Chapter 3: The Relational Database Model

1. The practical significance of taking the logical view of a database is that it serves as a reminder of the simple file concept of data storage.
   True  False

2. You can think of a table as a persistent representation of a logical relation.
   True  False

3. Because the relational model uses attribute values to establish relationships among tables, many database users correctly assume that the term relation refers to such relationships.
   True  False

4. The order of the rows and columns is important to the DBMS.
   True  False

5. Numeric data are data on which you can perform meaningful arithmetic procedures.
   True  False

6. Character data can contain any character or symbol intended for mathematical manipulation.
   True  False

7. Each table in a relational database must have a primary key.
   True  False

8. A proper understanding of the concept and use of keys in a relational database model is very important.
   True  False

   True  False

10. Only a single attribute, not multiple attributes, can define functional dependence.
    True  False

11. If the attribute (B) is functionally dependent on a composite key (A) but not on any subset of that composite key, the attribute (B) is fully functionally dependent on (A).
    True  False

12. A null is created when you press the Enter key or the Tab key to move to the next entry without making a prior entry of any kind.
    True  False
13. There is never a good reason to use null values in a database.
   True   False

14. Depending on the sophistication of the application development software, nulls can create problems when functions such as COUNT, AVERAGE, and SUM are used.
   True   False

15. Tables within a database share common attributes that enable the tables to be linked together.
   True   False

16. A foreign key must exist in both tables that have a relationship.
   True   False

17. All RDBMSs enforce integrity rules automatically.
   True   False

18. Referential and entity integrity are two names for the same thing.
   True   False

19. The SELECT operator yields a vertical subset of a table.
   True   False

20. Tables must have the same attribute characteristics (the columns and domains must be compatible) to be used in a UNION.
   True   False

21. The DIFFERENCE operator subtracts one table from the other.
   True   False

22. In a natural join, the column on which the join was made occurs twice in the new table.
   True   False

23. A left outer join on tables CUSTOMER and AGENT yields all of the rows in the CUSTOMER table, including those that do not have a matching value in the AGENT table.
   True   False

24. The DIVIDE operation uses one single-column table (i.e. column “a”) as the divisor and one two-column table (i.e. columns “a” and “b”) as the dividend.
   True   False

25. A data dictionary contains metadata—data about data.
   True   False
26. A data dictionary is sometimes described as “the database designer’s database” because it records the design decisions about tables and their structures.  
   True   False

27. Current relational database software generally provides only a system catalog (and not a data dictionary).  
   True   False

28. The one-to-many (1:M) relationship is easily implemented in the relational model by putting the foreign key of the “1” side in the table of the “many” side as a primary key.  
   True   False

29. As rare as 1:1 relationships should be, certain conditions absolutely require their use.  
   True   False

30. DBMSs use indexes for many different purposes.  
   True   False

31. _____ logic, used extensively in mathematics, provides a framework in which an assertion (statement of fact) can be verified as either true or false.  
   A. Predicate  
   B. Database  
   C. Relational  
   D. Index

32. The relational database model enables you to view data ____ rather than ____.  
   A. relationally, hierarchically  
   B. hierarchically, relationally  
   C. physically, logically  
   D. logically, physically

33. The relational model’s creator, E. F. Codd, used the term relation as a synonym for ____.  
   A. index  
   B. key  
   C. table  
   D. relationship

34. A(n) ____ is perceived as a two-dimensional structure composed of rows and columns.  
   A. table  
   B. rowset  
   C. attribute  
   D. intersection

35. Date attributes contain calendar dates stored in a special format known as the ____ date format.  
   A. Epoch  
   B. Calendar  
   C. Julian  
   D. logical
36. ____ data can have only a true or false (yes or no) values.
   A. Logical
   B. Character
   C. Date
   D. Numeric

37. In the relational model, ____ are important because they are used to ensure that each row in a table is uniquely identifiable.
   A. relations
   B. keys
   C. indexes
   D. logical structures

