

# Normalisation

The example tables below have not been normalised ie ONF. They have repeating groups.

| Name           | Grade | Sports              |
|----------------|-------|---------------------|
| Roger Phillips | 10    | Cricket             |
| Patience Mbata | 10    | Netball, Hockey     |
| Hennie Venter  | 12    | Hockey, Rugby, Golf |
| Sarah Cohen    | 11    | Golf                |

| StuID | Name           | Grade | House     | House Colour | Sport            | Coach   | Practice Day | Num Matches |
|-------|----------------|-------|-----------|--------------|------------------|---------|--------------|-------------|
| 1225  | Joe Soap       | 10    | Cambridge | Yellow       | Cricket U16      | Lezar   | Thursday     | 4           |
|       |                |       |           |              | Rugby 1st Team   | Meyer   | Tuesday      | 2           |
| 1124  | Roger Phillips | 10    | Oxford    | Blue         | Cricket U16      | Lezar   | Thursday     | 3           |
| 2345  | Patience Mbata | 11    | Yale      | Red          | Netball U18      | Smid    | Wednesday    | 8           |
|       |                |       |           |              | Girls Hockey U18 | Bailly  | Monday       | 5           |
| 3221  | Hennie Visser  | 12    | Cambridge | Yellow       | Boys Hockey U19  | Jones   | Monday       | 5           |
|       |                |       |           |              | Rugby 1st Team   | Meyer   | Tuesday      | 2           |
|       |                |       |           |              | Golf             | Joubert | Friday       | 7           |
| 2334  | Sarah Cohen    | 11    | Oxford    | Blue         | Golf             | Joubert | Friday       | 5           |

| VidID | VidName    | Price | Categ  | Genre     | CustID | CustName    | CellNo | Date  |
|-------|------------|-------|--------|-----------|--------|-------------|--------|-------|
| 123   | The Matrix | 20    | Yellow | Sci-Fi    | 567    | Tony Spark  | 08387  | 04/05 |
| 789   | Batman 3   | 20    | Purple | Action    |        |             |        |       |
| 456   | Peanuts    | 25    | Green  | Animation | 890    | Clark Clent | 09832  | 04/05 |
| 789   | Batman 3   | 20    | Purple | Action    | 567    | Tony Spark  | 08387  | 05/05 |
| 849   | Star Wars  | 25    | Yellow | Sci-Fi    | 453    | Bear Shikar | 09483  | 05/05 |
| 123   | The Matrix | 20    | Yellow | Sci-Fi    | 890    | Clark Clent | 09832  | 07/05 |
|       |            |       |        |           |        |             |        |       |

NB. Multiple empty fields - also repeating groups

## First Normal Form - 1NF

- No repeating groups
- Primary Key has been chosen  
(composite in this case)  
(StuID and Sport)

Using the **Student** table, we can change the table to be in 1NF by eliminating the repeating groups and choosing a primary key. This will introduce data redundancy, but will satisfy the requirements for 1NF.

| <u>StuID</u> | <u>Name</u>    | <u>Grade</u> | <u>House</u> | <u>House Colour</u> | <u>Sport</u>     | <u>Coach</u> | <u>Practice Day</u> | <u>Num Matches</u> |
|--------------|----------------|--------------|--------------|---------------------|------------------|--------------|---------------------|--------------------|
| 1225         | Joe Soap       | 10           | Cambridge    | Yellow              | Cricket U16      | Lezar        | Thursday            | 4                  |
| 1225         | Joe Soap       | 10           | Cambridge    | Yellow              | Rugby 1st Team   | Meyer        | Tuesday             | 2                  |
| 1124         | Roger Phillips | 10           | Oxford       | Blue                | Cricket U16      | Lezar        | Thursday            | 3                  |
| 2345         | Patience Mbata | 11           | Yale         | Red                 | Netball U18      | Smid         | Wednesday           | 8                  |
| 2345         | Patience Mbata | 11           | Yale         | Red                 | Girls Hockey U18 | Bailly       | Monday              | 5                  |
| 3221         | Hennie Visser  | 12           | Cambridge    | Yellow              | Boys Hockey U19  | Jones        | Monday              | 5                  |
| 3221         | Hennie Visser  | 12           | Cambridge    | Yellow              | Rugby 1st Team   | Meyer        | Tuesday             | 2                  |
| 3221         | Hennie Visser  | 12           | Cambridge    | Yellow              | Golf             | Joubert      | Friday              | 7                  |
| 2334         | Sarah Cohen    | 11           | Oxford       | Blue                | Golf             | Joubert      | Friday              | 5                  |

