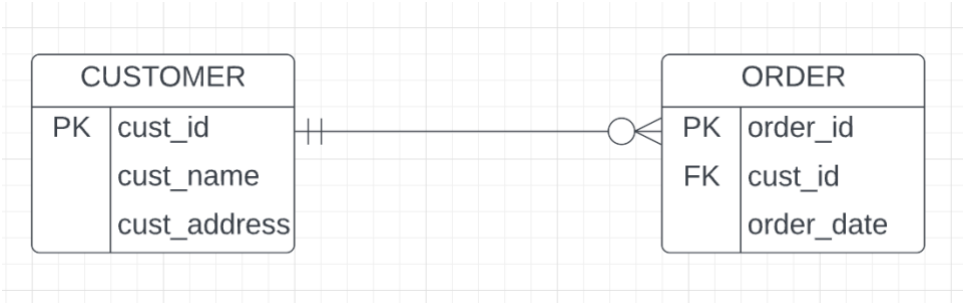
4.1.1 Relational Model Theory

Given these two relations: CUSTOMER (cust_id, cust_name, cust_address) ORDER (order_id, order_date, cust_id) Assuming that a customer may have any number of orders and each order is placed by a single customer, discuss the following terms based on the above relations:



1. Relation – "A table is also called a relation because the relational model's creator, E. F. Codd, used the two terms as synonyms". Hence, CUSTOMER and ORDER are considered relations. places relationship, because someone to place an order before they are regarded as a customer.

2. Attribute – Attributes (columns in respective table) are the following cust_id, cust_name, cust_address, order_id and order_date. All these are under the relation.

3. Domain – Domain is in reference to the different attributes in the respective relations.

- Cust_id and order_id can range from [0, n] where n is the number of customers
- Cust_name and cust_address is text and does not contain range.
- Order_date, can have a domain. It can be from potentially 1st Jan 1990 to 1st Jan 2100; to ensure that it is valid.

4. Tuple – Tuple is the value for each of the tuple give the attribute. Tuples must be unique. Tuple for CUSTOMER is (cust_id, cust_name, cust_address) and ORDER is (order_id, cust_id, order_date)

5. Degree and cardinality of a relation – The relationship can be defined from the sentence above "customer may have any number of orders" and "each order is placed by a single customer". Customer can have [0, n] number of orders and orders can only be assigned to 1 and only 1 customer.

6. Primary key and foreign key – For every relation, it must have one primary key, referents foreign key to primary key. cust_id and order_id are PK for their respective relations CUSTOMER and ORDER. Cust_id is a FK as it is taken from parent entity CUSTOMER placed in its own entity ORDER.

4.1.2 Choosing the Primary key

1. In any relation, tuples must be unique. However, in many cases, the set of all the attributes in a relation is not considered a candidate key. Why not? On the other hand, suppose we do have a relation where the set of all attributes is a candidate key. In this case, show that this set must, therefore, be the only candidate key and hence the primary key.

2. Identify the primary key and foreign key for these three relations:

- ORDER (order_id, order_date, cust_id) pk: order_id, prod_no
- ORDERLINE (order_id, prod_no, ol_qtyordered, ol_lineprice) - this acts as an associative entity.
- PRODUCT (prod_no, prod_desc, prod_unitprice) fk: order_id, prod_no

3. Consider a relation that depicts a dental surgery appointment system.

- APPOINTMENT (dentist_id, dentist_name, patient_id, patient_name, appointment_datetime, surgery_roomno)

Identify the superkey(s), candidate key(s) and the primary key for the relation if the following business rules are applicable:

- A dentist can only see a single patient at a particular date and time
- A dentist treats a patient in a particular surgery room, and
- A patient can see the same dentist multiple times

- Super key: The set of all attributes is a superkey.
- Candidate Key: {dentist_id,+appointment_datetime, patient_id,+appointment_datetime, Surgeryroom_no+appointment_datetime}
    - dentist_id,+patient_id+appointment_datetime is a unique but not the minimal, appointment_datetime recalls the actual time.
    - dentist_id,+appointment_datetime is also a unique and it is minimal, so it is one of the Candidate Key.
        - This is unique and can't be broken down further. This is unique and minimal. This is one of the candidate keys.
    - Patient_id+appointment_datetime this is unique, this is the second candidate key.
    - If remove appointment_datetime, then it is not unique because dentist_id and patient_id can occur in any date and time.
    - Surgeryroom_no+appointment_datetime. We know that this is unique.
- Primary Key: Choose one of the candidate keys. Can choose any.
    - Can choose any from above. Can be either: {dentist_id,+appointment_datetime, patient_id,+appointment_datetime, Surgeryroom_no+appointment_datetime}