38. In the context of a database table, the statement “A ____ B” indicates that if you know the value of attribute A, you can look up the value of attribute B.
   A. contains
   B. is related to
   C. owns
   D. determines

39. The attribute B is ____ the attribute A if each value in column A determines one and only one value in column B.
   A. logically dependent on
   B. owned by
   C. determined by
   D. functionally dependent on

40. Any attribute that is part of a key is known as a ____.
   A. key attribute
   B. logical attribute
   C. key determiner
   D. selector

41. If the attribute (B) is functionally dependent on a composite key (A) but not on any subset of that ____ key, the attribute (B) is fully functionally dependent on (A).
   A. foreign
   B. unique
   C. composite
   D. complete

42. A ____ is any key that uniquely identifies each row.
   A. superkey
   B. special
   C. selective
   D. candidate

43. No data entry at all is known as a(n) ____.
   A. nil
   B. null
   C. empty
   D. zero
44. Controlled ____ makes a relational database work.
   A. relations  
   B. logic  
   C. chaos  
   D. redundancy

45. A ____ is a textual representation of the database tables where each table is listed by its name followed by the list of its attributes in parentheses.
   A. relational dictionary  
   B. logical schema  
   C. relational schema  
   D. data dictionary

46. In the following table description, ____ is the primary key.
   PRODUCT (PROD_CODE, PROD_DESCRIP, PROD_PRICE, PROD_ON_HAND, VEND_CODE)
   A. PROD_DESCRIP  
   B. PROD_CODE  
   C. PROD_PRICE  
   D. PROD_ON_HAND

47. Referential ____ means that if the foreign key contains a value, that value refers to an existing valid tuple (row) in another relation.
   A. integrity  
   B. uniqueness  
   C. direction  
   D. relations

48. A ____ key is defined as a key that is used strictly for data retrieval purposes.
   A. lookup  
   B. foreign  
   C. candidate  
   D. secondary

49. A ____ key can be described as a superkey without unnecessary attributes, that is, a minimal superkey.
   A. secondary  
   B. candidate  
   C. primary  
   D. foreign

50. All primary key entries are unique, and no part of a primary key may be ____.
   A. zero  
   B. a foreign key  
   C. null  
   D. a candidate key

51. A CUSTOMER table’s primary key is CUS_CODE. The CUSTOMER primary key column has no null entries, and all entries are unique. This is an example of ____ integrity.
   A. entity  
   B. referential  
   C. complete  
   D. null
52. The ____ constraint can be placed on a column to ensure that every row in the table has a value for that column.
   A. HAS VALUE
   B. NOT NULL
   C. MUST HAVE VALUE
   D. NOT EMPTY

53. To be considered minimally relational, the DBMS must support the key relational operators ____ , PROJECT, and JOIN.
   A. INTERSECT
   B. UNION
   C. DIFFERENCE
   D. SELECT

54. ____ , also known as RESTRICT, yields values for all rows found in a table that satisfy a given condition.
   A. INTERSECT
   B. UNION
   C. DIFFERENCE
   D. SELECT

55. ____ yields a vertical subset of a table.
   A. PROJECT
   B. SELECT
   C. UNION
   D. DIFFERENCE

56. ____ combines all rows from two tables, excluding duplicate rows.
   A. INTERSECT
   B. UNION
   C. DIFFERENCE
   D. SELECT

57. ____ yields only the rows that appear in both tables.
   A. INTERSECT
   B. UNION
   C. DIFFERENCE
   D. SELECT

58. A(n) ____ join links tables by selecting only the rows with common values in their common attribute(s).
   A. equal
   B. unique
   C. foreign
   D. natural

59. The equijoin takes its name from the comparison operator ____ used in the condition.
   A. *
   B. <
   C. =
   D. >
60. In an outer join, the matched pairs would be retained and any unmatched values in the other table would be left ____.  
   A. in another table  
   B. null  
   C. out of the results  
   D. with matching values from the original table