### Partial Dependencies

- Fields dependant on one part of the composite key

Name, Grade, House, House colour are derived from StuID

Coach, Practice Day, Num Matches are derived from Sport

### Transitive Dependencies

Fields dependent on another field that is not part of the composite primary key  
ie House colour is derived from House

# Second Normal Form - 2NF

1NF is sorted ✓

No partial dependencies ✓

StuID

Sport

StuID, Sport

Write all dependant fields next to their respective keys and give each table a name. We have chosen the name **Players** for third table.

**Students** (StuID, Name, Grade, House, House\_Colour)

**Sports** (Sport, Coach, Practice Day)

**Players** (StuID, Sport, NumMatches)

} 2NF expressed as  
a relation  
↘

## Students

| <u>StuID</u> | Name           | Grade | House     | House_Colour |
|--------------|----------------|-------|-----------|--------------|
| 1225         | Joe Soap       | 10    | Cambridge | Yellow       |
| 1124         | Roger Phillips | 10    | Oxford    | Blue         |
| 2345         | Patience Mbata | 11    | Yale      | Red          |
| 3221         | Hennie Visser  | 12    | Cambridge | Yellow       |
| 2334         | Sarah Cohen    | 11    | Oxford    | Blue         |

## Sports

| <u>Sport</u>     | Coach   | Practice Day |
|------------------|---------|--------------|
| Cricket U16      | Lezar   | Thursday     |
| Netball U18      | Smid    | Wednesday    |
| Girls Hockey U18 | Bailly  | Monday       |
| Boys Hockey U19  | Jones   | Monday       |
| Rugby 1st Team   | Meyer   | Tuesday      |
| Golf             | Joubert | Friday       |

## Players

| <u>StuID</u> | <u>Sport</u>     | Matches |
|--------------|------------------|---------|
| 1225         | Cricket U16      | 4       |
| 1225         | Rugby 1st Team   | 2       |
| 1124         | Cricket U16      | 3       |
| 2345         | Netball U18      | 8       |
| 2345         | Girls Hockey U18 | 5       |
| 3221         | Boys Hockey U19  | 5       |
| 3221         | Rugby 1st Team   | 2       |
| 3221         | Golf             | 7       |
| 2334         | Golf             | 5       |

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# Third Normal Form - 3NF

2NF is sorted ✓

No transitive dependencies ✓

We can now write the relations as follows:

**Students** (StuID, Name, Grade, House)

**Sports** (Sport, Coach, Practice Day)

**Players** (StuID, Sport, NumMatches)

**Houses** (House, House\_Colour)

} 3NF expressed as  
a relation

## Students

| <u>StuID</u> | Name           | Grade | House     |
|--------------|----------------|-------|-----------|
| 1225         | Joe Soap       | 10    | Cambridge |
| 1124         | Roger Phillips | 10    | Oxford    |
| 2345         | Patience Mbata | 11    | Yale      |
| 3221         | Hennie Visser  | 12    | Cambridge |
| 2334         | Sarah Cohen    | 11    | Oxford    |

## Sports

| <u>Sport</u>     | Coach   | Practice Day |
|------------------|---------|--------------|
| Cricket U16      | Lezar   | Thursday     |
| Netball U18      | Smid    | Wednesday    |
| Girls Hockey U18 | Bailly  | Monday       |
| Boys Hockey U19  | Jones   | Monday       |
| Rugby 1st Team   | Meyer   | Tuesday      |
| Golf             | Joubert | Friday       |

## Players

| <u>StuID</u> | <u>Sport</u>     | Matches |
|--------------|------------------|---------|
| 1225         | Cricket U16      | 4       |
| 1225         | Rugby 1st Team   | 2       |
| 1124         | Cricket U16      | 3       |
| 2345         | Netball U18      | 8       |
| 2345         | Girls Hockey U18 | 5       |
| 3221         | Boys Hockey U19  | 5       |
| 3221         | Rugby 1st Team   | 2       |
| 3221         | Golf             | 7       |
| 2334         | Golf             | 5       |

## Houses

| <u>House</u> | House_Colour |
|--------------|--------------|
| Cambridge    | Yellow       |
| Oxford       | Blue         |
| Yale         | Red          |