

1NF – First Normal Form

(table in 1NF included at right, description/information included at left)

Notes:

- Columns added for TransactionID#, CustomerID#, BuyerID#, SellerID# (all unique), CattleSaleBreed, HorseDescription, TransactionTotalSale (total sale value of single transaction), TransactionTotalCharges (summed value of all charges for a single transaction) and DateofSale/TimeofSale. TackUsed and TackNew have been combined into a single column named TackUsedorNew that is still of data type BIT.
 - Data types listed next to each column name for reference (highlighted in yellow and italicized).
 - TraansactionID# can be thought of an overarching Slip# that combines the sales of horse, cattle, and tack. CustomerID# can be thought of as a unique number given to both sellers and buyers. While a customer can be a buyer, seller, or both, every transaction must include both a buyer and seller.
 - ID#'s, Slip#'s, and Tag#'s used as keys as they are unique and can produce all values in the database.
 - Duplicate information in any column (such as CustomerPhoneNumber, HorseSaleBreed, etc.) is added as a completely new row.
- Using a hypothetical example to illustrate the point, if data is entered as (a snapshot showing some rows that could be affected in 1NF):

TransactionID#	CustomerPhoneNumber	HorseSaleBreed
123455789	(619)619-6191, (805)619-2345	Morgan, Thoroughbred

This table gets converted to the following for 1NF:

TransactionID#	CustomerPhoneNumber	HorseSaleBreed
123455789	(619)619-6191	Morgan
123455789	(619)619-6191	Thoroughbred
123455789	(805)619-2345	Thoroughbred
123455789	(805)619-2345	Morgan

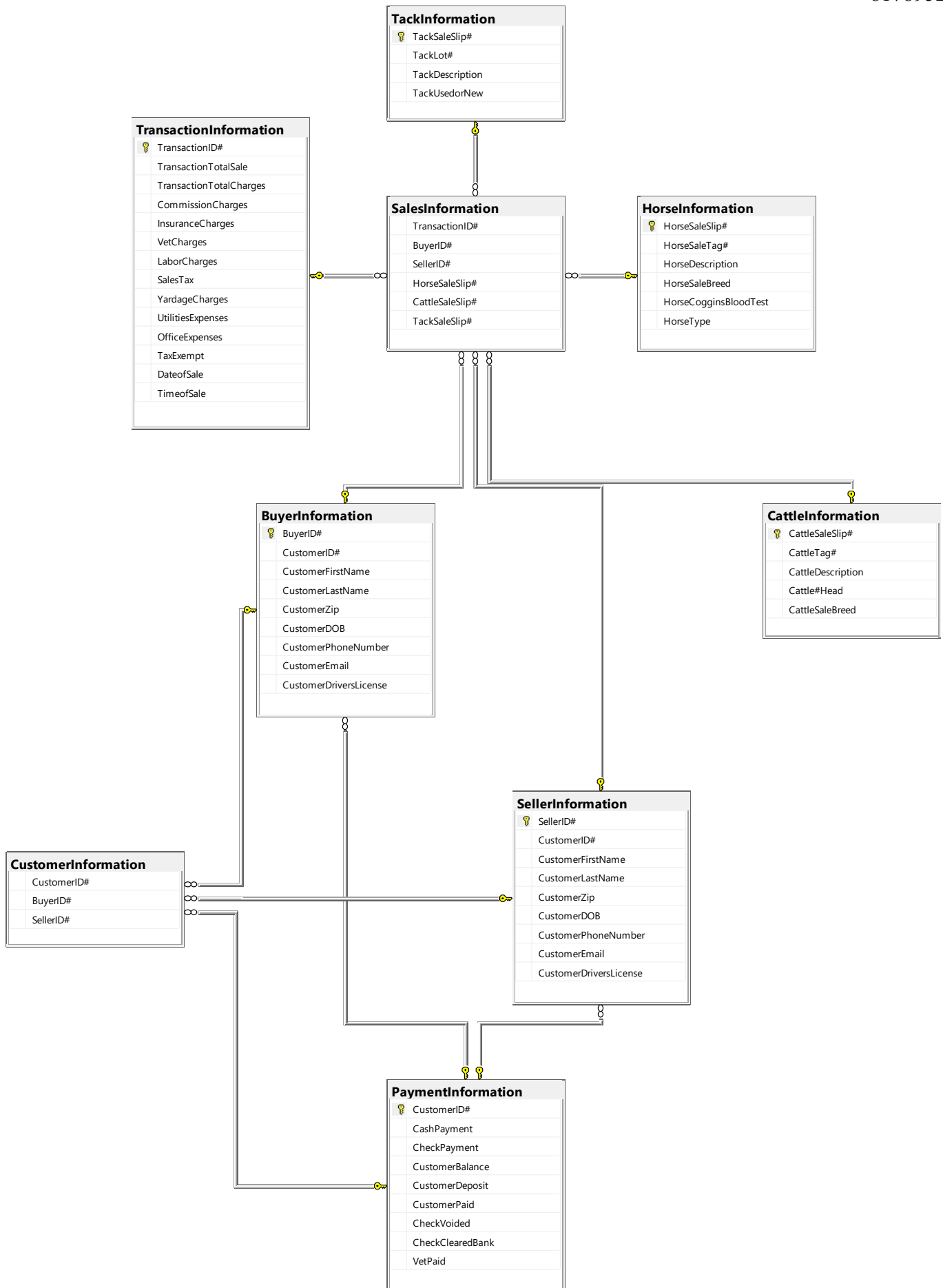
Sales	
TransactionID#	<i>(INT)</i>
CustomerID#	<i>(INT)</i>
BuyerID#	<i>(INT)</i>
SellerID#	<i>(INT)</i>
HorseSaleSlip#	<i>(INT)</i>
CattleSaleSlip#	<i>(INT)</i>
TackSaleSlip#	<i>(INT)</i>
CustomerFirstName	<i>(VARCHAR(30))</i>
CustomerLastName	<i>(VARCHAR(30))</i>
CustomerZip	<i>(VARCHAR(15))</i>
CustomerAddress	<i>(VARCHAR(50))</i>
CustomerCity	<i>(VARCHAR(50))</i>
CustomerState	<i>(VARCHAR(3))</i>
CustomerDOB	<i>(DATE)</i>
CustomerPhoneNumber	<i>(VARCHAR(50))</i>
CustomerEmail	<i>(VARCHAR(50))</i>
CustomerDriversLicense	<i>(VARCHAR(50))</i>
HorseSaleTag#	<i>(INT)</i>
HorseDescription	<i>(VARCHAR(50))</i>
HorseSaleBreed	<i>(VARCHAR(50))</i>
HorseCogginsBloodTest	<i>(BIT)</i>
HorseType	<i>(VARCHAR(50))</i>
CattleSaleTag#	<i>(INT)</i>
CattleDescription	<i>(VARCHAR(50))</i>
Cattle#Head	<i>(INT)</i>
CattleSaleBreed	<i>(VARCHAR(50))</i>
TackLot#	<i>(INT)</i>
TackDescription	<i>(VARCHAR(50))</i>
TackUsedorNew	<i>(BIT)</i>
TransactionTotalSale	<i>(MONEY)</i>
TransactionTotalCharges	<i>(MONEY)</i>
CommissionCharges	<i>(MONEY)</i>
InsuranceCharges	<i>(MONEY)</i>
VetCharges	<i>(MONEY)</i>
LaborCharges	<i>(MONEY)</i>
SalesTax	<i>(MONEY)</i>
YardageCharges	<i>(MONEY)</i>
UtilitiesExpenses	<i>(MONEY)</i>
OfficeExpenses	<i>(MONEY)</i>
TaxExempt	<i>(BIT)</i>
CashPayment	<i>(MONEY)</i>
CheckPayment	<i>(MONEY)</i>
CustomerBalance	<i>(MONEY)</i>
CustomerDeposit	<i>(MONEY)</i>
CustomerPaid	<i>(BIT)</i>
CheckVoided	<i>(BIT)</i>
CheckClearedBank	<i>(BIT)</i>
VetPaid	<i>(BIT)</i>
DateofSale	<i>(DATE)</i>
TimeofSale	<i>(TIME)</i>

