# **Homework #3: Normalization**

The following table is a non-normalized table for a Rental Property Management Database. Data is included to help you to perform the normalization. One client may have multiple rental records.

Identify the functional dependencies and normalize the table to 1NF, 2NF, and 3NF respectively. You also need to show the steps to reach normal form and populate each relation with sample data. As a result, you can see that duplicate data will be removed through the normalization process.

### **CLIENT\_RENTAL**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ClientNo** | **ClientName** | **PropertyNo** | **PropertyAddress** | **RentStart** | **RentEnd** | **RentFee** | **OwnerNo** | **OwnerName** |
| CN12 | John Smith | PN21  PN52  PN89 | 4 Market St. Bowie 12 S. Main St. Chevy Chase  4871 East St. Silver Spring | 12/01/2011  7/01/2014  4/01/2018 | 6/30/2013  3/31/2016 | 1500  1750  1900 | ON68  ON77  ON120 | Kent Shaw  Tina Short  Tim Johnson |
| CN18 | Mary Helen | PN36  PN73  PN82 | 123 Ease St. Rockville 6528 Ohio Ave. Penn Park  21 West Point St. Bethesda | 3/01/2010  3/01/2012  6/01/2016 | 2/28/2011  5/31/2015  12/31/2018 | 1450  1660  1820 | ON68  ON77  ON82 | Kent Shaw  Tina Short  Steven Gates |
| CN20 | Wendy King | PN66 | 2332 Main Street, Fulton | 9/01/2019 |  | 1880 | ON10 | Ben Johnson |

ClientNo: Client Number (PK)

ClientName: Client (who rents a property) Name

PropertyNo: Property Number

PropertyAddress: Property Address (Do not need to break this attribute)

RentStart: Rent Start Date

RentEnd: Rent Ended Date

RentFee: Monthly Rental Fee

OwnerNo: Property Owner Number

OwnerName: Property Owner Name

**Notes:**

1. Can multiple clients rent the same property at the same time?  For example, co-signers on a lease. No
2. Can one client rent multiple properties at the same time?  I.e. if he rented a home and an office. Yes
3. Can one client rent the same property multiple consecutive times, requiring multiple records?  For instance, he extends a lease for another year at a different rent. No
4. A property cannot have multiple owners.
5. The RentFee is not fixed for each property and can change from one Client to the next.
6. A different client can rent the same property for a different time period creating another record for the same property.

1NF: Removing attributes with multiple values

ClientNo → {ClientName}

{ClientNo, PropertyNo} → {PropertyAddress, RentStart, RentEnd, RentFee, OwnerNo, OwnerName

|  |  |
| --- | --- |
| ClientNo (PK) | ClientName |
| CN12 | John Smith |
| CN18 | Mary Helen |
| CN20 | Wendy King |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ClientNo (PK) | PropertyNo (PK) | PropertyAddress | RentStart | RentEnd | RentFee | OwnerNo | OwnerName |
| CN12 | PN21 | 4 Market St. Bowie | 12/01/2011 | 6/30/2013 | 1500 | ON68 | Kent Shaw |
| CN12 | PN52 | 12 S. Main St. Chevy Chase | 7/01/2014 | 3/31/2016 | 1750 | ON77 | Tina Short |
| CN12 | PN89 | 4871 East St. Silver Spring | 4/01/2018 |  | 1900 | ON120 | Tim Johnson |
| CN18 | PN36 | 123 Ease St. Rockville | 3/01/2010 | 2/28/2011 | 1450 | ON68 | Kent Shaw |
| CN18 | PN73 | 6528 Ohio Ave. Penn Park | 3/01/2012 | 5/31/2015 | 1660 | ON77 | Tina Short |
| CN18 | PN82 | 21 West Point St. Bethesda | 6/01/2016 | 12/31/2018 | 1820 | ON82 | Steven Gates |
| CN20 | PN66 | 2332 Main Street, Fulton | 9/01/2019 |  | 1880 | ON10 | Ben Johnson |

