RDMS INTRO

08 January 2025 11:26

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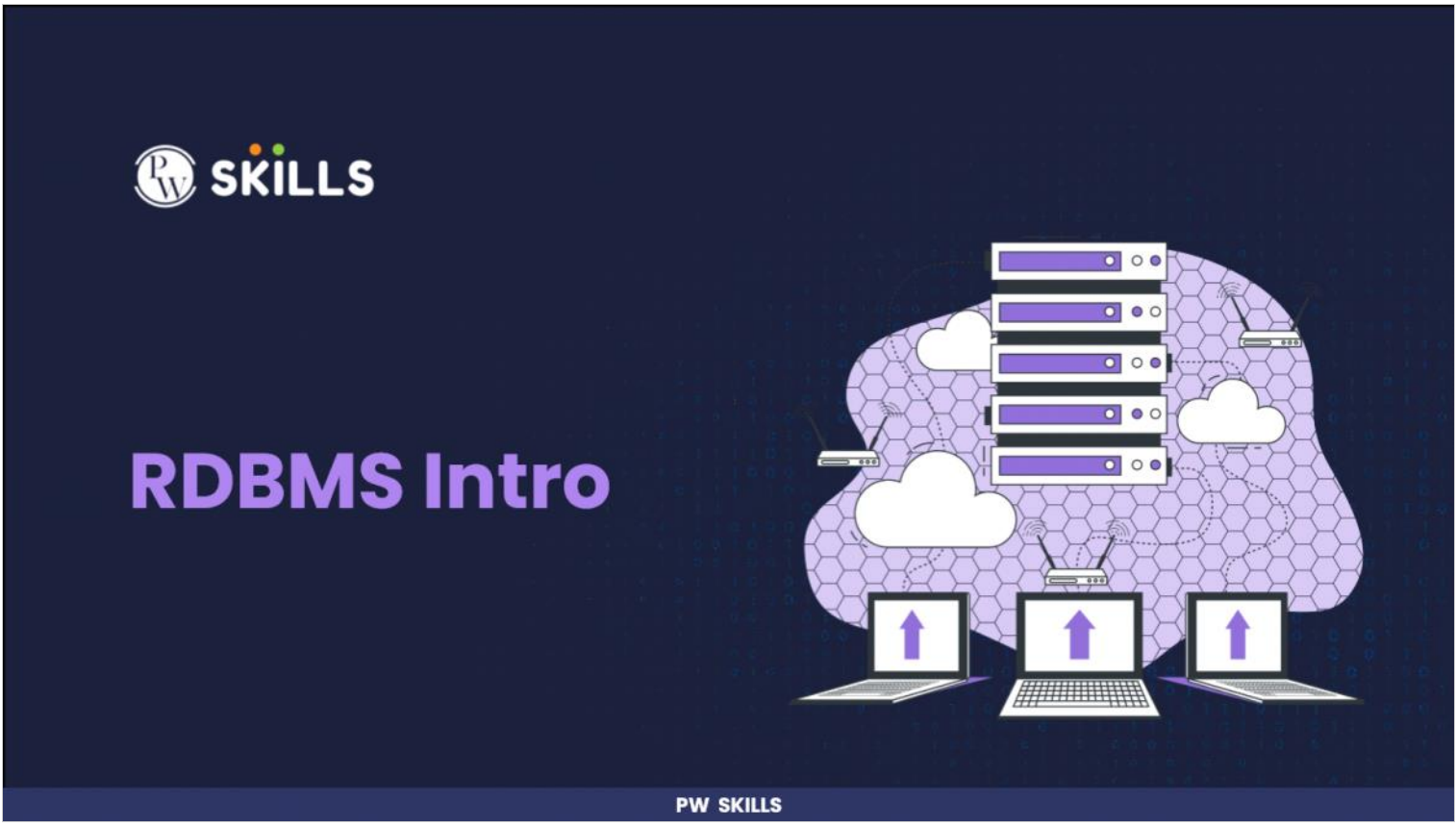
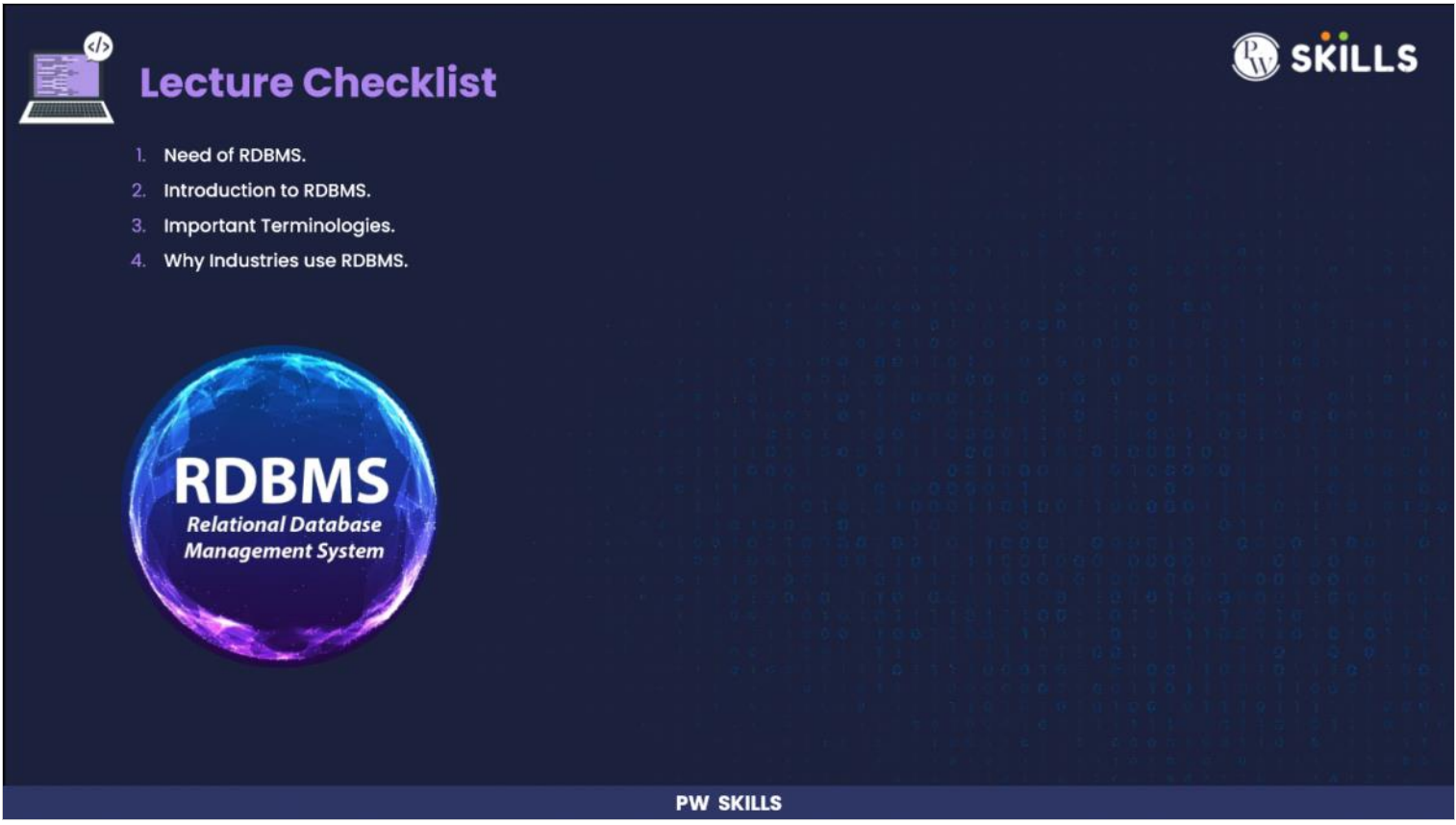




Need of RDBMS

Evolution of Internet Applications.

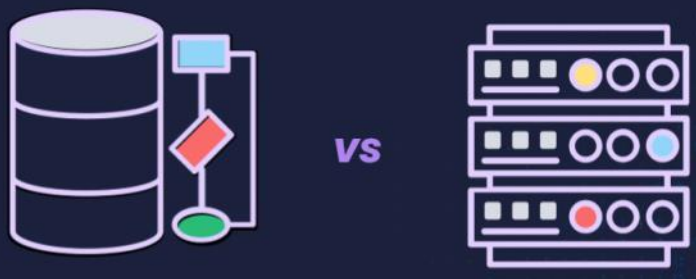
PW SKILLS

Need of RDBMS

Entities & Relationships.

PW SKILLS

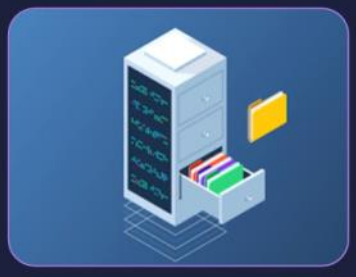
Need of RDBMS



PW SKILLS

Important Terminologies

1. Data.
2. Database.



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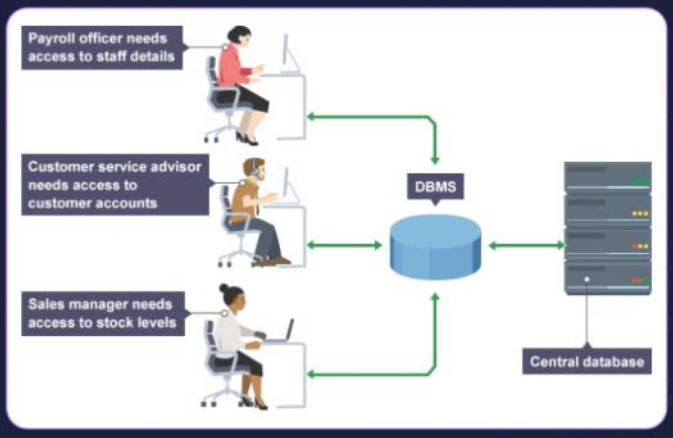
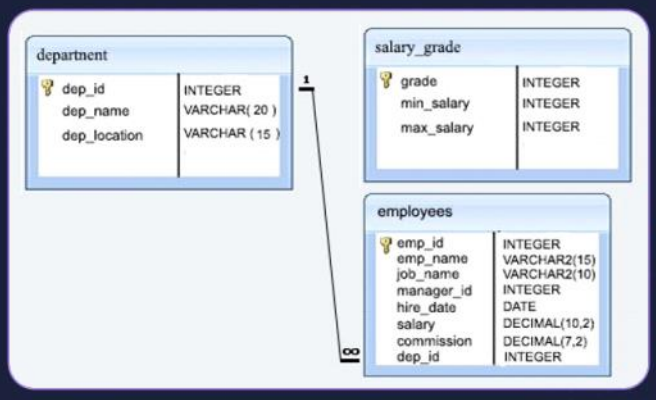
Important Terminologies

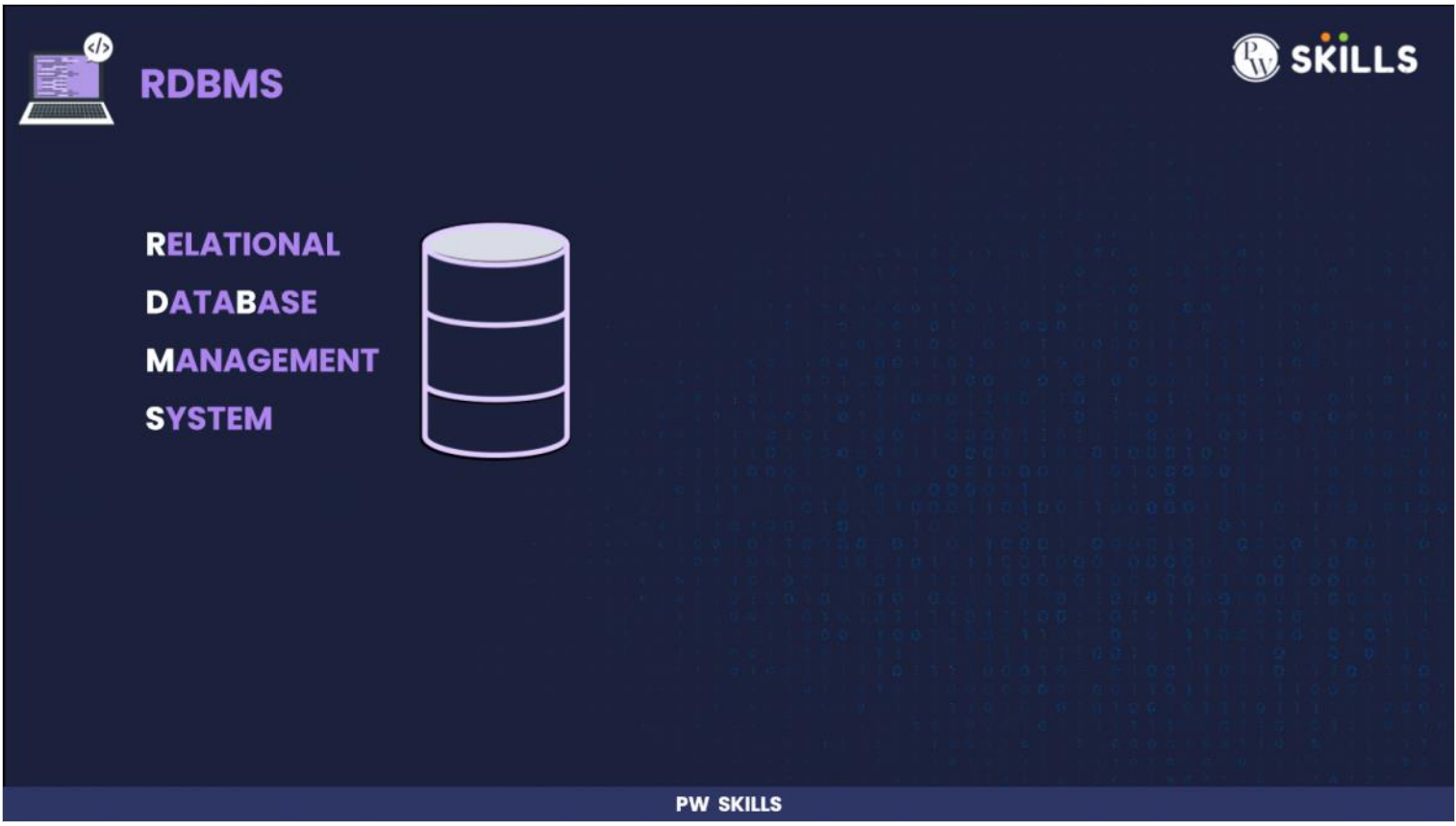
- DBMS

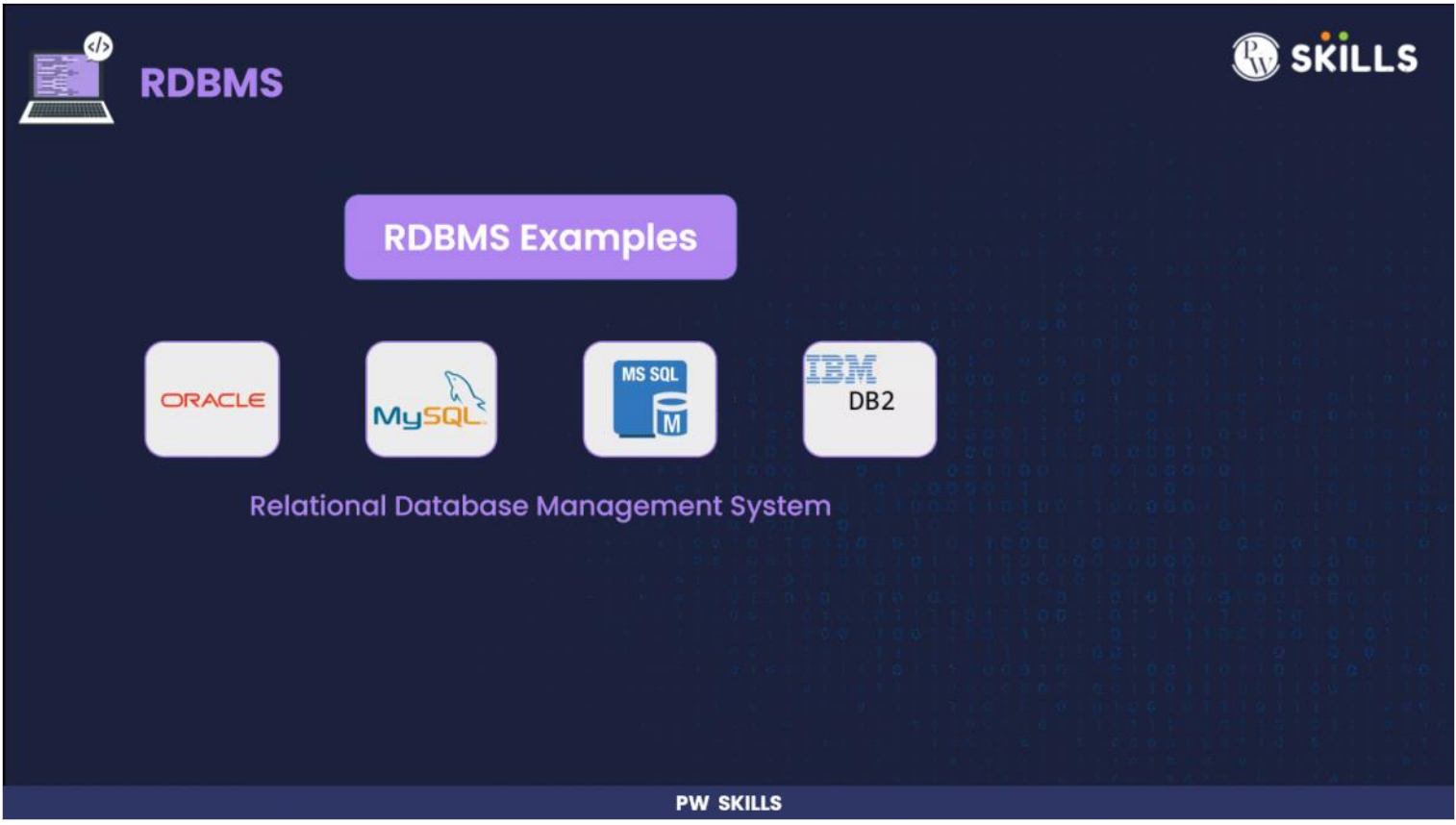


Important Terminologies

- Relational Data.