61. A ____ contains at least all of the attribute names and characteristics for each table in the system.  
   A. data dictionary  
   B. relational schema  
   C. logical schema  
   D. join

62. The ____ is actually a system-created database whose tables store the user/designer-created database characteristics and contents.  
   A. meta dictionary  
   B. schema  
   C. data dictionary  
   D. system catalog

63. In a database context, the word ____ indicates the use of the same attribute name to label different attributes.  
   A. redundancy  
   B. homonym  
   C. duplicate  
   D. synonym

64. In a database context, a(n) ____ indicates the use of different names to describe the same attribute.  
   A. entity  
   B. duplicate  
   C. synonym  
   D. homonym

65. ____ relational type is the “relational model ideal.”  
   A. 1:1  
   B. 1:M  
   C. M:1  
   D. M:N

66. The ____ relationship should be rare in any relational database design.  
   A. 1:1  
   B. 1:M  
   C. M:1  
   D. M:N

67. Since it is used to link the tables that originally were related in a M:N relationship, the composite entity structure includes—as foreign keys—at least the ____ keys of the tables that are to be linked.  
   A. composite  
   B. super  
   C. primary  
   D. unique
68. A(n) ____ is an ordered arrangement of keys and pointers.
   A. table  
   B. superkey  
   C. relationship  
   D. index

69. When you define a table’s primary key, the DBMS automatically creates a(n) ____ index on the primary key column(s) you declared.
   A. key  
   B. incomplete  
   C. unique  
   D. primary

70. Codd’s rule of ____ states:
    Application programs and ad hoc facilities are logically unaffected when changes are made to the table structures that preserve the original table values (changing order of columns or inserting columns).
   A. Nonsubversion  
   B. Logical Data Independence  
   C. Comprehensive Data Sublanguage  
   D. Integrity Independence

71. The logical view of the relational database is facilitated by the creation of data relationships based on a logical construct known as a(n) ____________________.

72. In a relational table, each column has a specific range of values known as the ____________________ domain.

73. In the relational model, ____________________ are important because they are used to ensure that each row in a table is uniquely identifiable.

74. Attribute A determines attribute B (that is, B is functionally ____________________ on A) if all of the rows in the table that agree in value for attribute A also agree in value for attribute B.

75. A(n) ____________________ key can be described as a superkey without unnecessary attributes.

76. If the foreign key contains either matching values or nulls, the table that makes use of that foreign key is said to exhibit ____________________ integrity

77. The following example exhibits ____________________ integrity:
    The CUSTOMER table’s primary key is CUS_CODE. The CUSTOMER primary key column has no null entries, and all entries are unique. Similarly, the AGENT table’s primary key is AGENT_CODE, and this primary key column also is free of null entries.
78. To avoid nulls, some designers use special codes, known as ________________, to indicate the absence of some value.

79. The relational operators have the property of ________________; that is, the use of relational algebra operators on existing relations (tables) produces new relations.

80. PRODUCT yields all possible pairs of rows from two tables—also known as the ________________ product.

81. ________________ is the real power behind the relational database, allowing the use of independent tables linked by common attributes.

82. A(n) ________________ links tables on the basis of an equality condition that compares specified columns of each table.

83. ________________ joins are especially useful when you are trying to determine what value(s) in related tables cause(s) referential integrity problems.

84. A(n) ________________ provides a detailed description of all tables found within the user/designer-created database.

85. The ________________ catalog can be described as a detailed system data dictionary that describes all objects within the database, including data about table names, the table’s creator and creation date, the number of columns in each table, the data type corresponding to each column, index filenames, index creators, authorized users, and access privileges.

86. The ________________ relationship is the relational database norm.

87. If one department chair—a professor—can chair only one department and one department can have only one department chair, then the entities PROFESSOR and DEPARTMENT exhibit a(n) ________________ relationship.

88. ________________ relationships can be implemented by creating a new entity in 1:M relationships with the original entities.
89. Fortunately, the problems inherent in the ________________ relationship can easily be avoided by creating a composite entity.

