

Normalization

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Example 1

Initial table:

Primary key

Sample Data

<u>StudentId</u>	StudentName	Year	Semester	UnitCode	UnitName
0023765	John Doe	2009	2	UG45783	Advance Database
				UG45832	Network Systems
				UG45734	Multi-User Operating Systems
0035643	Ann Smith	2009	2	UG45832	Network Systems
				UG45951	Project
0061234	Peter Wolfe	2009	2	UG45783	Advance Database

Model Data

First normal Form

Repeating Groups of Data

<u>StudentId</u>	StudentName	Year	Semester	UnitCode	UnitName
0023765	John Doe	2009	2	UG45783	Advance Database
0023765	John Doe	2009	2	UG45832	Network Systems
0023765	John Doe	2009	2	UG45734	Multi-User Operating Systems
0035643	Ann Smith	2009	2	UG45832	Network Systems
0035643	Ann Smith	2009	2	UG45951	Project
0061234	Peter Wolfe	2009	2	UG45783	Advance Database

Second normal form

<u>StudentId</u>	StudentName	Year	Semester
0023765	John Doe	2009	2
0035643	Ann Smith	2009	2
0061234	Pete Smith	2009	2

<u>StudentId</u>	<u>UnitCode</u>	UnitName
0023765	UG45783	Advance Database
0023765	UG45832	Network Systems
0023765	UG45734	Multi-User Operating Systems
0035643	UG45832	Network Systems
0035643	UG45951	Project
0061234	UG45783	Advance Database

Composite Key

Tables in First Normal Form

<u>StudentId</u>	<u>UnitCode</u>
0023765	UG45783
0023765	UG45832
0023765	UG45734
0035643	UG45832
0035643	UG45951
0061234	UG45783

Tables in Second
Normal Form

<u>UnitCode</u>	UnitName
UG45783	Advance Database
UG45832	Network Systems
UG45734	Multi-User Operating Systems
UG45951	Project

3NF

Transitively Dependent

Dependent

Dependent

<u>UnitCode</u>	UnitName	CourseCode	CourseName
UG45783	Advance Database	COMP2009	Computing
UG45832	Network Systems	COMP2009	Computing
UG45734	Multi-User Operating Systems	COMP2009	Computing
UG45951	Project	BUS22009	Business & Computing

3NF

Foreign Key

<u>UnitCode</u>	UnitName	CourseCode*
UG45783	Advance Database	COMP2009
UG45832	Network Systems	COMP2009
UG45734	Multi-User Operating Systems	COMP2009
UG45951	Project	BUS22009

Tables in Third Normal Form

<u>CourseCode</u>	CourseName
COMP2009	Computing
BUS22009	Business & Computing

Primary Key

The diagram illustrates two tables in Third Normal Form. The first table, 'Units', has columns UnitCode (primary key), UnitName, and CourseCode* (foreign key). The second table, 'Courses', has columns CourseCode (primary key) and CourseName. The foreign key relationship is shown by an arrow from CourseCode* in the first table to CourseCode in the second table. The text 'Tables in Third Normal Form' points to both tables. The text 'Primary Key' points to CourseCode. The text 'Foreign Key' points to CourseCode*.

Initial table

Sales Records:

Cust Name	Item	Shipping Address	Newsletter	Supplier	Supplier Phone	Price
Alan Smith	Xbox One	35 Palm St, Miami	Xbox News	Microsoft	(800) BUY-XBOX	250
Roger Banks	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300
Evan Wilson	Xbox One, PS Vita	28 Rock Av, Denver	Xbox News, PlayStation News	Wholesale	Toll Free	450
Alan Smith	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300

1NF

Sales Records:

Cust Name	Item	Shipping Address	Newsletter	Supplier	Supplier Phone	Price
Alan Smith	Xbox One	35 Palm St, Miami	Xbox News	Microsoft	(800) BUY-XBOX	250
Roger Banks	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300
Evan Wilson	Xbox One, PS Vita	28 Rock Av, Denver	Xbox News, PlayStation News	Wholesale	Toll Free	450
Alan Smith	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300

- 1st Normal Form**
- Each cell to be Single valued
 - Entries in a column are same type
 - Rows uniquely identified - Add Unique ID, or Add more columns to make unique
(Note: The order of the rows and the order of the columns are irrelevant)