2NF: Ensuring each attribute depends on the whole key for the relation

ClientNo → {ClientName}

PropertyNo → {PropertyAddress, OwnerNo, OwnerName}

{ClientNo, PropertyNo} → {PropertyAddress, RentStart, RentEnd, RentFee}

|  |  |
| --- | --- |
| ClientNo (PK) | ClientName |
| CN12 | John Smith |
| CN18 | Mary Helen |
| CN20 | Wendy King |

|  |  |  |  |
| --- | --- | --- | --- |
| PropertyNo (PK) | PropertyAddress | OwnerNo | OwnerName |
| PN21 | 4 Market St. Bowie | ON68 | Kent Shaw |
| PN52 | 12 S. Main St. Chevy Chase | ON77 | Tina Short |
| PN89 | 4871 East St. Silver Spring | ON120 | Tim Johnson |
| PN36 | 123 Ease St. Rockville | ON68 | Kent Shaw |
| PN73 | 6528 Ohio Ave. Penn Park | ON77 | Tina Short |
| PN82 | 21 West Point St. Bethesda | ON82 | Steven Gates |
| PN66 | 2332 Main Street, Fulton | ON10 | Ben Johnson |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ClientNo (PK) | PropertyNo (PK) | RentStart | RentEnd | RentFee |
| CN12 | PN21 | 12/01/2011 | 6/30/2013 | 1500 |
| CN12 | PN52 | 7/01/2014 | 3/31/2016 | 1750 |
| CN12 | PN89 | 4/01/2018 |  | 1900 |
| CN18 | PN36 | 3/01/2010 | 2/28/2011 | 1450 |
| CN18 | PN73 | 3/01/2012 | 5/31/2015 | 1660 |
| CN18 | PN82 | 6/01/2016 | 12/31/2018 | 1820 |
| CN20 | PN66 | 9/01/2019 |  | 1880 |

3NF: Determine which attributes depend on another non-key attribute

ClientNo → {ClientName}

PropertyNo → {PropertyAddress}

{ClientNo, PropertyNo} → {PropertyAddress, RentStart, RentEnd, RentFee, OwnerNo}

OwnerNo → {OwnerName}

|  |  |
| --- | --- |
| ClientNo (PK) | ClientName |
| CN12 | John Smith |
| CN18 | Mary Helen |
| CN20 | Wendy King |

|  |  |  |
| --- | --- | --- |
| PropertyNo (PK) | PropertyAddress | OwnerNo |
| PN21 | 4 Market St. Bowie | ON68 |
| PN52 | 12 S. Main St. Chevy Chase | ON77 |
| PN89 | 4871 East St. Silver Spring | ON120 |
| PN36 | 123 Ease St. Rockville | ON68 |
| PN73 | 6528 Ohio Ave. Penn Park | ON77 |
| PN82 | 21 West Point St. Bethesda | ON82 |
| PN66 | 2332 Main Street, Fulton | ON10 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ClientNo (PK) | PropertyNo (PK) | RentStart | RentEnd | RentFee |
| CN12 | PN21 | 12/01/2011 | 6/30/2013 | 1500 |
| CN12 | PN52 | 7/01/2014 | 3/31/2016 | 1750 |
| CN12 | PN89 | 4/01/2018 |  | 1900 |
| CN18 | PN36 | 3/01/2010 | 2/28/2011 | 1450 |
| CN18 | PN73 | 3/01/2012 | 5/31/2015 | 1660 |
| CN18 | PN82 | 6/01/2016 | 12/31/2018 | 1820 |
| CN20 | PN66 | 9/01/2019 |  | 1880 |

|  |  |
| --- | --- |
| OwnerNo (PK) | OwnerName |
| ON68 | Kent Shaw |
| ON77 | Tina Short |
| ON120 | Tim Johnson |
| ON68 | Kent Shaw |
| ON77 | Tina Short |
| ON82 | Steven Gates |
| ON10 | Ben Johnson |