Module 3

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Introduction to Relational Model

- Relational Model was Proposed by E.F. Codd , a researcher of IBM
- It is an Abstract Model used to store and organize data in database
- It represent how data is stored in relational database
- Most of the modern Database Management systems (DBMS) are relational

The relational model consists of three major components:

1. **Data structure** : the set of relations and set of domains that defines the way data can be represented
2. **Data integrity** : Integrity rules that define the procedure to protect the data
3. **Data manipulation**: the operations that can be performed on data

Advantages of Relational model

- Ease to use
- Flexibility
- Security
- Data independence
- Data Manipulation Language

Basic Concepts of Relational Model

- Tables
- Tuple
- Attribute
- Domain
- Degree
- Cardinality

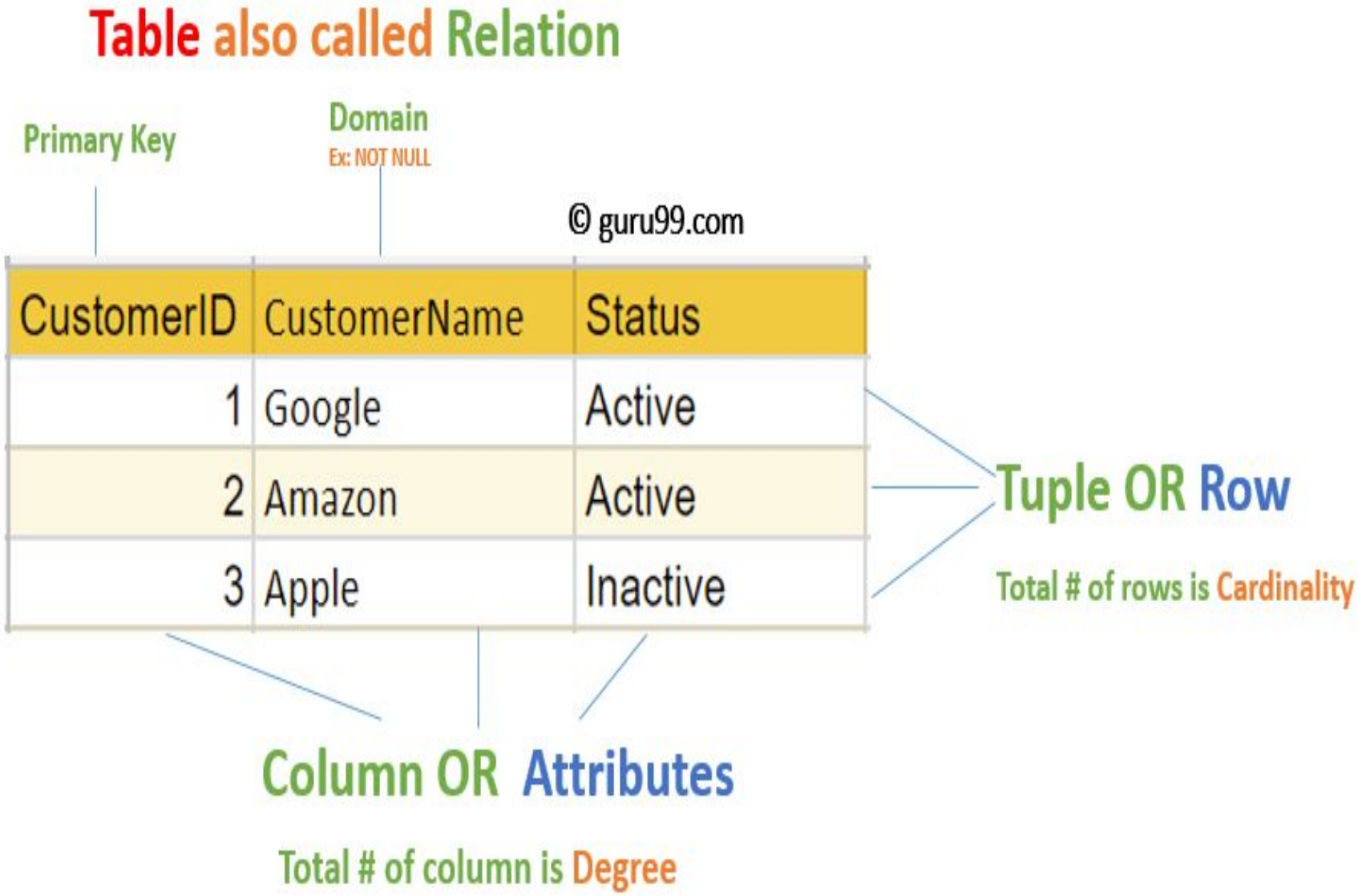
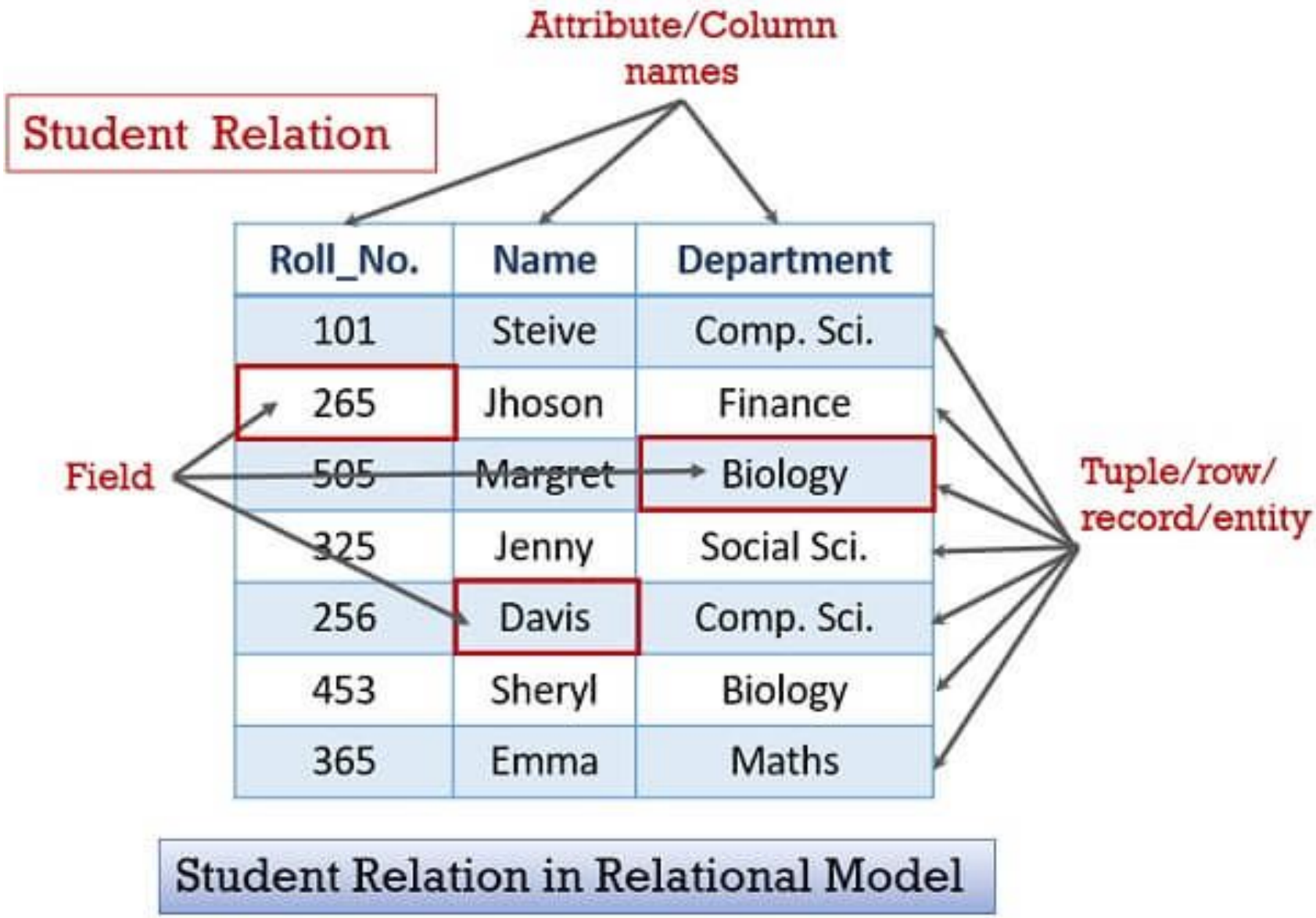