90. The proper use of ________________ keys is crucial to controlling data redundancy.

91. Proper data ________________ design requires carefully defined and controlled data redundancies to function properly.

92. A(n) ________________ is an orderly arrangement used to logically access rows in a table.

93. A(n) ________________ index is an index in which the index key can have only one pointer value (row) associated with it.

94. The index key can have multiple attributes, this is called a(n) ________________ index.

95. Codd’s rule of ________________ states that every value in a table is guaranteed to be accessible through a combination of table name, primary key value, and column name.

96. What are the characteristics of a relational table?

97. What is a key and why is it important in the relational model?
98. Describe the use of nulls in a database.

99. Describe the use of the UNION operator.

100. What is the system catalog?
Chapter 3: The Relational Database Model Key

1. The practical significance of taking the logical view of a database is that it serves as a reminder of the simple file concept of data storage.
   **TRUE**

2. You can think of a table as a persistent representation of a logical relation.
   **TRUE**

3. Because the relational model uses attribute values to establish relationships among tables, many database users correctly assume that the term relation refers to such relationships.
   **FALSE**

4. The order of the rows and columns is important to the DBMS.
   **FALSE**

5. Numeric data are data on which you can perform meaningful arithmetic procedures.
   **TRUE**

6. Character data can contain any character or symbol intended for mathematical manipulation.
   **FALSE**

7. Each table in a relational database must have a primary key.
   **TRUE**

8. A proper understanding of the concept and use of keys in a relational database model is very important.
   **TRUE**

   **FALSE**

10. Only a single attribute, not multiple attributes, can define functional dependence.
    **FALSE**

11. If the attribute (B) is functionally dependent on a composite key (A) but not on any subset of that composite key, the attribute (B) is fully functionally dependent on (A).
    **TRUE**

12. A null is created when you press the Enter key or the Tab key to move to the next entry without making a prior entry of any kind.
    **TRUE**
13. There is never a good reason to use null values in a database.  
**FALSE**

14. Depending on the sophistication of the application development software, nulls can create problems when functions such as COUNT, AVERAGE, and SUM are used.  
**TRUE**

15. Tables within a database share common attributes that enable the tables to be linked together.  
**TRUE**

16. A foreign key must exist in both tables that have a relationship.  
**FALSE**

17. All RDBMSs enforce integrity rules automatically.  
**FALSE**

18. Referential and entity integrity are two names for the same thing.  
**FALSE**

19. The SELECT operator yields a vertical subset of a table.  
**FALSE**

20. Tables must have the same attribute characteristics (the columns and domains must be compatible) to be used in a UNION.  
**TRUE**

21. The DIFFERENCE operator subtracts one table from the other.  
**TRUE**

22. In a natural join, the column on which the join was made occurs twice in the new table.  
**FALSE**

23. A left outer join on tables CUSTOMER and AGENT yields all of the rows in the CUSTOMER table, including those that do not have a matching value in the AGENT table.  
**TRUE**

24. The DIVIDE operation uses one single-column table (i.e. column “a”) as the divisor and one two-column table (i.e. columns “a” and “b”) as the dividend.  
**TRUE**

25. A data dictionary contains metadata—data about data.  
**TRUE**
26. A data dictionary is sometimes described as “the database designer’s database” because it records the design decisions about tables and their structures.

TRUE

27. Current relational database software generally provides only a system catalog (and not a data dictionary).

TRUE

28. The one-to-many (1:M) relationship is easily implemented in the relational model by putting the foreign key of the “1” side in the table of the “many” side as a primary key.

FALSE

29. As rare as 1:1 relationships should be, certain conditions absolutely require their use.

TRUE

30. DBMSs use indexes for many different purposes.

TRUE

31. ____ logic, used extensively in mathematics, provides a framework in which an assertion (statement of fact) can be verified as either true or false.

