

Database

Data & information

Database = Data + Base

ডেটা (Data) ও তথ্য (Information) কি ?

4

- Latin শব্দ Dataum এর বহুবচন হল Data.
- Datum শব্দের অর্থ হচ্ছে তথ্যের উপাদান ।

17 Female
Hasina Rahim 18
Age 3.44 Roll City
male 102 Name 4.50
Dhaka 101 Sylhet GPA
Gender

Roll	Name	Gender	Age	GPA	City
101	Rahim	Male	18	3.44	Sylhet
102	Hasina	Female	17	4.50	Dhaka

সাজানো ও অর্থবোধক নয় এমন কিছু fact/ঘটনাকে উপাত্ত বলে ।
unprocessed or meaningless fact = data

Click here to subscribe

What is Difference Data & Information?

উপাত্ত / Data	তথ্য / Information
১. সাজানো ও অর্থবোধক নয় এমন কিছু fact/ঘটনাকে উপাত্ত বলে ।	১. সাজানো ও অর্থবোধক উপাত্তকে তথ্য বলে ।
২. উপাত্ত কোন বিষয় সম্পর্কে আংশিক ধারণা ।	২. তথ্য কোন বিষয় সম্পর্কে সম্পূর্ণ ধারণা ।
৩. উপাত্তকে সরাসরি ব্যবহার করা যায়না ।	৩. তথ্যকে সরাসরি ব্যবহার করা যায়।
৪. উদাহরণ :	৪. উদাহরণ :

What is Database?

A database is an organized collection of structured information, or data, typically stored electronically in a computer system.

Type of Database?

1. Normal Database
2. Relational Database

Table-> Row + Column

Database-basic-components

• ডেটাবেজ এর উপাদানসমূহ

1. Field
2. Record
3. Value (data)

Field = column
Record = row

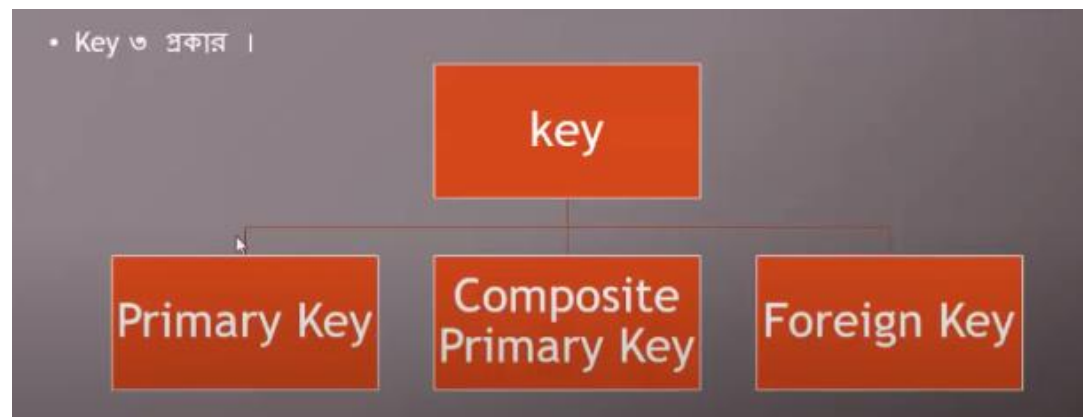
Roll	Name	Gender	Age
101	Rahim	Male	18
102	Hasina	Female	17

Student

What is key Fluid?

It is used to uniquely identify any record or row of data from the table. It is also used to establish and identify relationships between tables.

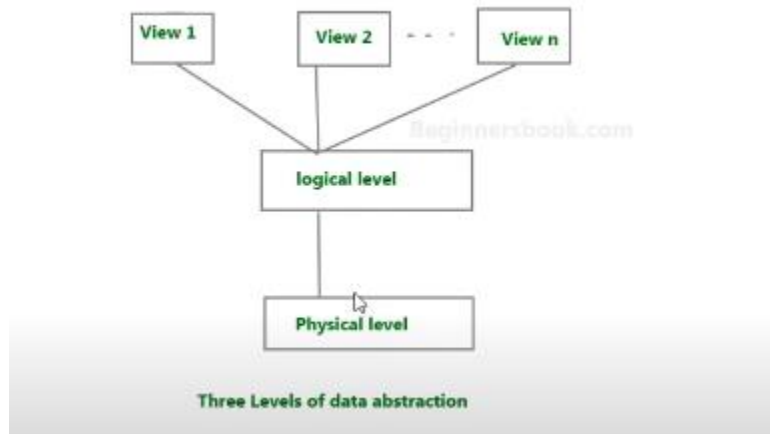
Type of key



What is DBMS?