Table also called Relation
Primary Key
Domain
Ex: NOT NULL
© guru99.com
CustomerID
CustomerName
Status
1
Google
Active
2
Amazon
Active
3
Apple
Inactive
Tuple OR Row
Total # of rows is Cardinality
Column OR Attributes
Total # of column is Degree


Attribute/Column names
Student Relation
Roll_No.
Name
Department
101
Steive
Comp. Sci.
265
Jhoson
Finance
505
Margret
Biology
325
Jenny
Social Sci.
256
Davis
Comp. Sci.
453
Sheryl
Biology
365
Emma
Maths
Field
Tuple/row/ record/entity
Student Relation in Relational Model

Integrity constraints over relation

- Integrity constraints: are used to ensure accuracy and consistency of the data in a relation database
- Integrity Constraints are set of rules that the database is not permitted to violet
- Constraints may apply to each attribute or they may apply to relationship between tables
- Integrity constraints ensures the changes (update, delete, insertion) made to the database by authorized users do not result in a loss of data consistency.

- Integrity Constraints guard against accidental damage to the database

- Ex: Blood group must be ‘A’, ‘B’, ‘AB’ ,’O’ only (cannot be any other values)

Types of Integrity Constraints

- Domain Constraints
- Entity Integrity Constraints
- Referential Integrity Constraints
- Key Constraints

Domain Constraints

- Defines the domain or the valid set of values for an attribute
- The data type of domain includes

string

integer

time

Date

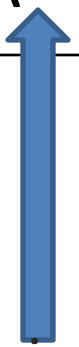
Currency

Character etc

The values of attribute must be available in the corresponding domain

Example

Sid	Name	Semester	Age
101	nancy	I	18
102	taniya	II	19
103	kiya	II	19
104	Amit	III	A



Not allowed bcoz age is an integer value

Entity Integrity Constraints

- States that primary key can’t be null, this is because the primary key value is used to identify individual rows in relations and if the primary key has a null value then we can’t identify those rows
- A table can contain a null value other than the primary key field

Example

EMPLOYEE

EMP_ID	EMP_NAME	SALARY
123	Jack	30000
142	Harry	60000
164	John	20000
	Jackson	27000

Not allowed as primary key can't contain a NULL value

Referential Integrity Constraints

- It is specified between two tables
- It is enforced when a foreign key references the primary key of a table 1 refer to the primary key of table 2 then either every value of foreign key in table 1 must be available in primary key value of table2 or it must be null

