Chun-Wei

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Help

Gradiance Online Accelerated Learning

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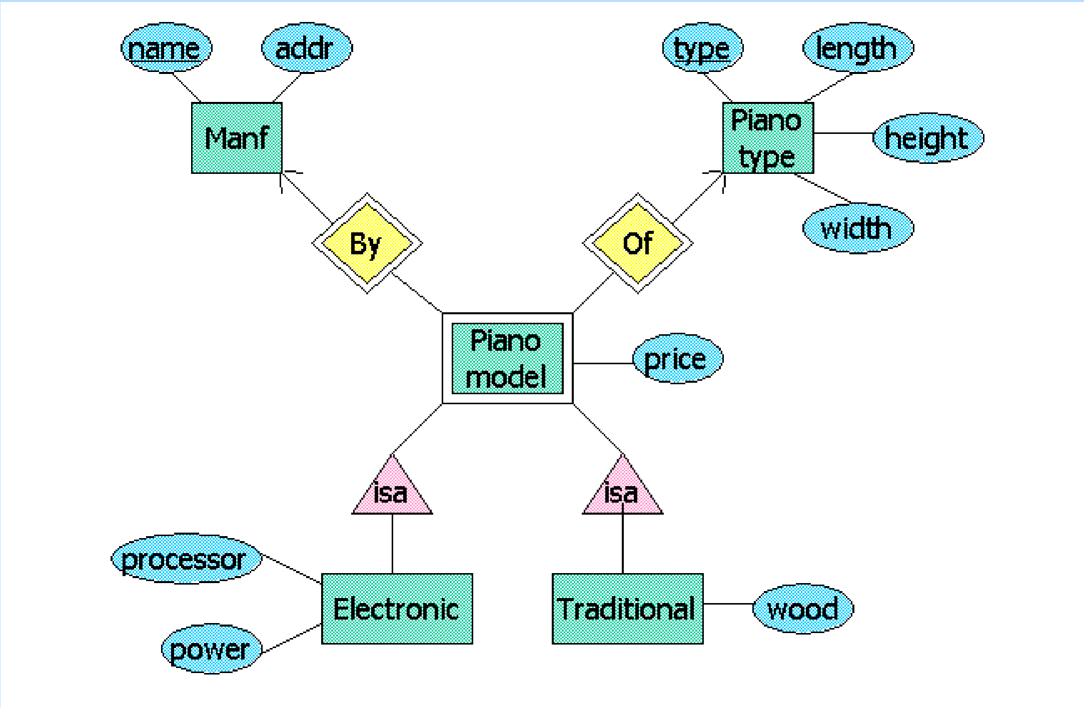
Your score:	30

1.



The above diagrams describes pianos for sale. The terms should be obvious, except perhaps for a "piano type," which is something like "Baby Grand" or "Upright." Translate the above diagram to relations, using the "E/R" approach to handle the ISA hierarchy. Then, identify which of the following relations appears in the database schema.

a) Of(type, price)

b) Traditional(name, wood)

c) PianoModel(manfName, type, price)

d) PianoModel(manfName, type, price, processor, power, wood)

Answer submitted: **c)**

You have answered the question correctly.

Question Explanation:

Here is the E/R-style conversion of the diagram to relations:

- Manf(name, addr): an ordinary entity-set-to-relation transformation.

- PianoType(type, height, length, width): ditto.
- PianoModel(manfName, type, price): This weak entity set needs, in its relation, the keys of the supporting entity sets, Manf and PianoType.
- Electronic(manfName, type, processor, power): A subclass uses the key from the root of the hierarchy (manfName and type in this case).
- Traditional(manfName, type, wood): ditto.

Note that the supporting relationships By and Of do not get converted to relations.

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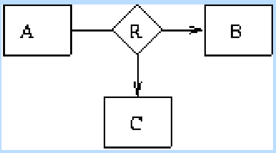
2. 

