**Normalization**

**Unnormalized – UNF**

**Issues:**

* **Not Atomic**
* **Group Data (multi-valued)**
* **Repeating Group**
* **Inconsistent Data Storage**

DOJOS (UNF)

|  |  |  |
| --- | --- | --- |
| id | name | location |
| 1 | Dojo Academy 1 | Palestine, Ramallah |
| 2 | Dojo Academy 2 | Palestine, Nablus |

STUDENTS (UNF)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| id | dojo\_id | name | address1 | address2 | interests |
| 1 | 1 | Adam | Palestine, Ramallah | USA, Panama | Tennis |
| 2 | 1 | Sara | Palestine, Ramallah | - | Swimming |
| 3 | 2 | Ali | Palestine, Nablus | - | Chess, Tennis |
| 4 | 2 | Omar | Palestine, Nablus | Jordan, Amman | Football |

**First Normal Form – 1NF**

**Solution:**

* **Atomic**
* **No Group Data (multi-valued)**
* **Identifier**

DOJOS (1NF)

|  |  |  |  |
| --- | --- | --- | --- |
| id | name | country | city |
| 1 | Dojo Academy 1 | Palestine | Ramallah |
| 2 | Dojo Academy 2 | Palestine | Nablus |

STUDENTS (1NF)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| id | dojo\_id | name | country | city | interests |
| 1 | 1 | Adam | Palestine | Ramallah | Tennis |
| 2 | 1 | Adam | USA | Panama | Tennis |
| 2 | 1 | Sara | Palestine | Ramallah | Swimming |
| 4 | 2 | Ali | Palestine | Nablus | Chess |
| 5 | 2 | Ali | Palestine | Nablus | Tennis |
| 6 | 2 | Omar | Palestine | Nablus | Football |
| 7 | 2 | Omar | Jordan | Amman | Football |

**Second Normal Form – 2NF**

**Issues:**

* **Partial Dependence**
* **Address Redundancy**

DOJOS (2NF)

|  |  |  |
| --- | --- | --- |
| id | name | location\_id |
| 1 | Dojo Academy 1 | 1 |
| 2 | Dojo Academy 2 | 2 |

LOCATIONES

|  |  |  |
| --- | --- | --- |
| id | country | city |
| 1 | Palestine | Ramallah |
| 2 | Palestine | Nablus |
| 3 | USA | Panama |
| 4 | Jordan | Amman |

STUDENTS (2NF)

|  |  |  |
| --- | --- | --- |
| id | dojo\_id | name |
| 1 | 1 | Adam |
| 2 | 1 | Sara |
| 3 | 2 | Ali |
| 4 | 2 | Omar |

STUDENTS\_INTERESTS

|  |  |  |
| --- | --- | --- |
| id | student\_id | interest |
| 1 | 1 | Tennis |
| 2 | 2 | Swimming |
| 3 | 3 | Chess |
| 4 | 3 | Tennis |
| 5 | 4 | Football |

STUDENTS\_ LOCATIONES

|  |  |  |
| --- | --- | --- |
| id | student\_id | location\_id |
| 1 | 1 | 1 |
| 2 | 1 | 3 |
| 3 | 2 | 1 |
| 4 | 3 | 2 |
| 6 | 4 | 2 |
| 7 | 4 | 4 |

**Third Normal Form – 3NF**

**Issues:**

* **no transitive dependencies**
* **2NF all attributes fully depend on the primary keys**

DOJOS (3NF)

|  |  |  |
| --- | --- | --- |
| id | name | location\_id |
| 1 | Dojo Academy 1 | 1 |
| 2 | Dojo Academy 2 | 2 |

LOCATIONES

|  |  |  |
| --- | --- | --- |
| id | country | city |
| 1 | Palestine | Ramallah |
| 2 | Palestine | Nablus |
| 3 | USA | Panama |
| 4 | Jordan | Amman |

STUDENTS (3NF)

|  |  |  |
| --- | --- | --- |
| id | dojo\_id | name |
| 1 | 1 | Adam |
| 2 | 1 | Sara |
| 3 | 2 | Ali |
| 4 | 2 | Omar |

STUDENTS\_INTERESTS

|  |  |  |
| --- | --- | --- |
| id | student\_id | Interest\_id |
| 1 | 1 | 1 |
| 2 | 2 | 2 |
| 3 | 3 | 3 |
| 4 | 3 | 1 |
| 5 | 4 | 4 |

INTERESTS

|  |  |
| --- | --- |
| id | interest |
| 1 | Tennis |
| 2 | Swimming |
| 3 | Chess |
| 4 | Football |

STUDENTS\_ LOCATIONES

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| id | student\_id | location\_id | country | city |
| 1 | 1 | 1 | Palestine | Ramallah |
| 2 | 1 | 3 | USA | Panama |
| 3 | 2 | 1 | Palestine | Ramallah |
| 4 | 3 | 2 | Palestine | Nablus |
| 6 | 4 | 2 | Palestine | Nablus |
| 7 | 4 | 4 | Jordan | Amman |