RDBMS
SKILLS
RELATIONAL
DATABASE
MANAGEMENT
SYSTEM
PW SKILLS


RDBMS
SKILLS
RDBMS Examples
ORACLE
MySQL
MS SQL
IBM
DB2
Relational Database Management System
PW SKILLS

Why do Industries use RDBMS?

Supports transactions.

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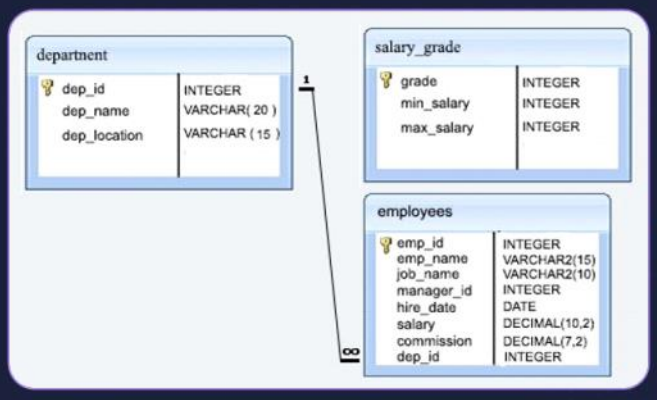
Why do Industries use RDBMS?

Relationships.



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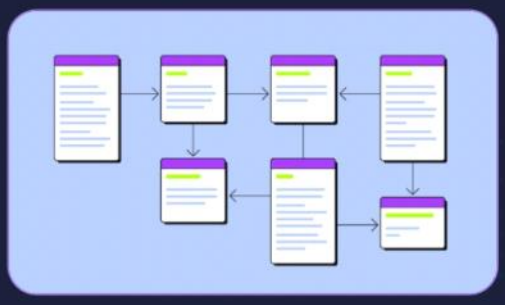
Why do Industries use RDBMS?

Proper Schema.



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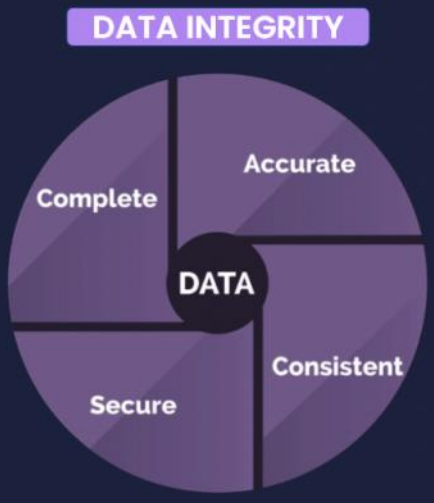
Why do Industries use RDBMS?

Ensures Data Integrity during read and write.



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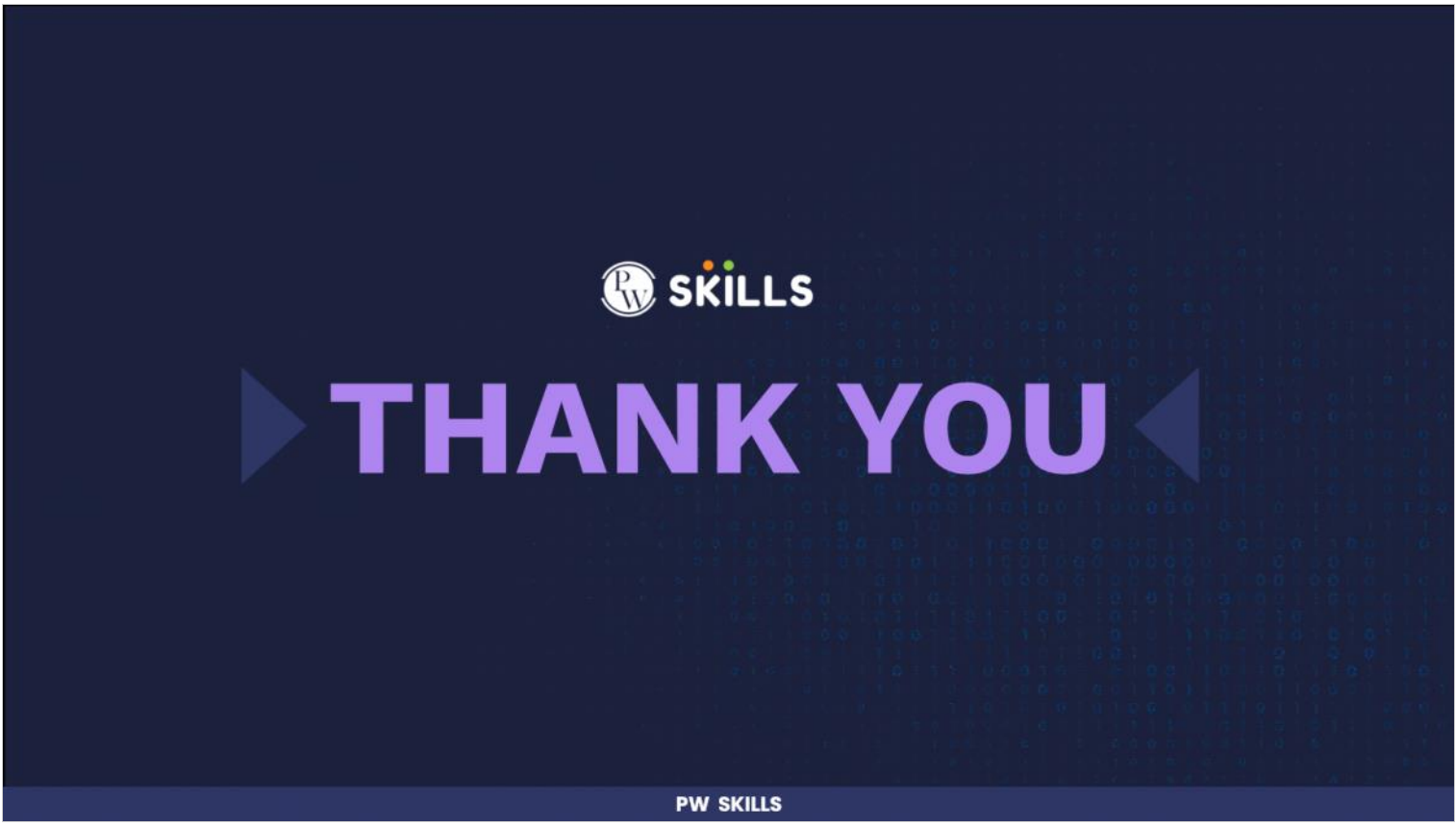
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RELATIONSHIP DATA MODEL

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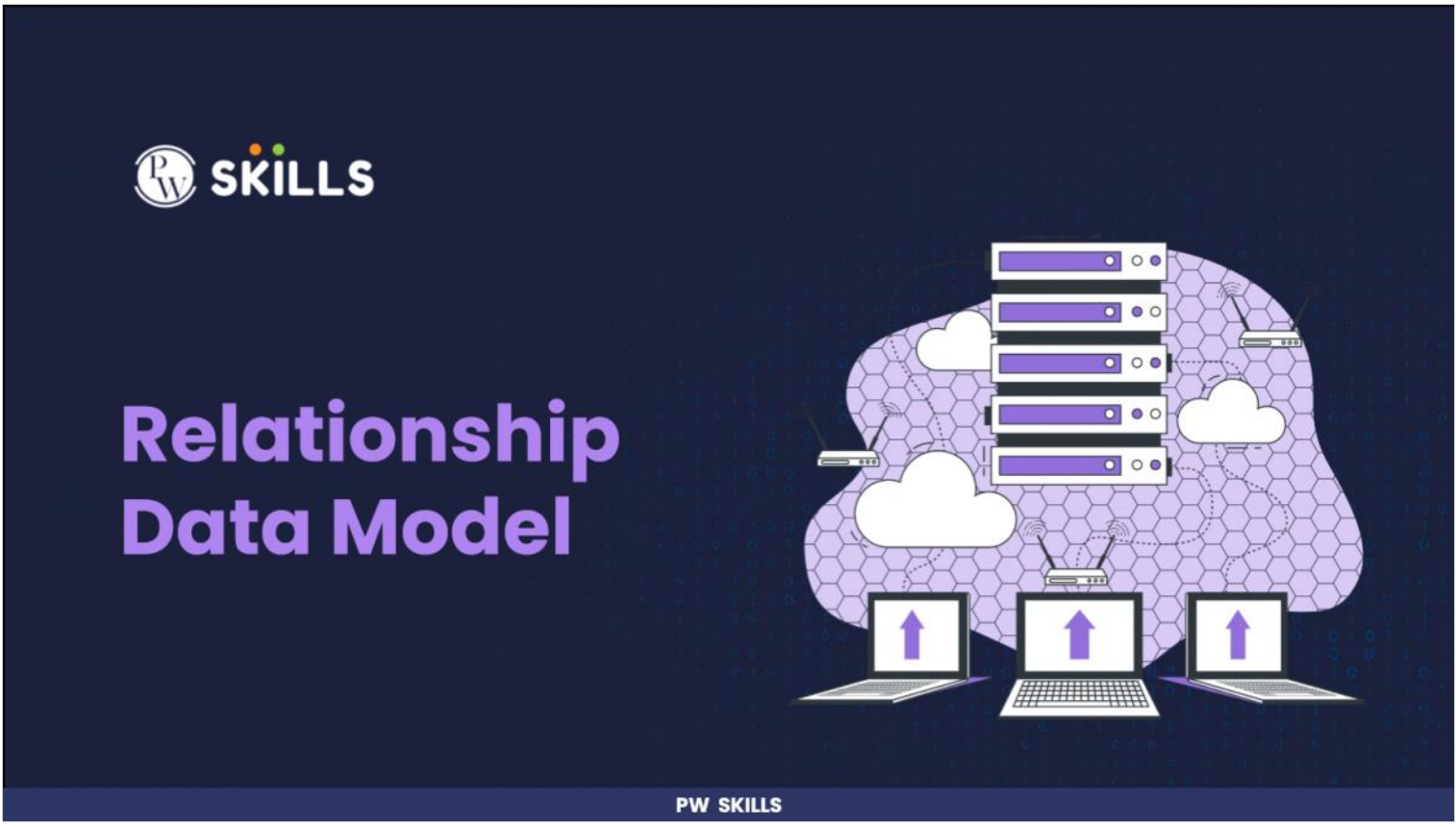
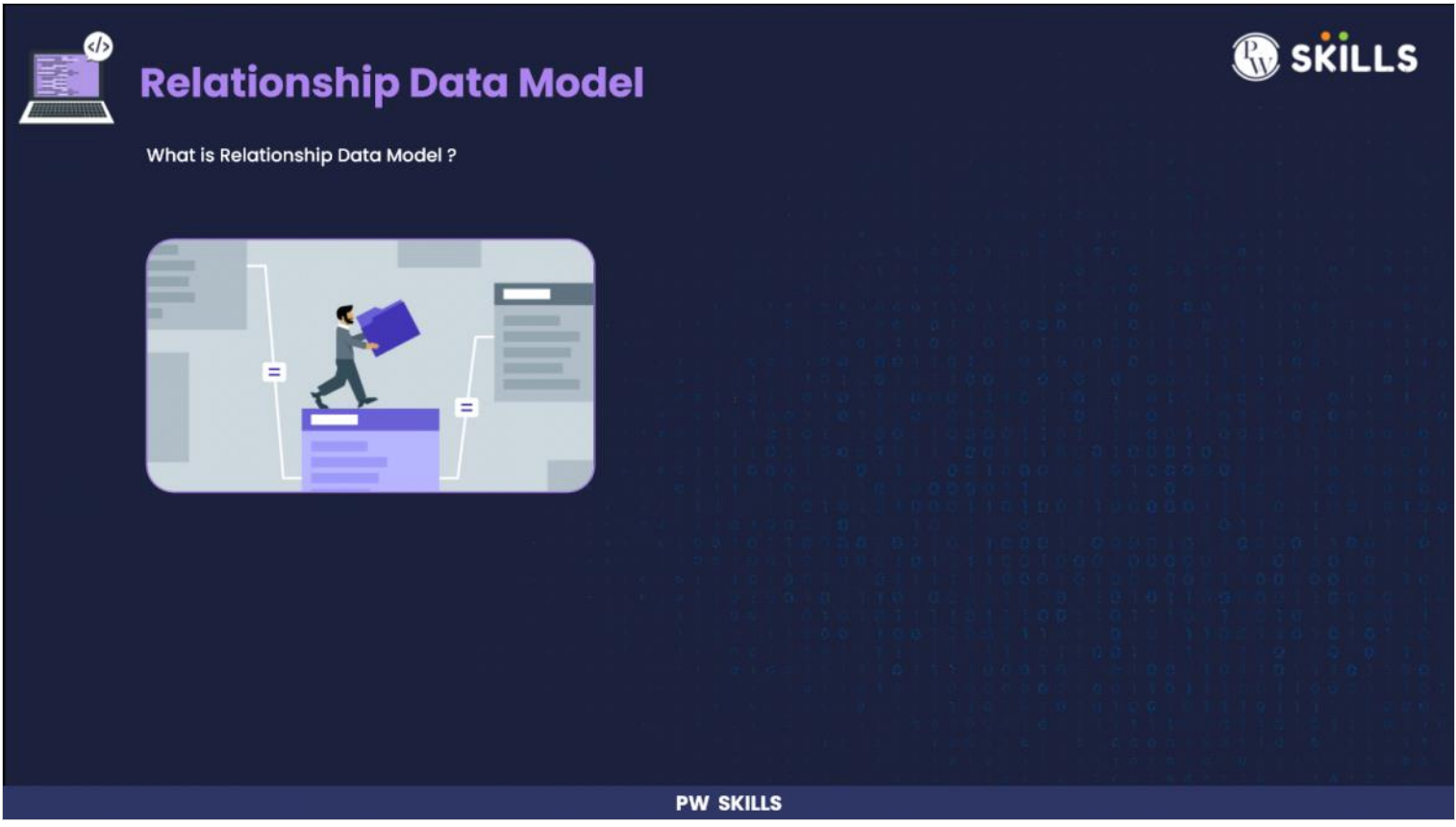




Relationship Data Model

Employee Table

Empno (PK)	Ename	Job	Deptno (FK)
101	A	Salesman	10
102	B	Manager	10
103	c	Manager	20

Department Table

Deptno (PK)	dname	loc
10	Sales	Chicago
20	Sales	Chicago
30	Finance	New York

Relationship Data Model

The relationship data model focuses on two things:

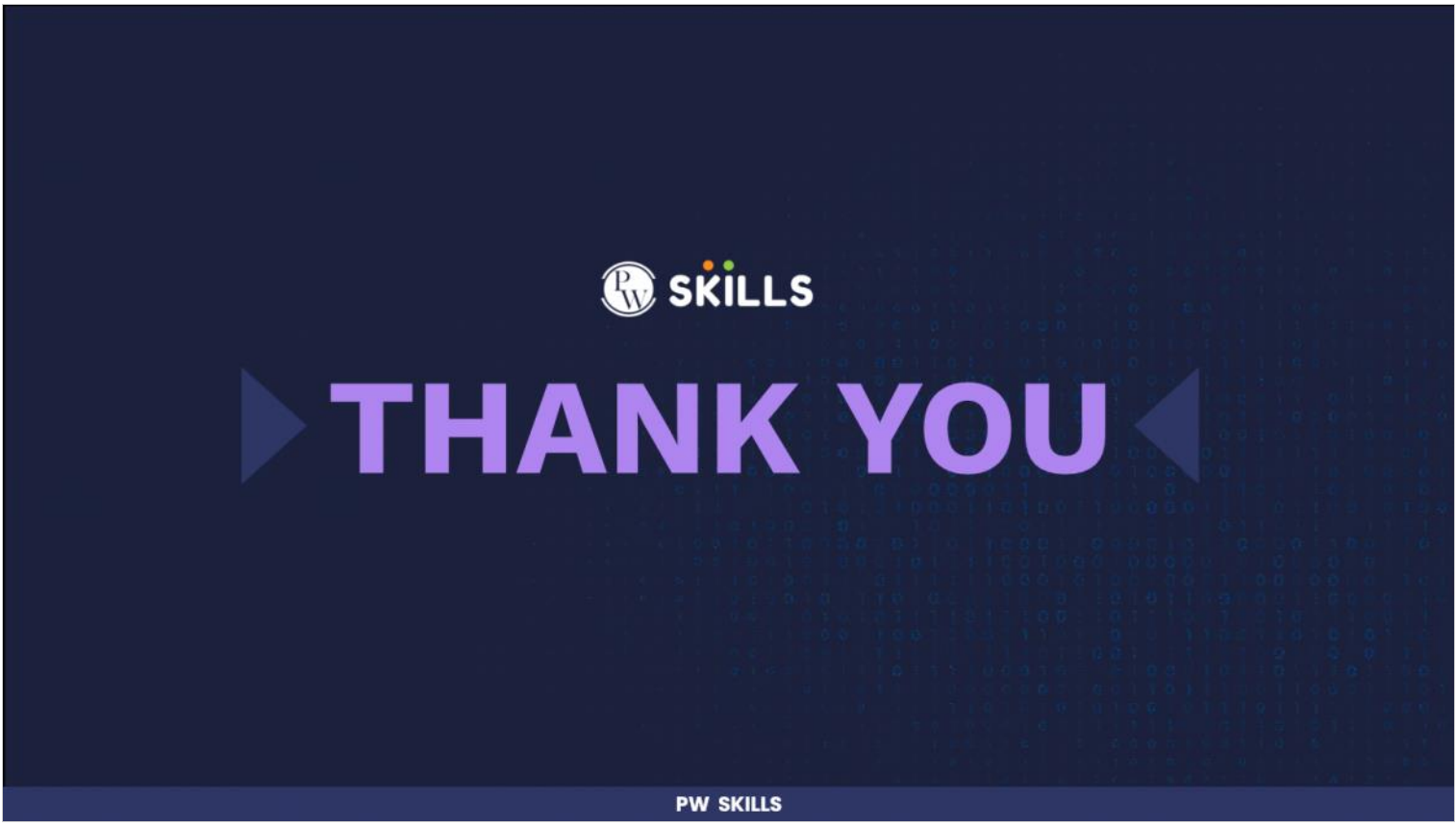
1. Tables.
2. Relationships.