Let a, b, and c be the numbers of entities in entity sets A, B, and C, respectively. Let t be the number of triples in the relationship set for R. Which of the following is a possible combination of values for a, b, c, and t?

a) a=1000, b=1, c=200, t=1200

b) a=3, b=10, c=5, t=12

c) a=5, b=3, c=4, t=20

d) a=10, b=0, c=10, t=10

Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

Since A and B together determine at most one C, there cannot be two tuples that agree on both a and b. Thus, $t <= a*b$. Likewise, because A and C together determine at most one B, $t <= a*c$. These are the only constraints on a, b, c, and t.

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3. Determine the keys and superkeys of the relation R(ABCDEF) with FD's:

AEF → C, BF → C, EF → D, and ACDE → F

Then, demonstrate your knowledge by selecting the true statement from the list below.

a) There are 6 superkeys that are not keys.

b) There is only one key.

c) There are two keys.

d) There are 9 superkeys.

Answer submitted: **c)**

You have answered the question correctly.

Question Explanation:

First, notice that A, B, and E don't appear in any right side, so they must be in any key. Thus, we might as well assume A, B, and E are in any closure we care about, and remove them from left sides. That leaves us with F → C, F → D, and CD → F. To get C, D, F in a closure, we can start with either F alone, or C and D; no subsets will serve, and any other subset of {C,D,F} is a superset of either {F} or {C,D}. Thus, the only keys are ABCDE and ABEF.

There are three superkeys other than the two keys above. These are the proper superses of ABCDE or ABEF, namely ABCDEF, ABCEF, and ABDEF. Thus, there are two keys, five superkeys, and three superkeys that are not keys.

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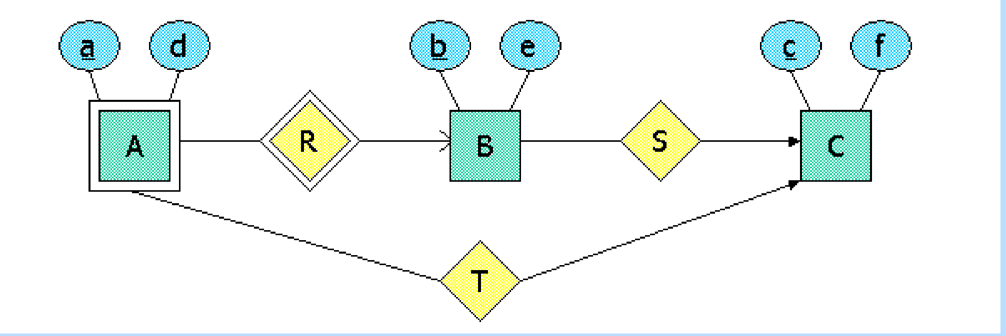
4. 

Convert the above E/R diagram to relations in the normal manner, and then identify which of the following is NOT a relation schema.

a) C(c,f)

b) A(a,b,d)

c) S(b,c)

d) B(a,b,e)

Answer submitted: **d)**

You have answered the question correctly.

Question Explanation:

The translation to relations gives us A(a,b,d), B(b,e), C(c,f), S(b,c), and T(a,b,c). Note that because A is weak, its relation includes the key for B, and supporting relationship R yields no relation.

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5. Let R(ABCDEFGH) satisfy the following functional dependencies:

$A \rightarrow B$, $CH \rightarrow A$, $B \rightarrow E$, $BD \rightarrow C$, $EG \rightarrow H$, $DE \rightarrow F$.