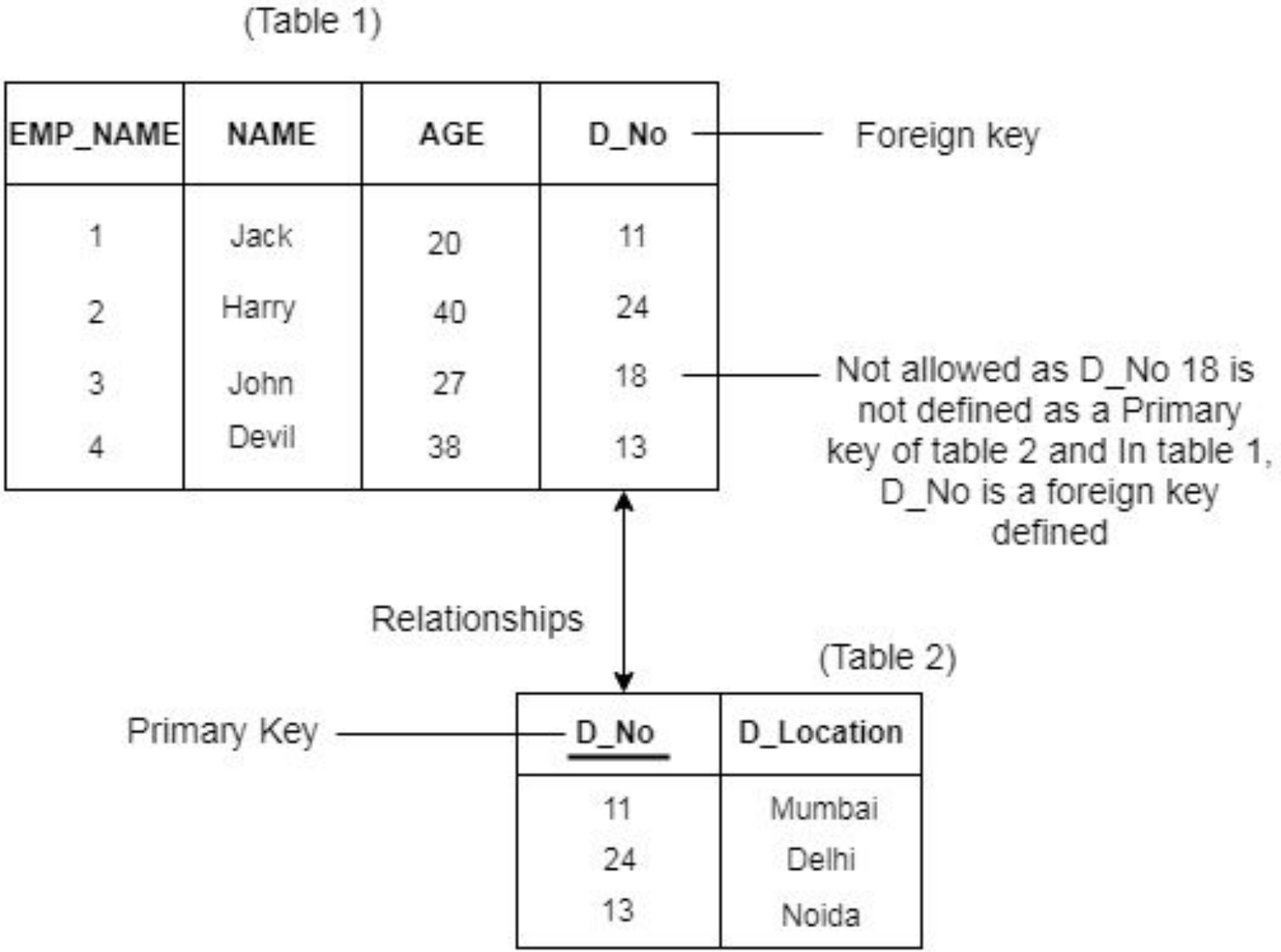
STUDENT

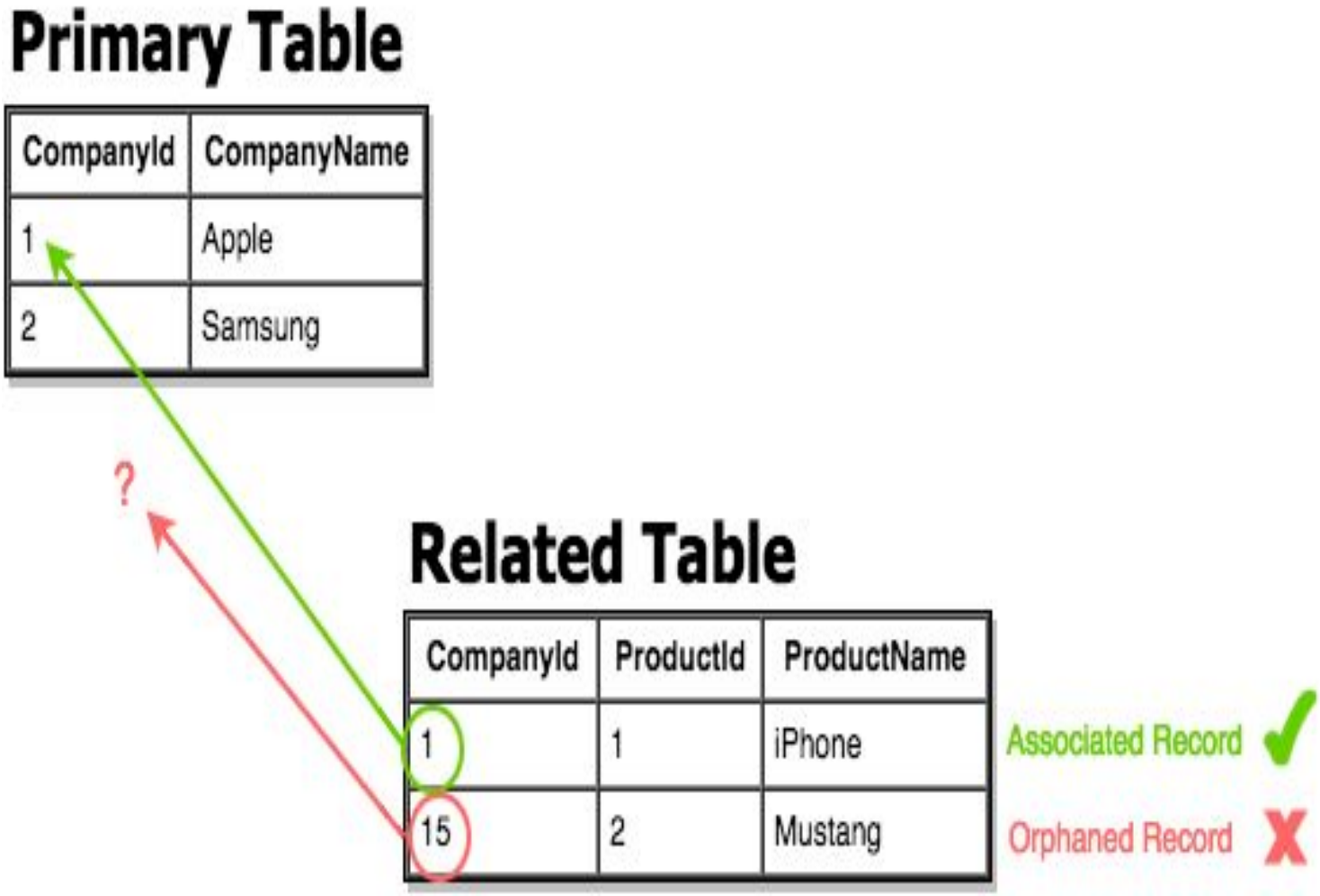
Enrl No	Roll No	Name	City	*Mobile*
11	17	Ankit Vats	Delhi	9891663808
15	16	Vivek Rajput	Meerut	9891468487
6	6	Vanita	Punjab	
33	75	Bhavya	Delhi	9810618396

GRADE

Roll No	Course	*Grade*
6	C	A
17	VB	C
75	VB	A
6	DBMS	B
16	C	B

Example of referential Integrity Constraints




Primary Table
CompanyId
CompanyName
1
Apple
2
Samsung
?
Related Table
CompanyId
ProductId
ProductName
1
1
iPhone
15
2
Mustang
Associated Record
Orphaned Record

Student (First Table)

Roll_no	Student_name	Age	Course_id
1	Andrew	18	78
2	Angel	19	16
3	Priya	20	56
4	Analisa	21	

Foreign Key

This value is not allowed because this value is not defined as a primary key in the course table.

The value can be NULL as the student(Analisa) may not have taken any course.

Primary Key

Course (Second Table)

Primary Key

Course_id	Course_name	Duration (months)
78	Big Data	4
56	Algorithm	2

REFERENTIAL INTEGRITY

Key constraints

- An entity set can have multiple keys or candidate keys(minimal super key) but out of which one key will be primary key
- Key constraint specifies that in any relation all the values of primary key must be unique, values of primary key must not be null

ID	NAME	SEMENSTER	AGE
1000	Tom	1st	17
1001	Johnson	2nd	24
1002	Leonardo	5th	21
1003	Kate	3rd	19
1002	Morgan	8th	22

Not allowed. Because all row must be unique