2NF – Second Normal Form

(description/information included on this page, tabling in 2NF included on the page immediately following)

Notes:

- Like information separated into like tables.
 - Horse, cattle, and tack inventory separated into separate information and only dependent on the Slip# indicating the inventory involved in the transaction.
 - Transaction and payment information separated into their own tables. Payment and transaction history dependent on CustomerID# and TransactionID#, respectively.
 - Buyer and seller information separated as a customer may only be a buyer or seller, but the information is the same if a customer is both a buyer and seller. I could have split the column names in the buyer and seller tables to Buyer... and Seller... instead of Customer... for each attribute, but it is unnecessary.
- Main reference tables, sales information and customer information provide referential integrity so that transactions always include a buyer and seller and include one slip#, linked to an overarching TransactionID#. Sales information guarantees the fact that a customer that is both a buyer and seller will have only one CustomerID#, but a customer doesn't necessarily need to be both a buyer and seller.
- All columns in each table dependent on the existence of the entire candidate key (primary keys and foreign keys combined). For example, for a tack transaction, TackLot#, TackDescription, and TackUsedorNew are all dependent on the TackSaleSlip# and can be derived from exclusively that transaction number.



3NF – Third Normal Form

(description/information included at the top of this page, tabling in 3NF included just below)

Notes:

- As all tables already split up and dependent on entire candidate key (some tables only have a primary key), non-key attributes must be determined to not depend on each other to satisfy 3NF rules.
- Reference tables contain only foreign keys and need not be considered.
- Customer location information outsourced to a new table named “Customer Information” as CustomerAddress, CustomerCity, and CustomerState are transitively dependent on CustomerZip. CustomerZip is used as the primary key in this new table.

