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Unit 2 Database Normalization

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Tabular data with no normalizations:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Client | Address | Phone Number | Equipment 1 | Equipment 2 | Equipment 3 | Membership | Trainer 1 | Trainer 2 |
| Fred Brown | 123 Main Street | 555-123-9281 | Barbells |  |  | Bronze | Strength |  |
| Fred Brown | 88 Grand Pinen Dr | 555-822-8809 | Rower | Recumbent |  | Silver |  |  |
| Melanie Smith | 75 Lokey Avenue | 555-509-3936 | Elliptical | Kettle Bells | Exercise Ball | Gold | Strength | Yoga |
| Jeff Smith | 7355 Oak Mountain Drive | 555-338-2820 | Rower | Treadmill |  | Silver | Cardio |  |
| Tamara Rohly | 900 Friendship Loop | 555-838-3830 | Recumbent Bike |  |  | Bronze | Yoga |  |
| Jennifer Walters | 15 Stone Lane | 555-282-2820 | Elliptical |  |  | Bronze | Cardio |  |

Some Problems with this data:

1. If someone changes their name, inconsistencies could arise.
2. Is Fred Brown the same person with a different phone and address, or is he the same person, just moved and with a new phone?
3. What if a new membership tier is installed? What if we give clients more than 3 equipment? What about more than 2 Trainers?

Tabular Data put into First Normal Form:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Client ID | Client Name | Address | Phone Number | Equipment | Membership | Trainer |
| 1 | Fred Brown | 123 Main Street | 555-123-9281 | Barbells | Bronze | Strength |
| 2 | Fred Brown | 88 Grand Pinen Dr | 555-822-8809 | Rower | Silver |  |
| 2 | Fred Brown | 88 Grand Pinen Dr | 555-822-8809 | Recumbent Bike | Silver |  |
| 3 | Melanie Smith | 75 Lokey Avenue | 555-509-3936 | Elliptical | Gold | Strength |
| 3 | Melanie Smith | 75 Lokey Avenue | 555-509-3936 | Kettle Bells | Gold | Yoga |
| 3 | Melanie Smith | 75 Lokey Avenue | 555-509-3936 | Exercise Ball | Gold |  |
| 4 | Jeff Smith | 7355 Oak Mountain Drive | 555-338-2820 | Rower | Silver | Cardio |
| 4 | Jeff Smith | 7355 Oak Mountain Drive | 555-338-2820 | Treadmill | Silver |  |
| 5 | Tamara Rohly | 900 Friendship Loop | 555-838-3830 | Recumbent Bike | Bronze | Cardio |
| 6 | Jennifer Walters | 15 Stone Lane | 555-282-2820 | Elliptical | Bronze | Cardio |

Solutions to problems arisen in previous table:

1. Name changes in this format would simply be tracked as a new entry, or row with the same Client ID. This means they’re the same person with a new name.
2. Fred Brown has been given designated a new client ID. In a realistic setting, we could reach out to the staff of Fit @ Home to ascertain the truth of Fred Brown. It is entirely possible that it is two separate people with the same name, so the Client ID helps distinguish them. It will also fix any mix-ups should additional same-name clients appear, such as a new Melanie Smith, or Jennifer Walters.
3. Additional Membership tiers fit neatly into this new format, and there is no longer a limit on the amount of equipment nor trainers that one client may have.

Problems that still need to be addressed:

1. There is a concerning amount of data duplication present within the table. Client, Address, Phone Number, and Membership data is duplicated for each non-bronze client in the database.
2. Non key dependencies within the table could still cause problems. Updating one field would cause a cascade of needing to update many more.

Tabular Data put into Second and Third Normal Forms:

ClientInfo:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ClientID | FirstName | LastName | Address | PhoneNumber | Membership |
| 1 | Fred | Brown | 123 Main Street | 555-123-9281 | Bronze |
| 2 | Fred | Brown | 88 Grand Pinen Dr | 555-822-8809 | Silver |
| 3 | Melanie | Smith | 75 Lokey Avenue | 555-509-3936 | Gold |
| 4 | Jeff | Smith | 7355 Oak Mountain Drive | 555-338-2820 | Silver |
| 5 | Tamara | Rohly | 900 Friendship Loop | 555-838-3830 | Bronze |
| 6 | Jennifer | Walters | 15 Stone Lane | 555-282-2820 | Bronze |

* This data went from first to second normal form by ensuring that all non-key attributes are dependent on the primary key. That is to say, non-key attributes must be changed if the primary key is changed.
* This data is in third normal form because there are no transitive dependencies. Non-key attributes will not change if another non-key attribute is modified.
* This data eliminates non necessary redundancy, and thus cleans up the database in both aesthetics and file-size.
* Client Equipment Table has a Composite Primary Key.

Training:

|  |  |
| --- | --- |
| TrainerID | ReservedClientID |
| 1 | 1 |
| 2 | 3 |
| 3 |  |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 3 |
| 8 |  |
| 9 |  |

Trainers:

|  |  |  |
| --- | --- | --- |
| TrainerID | TrainerName | Specialty |
| 1 | Molly | Strength |
| 2 | James | Strength |
| 3 | Kevin | Strength |
| 4 | Sean | Cardio |
| 5 | Amelia | Cardio |
| 6 | Jon | Cardio |
| 7 | Sasha | Yoga |
| 8 | Brian | Yoga |
| 9 | Calvin | Yoga |

ClientEquipment:

|  |  |
| --- | --- |
| Equipment | ClientID |
| BarbellSets | 1 |
| Rower | 2 |
| RecumbentBike | 2 |
| Elliptical | 3 |
| KettleBells | 3 |
| ExerciseBall | 3 |
| Rower | 4 |
| Treadmill | 4 |
| RecumbentBike | 5 |
| Elliptical | 6 |

MembershipPerks:

|  |  |  |  |
| --- | --- | --- | --- |
| Tier | EquipmentMax | TrainerMax | ShippingFee |
| Gold | 3 | 2 | $0 |
| Silver | 2 | 1 | $25 |
| Bronze | 1 | 1 | $25 |

EquipmentTypes:

|  |  |  |
| --- | --- | --- |
| Equipment | MaximumRentals | Available |
| BarbellSets | 10 | 9 |
| Rower | 3 | 1 |
| RecumbentBike | 3 | 1 |
| Treadmill | 3 | 2 |
| Elliptical | 3 | 1 |
| KettleBells | 10 | 9 |
| ExerciseBall | 10 | 9 |