

# Bank system

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# Web store (eCommerce)



# Database



A **database** is an organized collection of data.

It is the collection of

- schemas,
  - tables,
  - queries,
  - views,
  - stored procedures,
  - other objects.
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# Table

A **table** is a collection of related data held in a structured format within a database. It consists of columns, and rows.

CustomerId	FirstName	LastName	Email	Phone	AltPhone	FaxNumber	ZipCode	NewsLetter
1	John	Smith	John@gmail.com	703-543-3302	703-543-3302	NULL	22201	1
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	NULL	NULL	22203	0
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	NULL	NULL	22031	1
4	Bob	James	bob@microsoft.com	703-366-9632	NULL	703-455-9632	22221	0
5	Adam	Marcos	adam@Marcos.com	703-566-0000	NULL	703-366-0000	22001	1

# Database design

## Customers + Schedules relationship

CustomerId	FirstName	LastName	Email	Phone	ZipCode	ScheduleDescription	DateNeeded	JobType
1	John	Smith	John@gmail.com	703-543-3302	22201	Kitchen remodel needed	2013-10-10	Remodeling
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	22203	Decorating help for dinig room	2013-10-15	Decorating
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	22031	Kitchen remodel needed	2015-11-29	Remodeling
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	22031	Garade rebuild	2016-12-31	Rebuild

### Problems:

1. Duplicated data
2. Updated problem
3. Possible data ambiguity

# Database design (Normalization)

## Solution

Each table contains information about single functional item.

Primary key

## Customers

CustomerId	FirstName	LastName	Email	Phone	ZipCode
1	John	Smith	John@gmail.com	703-543-3302	22201
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	22203
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	22031

Relationship



## Schedules

ID	CustomerId	Description	DateNeeded	Job Type
1	1	Kitchen remodel needed	2013-10-10	Remodeling
2	2	Decorations help for dinig room	2013-10-15	Decorating
3	3	Kitchen remodel needed	2015-11-29	Remodeling
4	3	Garade rebuild	2016-12-31	Rebuild

Foreign Key

# Schema HomePro

HomePro.Customers

Primary Key

CustomerId	FirstName	LastName	Email	Phone	AltPhone	FaxNumber	ZipCode	NewsLetter	State	Age
1	John	Smith	John@gmail.com	703-543-3302	703-543-3302	NULL	22201	1	VA	18
2	Jeremy	Smith	Jeremy@gmail.com	723-543-3302	NULL	NULL	22203	0	NY	23
3	Mark	Long	MarkLong@Yahoo.com	722-366-5588	NULL	NULL	22031	1	CA	64
4	Bob	James	bob@microsoft.com	703-366-9632	NULL	703-455-9632	22221	0	VA	37
5	Adam	Marcos	adam@Marcos.com	703-566-0000	NULL	703-366-0000	22001	1	NC	41

HomePro.Schedules

Primary Key

ID	CustomerId	Description	DateNeeded	Job Type
1	1	Kitchen remodel needed	2013-10-10	Remodeling
2	2	Decorating help for dinig room	2013-10-15	Decorating
3	3	Kitchen remodel needed	2015-11-29	Remodeling
4	3	Garade rebuild	2016-12-31	Rebuild

Foreign key

HomePro.Quotes

Primary Key

ID	CustomerId	Description	Estimation
1	1	Kitchen remodel	210.55
2	3	Quote with discount	875.55
3	3	Quote with additional work	10000.00