Employee Table

Empno (PK)	Ename	Job	Deptno (FK)
101	A	Salesman	10
102	B	Manager	10
103	c	Manager	20

Department Table

Deptno (PK)	dname	loc
10	Sales	Chicago
20	Sales	Chicago
30	Finance	New York


SKILLS
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TYPES OF RELATIONSHIP

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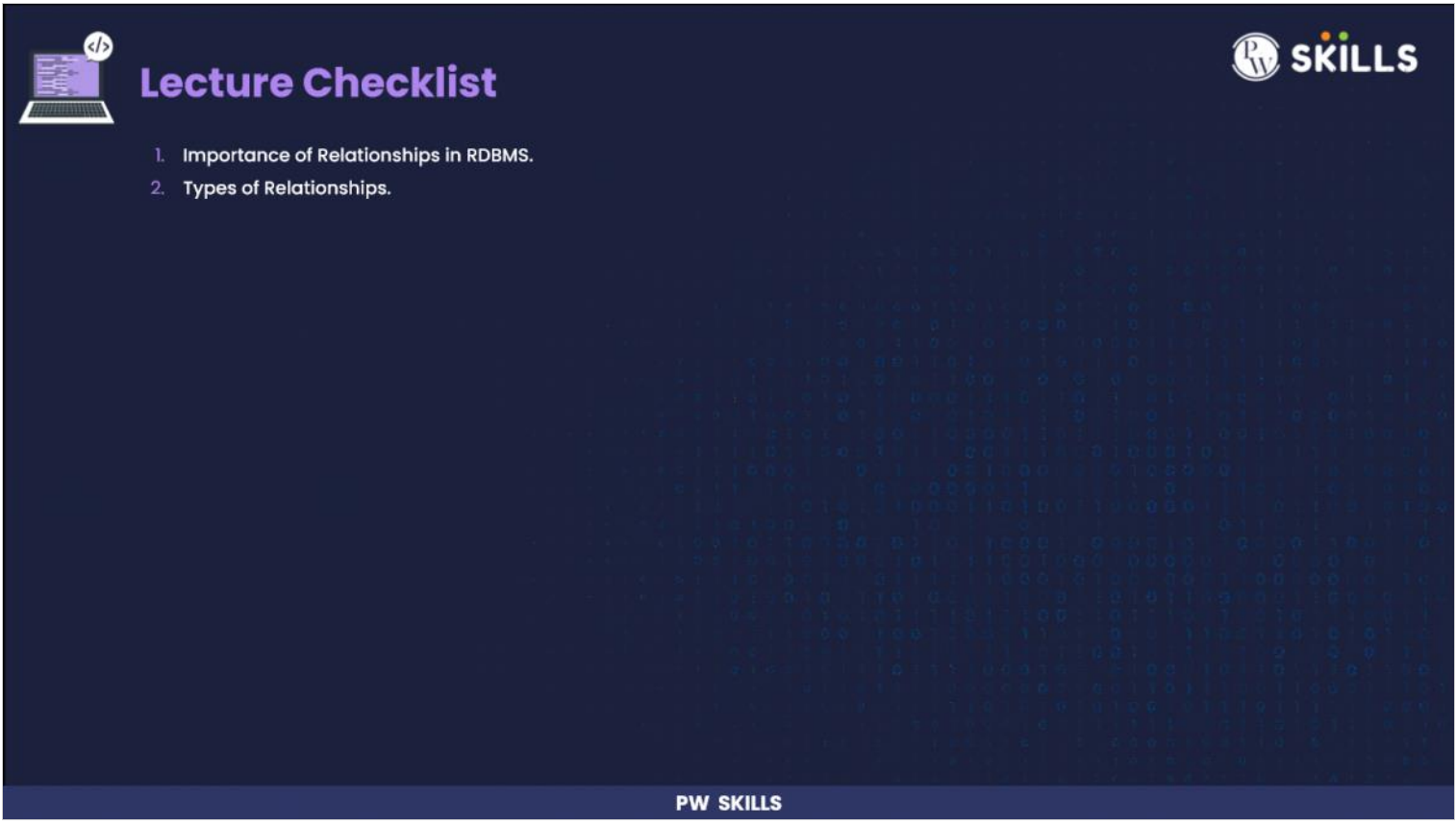

Importance of Relationships in RDBMS

The concept of relationships in RDBMS is inspired by daily life human relationships.

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Types of Relationships

One to One relationship

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Types of Relationships

One to One relationship: Citizens & Passport Number

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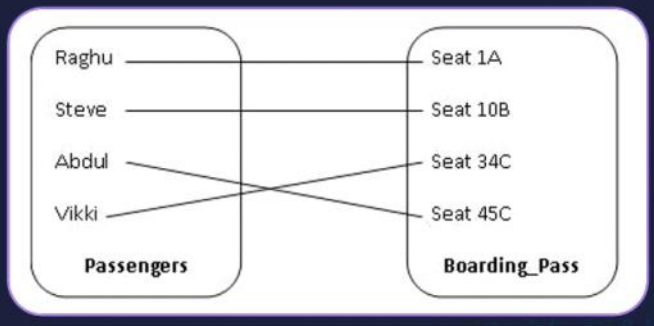
Types of Relationships

One to One relationship



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Types of Relationships

One to Many relationship: Country & Residents

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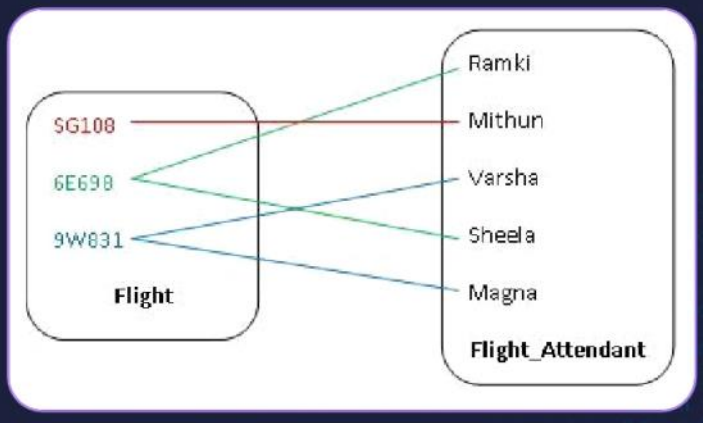
Types of Relationships

One to Many relationship



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Types of Relationships

Many To One relationship: Country & Residents

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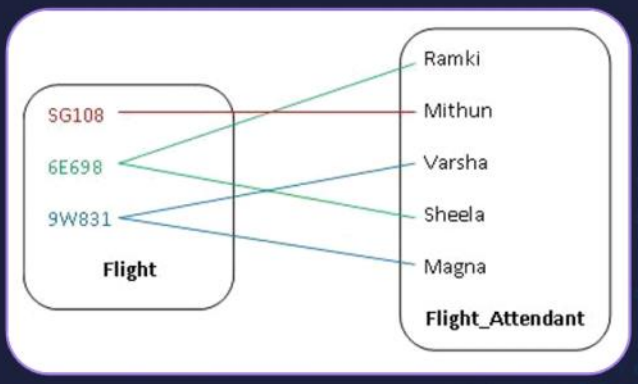
Types of Relationships

Many to One relationship



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Types of Relationships

Many To Many relationship: Tinder

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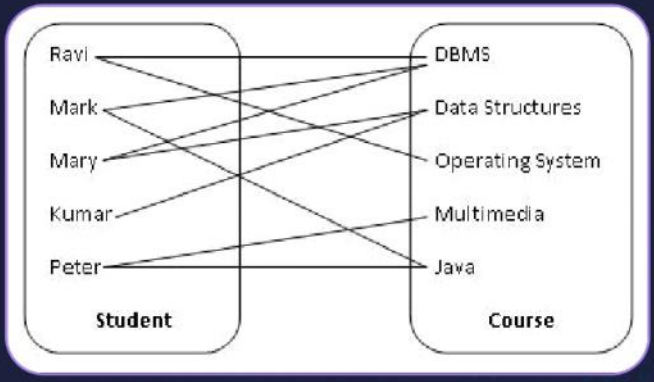
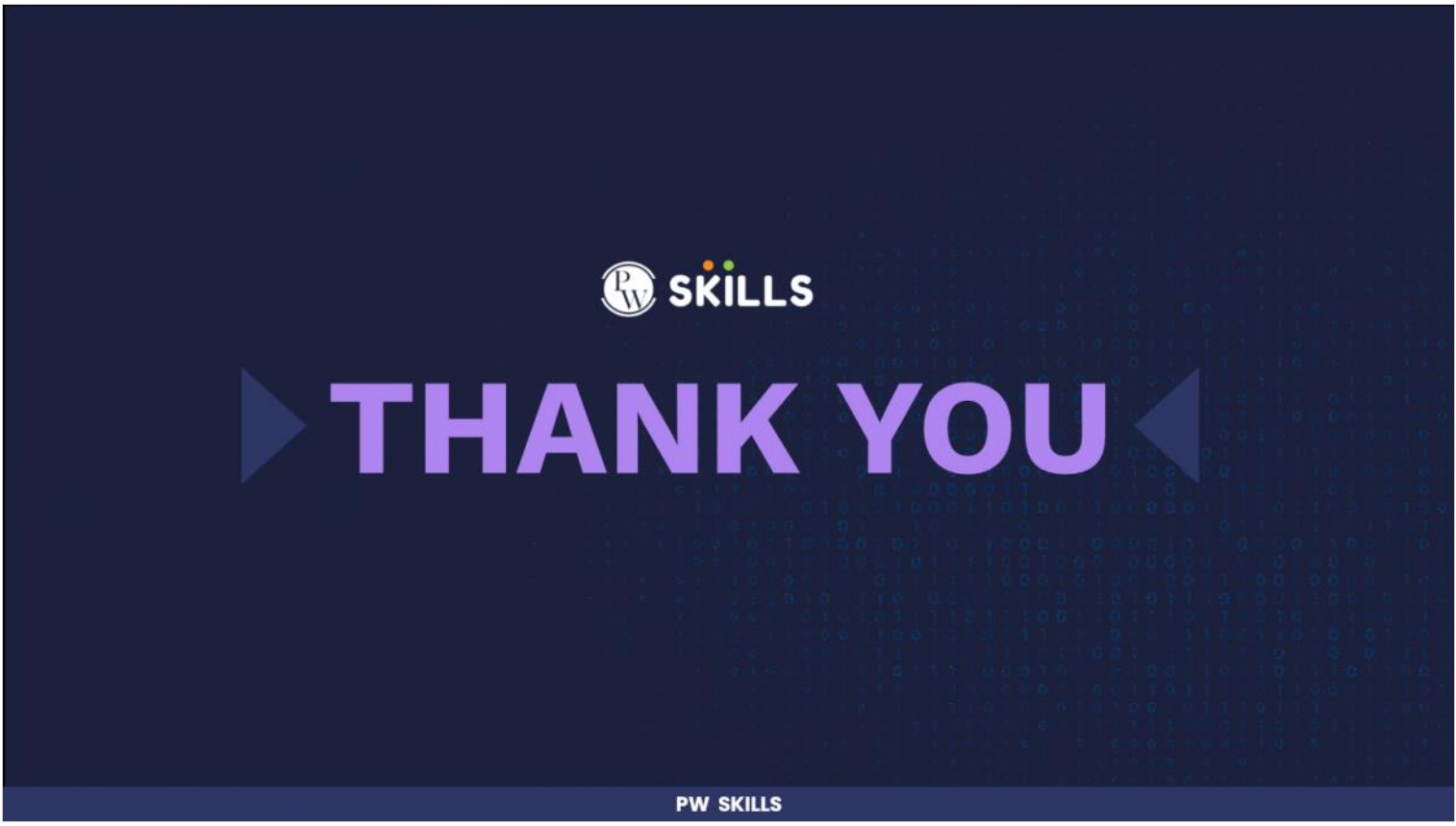
Types of Relationships

Many to Many relationship



PW SKILLS


SKILLS
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KEYS IN RDMS

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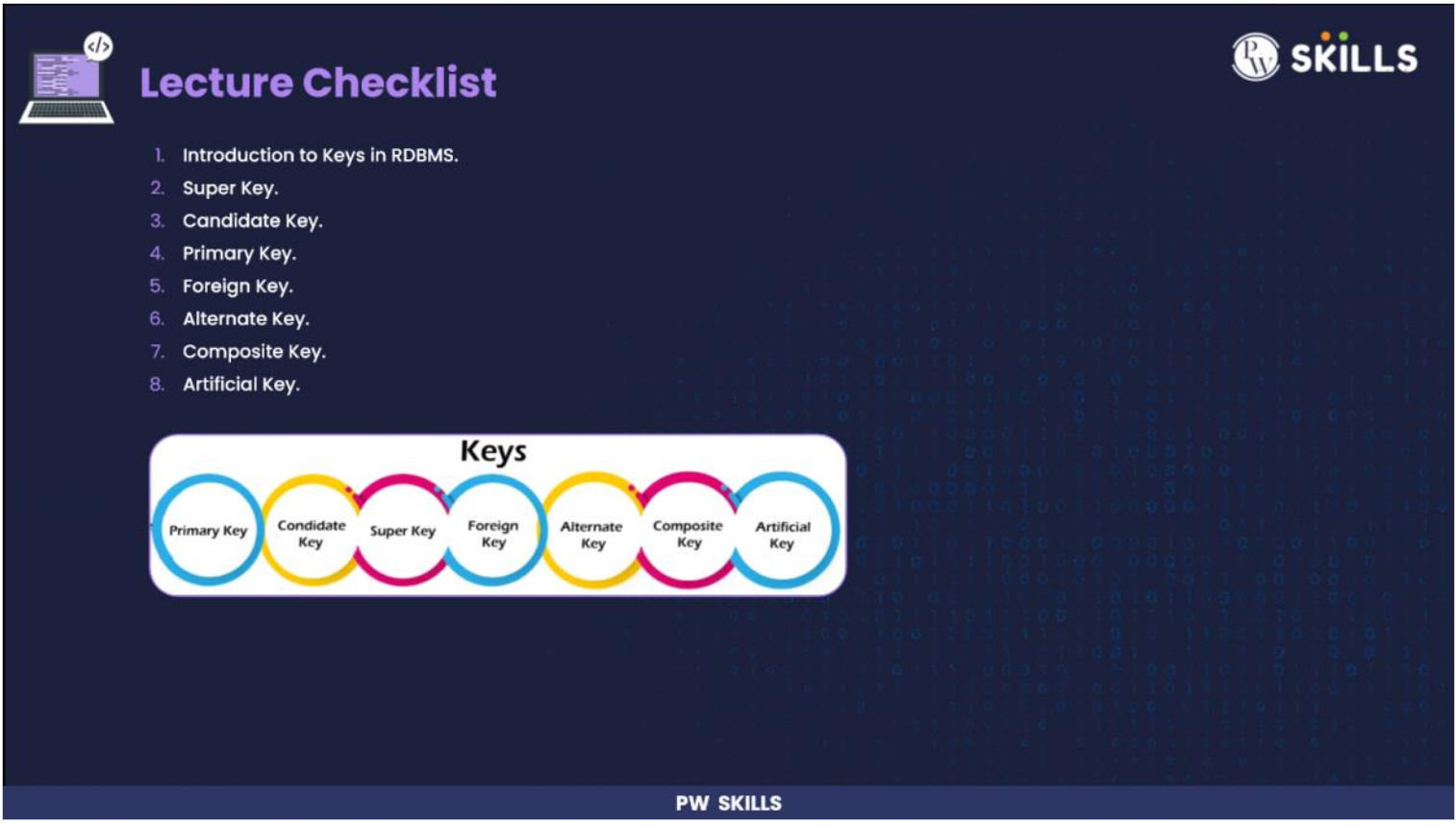

Introduction to Keys in RDBMS

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Super Key

Employee Table:

Column Name
Emp_ID
Emp_Name
Pan_Number
License_Number
Aadhar_number

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Candidate Key

What is candidate Key?

