

Step 1: Identify Appropriate Entities, Relationships, Attributes, Domains, and Keys

Objective: Design an online auction system by identifying the key entities, relationships, attributes, domains, and keys.

- **Identify Entities:**

- **Entities:**

- Users
 - Items
 - Category
 - Condition
 - Auction
 - Payment
 - Shipping

- **Explanation:** These entities represent the core components of an online auction system. Users search for the items by category, after checking the condition the user creates an auction. When the user wins the Auction, it will proceed to the payment and then shipping.

- **Determine Relationships:**

- Users LISTS items - (1,N): A User can place multiple items, each item is listed by a seller(user).
 - Items BELONGS_TO Category - (N,1): Every item belongs to a category.
 - Items HAS_CONDITION Condition - (N,1): Every item has a different condition.
 - Users CREATE Auction-(1,N): Each user can make multiple auctions.
 - Auction RESULT_IN Payment - (1,1): Each Auction has their only translation to payment.
 - Payment SHIPS_BY SHIPPING - (N,1): There's different methods or ways to pay, and the shipping address only has one.

- **Relationships:**

- Users <create> Auction
 - Users <list> Items
 - Items <belongs> Category
 - Items <has> Condition
 - Auction <result> Payment
 - Payment <Shipsby> Shipping

- **Explanation:**

- (1,N): means one to many; (N,1): means many to one.
- Users <create> Auction - (1,N): Each user can make multiple auctions.
- Users <list> Items - (1,N): A User can place multiple items, each item is listed by a seller(user).
- Items <belongs> Category - (N,1): Every item belongs to a category.
- Items <has> Condition - (N,1): Every item has a different condition.
- Auction <result> Payment - (1,1): Each Auction has their only translation to payment.
- Payment <Shipsby> Shipping - (N,1): There's different methods or ways to pay, and the shipping address only has one.
- **Define Attributes for Each Entity:**
- **Attributes:**
 - **Users:** UserID, UserName, Email
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- **Explanation:** Each entity has attributes that describe its properties. For example, Users have attributes like UserID and UserName.
- **Determine Domains for Each Attribute:**
 - **Domains:**
 - **UserID:** Integer, positive values.
 - **UserName:** Not Null, VARCHAR(80)
 - **Email:** Not Null, VARCHAR(100)
 - **Item Name:** Not Null, VARCHAR(100)
 - **Price:** Must be greater than 0, Decimal(10,2)
 - **Description:** TEXT
 - **Category name:** Not Null, VARCHAR(50)
 - **Detail:** Optional, TEXT
 - **Type:** Not Null, VARCHAR(50)
 - **Start date:** DATE
 - **End date:** DATE
 - **Bid:** Must be greater than 0, Decimal(10,2)
 - **Method:** Not Null, Credit Card, ApplePay, Paypal
 - **Total amount:** Must be greater than 0, Decimal(10,2)
 - **Cost:** Must be greater than 0, Decimal(10,2)
 - **Address:** Not Null, TEXT
 - **Explanation:** Domains specify the type of data and any constraints for each attribute. For example, UserID should be a positive integer. Address and Email must be authentic. Make sure all the information is correct and complete.
- **Identify Keys for Each Entity:**
 - **Keys:**

- **Users:** Primary Key - UserID
- Items: Primary Key - ItemID
- Category: Primary Key - CategoryID
- Condition: Primary Key - ConditionID
- Auction: Primary Key - AuctionID
- Payment: Primary Key - PaymentID
- Shipping: Primary Key - ShippingID
- **Explanation:** Keys are used to uniquely identify records and establish relationships between entities. UserID is a primary key who participates in the auction. ItemID is for each item listed for auction. CategoryID groups different items together. ConditionID is to identify the condition of the item. AuctionID is an auction created by users. PaymentID is the proof of which user got the auction. ShippingID is to show the shipping information.

Step 2: Producing the ER Diagram

- **Create an Entity-Relationship Diagram (ERD):** Next Page
- **Detailed Explanation Paragraph:**

The reason I chose Users, Items, Category, Condition, Auction, Payment, Shipping is because these 7 entities cover the full online auction system steps.

Starting with the Users, either seller or buyer has to have their only Username and Email to create Auctions to buy/sell items. Each Item belongs to a Category and each item has a condition. One User can create multiple Auctions at the same time. When it's the Auction End date, it goes directly to the Payment system. Then the buyer needs to select a method to pay and fulfill by Shipping.

Attributes like UserName and Email are necessary for identifying and contacting users. ItemName and Price describe what's being sold in the auction. Start date/End date shows when the auction starts and ends. Method and Total amount means how much in total after tax. Address and Cost means for the shipping details and shipping fee.