Which of the following FD's is also guaranteed to be satisfied by R?

a) $BFG \rightarrow AE$

b) $ADG \rightarrow CH$

c) $ADE \rightarrow CH$

d) $CGH \rightarrow BF$

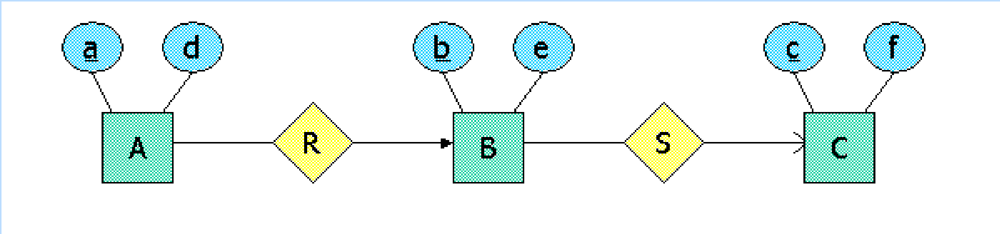
Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

The secret is to compute the closure of the left side of each FD that you get as a choice. Recall that the closure of a set of attributes is computed by starting with that set, and repeatedly looking for left sides of given FD's that are wholly contained within your current set of attributes. If you find such an FD, you add its right side to your set, until you can add no more. If the right side of the candidate FD is contained in your set, then the candidate does follow from the given FD's; otherwise not.

6.



Consider the E/R diagram above, and suppose that a1 and a2 are entities of entity set A, b1 and b2 are entities of set B, and c1 and c2 are entities of set C. The arrows limit the possible relationship sets for R and S. Describe the limitations on these relationship sets. Then, confirm your understanding by identifying which of the following relationships sets for R and S are possible according to the diagram.

a) R = {(a1,b1), (a2,b2)}; S = {(b1,c1), (b1,c2)}
b) R = {}; S = {}
c) R = {(a1, b1)}; S = {(b1,c1), (b2, c2)}
d) R = {(a2,b2)}; S = {(b1,c1), (b1,c2)}

Answer submitted: **c)**

You have answered the question correctly.

Question Explanation:

Since R is many-one from A to B, no A-entity may be associated with more than one B entity. However, since the arrow is pointed, it is OK if an A-entity is not associated with any B-entity at all. Thus, some acceptable relationship sets for R are: {}, {(a1,b1)}, and {(a1,b1), (a2,b2)}. However, a relationship set such as {(a1,b1), (a1,b2)} is unacceptable, because a1 is associated with both b1 and b2.

The rounded arrow says that S is not only many-one from B to C, but every B-entity must have an associated C-entity. Thus, all correct relationship sets for S have exactly one pair with b1 and exactly one pair with b2, and nothing else. Examples include {(b1,c1), (b2,c2)} and {(b1,c1), (b2,c1)}. Examples of incorrect relationship sets for S include {}, {(b1,c1)}, and {(b1,c1), (b1,c2), (b2,c2)}.

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7. Find all the keys of the relation R(ABCDEF) with FD's:

CDE → B, ACD → F, BEF → C, and B → D

Demonstrate your knowledge by identifying which of the following is a key.

a) ABDF
b) BDF
c) ABCE
d) CD

Answer submitted: **c)**

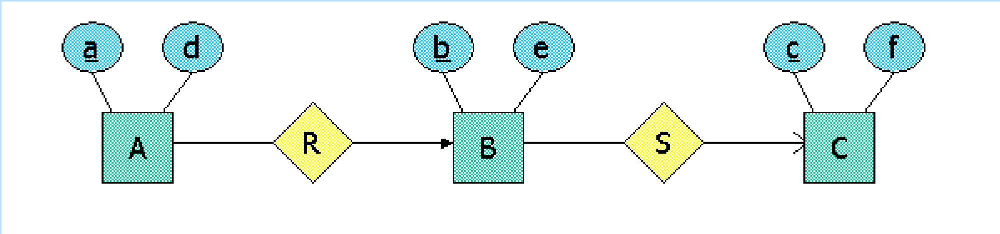
You have answered the question correctly.

Question Explanation:

In order for a set of attributes S to be a key, given a set of FD's, not only must the closure of this set of attributes be all attributes, but no proper subset of S must also have a closure that is all attributes. It is sufficient to check that no proper subset missing exactly one of the attributes of S has a closure equal to all the attributes.

Recall that the closure of a set of attributes is computed by starting with that set, and repeatedly looking for left sides of given FD's that are wholly contained within your current set of attributes.

8.