A. Predicate  
B. Database  
C. Relational  
D. Index

32. The relational database model enables you to view data ____ rather than ____.

A. relationally, hierarchically  
B. hierarchically, relationally  
C. physically, logically  
D. logically, physically

33. The relational model’s creator, E. F. Codd, used the term relation as a synonym for ____.

A. index  
B. key  
C. table  
D. relationship

34. A(n) ____ is perceived as a two-dimensional structure composed of rows and columns.

A. table  
B. rowset  
C. attribute  
D. intersection

35. Date attributes contain calendar dates stored in a special format known as the ____ date format.

A. Epoch  
B. Calendar  
C. Julian  
D. logical
36. **Logical** data can have only a true or false (yes or no) values.
   A. Logical  
   B. Character  
   C. Date  
   D. Numeric

37. In the relational model, ____ are important because they are used to ensure that each row in a table is uniquely identifiable.
   A. relations  
   B. keys  
   C. indexes  
   D. logical structures

38. In the context of a database table, the statement “A ____ B” indicates that if you know the value of attribute A, you can look up the value of attribute B.
   A. contains  
   B. is related to  
   C. owns  
   D. determines

39. The attribute B is ____ the attribute A if each value in column A determines one and only one value in column B.
   A. logically dependent on  
   B. owned by  
   C. determined by  
   D. functionally dependent on

40. Any attribute that is part of a key is known as a ____.
   A. key attribute  
   B. logical attribute  
   C. key determiner  
   D. selector

41. If the attribute (B) is functionally dependent on a composite key (A) but not on any subset of that ____ key, the attribute (B) is fully functionally dependent on (A).
   A. foreign  
   B. unique  
   C. composite  
   D. complete

42. A ____ is any key that uniquely identifies each row.
   A. superkey  
   B. special  
   C. selective  
   D. candidate

43. No data entry at all is known as a(n) ____.
   A. nil  
   B. null  
   C. empty  
   D. zero
44. Controlled ____ makes a relational database work.
   A. relations  
   B. logic  
   C. chaos  
   D. redundancy

45. A ____ is a textual representation of the database tables where each table is listed by its name followed by the list of its attributes in parentheses.
   A. relational dictionary  
   B. logical schema  
   C. relational schema  
   D. data dictionary

46. In the following table description, ____ is the primary key.
   \[\text{PRODUCT (PROD\_CODE, PROD\_DESCRIPT, PROD\_PRICE, PROD\_ON\_HAND, VEND\_CODE)}\]
   A. PROD\_DESCRIPT  
   B. PROD\_CODE  
   C. PROD\_PRICE  
   D. PROD\_ON\_HAND

47. Referential ____ means that if the foreign key contains a value, that value refers to an existing valid tuple (row) in another relation.
   A. integrity  
   B. uniqueness  
   C. direction  
   D. relations

48. A ____ key is defined as a key that is used strictly for data retrieval purposes.
   A. lookup  
   B. foreign  
   C. candidate  
   D. secondary

49. A ____ key can be described as a superkey without unnecessary attributes, that is, a minimal superkey.
   A. secondary  
   B. candidate  
   C. primary  
   D. foreign

50. All primary key entries are unique, and no part of a primary key may be ____.
   A. zero  
   B. a foreign key  
   C. null  
   D. a candidate key
51. A CUSTOMER table’s primary key is CUS_CODE. The CUSTOMER primary key column has no null entries, and all entries are unique. This is an example of ____ integrity.

A. entity
B. referential
C. complete
D. null

52. The ____ constraint can be placed on a column to ensure that every row in the table has a value for that column.

A. HAS VALUE
B. NOT NULL
C. MUST HAVE VALUE
D. NOT EMPTY

53. To be considered minimally relational, the DBMS must support the key relational operators ____ PROJECT, and JOIN.

A. INTERSECT
B. UNION
C. DIFFERENCE
D. SELECT

54. ____ also known as RESTRICT, yields values for all rows found in a table that satisfy a given condition.

A. INTERSECT
B. UNION
C. DIFFERENCE
D. SELECT

55. ____ yields a vertical subset of a table.

