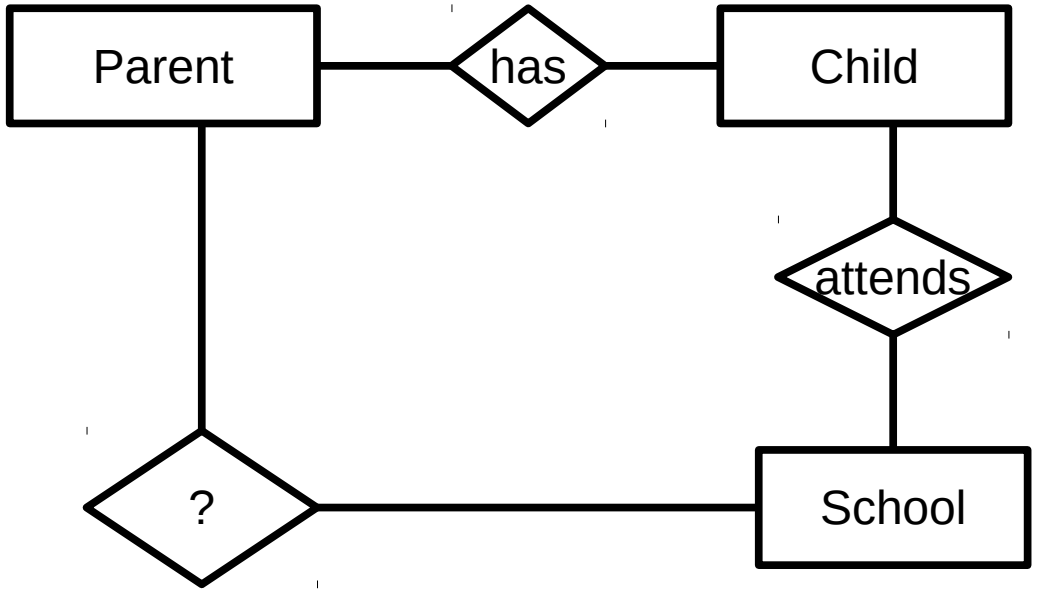
1.



a) Replace the question mark with a relationship that would create redundancy, and add attributes.

b) Replace the question mark with a relationship that does not create redundancy, and add attributes.

c) In both cases add the correct cardinality and participation constraints

d) Based on a) and b) define dependent and independent loops.

c) Show that dependent loops create redundancy. Assume loops of length n. Use the composition operator on relations to formally describe the problem.

2. Given the following database description:

Professors work for a single Department, Students major in one and only one Department, and Students are advised by one and only one Professor.

a) Draw the E/R diagram. Include cardinality and participation constraints.

b) Write assumptions that will create a dependent loop?

c) Write assumptions that will not allow the loop to be dependent.

d) Can you include those assumptions as domain constraints?

3. Let S be a sequence of update operations that will be applied to a relation instance R. If the order of the update operations is changed (call the new sequence S'), in which cases will the result of applying S' be the same as the result of applying S? Provide an example or an explanation in each case.

   a) S only consists of insert operations.

   b) S only consists of delete operations.

   c) S consists only of insert and delete operations.

   d) S consists of insert and update operations.

   e) S consists only of update operations.

4. Prove or disprove the following statements:

   a) The union of two candidate keys is a candidate key.

   b) The intersection of two superkeys is a candidate key.

5. Given a relation R(A1,A2,…,An). What is the maximum number of candidate keys that R can have?

6. Exercise 2.6 from the textbook.

7. Exercise 2.7 from the textbook.