cared for by at least one and generally many zookeepers; each zookeeper has cared for at least one and generally many animals. Each time a zookeeper performs a specific, significant service for an animal the service type, date, and time are recorded.

A sponsor sponsors at least one and possibly several animals. An animal may have several sponsors or none. A sponsor has a unique sponsor number, a name, address, and telephone number. For each animal that a particular sponsor sponsors, the zoo wants to track the annual sponsorship contribution and renewal date. In addition, Central Zoo wants to keep track of each sponsor's dependents, keeping their name, relationship to the sponsor, and date of birth. A sponsor may have several dependents or none. A dependent is associated with exactly one sponsor.



2. Draw an entity-relationship diagram that describes the following business environment.

Grand Travel Airlines has to keep track of its flight and airplane history. A flight is uniquely identified by *the combination of* a flight number and a date. In addition, every flight has an actual departure time and an actual arrival time. Every passenger who has flown on Grand Travel has a unique passenger number plus their name, address, and telephone number. For a particular passenger who has taken a particular flight, the company wants to keep track of the fare that she paid for it and the date that she made the reservation for it. Clearly, a passenger may have taken many flights (he must have taken at least one to be in the database) and every flight has had many passengers on it.

A pilot is identified by a unique pilot (or employee) number, a name, date of birth, and date of hire. A flight on a particular date has exactly one pilot. Each pilot has typically flown many flights but a pilot may be new to the company, is in training, and has not flown any flights, yet.

Each airplane has a unique serial number, a model, manufacturer name, passenger capacity, and year built. A flight on a particular date used one airplane. Each airplane has flown on many flights and dates, but a new airplane may not have been used at all, yet.

Grand Travel also wants to maintain data about its airplanes' maintenance history. A maintenance procedure has a unique procedure number, a procedure name, and the frequency with which it is to be performed on every airplane. A maintenance location has a unique location name, plus an address, telephone number, and manager. Grand Travel wants to keep track of which airplane had which maintenance procedure performed at which location. For each such event it wants to know the date of the event and the duration.

