

The following uses the book notation which I will stick to going forward.

Let's take the following set of business rules:

Customer submits Orders
Orders request Products
Products contain Items
Items are supplied by Vendors
Vendors ship Shipments
Shipments include Items

For each side of a relationship you identify the key constraints and the participation constraints.

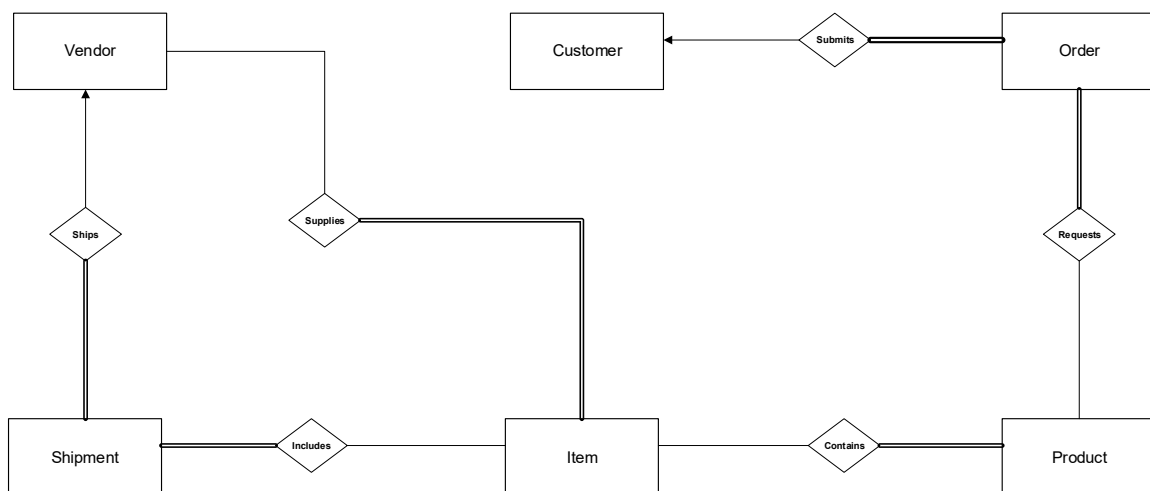
Key constraint – does the Entity appear in at most one of the relationships for any allowable instance of the relationship?

- If the answer is no, a straight line is used
- If the answer is yes, an arrow is used from the relationship to the entity to illustrate

Participation constraint – does the Entity appear in at least one of the relationships for any allowable instance of the relationship?

- If the answer is no, a normal size line is used.
- If the answer is yes, a thick (Bolted) line or a double line is used from entity to the relationship to illustrate.

Using the above, we get the following:



Let's explore this diagram by asking the pertinent questions for each entity/relationship

Does a Customer submit at most one order? No – no arrowhead

Does a Customer submit at least one order? No – normal size line

Is an Order submitted by at most one customer? Yes – add an arrowhead

Is an Order submitted by at least one customer? Yes – make it bold (or double)

Does an Order request at most one product? No – no arrowhead

Does an Order request at least one product? Yes – make it bold (or double)

Is a Product requested by at most one order? No – no arrowhead

Is a product requested by at least one order? No – normal size

Does a product contain at most one item? No – no arrowhead

Does a product contain at least one item? Yes – Bold (or double)

Is an item contained in at most one product? No – no arrowhead

Is an item contained in at least one product? No – normal

Is an item supplied by at most one vendor? No – no arrowhead

Is an item supplied by at least one vendor? Yes – bold (or double)

Does a vendor supply at most one item? No – no arrowhead

Does a vendor supply at least one item? No – normal

Is an item contained in at most one shipment? No – no arrowhead

Is an item contained in at least one shipment? No – normal

Does a shipment contain at most one item? No – no arrowhead

Does a shipment contain at least one item? Yes – bold (or double)

Does a vendor ship at most one shipment? No – no arrowhead

Does a vendor ship at least one shipment? No – normal

Is a shipment shipped by at most one vendor? Yes – arrowhead

Is a shipment shipped by at least one vendor? Yes – bold (or double)

How does this notation illustrate cardinality?

1:1 – Let's use the situation of Employee / Mailbox

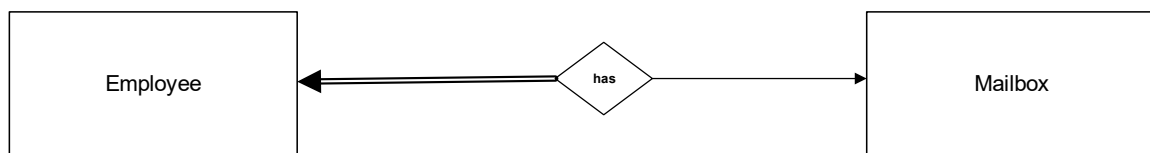
- Each employee has exactly 1 mailbox
- Each mailbox belongs to exactly one employee

Does an employee have at most one mailbox? Yes – arrowhead

Does an employee have at least one mailbox? Yes – bold (or double)

Does a mailbox belong to at most one employee? Yes – arrowhead

Does a mailbox belong to at least one employee? No – normal (i.e. there are unassigned mailboxes)



The first question identifies the cardinality, the second participation. With the answers to both of the first questions being Yes, the cardinality is 1:1. The Employee entities' participation in the relationship is total (i.e. every employee has a mailbox), the Mailbox entities' participation in the relationship is partial (i.e. there are mailboxes that do not have an employee associated with them)

1:Many – Let's use the situation of Customer / Order

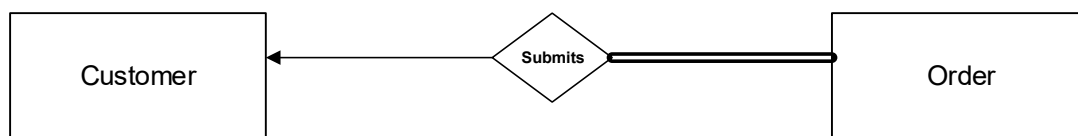
- Every Customer can have many orders
- Every Order has exactly one customer

Does a Customer submit at most one order? No – no arrowhead

Does a Customer submit at least one order? No – normal size line

Is an Order submitted by at most one customer? Yes – add an arrowhead

Is an Order submitted by at least one customer? Yes – make it bold (or double)



The Key constraint question identifies the cardinality, the second participation. With the answer to the first being No/Yes the cardinality is 1:Many. The Order entities' participation in the relationship is total, the Customer entities' participation is partial.

Many:Many – Let's use the situation of Student/Class

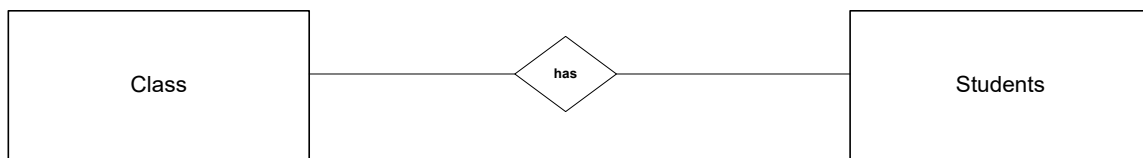
- Every Student may have many classes
- Every Class may have many students

Does a Student have at most one class? No – no arrowhead

Does a Student have at least one class? No – normal size line

Does a Class have at most one student? No – no arrowhead

Does a Class have at least one student? No – normal size line



The Key constraint question identifies the cardinality, with the answer to the two questions being No/No, the cardinality is Many:Many. The Class participation is partial as is the students.