Employee Table:

Column Name
Emp_ID
Emp_Name
Pan_Number
License_Number
Aadhar_number

PW SKILLS

Candidate Key

How is it different from super key?

Employee Table:

Column Name
Emp_ID
Emp_Name
Pan_Number
License_Number
Aadhar_number

PW SKILLS

Primary Key

Employee Table:

Column Name
Emp_ID
Emp_Name
Pan_Number
License_Number
Aadhar_number

PW SKILLS

Primary Key

Column Name
Emp_ID (PK)
Emp_Name
Pan_Number
License_Number
Aadhar_number

PW SKILLS

Foreign Key

Column Name
Emp_ID
Emp_Name
Pan_Number
License_Number
Aadhar_Number
Department_ID

Column Name
Department_ID
Department_Name
Location
Manager_ID

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Foreign Key

Employee Table:

Column Name	Data Type	Primary Key	Foreign Key
Emp_ID	Integer	Yes	
Emp_Name	Text		
Pan_Number	Text		
License_Number	Text		
Aadhar_Number	Text		
Department_ID	Integer		Yes

PW SKILLS

Alternate Key

Alternate Key

Employee Table:

Column Name	Primary Key	Foreign Key	Alternate Key
Emp_ID	Yes		
Emp_Name			
Pan_Number			Yes
License_Number			Yes
Aadhar_Number			Yes
Department_ID		Yes	

Composite Key

OrderDetails Table:

Column Name
Cust_ID
Order_ID
Prod_Code
Prod_Name

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Artificial Key

OrderDetails Table:

Column Name
Cust_ID
Order_ID
Prod_Code
Prod_Name

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Artificial Key

OrderDetails Table:

Field	Description
ID	Artificial key for uniquely identifying each order detail record
Cust_ID	Customer ID associated with the order
Order_ID	Order ID
Prod_Code	Product code
Prod_Name	Name of the product associated with the order

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NORMALISATION INTRODUCTION

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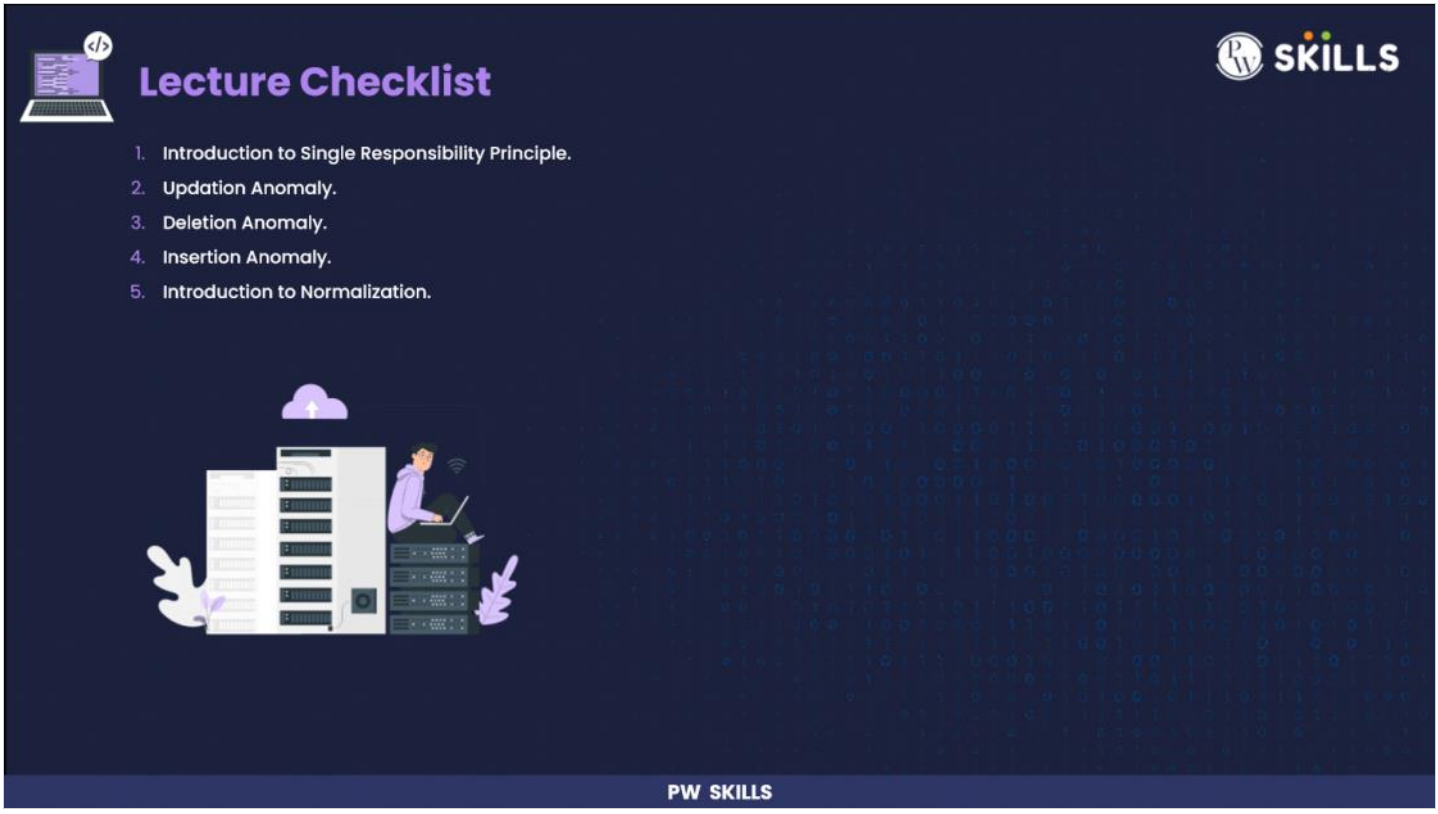

Introduction to Single Responsibility Principle

Single Responsibility Principle.

Std_Id	Std_Name	Std_Batch	Course_Id	Course_Name	Course_Instructor
S101	Dhoni	B1	C101	Data Science	Mr. Ganguly
S102	Pandya	B1	C102	Big Data	Mr. Dev
S103	Kohli	B1	C103	Full Stack	Mr. Ishanth
S104	Rahul	B1	C104	Back end	Mr. John
S105	Rohith	B1	C105	Digital Marketing	Mr. Irfan
S106	Bumrah	B1	C106	Data Analyst	Mr. Sachin

Updation anomaly

Std_Id	Std_Name	Std_Batch	Course_Id	Course_Name	Course_Instructor
S101	Dhoni	B1	C101	Data Science	Mr. Ganguly
S102	Pandya	B1	C102	Big Data	Mr. Dev
S103	Kohli	B1	C103	Full Stack	Mr. Ishanth
S104	Rahul	B1	C104	Back end	Mr. John
S105	Rohith	B1	C105	Digital Marketing	Mr. Irfan
S106	Bumrah	B1	C106	Data Analyst	Mr. Sachin

Updation anomaly

Std_Id	Std_Name	Std_Batch	Course_Id	Course_Name	Course_Instructor
S101	Dhoni	B1	C101	Data Science	Mr. Vishwa
S102	Pandya	B1	C102	Big Data	Mr. Dev
S103	Kohli	B1	C103	Full Stack	Mr. Ishanth
S104	Rahul	B1	C104	Back end	Mr. John
S105	Rohith	B1	C105	Digital Marketing	Mr. Irfan
S106	Bumrah	B1	C106	Data Analyst	Mr. Sachin

Deletion anomaly

Std_Id	Std_Name	Std_Batch	Course_Id	Course_Name	Course_Instructor
S101	Dhoni	B1	C101	Data Science	Mr. Ganguly
S102	Pandya	B1	C102	Big Data	Mr. Dev
S103	Kohli	B1	C103	Full Stack	Mr. Ishanth
S104	Rahul	B1	C104	Back end	Mr. John
S105	Rohith	B1	C105	Digital Marketing	Mr. Irfan
S106	Bumrah	B1	C106	Data Analyst	Mr. Sachin

Deletion anomaly

Std_Id	Std_Name	Std_Batch	Course_Id	Course_Name	Course_Instructor
S101	Dhoni	B1	C101	Data Science	Mr. Ganguly
S102	Pandya	B1	C102	Big Data	Mr. Dev
S103	Kohli	B1	C103	Full Stack	Mr. Ishanth
S104	Rahul	B1	C104	Back end	Mr. John
S106	Bumrah	B1	C106	Data Analyst	Mr. Sachin

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Insertion anomaly

Std_Id	Std_Name	Std_Batch	Course_Id	Course_Name	Course_Instructor
S101	Dhoni	B1	C101	Data Science	Mr. Ganguly
S102	Pandya	B1	C102	Big Data	Mr. Dev
S103	Kohli	B1	C103	Full Stack	Mr. Ishanth
S104	Rahul	B1	C104	Back end	Mr. John
S105	Rohith	B1	C105	Digital Marketing	Mr. Irfan
S106	Bumrah	B1	C106	Data Analyst	Mr. Sachin

PW SKILLS

Normalization

- Denormalized table.
- Normalization.

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THANK YOU

PW SKILLS

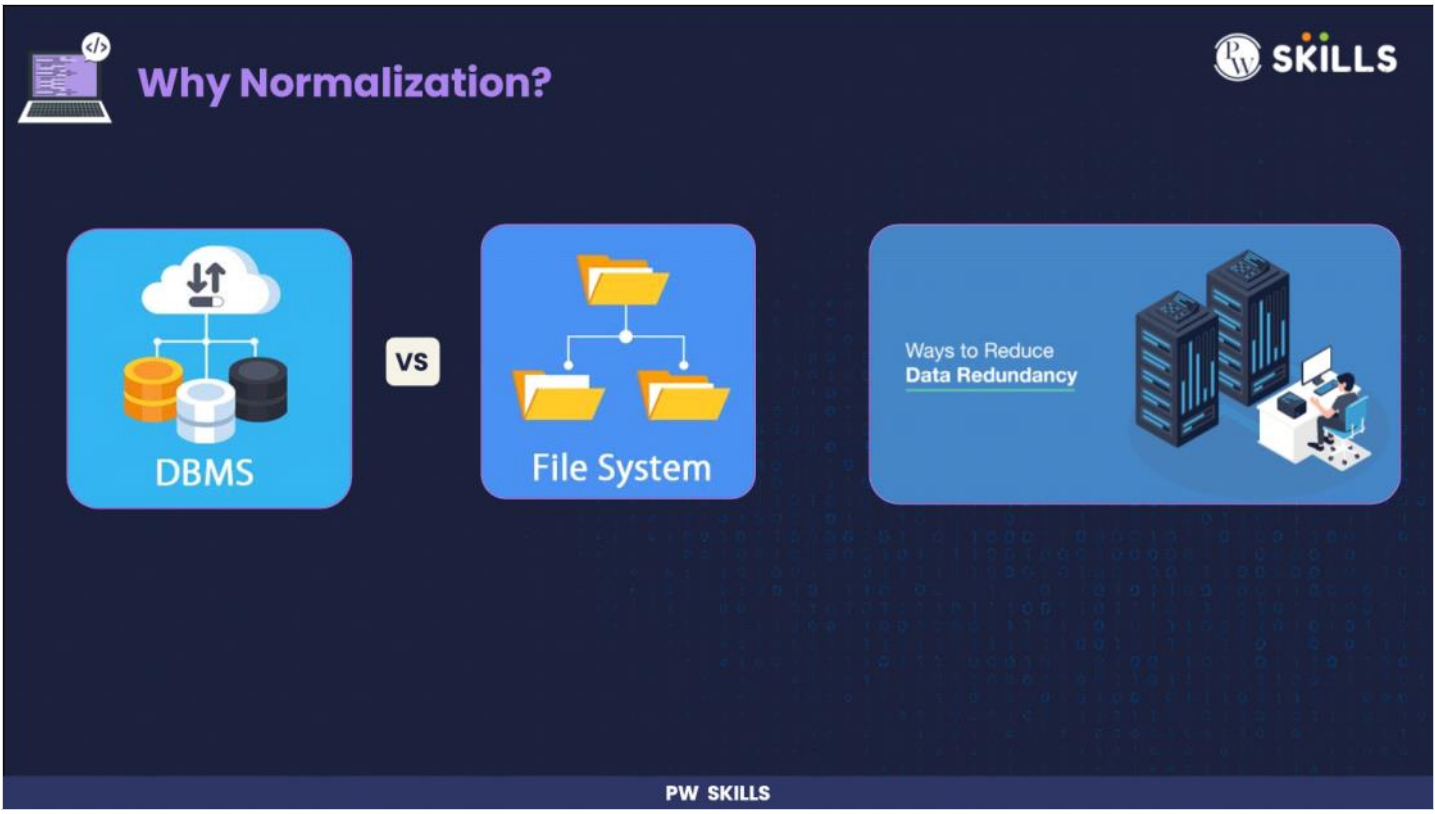
SKILLS

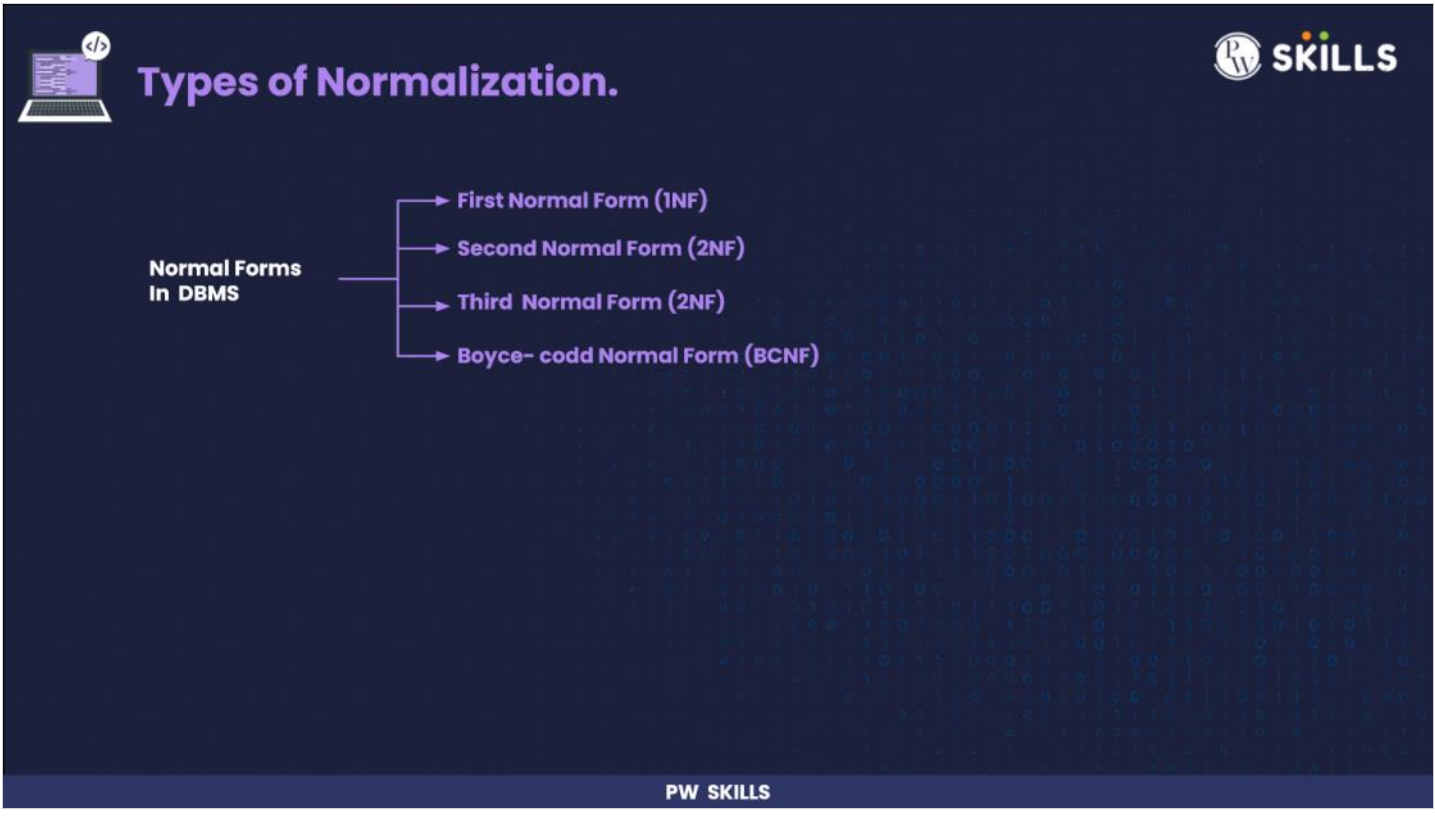
Why Normalization?