A. PROJECT
B. SELECT
C. UNION
D. DIFFERENCE

56. ____ combines all rows from two tables, excluding duplicate rows.

A. INTERSECT
B. UNION
C. DIFFERENCE
D. SELECT

57. ____ yields only the rows that appear in both tables.

A. INTERSECT
B. UNION
C. DIFFERENCE
D. SELECT
58. A(n) ____ join links tables by selecting only the rows with common values in their common attribute(s).
   A. equal
   B. unique
   C. foreign
   D. natural

59. The equijoin takes its name from the comparison operator ____ used in the condition.
   A. *
   B. <
   C. =
   D. >

60. In an outer join, the matched pairs would be retained and any unmatched values in the other table would be left ____.
   A. in another table
   B. null
   C. out of the results
   D. with matching values from the original table

61. A ____ contains at least all of the attribute names and characteristics for each table in the system.
   A. data dictionary
   B. relational schema
   C. logical schema
   D. join

62. The ____ is actually a system-created database whose tables store the user/designer-created database characteristics and contents.
   A. meta dictionary
   B. schema
   C. data dictionary
   D. system catalog

63. In a database context, the word ____ indicates the use of the same attribute name to label different attributes.
   A. redundancy
   B. homonym
   C. duplicate
   D. synonym

64. In a database context, a(n) ____ indicates the use of different names to describe the same attribute.
   A. entity
   B. duplicate
   C. synonym
   D. homonym

65. ____ relational type is the “relational model ideal.”
   A. 1:1
   B. 1:M
   C. M:1
   D. M:N
66. The ____ relationship should be rare in any relational database design.
   A. 1:1
   B. 1:M
   C. M:1
   D. M:N

67. Since it is used to link the tables that originally were related in a M:N relationship, the composite entity structure includes—as foreign keys—at least the ____ keys of the tables that are to be linked.
   A. composite
   B. super
   C. primary
   D. unique

68. A(n) ____ is an ordered arrangement of keys and pointers.
   A. table
   B. superkey
   C. relationship
   D. index

69. When you define a table’s primary key, the DBMS automatically creates a(n) ____ index on the primary key column(s) you declared.
   A. key
   B. incomplete
   C. unique
   D. primary

70. Codd’s rule of ____ states:
   Application programs and ad hoc facilities are logically unaffected when changes are made to the table structures that preserve the original table values (changing order of columns or inserting columns).
   A. Nonsubversion
   B. Logical Data Independence
   C. Comprehensive Data Sublanguage
   D. Integrity Independence

71. The logical view of the relational database is facilitated by the creation of data relationships based on a logical construct known as a(n) ________.

72. In a relational table, each column has a specific range of values known as the ________________ domain.

73. In the relational model, ________________ are important because they are used to ensure that each row in a table is uniquely identifiable.

74. Attribute A determines attribute B (that is, B is functionally ________________ on A) if all of the rows in the table that agree in value for attribute A also agree in value for attribute B.

dependent
75. A(n) __________________ key can be described as a superkey without unnecessary attributes.

**candidate**

76. If the foreign key contains either matching values or nulls, the table that makes use of that foreign key is said to exhibit __________________ integrity.

**referential**

77. The following example exhibits __________________ integrity:
The CUSTOMER table’s primary key is CUS_CODE. The CUSTOMER primary key column has no null entries, and all entries are unique. Similarly, the AGENT table’s primary key is AGENT_CODE, and this primary key column also is free of null entries.

**entity**

78. To avoid nulls, some designers use special codes, known as __________________, to indicate the absence of some value.

**flags**

79. The relational operators have the property of __________________; that is, the use of relational algebra operators on existing relations (tables) produces new relations.

**closure**

80. PRODUCT yields all possible pairs of rows from two tables—also known as the __________________ product.

**Cartesian**

81. __________________ is the real power behind the relational database, allowing the use of independent tables linked by common attributes.

**JOIN**

82. A(n) __________________ links tables on the basis of an equality condition that compares specified columns of each table.

