Tutorial n°1: Understanding the ER model

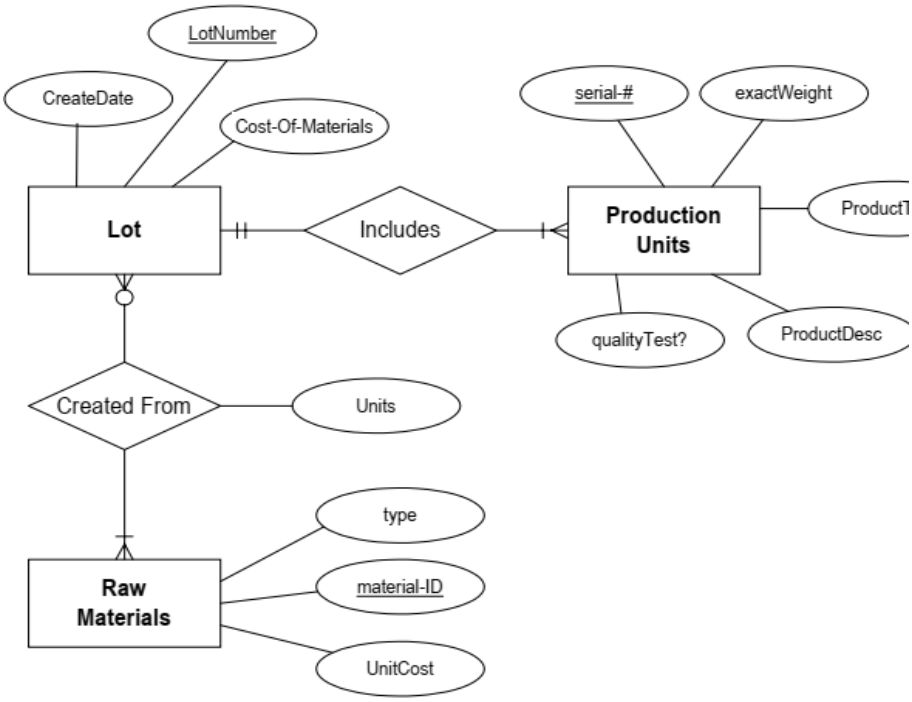
Exercises 1: Creating an Entity-Relationship Diagram.

UPS prides itself on having up-to-date information on the processing and current location of each shipped item. To do this, UPS relies on a company-wide information system. Shipped items are the heart of the UPS product tracking information system. Shipped items can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the UPS system at a single retail center. Retail centers are characterized by their type, uniqueID, and address. Shipped items make their way to their destination via one or more standard UPS transportation events (i.e., flights, truck deliveries). These transportation events are characterized by a unique scheduleNumber, a type (e.g, flight, truck), and a deliveryRoute.

Create an Entity Relationship diagram that captures this information about the UPS system. Be certain to indicate identifiers and cardinality constraints.

Exercise 2: Creating a Relational Database Schema

Production tracking is important in many manufacturing environments (e.g., the pharmaceuticals industry, children's toys, etc.). The following ER diagram captures important information in the tracking of production. Specifically, the ER diagram captures relationships between production lots (or batches), individual production units, and raw materials.



a) Convert the ER diagram into a relational database schema. Be certain to indicate primary keys and referential integrity constraints

b) Identify an attribute in the above ER diagram that might represent a composite attribute, and explain why/how it might represent a composite attribute

c) Identify an attribute in the ER diagram that could represent a derived attribute and explain why/how it might represent a derived attribute

d) The ER diagram/relational database schema contains several instances of data redundancy. Identify one instance where a data redondancy issue exists

e) The current ER diagram has the following relationship, “raw materials are used in 0 to many lots.” Explain, in the context of the manufacturing environment, how the meaning changed if the minimal cardinality is changed to “1” (i.e., the relationship becomes "raw materials are used in 1 to many lots.”)

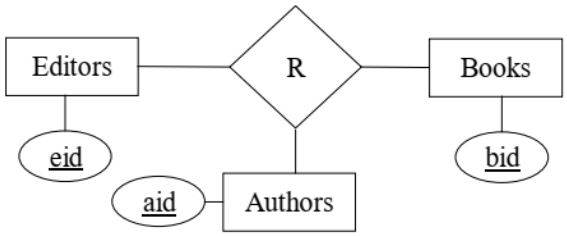
Exercises 3

Below we present several entity relationship diagrams for modeling information about authors, editors and books. Note that aid is the key of Authors, eid is the key of Editors and bid is the key of Books. For each of the entity relationship diagrams below:

(a) State briefly the meaning of the diagram. Emphasize the constraints in the diagrams.

(b) Suppose that there are 300 authors, 1000 books and 10 editors. What is the maximal number of triples that R contains?

(c) Suppose that there are 300 authors, 1000 books and 10 editors. What is the minimal number of triples that R contains?



Exercises 4

1- As in exercises 2, we consider information about Authors, Books and Editors. We wish to store information about which author wrote which book with which editor. Two basic approaches can be taken to model this information:

(a) Assuming that there are no further constraints on the information, which of the two diagrams presented are more suitable for modeling the information? Can the information be captured in both diagrams? Explain.

(b) Suppose that each book is edited by at most one editor. Can you add edge constraints (arrows) to the diagram on the left in order to capture this information? What about the diagram on right? Explain

2- What is wrong with using the following diagram to model the information?