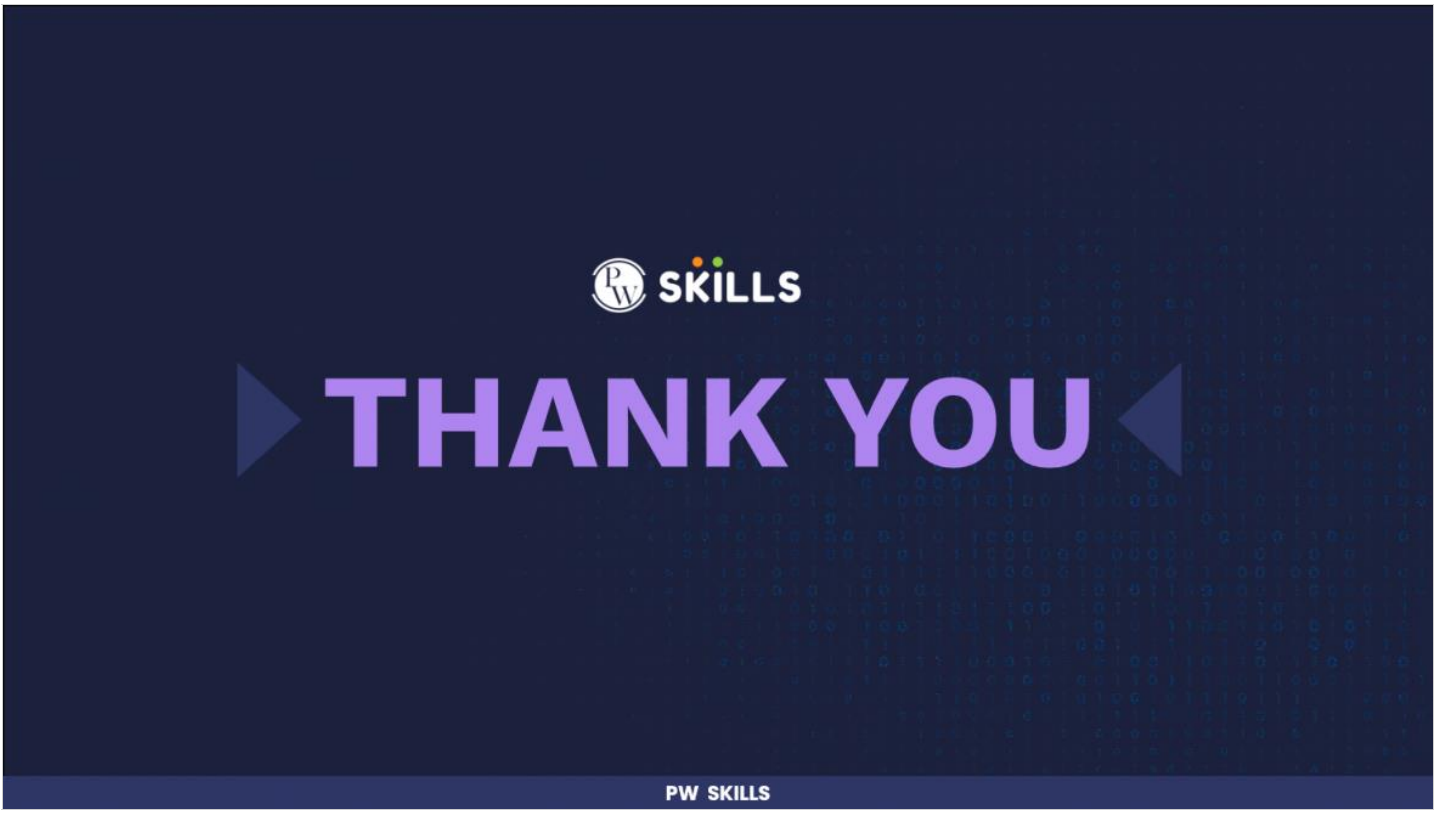
Lecture Checklist

SKILLS

1. Why Normalization?
2. Types of Normalization.


Why Normalization?
SKILLS
DBMS
VS
File System
Ways to Reduce
Data Redundancy
PW SKILLS


Types of Normalization.
SKILLS
Normal Forms
In DBMS
First Normal Form (1NF)
Second Normal Form (2NF)
Third Normal Form (2NF)
Boyce- codd Normal Form (BCNF)
PW SKILLS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1 NF

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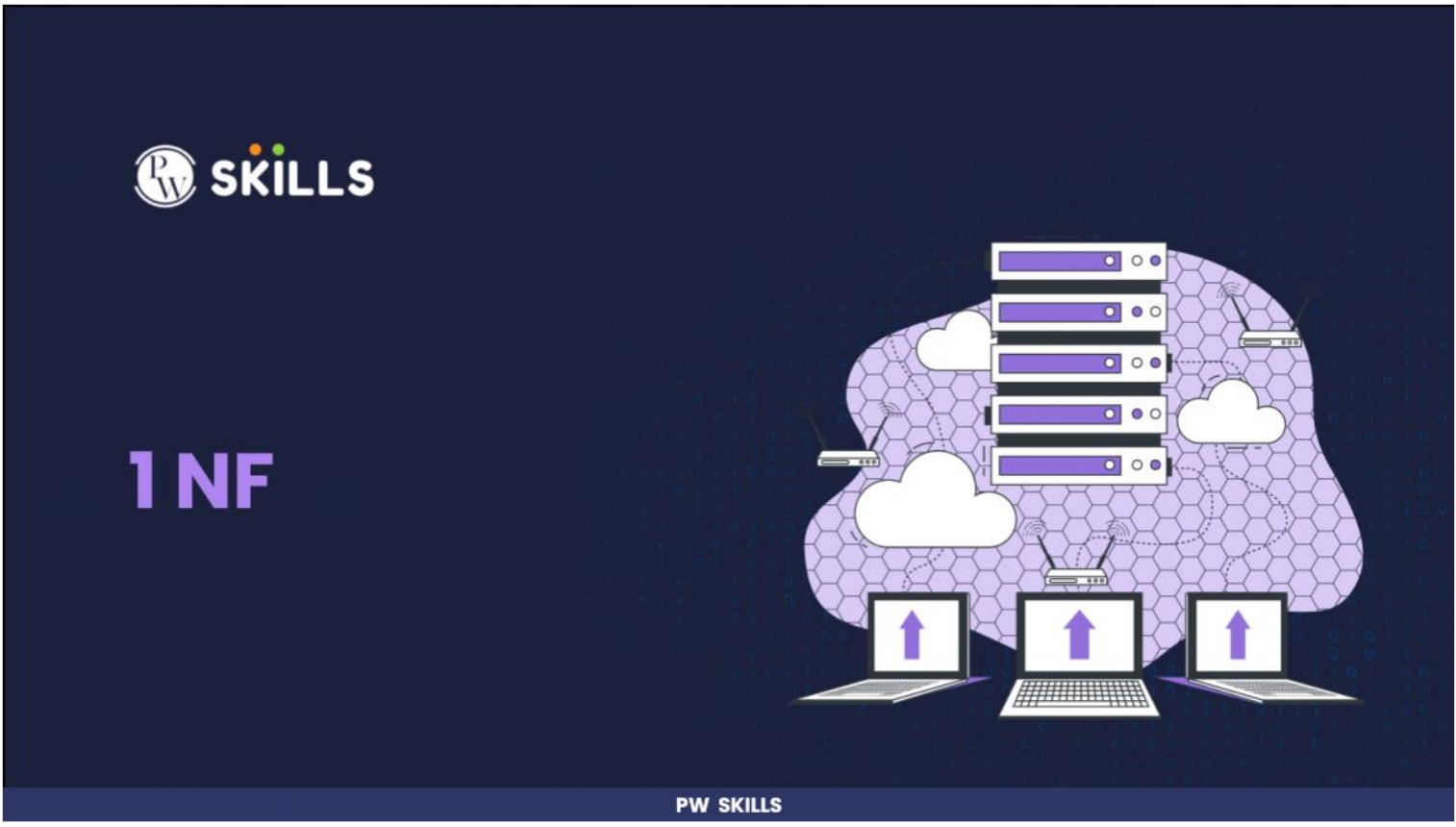

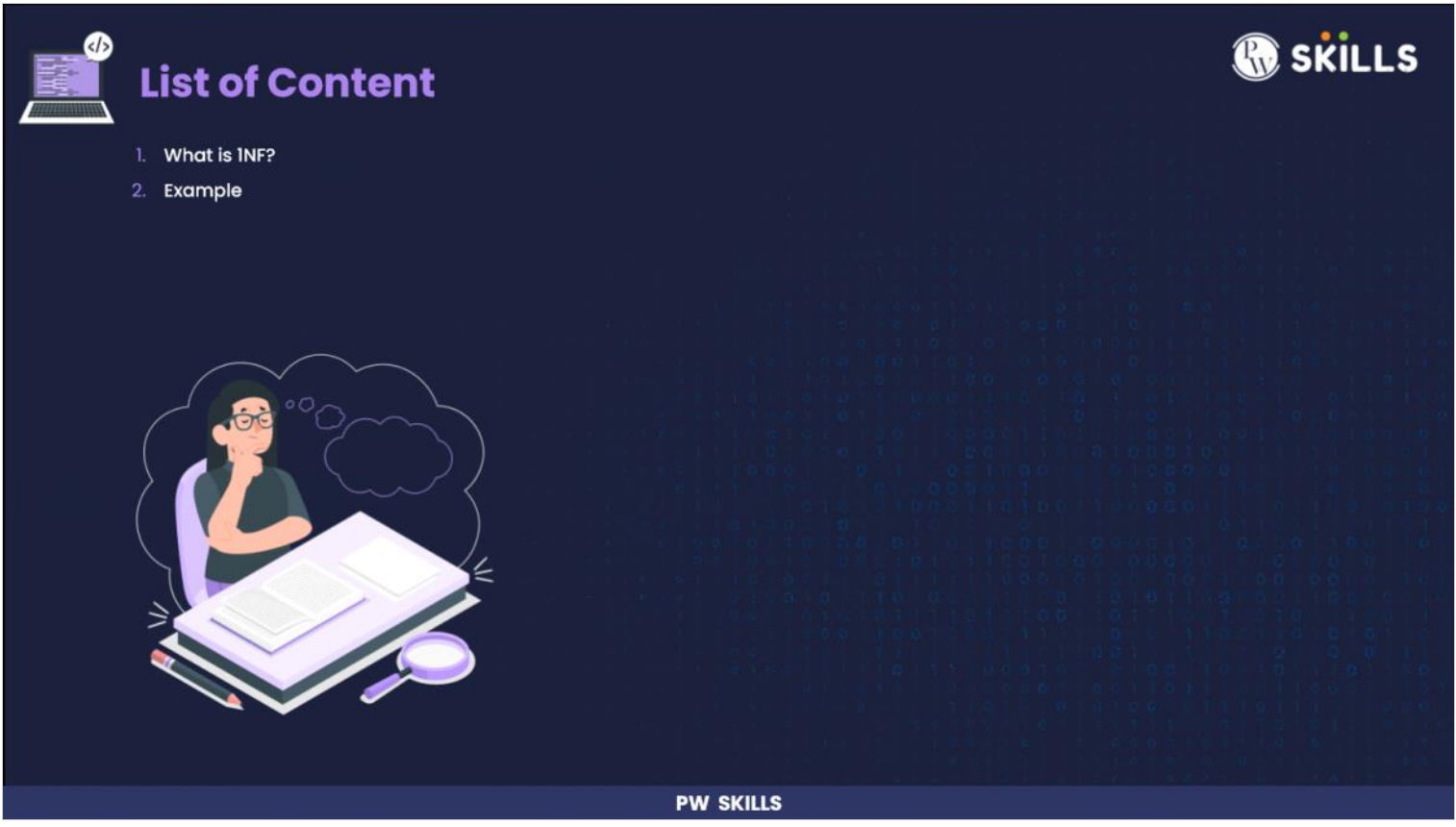

What is 1NF ?

For a table to be in 1NF:

- All cells should have single/atomic values and no multiple values
- There has to be a primary key that uniquely identifies each row.

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Use case for Car Rental Company

PW SKILLS

Use case for Car Rental Company

Assume the table below for a car rental company where owners can rent out their cars and customers can take the car on rent for a certain time.

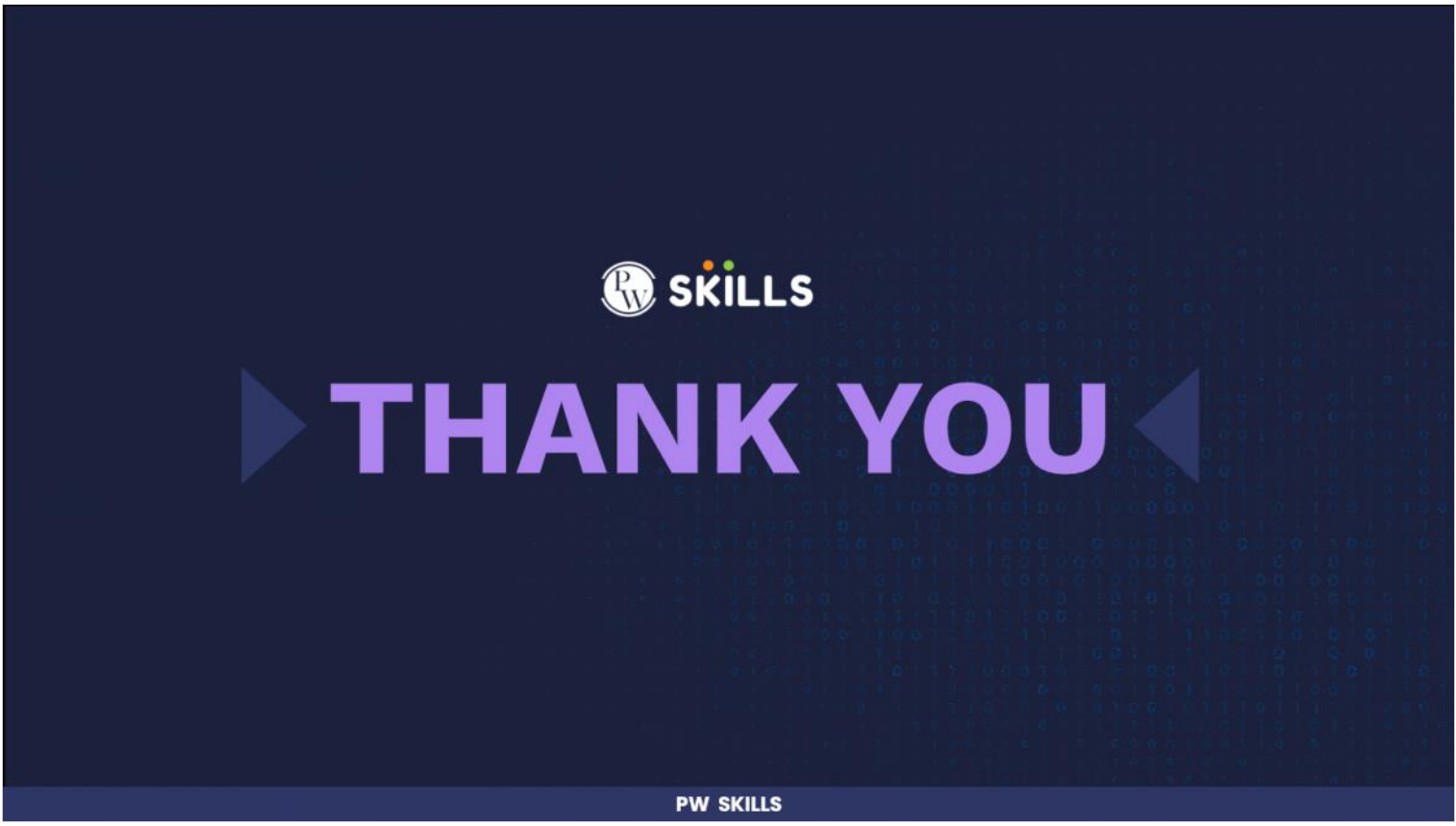
Table :

Cust_Id	Cust_Name	Car_Num_Plate	Car_Name	Date_of_trans	Owner_id	Owner_name
13452	Sachin	KA51MK1234 KA51MK5436	Swift Thar	12/01/2020 18/01/2020	O_76 O_78	Dev Irfan
45621	Rahul	KA51MK3421 KA51MK6534 KA51MK3789	BMW HondaCity Swift	12/01/2020 14/01/2020 15/01/2020	O_54 O_65 O_86	Rohit Shikhar Irfan

Use case for Car Rental Company

If it has to be converted into 1NF the first thing to be done is to fix the multi-valued cells. In order to fix it, we need to break each row into multiple rows which will result in the following transformed table.

Cust_Id	Cust_Name	Car_Num_Plate	Car_Name	Date_of_trans	Owner_id	Owner_name
13452	Sachin	KA51MK1234	Swift	12/01/2020	O_76	Dev
13452	Sachin	KA51MK5436	Thar	18/01/2020	O_78	Irfan
45621	Rahul	KA51MK3421	BMW	12/01/2020	O_54	Rohit
45621	Rahul	KA51MK6534	HondaCity	14/01/2020	O_65	Shikhar
45621	Rahul	KA51MK3789	Swift	15/01/2020	O_86	Irfan


SKILLS
THANK YOU
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2 NF

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What is 2NF (Second Normal Form) Dependency?

The **Second Normal Form (2NF)** is a step in the normalization process in database design. It ensures that the table is **free from partial dependencies**.

Dependency in 2NF

- A **partial dependency** occurs when a **non-prime attribute** (i.e., an attribute that is not part of the candidate key) depends only on a **part** of a composite primary key and not on the entire primary key.
- In **2NF**, every non-prime attribute must depend on the **whole primary key**, not just a part of it.