Foreign key

# Schema Bank

**Bank.Clients**

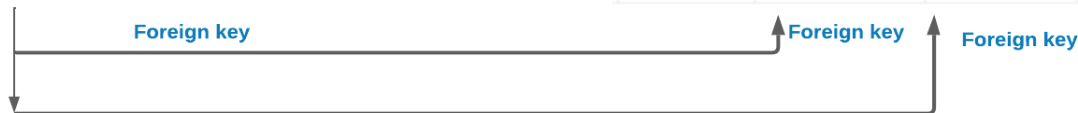
Primary Key	ClientId	FirstName	LastName	Phone	Email	State	Age	Type
	1	John	Smith	703-543-3302	John@gmail.com	VA	33	Private
	2	Jeremy	Smith	723-543-3302	Jeremy@gmail.com	WA	19	Private
	3	Long	Mark	722-366-5588	MarkLong@Yahoo.com	TN	41	Private
	4	Bob	James	703-366-9632	bob@microsoft.com	VA	28	Business
	5	Adam	Marcos	703-566-0000	adam@Marcos.com	CA	38	Business
	6	Jason	Boley	345-234-9784	json@blabla.com	NY	31	Business
	7	Tom	Soyer	572-223-5392	stom@hotmail.com	NJ	49	Private

**Bank.Accounts**

Primary Key	AccountNum	ClientId	Balance	Type
	1	1	10200.00	CHECKING
	2	1	3550.00	CREDIT
	3	2	1001.00	CHECKING
	4	2	150.00	CREDIT
	5	3	1303.00	CHECKING
	6	3	25000.00	SAVING
	7	4	15731.00	CHECKING
	8	4	31014.00	SAVING
	9	5	1724.00	CHECKING
	10	5	3043.00	CREDIT
	11	5	79320.00	SAVING

**Bank.Transactions**

Primary Key	TransactionId	AccountNumFrom	AccountNumTo	Amount	TransactionTime	Status
	1	1	2	150.00	2015-01-10 00:00:00.000	Pending
	2	1	4	1000.00	2016-02-11 00:00:00.000	Committed
	3	1	8	100.00	2016-04-01 00:00:00.000	Rejected
	4	1	9	343.55	2017-01-18 00:00:00.000	Pending
	5	2	9	36.70	2016-12-10 00:00:00.000	Committed
	6	3	9	100.00	2016-12-12 00:00:00.000	Committed
	7	5	9	1500.00	2015-01-10 00:00:00.000	Committed
	8	5	10	1500.00	2016-06-13 00:00:00.000	Rejected
	9	9	10	2300.00	2016-11-30 00:00:00.000	Committed
	10	9	11	15000.00	2017-01-01 00:00:00.000	Committed





# Primary key

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1. The column(s) that has completely unique data throughout the table
2. The main role of a primary key in a data table is to maintain the internal integrity of a data table.
3. Table can have only one primary key.

# Foreign key

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1. The column that links one table to another table's primary key or unique constraint
2. Table can have any number of foreign keys defined.

# Structured Query Language (SQL)

SQL is a language used for creating, storing, fetching and updating of data and database objects in database.

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# SELECT

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**SELECT** is used to retrieve rows selected from one or more tables.

Basic syntax:

```
SELECT <columns>  
FROM <Table>  
WHERE <condition>  
ORDER BY <columns>
```

# Select (examples)

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```
Select * from HomePro.Customers;
```

```
Select FirstName, LastName  
From HomePro.Customers  
Order by LastName;
```

# Where (char, varchar)

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Select \* from HomePro.Customers

Where LastName = 'Smith'

Select \* from HomePro.Customers

Where LastName like 'S%'

Select \* from HomePro.Customers

Where LastName like '\_m%'

# Where (numbers)

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1. Where Age = 10
2. Where Age > 10
3. Where Age > 10 and Age < 40
4. Where Age >= 10 and Age <= 40
5. Where Age between 10 and 40
6. Where Age in (10, 20, 30)

# Where (date)

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1. Where DateNedeed = '2015-11-29'
2. Where DateNedeed > '2014-12-30'
3. Where DateNedeed between '2015-12-01' and '2015-12-31'



# NULL values

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- NULL is an unknown and undefined value.
- Arithmetic operation with NULL in SQL will return a NULL.
- ~~Where Value = Null~~ -> Where Value is Null

Question: How much money do you have?

Answer 1. I have \$10                      Meaning: \$10

Answer 3. I have no money              Meaning : \$0

Answer 3. I don't tell you              Meaning : Null

# Query with NULL

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Select \*

from **HomePro.Customers**

where AltPhone is null;