**equijoin**

83. ________________ joins are especially useful when you are trying to determine what value(s) in related tables cause(s) referential integrity problems.

**Outer**

84. A(n) __________________ provides a detailed description of all tables found within the user/designer-created database.

**data dictionary**

85. The __________________ catalog can be described as a detailed system data dictionary that describes all objects within the database, including data about table names, the table’s creator and creation date, the number of columns in each table, the data type corresponding to each column, index filenames, index creators, authorized users, and access privileges.

**system**
86. The ____________________ relationship is the relational database norm.

1:M

87. If one department chair—a professor—can chair only one department and one department can have only one department chair, then the entities PROFESSOR and DEPARTMENT exhibit a(n) ____________________ relationship.

1:1

88. ____________________ relationships can be implemented by creating a new entity in 1:M relationships with the original entities.

M:N

89. Fortunately, the problems inherent in the ____________________ relationship can easily be avoided by creating a composite entity.

many-to-many or M:N

90. The proper use of ____________________ keys is crucial to controlling data redundancy.

foreign

91. Proper data ____________________ design requires carefully defined and controlled data redundancies to function properly.

warehousing

92. A(n) ____________________ is an orderly arrangement used to logically access rows in a table.

index

93. A(n) ____________________ index is an index in which the index key can have only one pointer value (row) associated with it.

unique

94. The index key can have multiple attributes, this is called a(n) ____________________ index.

composite

95. Codd’s rule of ____________________ states that every value in a table is guaranteed to be accessible through a combination of table name, primary key value, and column name.

Guaranteed Access
96. What are the characteristics of a relational table?

1. A table is perceived as a two-dimensional structure composed of rows and columns.
2. Each table row (tuple) represents a single entity occurrence within the entity set.
3. Each table column represents an attribute, and each column has a distinct name.
4. Each row/column intersection represents a single data value.
5. All values in a column must conform to the same data format.
6. Each column has a specific range of values known as the attribute domain.
7. The order of the rows and columns is immaterial to the DBMS.
8. Each table must have an attribute or a combination of attributes that uniquely identifies each row.

97. What is a key and why is it important in the relational model?

In the relational model, keys are important because they are used to ensure that each row in a table is uniquely identifiable. They are also used to establish relationships among tables and to ensure the integrity of the data. Therefore, a proper understanding of the concept and use of keys in the relational model is very important. A key consists of one or more attributes that determine other attributes. For example, an invoice number identifies all of the invoice attributes, such as the invoice date and the customer name.

98. Describe the use of nulls in a database.

Nulls can never be part of a primary key, and they should be avoided—to the greatest extent possible—in other attributes, too. There are rare cases in which nulls cannot be reasonably avoided when you are working with nonkey attributes. For example, one of an EMPLOYEE table’s attributes is likely to be the EMP_INITIAL. However, some employees do not have a middle initial. Therefore, some of the EMP_INITIAL values may be null. There may be situations in which a null exists because of the nature of the relationship between two entities. In any case, even if nulls cannot always be avoided, they must be used sparingly. In fact, the existence of nulls in a table is often an indication of poor database design.

99. Describe the use of the UNION operator.

UNION combines all rows from two tables, excluding duplicate rows. The tables must have the same attribute characteristics (the columns and domains must be compatible) to be used in the UNION. When two or more tables share the same number of columns, when their corresponding columns share the same (or compatible) domains, they are said to be union-compatible.
Like the data dictionary, the system catalog contains metadata. The system catalog can be described as a detailed system data dictionary that describes all objects within the database, including data about table names, the table’s creator and creation date, the number of columns in each table, the data type corresponding to each column, index filenames, index creators, authorized users, and access privileges. Because the system catalog contains all required data dictionary information, the terms system catalog and data dictionary are often used interchangeably. In fact, current relational database software generally provides only a system catalog, from which the designer’s data dictionary information may be derived. The system catalog is actually a system-created database whose tables store the user/designer-created database characteristics and contents. Therefore, the system catalog tables can be queried just like any user/designer-created table.