Conditions for 2NF

1. **The table must first be in 1NF** (First Normal Form):
   - No repeating groups or multivalued attributes.
   - Each column should have atomic values.
2. **No partial dependency**:
   - All non-prime attributes must be fully functionally dependent on the entire primary key.
   -

Example

Table in 1NF (but not 2NF):

plaintext Copy code

```
OrderID   ProductID   ProductName   OrderDate
1         101         Pen           2024-01-01
1         102         Notebook      2024-01-01
2         101         Pen           2024-01-02
```

- **Primary Key**: (OrderID, ProductID)
- **Non-prime Attributes**: `ProductName`, `OrderDate`

Partial Dependency:

- `ProductName` depends only on `ProductID` (not on the entire composite key).
- `OrderDate` depends only on `OrderID` (not on the entire composite key).

Table in 2NF (after removing partial dependencies):

Decompose into two tables:

1. **Products Table:**

plaintext Copy code

```
ProductID   ProductName
101         Pen
102         Notebook
```

2. **Orders Table:**

plaintext Copy code

```
OrderID   ProductID   OrderDate
1         101         2024-01-01
1         102         2024-01-01
2         101         2024-01-02
```

3 NF

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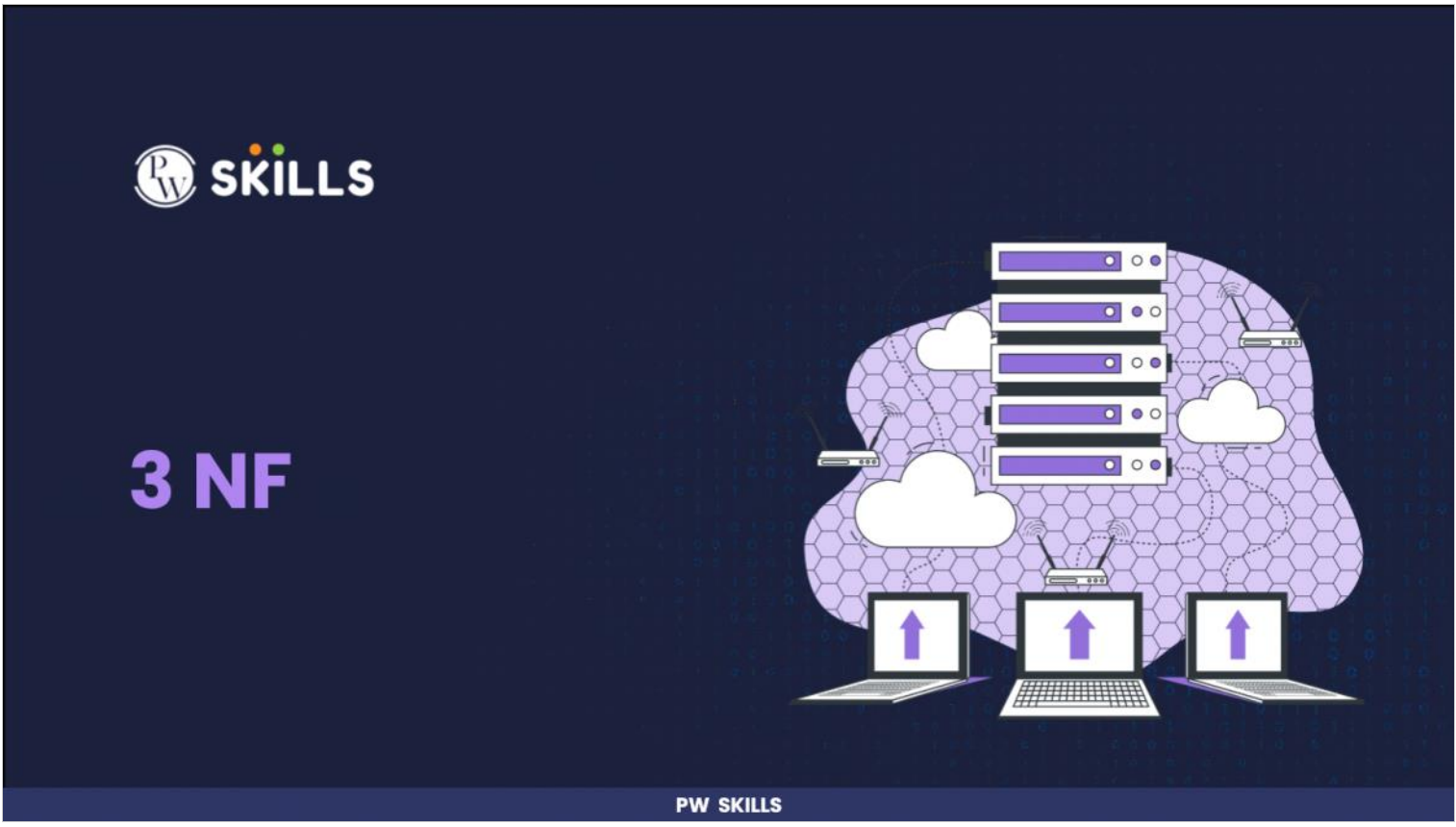

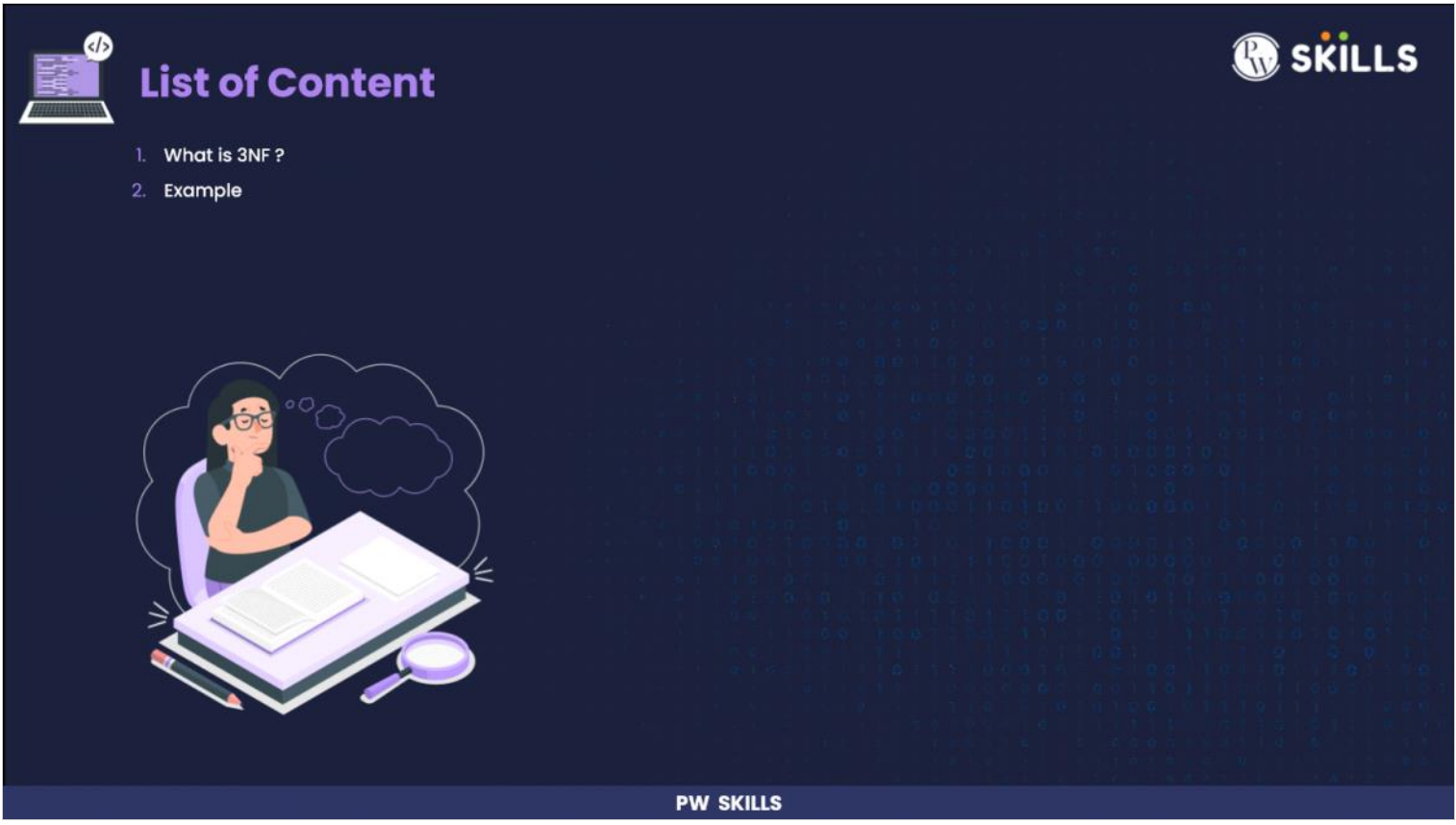

What is 3 NF ?

A relation is in third normal form, if:

- it is in second normal form and
- there is no transitive dependency for non-prime attributes

PW SKILLS

Example :

Table 1 :

Car_Num_Plate	Date_of_trans	Cust_Id	Cust_Name
KA51MK1234	12/01/2020	13452	Sachin
KA51MK5436	18/01/2020	13452	Sachin
KA51MK3421	12/01/2020	45621	Rahul
KA51MK6534	14/01/2020	45621	Rahul
KA51MK3789	15/01/2020	45621	Rahul

Table 2 :

Car_Num_Plate	Car_Name	Owner_id	Owner_name
KA51MK1234	Swift	O_76	Dev
KA51MK5436	Thar	O_78	Irfan
KA51MK3421	BMW	O_54	Rohit
KA51MK6534	HondaCity	O_65	Shikhar
KA51MK3789	Swift	O_86	Irfan

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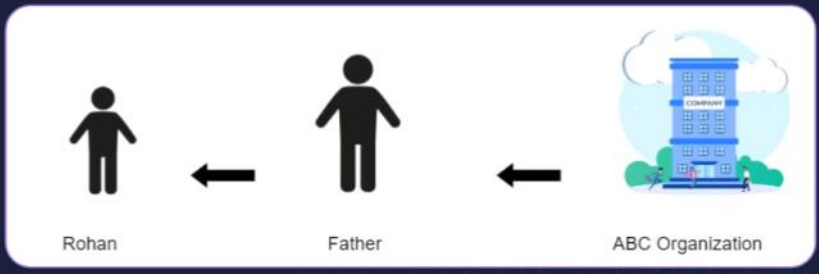
Transitive dependency



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3 NF

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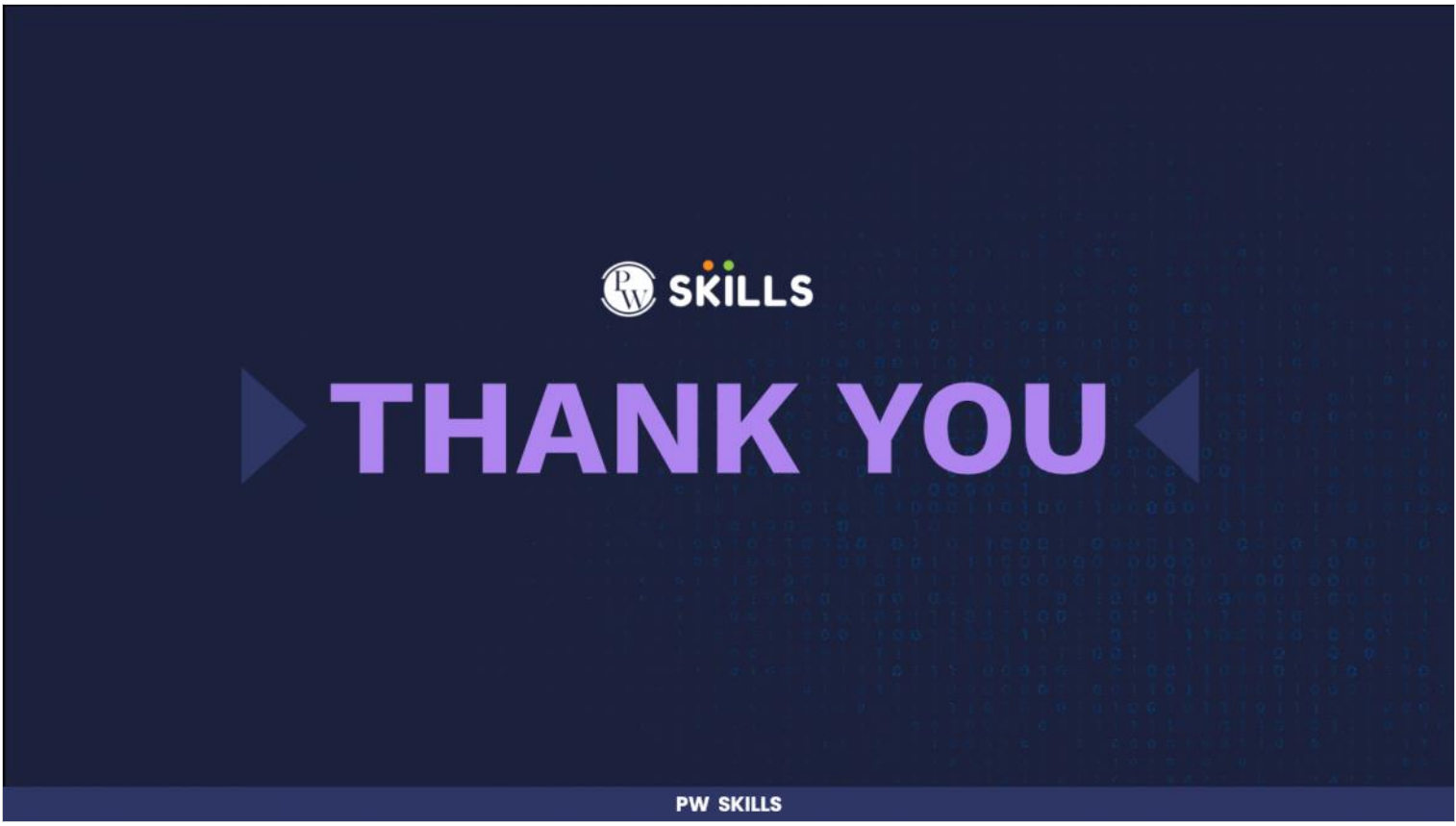
SKILLS
THANK YOU
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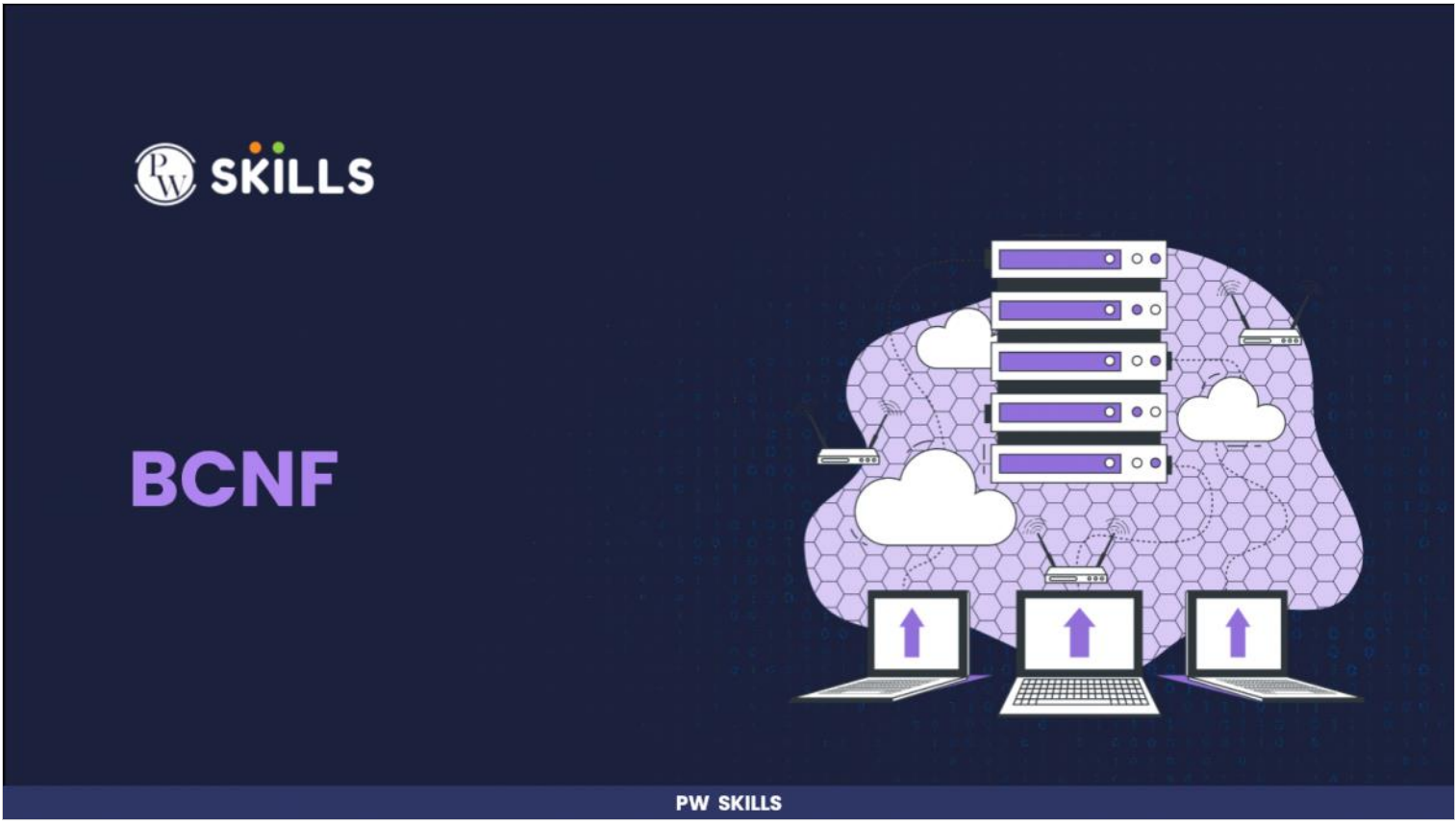
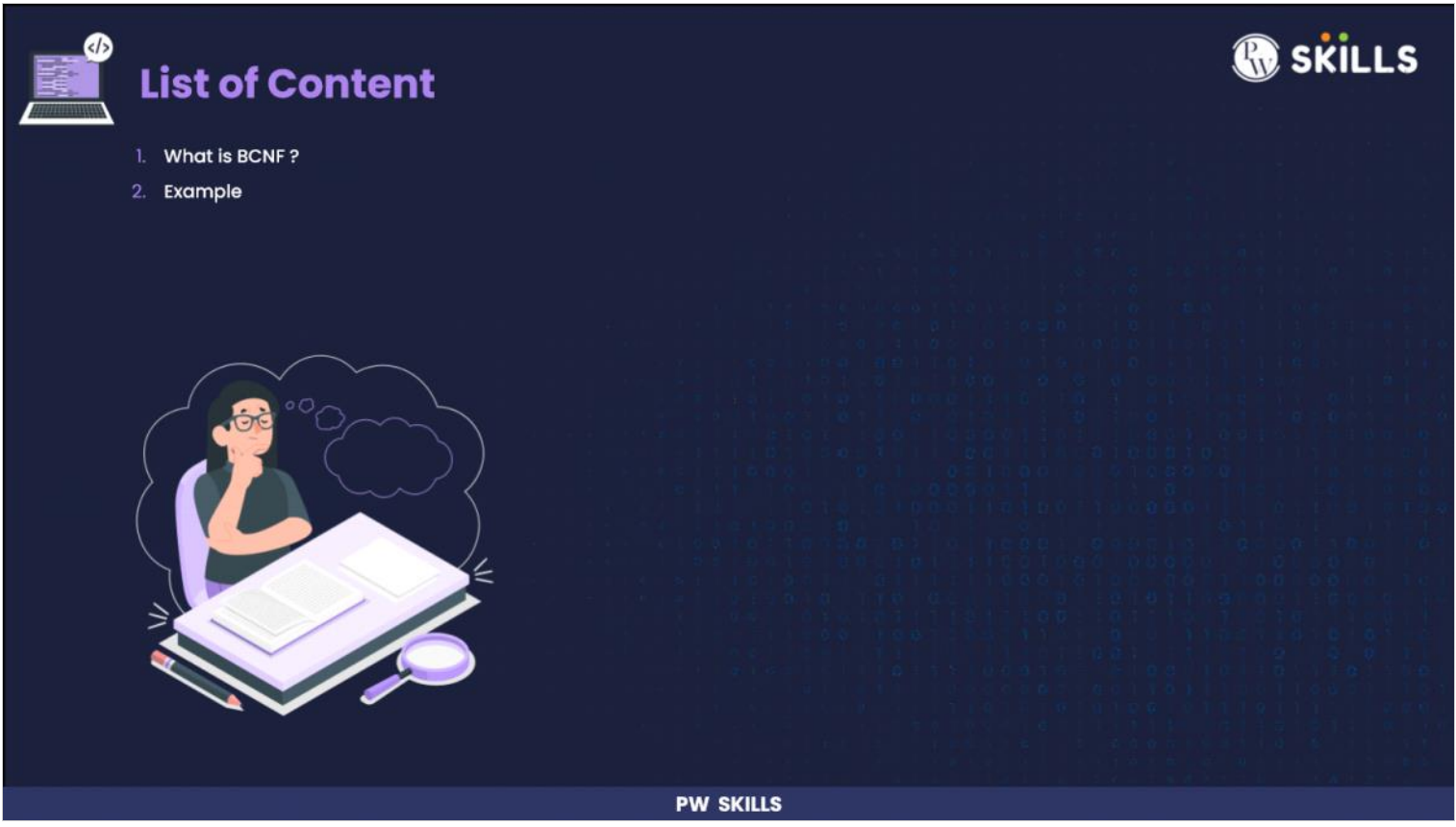
BCNF