Based on the above ER diagram, which of the following entity set cardinalities is valid?

a) |A| = 0; |B| = 0; |C| = 0

b) |A| = 1; |B| = 1; |C| = 0

c) |A| = 10; |B| = 1; |C| = 0

d) |A| = 0; |B| = 10; |C| = 0

Answer submitted: **a)**

You have answered the question correctly.

Question Explanation:

The relationship between B and C is such that every B entity must have a related C entity. Therefore, if the cardinality of B is nonzero, the cardinality of C must be nonzero. However, while every A entity may have at most one associated B entity, there is no requirement that even one B entity exists. There can always be B entities not associated with any A, and/or C entities not associated with any B. Thus, the only constraint on cardinalities is that if there are no C's there can be no B's.

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9. Let R(ABCD) be a relation with functional dependencies

$A \rightarrow B$, $C \rightarrow D$, $AD \rightarrow C$, $BC \rightarrow A$

Which of the following is a lossless-join decomposition of R into Boyce-Codd Normal Form (BCNF)?

a) {AB, AD, CD}

b) {AB, AC, CD}

c) {AB, ACD, BC, BD}

d) {AB, AC, BC, BD}

Answer submitted: **b)**

You have answered the question correctly.

Question Explanation:

The trick to telling whether a decomposition has a lossless join is to imagine that there is a tuple, say (a,b,c,d), in the result of projecting R(A,B,C,D) onto the decomposed relations, and then rejoining them. If we can prove, using the given dependencies, that (a,c,b,d) was really in R, then we have proved the decomposition has a lossless join. Of course, we must check that the decomposition also has only BCNF relations, but in most cases the suggested schemas have only two attributes, and every two-attribute relation is in BCNF.

For example, consider one of the correct choices {AB, AC, CD}. The tuple (a,b,c,d) could only come from some tuples in R of the form (a,b,c1,d1), (a,b2,c,d2), and (a3,b3,c,d), which project, respectively, as (a,b) in AB, (a,c) in AC, and (c,d) in CD. But $A \rightarrow B$ tells us b2=b, and $C \rightarrow D$ tells us d2=d. Thus, the tuple (a,b2,c,d2) is really (a,b,c,d). Since we know the former is in R, the latter is in R, which is exactly what we wanted to prove.

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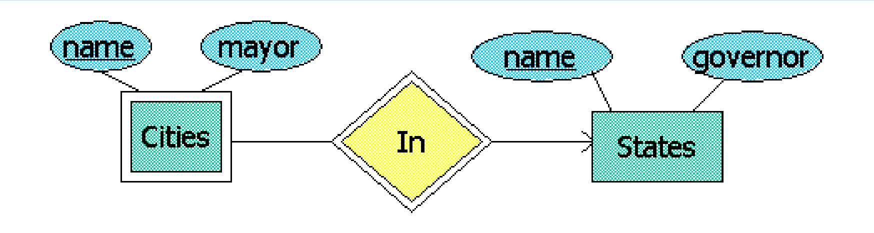
10. 

Which of the following is necessarily true about the City and State entity sets and their relationship In?

a) No two Cities In the same State can have the same name.

b) No person can be the mayor of Cities In two different States.

c) Two Cities with the same name cannot be In two different States.

d) No two cities can have mayors with the same name.

Answer submitted: **a)**

You have answered the question correctly.

Question Explanation:

First, notice that Cities is a weak entity set, supported by States, and the key for Cities is the name of the city and the state it is in. That is, it is possible for two cities in different states to have the same name (e.g., Portland OR and Portland ME). However, it is not possible for two cities in the same state to have the same name (if there were two Portlands in Oregon, how would we tell which was which?).

Name is the key for States, so no two states can have the same name. Mayor is an attribute of Cities, so each city has a unique mayor. However, there is nothing that prevents a person from being the mayor of two cities, or of two cities having mayors with the same name, even if they are different people. Likewise, each state has a unique governor, but in principle a person could be the governor of two states, or two states could have governors with the same name.