Primary Key

Cust ID	Cust Name	Item	Shipping Address	Newsletter	Supplier	Supplier Phone	Price
at_smith	Alan Smith	Xbox One	35 Palm St, Miami	Xbox News	Microsoft	(800) BUY-XBOX	250
roger25	Roger Banks	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300
wilson44	Evan Wilson	Xbox One	28 Rock Av, Denver	Xbox News	Microsoft	(800) BUY-XBOX	250
wilson44	Evan Wilson	PS Vita	28 Rock Av, Denver	PlayStation News	Sony	(800) BUY-SONY	200
am_smith	Alan Smith	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300

2NF

Primary Key

Cust ID	Cust Name	Item	Shipping Address	Newsletter	Supplier	Supplier Phone	Price
at_smith	Alan Smith	Xbox One	35 Palm St, Miami	Xbox News	Microsoft	(800) BUY-XBOX	250
roger25	Roger Banks	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300
wilson44	Evan Wilson	Xbox One	28 Rock Av, Denver	Xbox News	Microsoft	(800) BUY-XBOX	250
wilson44	Evan Wilson	PS Vita	28 Rock Av, Denver	PlayStation News	Sony	(800) BUY-SONY	200
am_smith	Alan Smith	PlayStation 4	47 Campus Rd, Boston	PlayStation News	Sony	(800) BUY-SONY	300

1NF table

2nd Normal Form - All attributes (Non-Key Columns) dependent on the key

Primary Key

Cust ID	Cust Name	Shipping Address	Newsletter
at_smith	Alan Smith	35 Palm St, Miami	Xbox News
roger25	Roger Banks	47 Campus Rd, Boston	PlayStation News
wilson44	Evan Wilson	28 Rock Av, Denver	Xbox News
wilson44	Evan Wilson	28 Rock Av, Denver	PlayStation News
am_smith	Alan Smith	47 Campus Rd, Boston	PlayStation News

Primary Key

Item	Supplier	Supplier Phone	Price
Xbox One	Microsoft	(800) BUY-XBOX	250
PlayStation 4	Sony	(800) BUY-SONY	300
PS Vita	Sony	(800) BUY-SONY	200

2NF

Primary Key

Cust ID	Cust Name	Shipping Address	Newsletter
at_smith	Alan Smith	35 Palm St, Miami	Xbox News
roger25	Roger Banks	47 Campus Rd, Boston	PlayStation News
wilson44	Evan Wilson	28 Rock Av, Denver	Xbox News
wilson44	Evan Wilson	28 Rock Av, Denver	PlayStation News
am_smith	Alan Smith	47 Campus Rd, Boston	PlayStation News

Primary Key

Item	Supplier	Supplier Phone	Price
Xbox One	Microsoft	(800) BUY-XBOX	250
PlayStation 4	Sony	(800) BUY-SONY	300
PS Vita	Sony	(800) BUY-SONY	200

Primary
key

Primary
key

Cust_ID	Item
At_smith	Xbox One
Roger25	PlayStation4
Wilson44	Xbox One
Wilson44	PS Vita
Am_smith	PlayStation4

3NF

3rd Normal Form - All Fields (columns) can be determined Only by the Key in the table and no other column

Primary Key

Cust ID	Cust Name	Shipping Address	Newsletter
at_smith	Alan Smith	35 Palm St, Miami	Xbox News
roger25	Roger Banks	47 Campus Rd, Boston	PlayStation News
wilson44	Evan Wilson	28 Rock Av, Denver	Xbox News
wilson44	Evan Wilson	28 Rock Av, Denver	PlayStation News
am_smith	Alan Smith	47 Campus Rd, Boston	PlayStation News

Primary Key

Foreign Key

Item	Supplier	Price
Xbox One	Microsoft	250
PlayStation 4	Sony	300
PS Vita	Sony	200

Primary Key

Primary Key

Cust ID	Item
at_smith	Xbox One
roger25	PlayStation 4
wilson44	Xbox One
wilson44	PS Vita
am_smith	PlayStation 4

Primary Key

Supplier	Supplier Phone
Microsoft	(800) BUY-XBOX
Sony	(800) BUY-SONY