08 January 2025 11:22





What is BCNF ?

For a table to be in BCNF:

It should be in 3NF

if every functional dependency X → Y, X is the super key of the table or in simple words,

If Y depends on X then X should be a part of the primary key.

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BCNF

Student_Id	Subject	Professor_Id
S101	Maths-100	P101
S101	CS-101	P102
S102	Maths-100	P103
S102	Civil-101	P104
S103	Electrical-100	P101

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What to do to bring it in BCNF ?

Student_Id	Professor_Id
S101	P101
S101	P102
S102	P103
S102	P104
S103	P101

Professor_Id	Subject
P101	Maths-100
P102	CS-101
P103	Maths-100
P104	Civil-101

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THANK YOU

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JOINS

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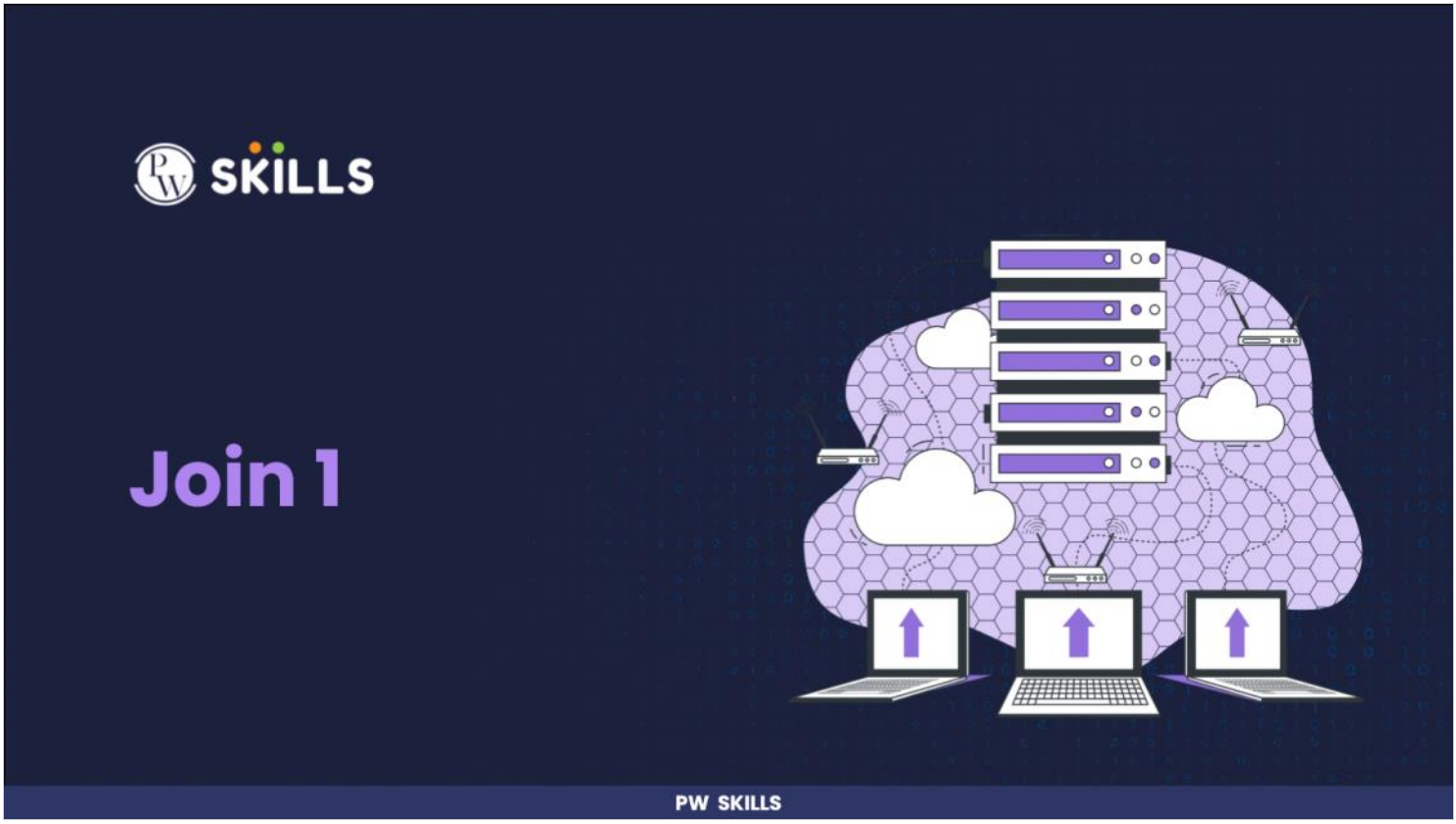

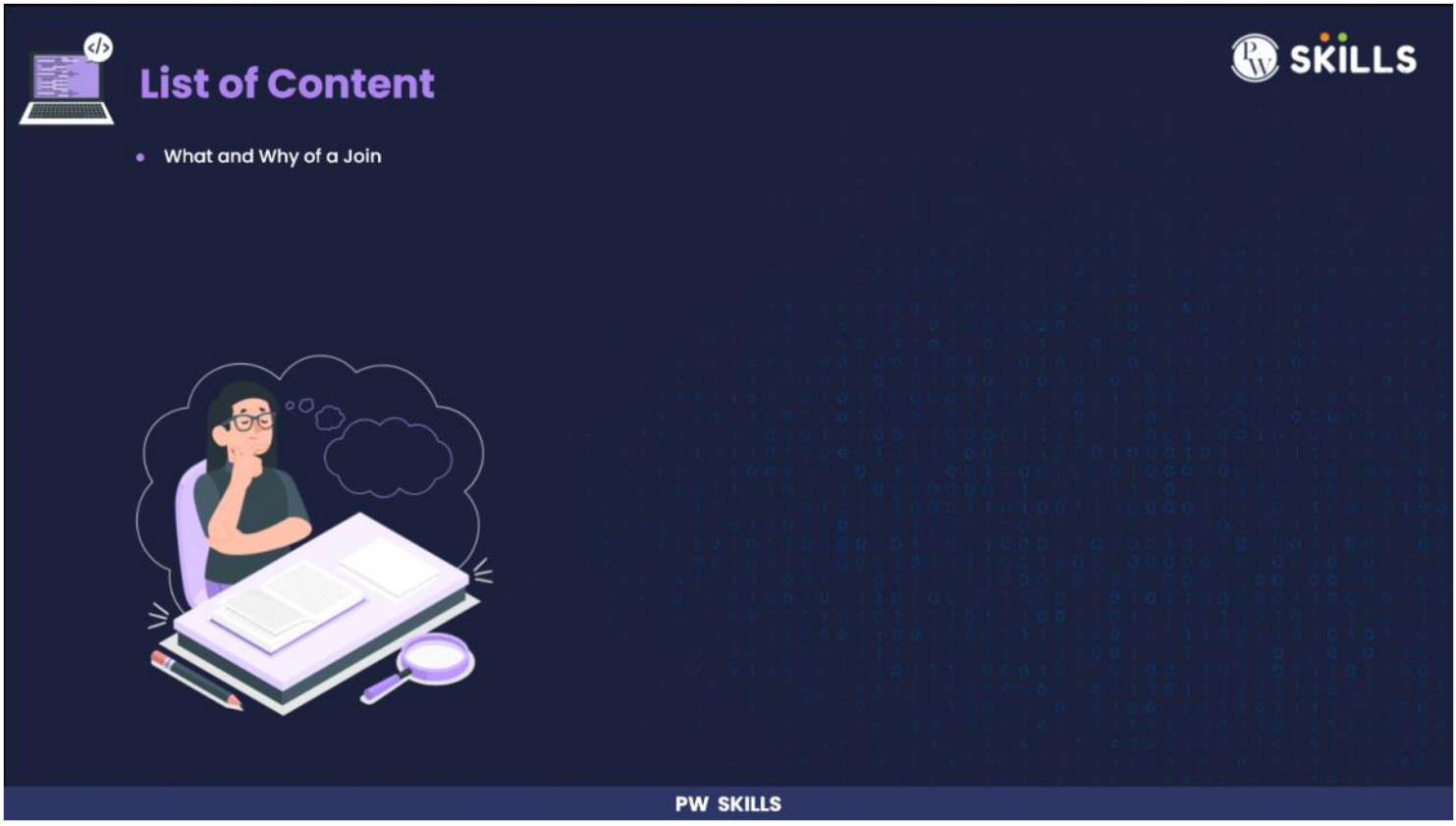

What is a Join?

- What and Why of a Join

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Why do we need Join ?

Suppose you want to understand/ fetch the data/report for customers in the age group of 25-30 years. For instance, what is the amount of sales and what is the hottest item on sale today in this age group.

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Why should you learn the concept ?

In the future or currently, if you are working with a firm that uses the concept of RDBMS, you should definitely know the concept of Joins.

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THANK YOU

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Join 2

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List of Content

- Types of Joins

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Inner Join
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Right Table
PW SKILLS

Left Join
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Left Table
Right Table
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Right Join
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Left Table
Right Table
PW SKILLS

Full Join
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Left Table
Right Table
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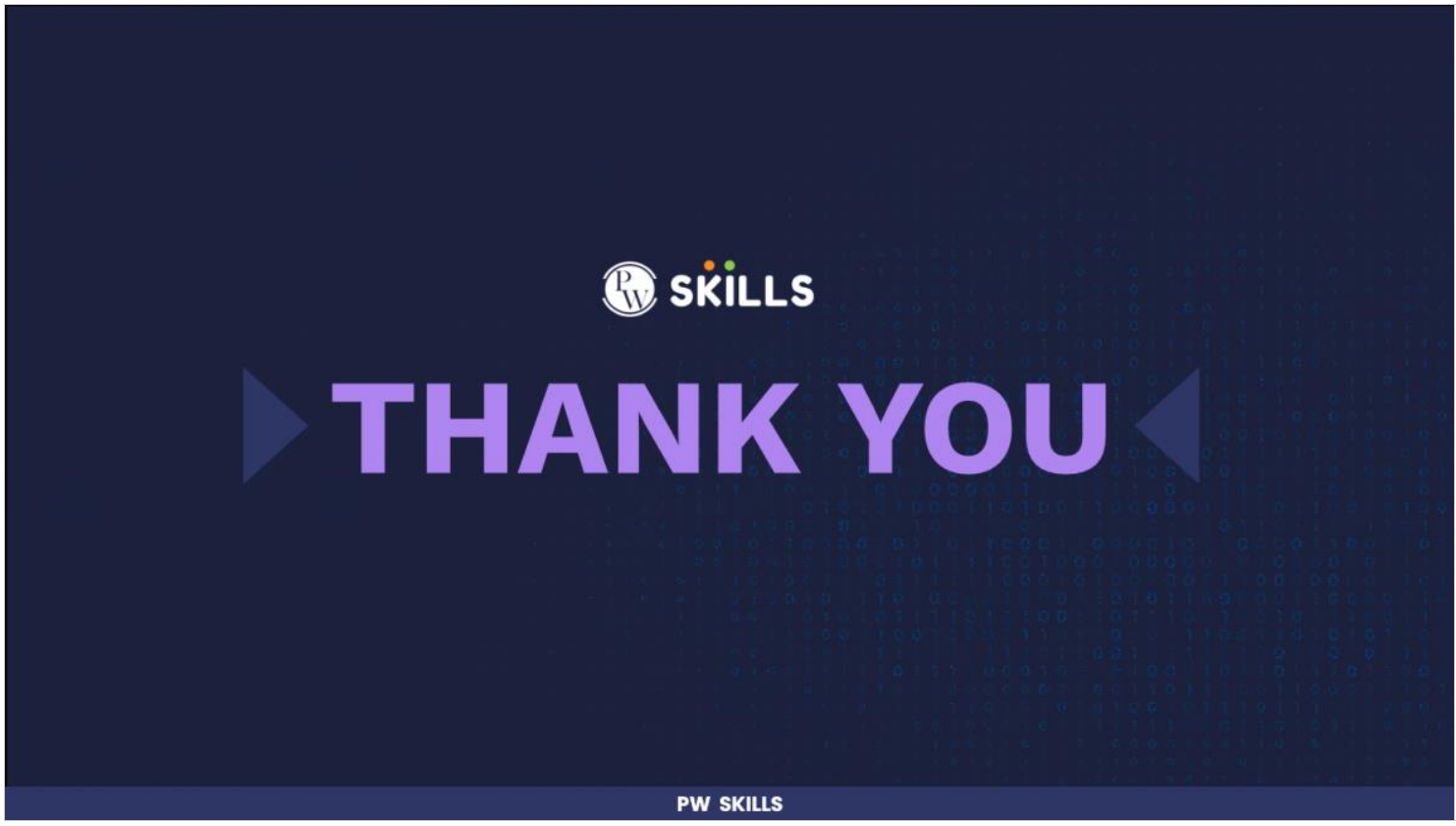
SKILLS
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TRANSACTION

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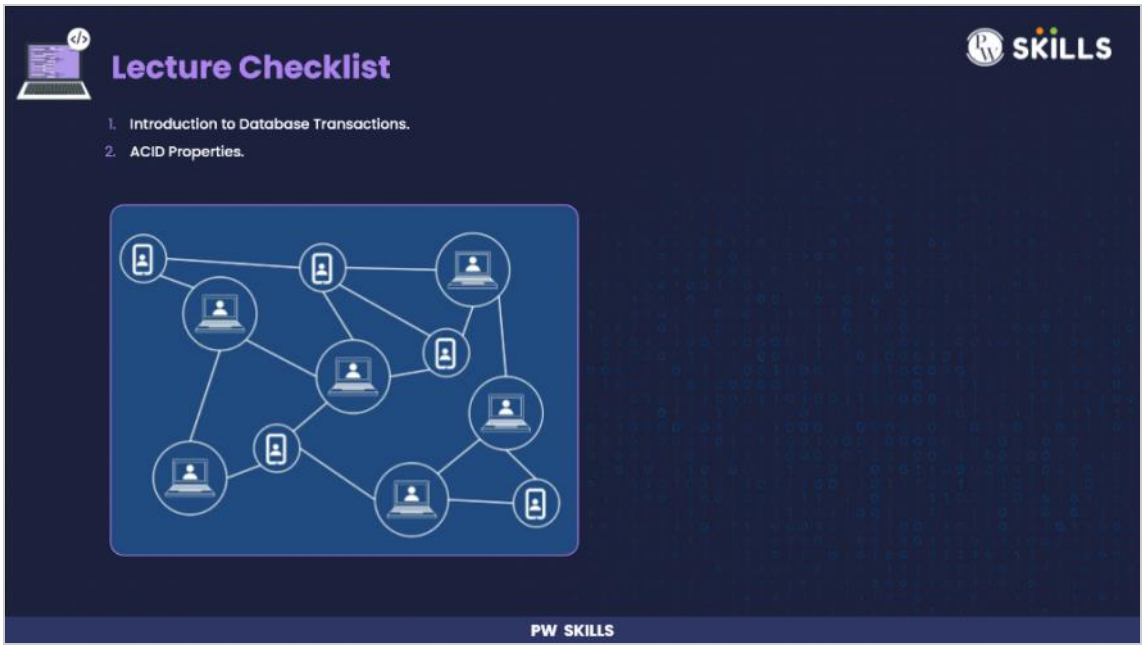

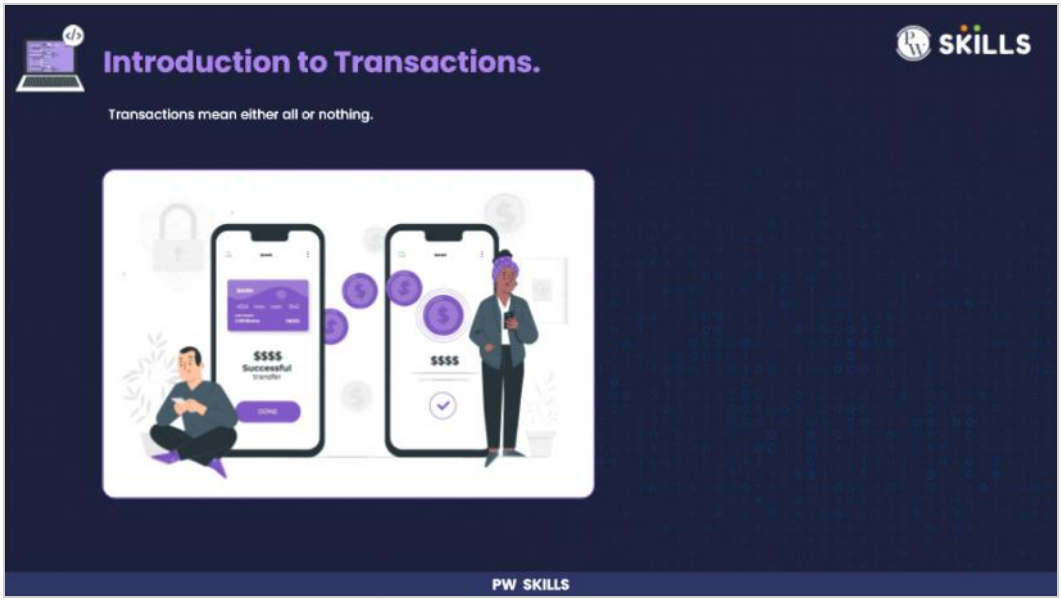

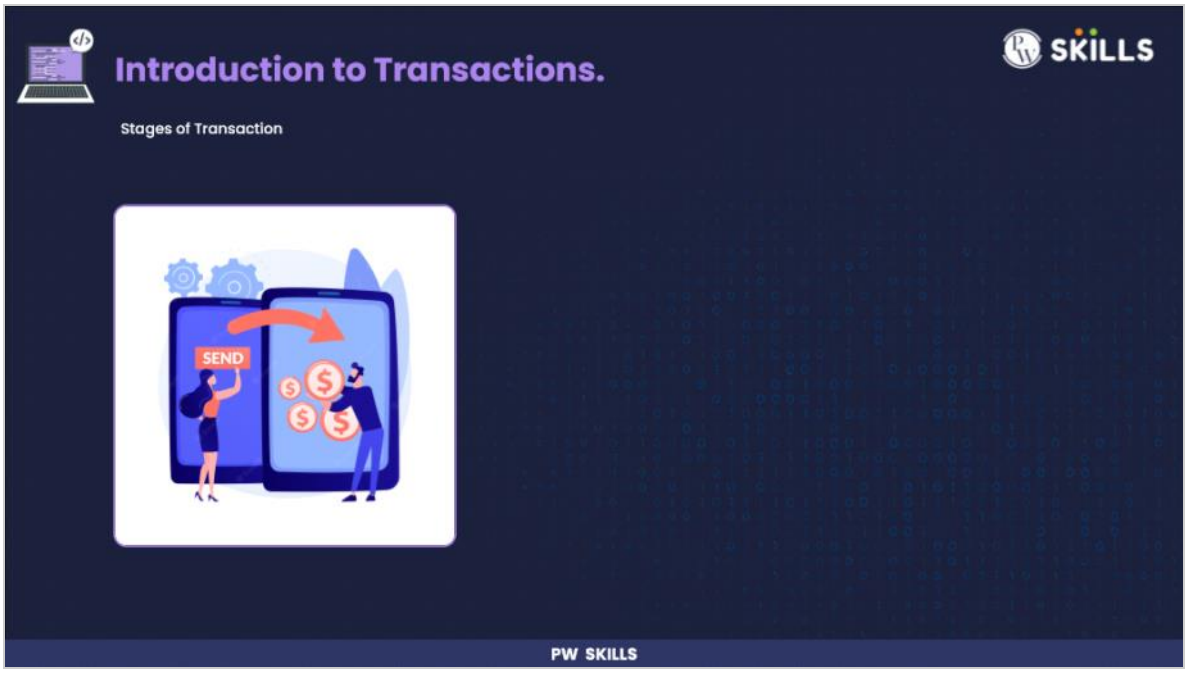
Introduction to Transactions.
SKILLS
Stages of Transaction
SEND
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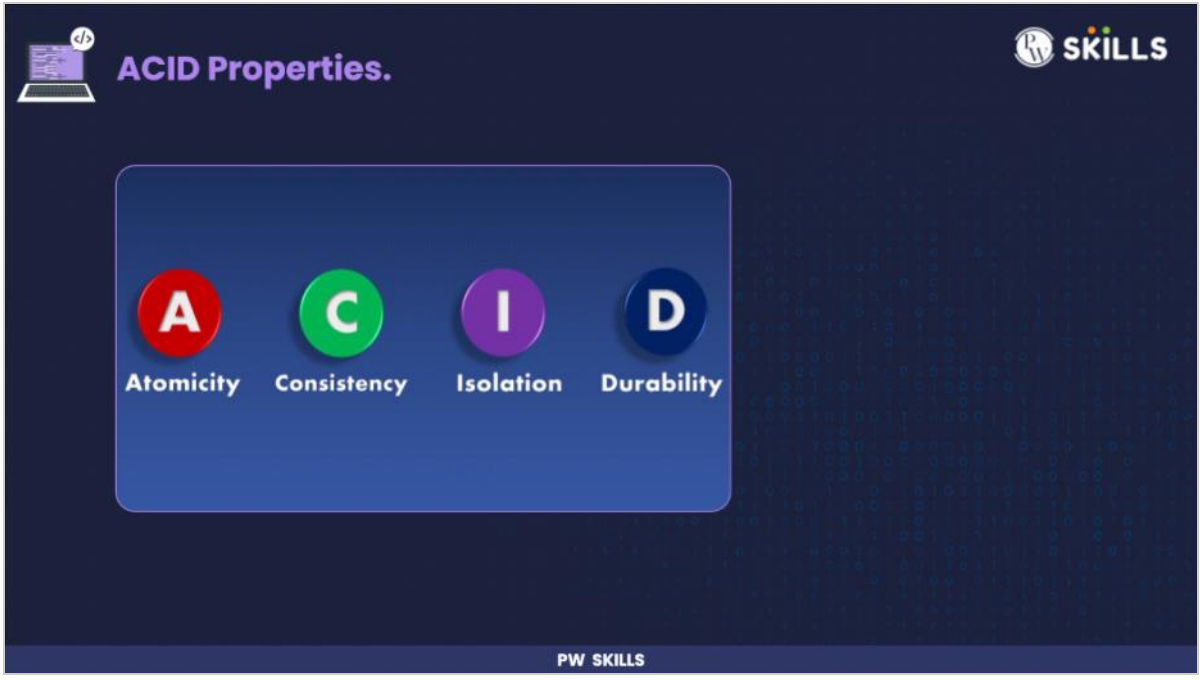
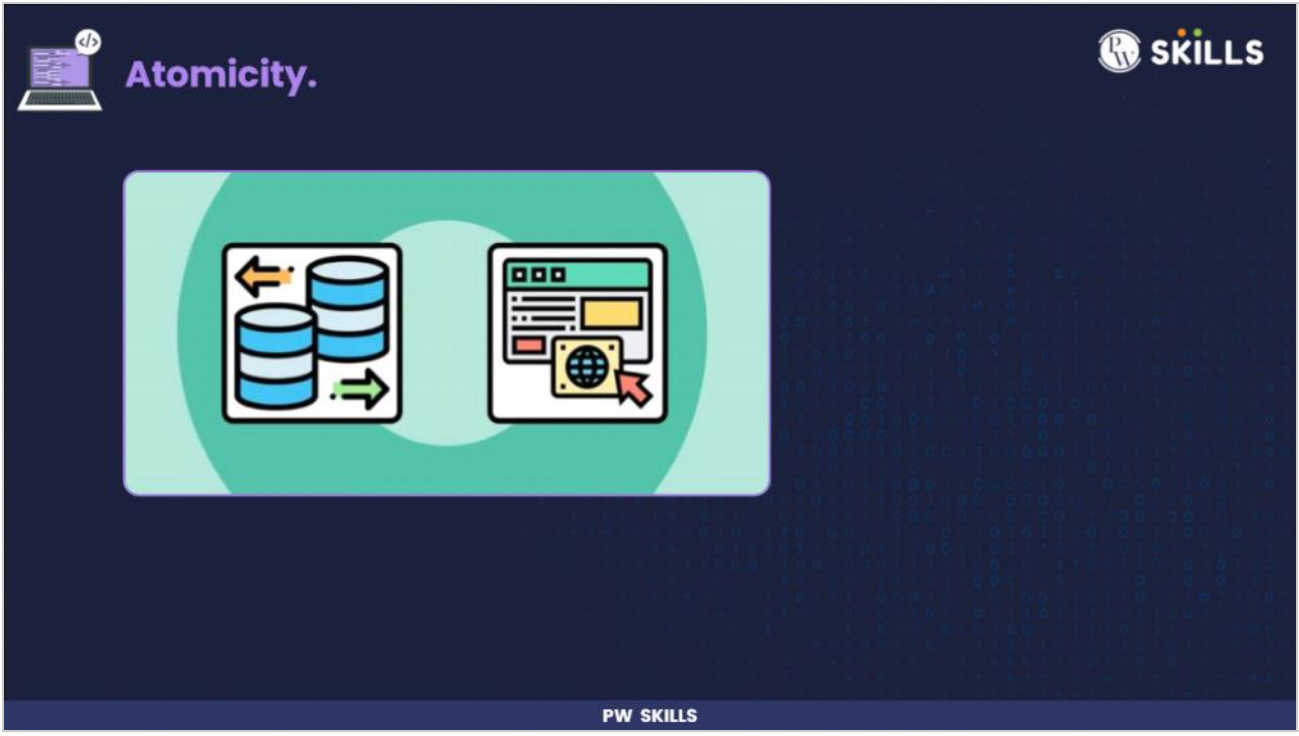
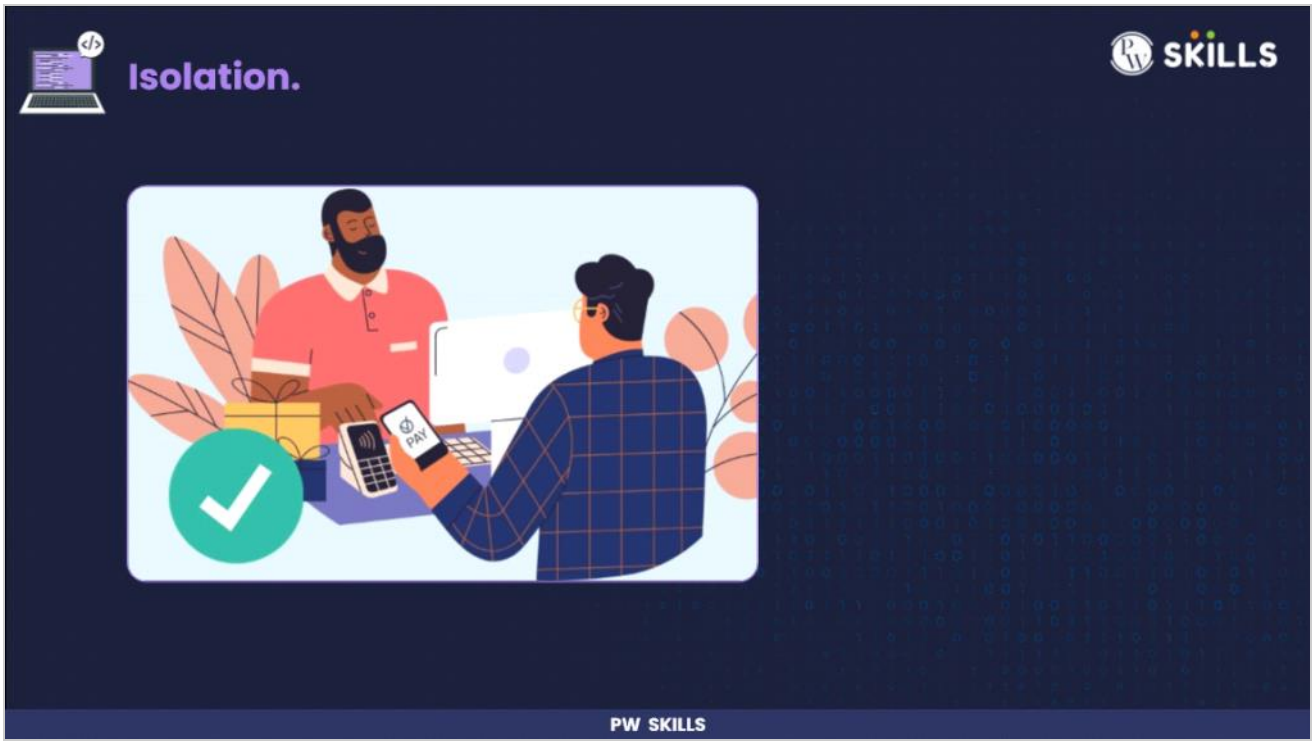

ACID Properties.
SKILLS
A
Atomicity
C
Consistency
I
Isolation
D
Durability
PW SKILLS


Atomicity.
SKILLS
PW SKILLS

Consistent.
SKILLS
Debits
Credits
PW SKILLS


Isolation.
SKILLS
PAY
PW SKILLS

1. Atomicity

- **Definition**: A transaction must be treated as a single, indivisible unit. Either the entire transaction is completed, or none of it is executed.
- **Key Point**: "All or nothing."
- **Example**:
  - Transferring money from one bank account to another:
    1. Debit ₹500 from Account A.
    2. Credit ₹500 to Account B.
  - If the system crashes after debiting Account A but before crediting Account B, atomicity ensures that the transaction is rolled back, leaving both accounts unchanged.

2. Consistency

- **Definition**: A transaction must bring the database from one valid state to another, maintaining the integrity of the data.
- **Key Point**: The database must always satisfy its defined rules and constraints.
- **Example**:
  - If a database rule requires the total balance across all accounts to remain constant, every transaction must ensure this rule is preserved.

3. Isolation

- **Definition**: Transactions must execute independently of one another. The intermediate state of a transaction should not be visible to other transactions.
- **Key Point**: Prevents interference between transactions.
- **Example**:
  - Two customers purchasing the last item of stock simultaneously:
    - Isolation ensures that only one customer successfully completes the purchase, avoiding conflicts.

4. Durability

- **Definition**: Once a transaction is successfully completed, its changes must be permanent, even in the case of system failures.
- **Key Point**: Data is safe and persisted.
- **Example**:
  - After a bank transfer is confirmed, the updated balances are saved permanently, ensuring no data loss even if the server crashes.