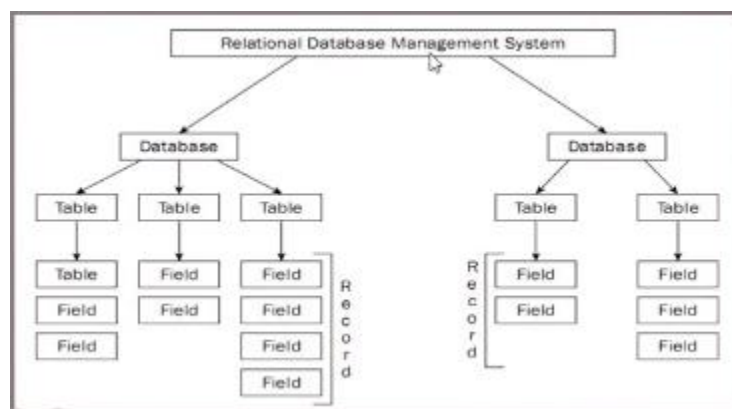
A database management system (or DBMS) is essentially nothing more than a computerized data-keeping system. Users of the system are given facilities to perform several kinds of operations on such a system for either manipulation of the data in the database or the management of the database structure itself. Database Management Systems (DBMSs) are categorized according to their data structures or types.

Data view system



What is RDBMS?

The software used to store, manage, query, and retrieve data stored in a relational database is called a relational database management system (RDBMS). The RDBMS provides an interface between users and applications and the database, as well as administrative functions for managing data storage, access, and performance.



What is database Relation?

Database relationships are associations between tables that are created using join statements to retrieve data.

Type of database Relation?

- 1 one to one
- 2 one to many
- 3 many to many
- 4 many to one

One to One Relation

One-To-One Database Relation

১। কোন একটি টেবিলের একটি রেকর্ডের সাথে যখন অন্য টেবিলের কেবল একটি রেকর্ডের সম্পর্ক স্থাপন করা হয়, তখন তাকে One-To-One Relation বলে।

Roll	Name	Group
101	Ayesha	Science
102	Tamim	Science
103	Ayesha	Arts

Roll	GPA	Section
101	4.5	A
102	4.5	A
103	5	B

One to many Relation

One-To-Many (Many-To-One) Database Relation

১। কোন একটি টেবিলের একটি রেকর্ডের সাথে যখন অন্য টেবিলের একাধিক রেকর্ডের সম্পর্ক স্থাপন করা হয়, তখন তাকে One-To-Many Relation বলে।

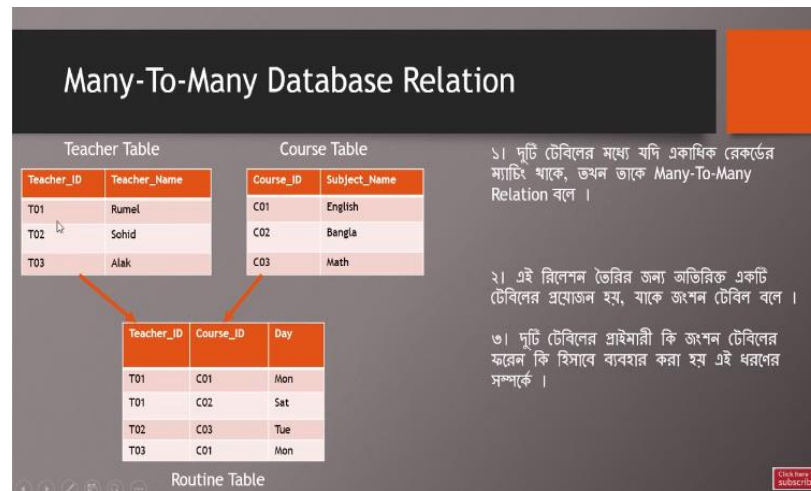
২। সবচেয়ে বেশী ব্যবহার করা হয়।

৩। একটি টেবিলের প্রাইমারী কি এর সাথে অন্য টেবিলের ফরেন কি এর সম্পর্ক হলে এই ধরনের সম্পর্ক তৈরি হয়।

Roll	Name
101	Ayesha
102	Tamim
103	Ayesha

Roll	Subject_ID	Subject_Title	Credit
101	C1001	English	3
101	C1002	Bangla	3
102	C1003	Math	3
103	C1004	ICT	3

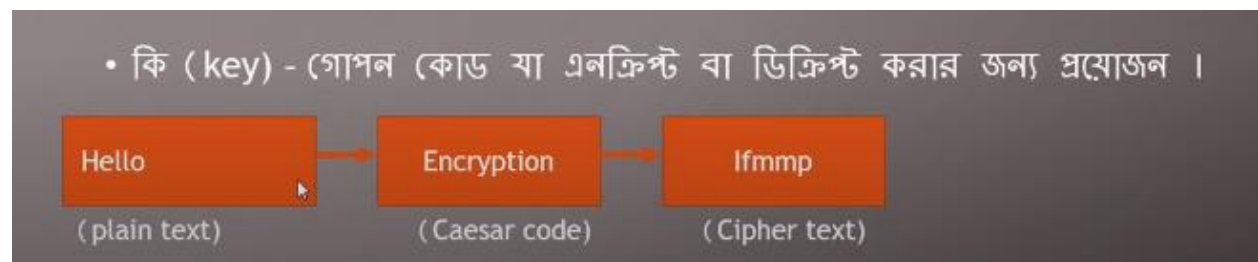
Many to many



Data encryption

Data encryption is a way of translating data from plaintext (unencrypted) to cipher text (encrypted). Users can access encrypted data with an encryption key and decrypted data with a decryption key.

Example for encryption



Database security?

Database security refers to the range of tools, controls, and measures designed to establish and preserve database confidentiality, integrity, and availability.

What is a query?

A query is a question or a request for information expressed in a formal manner. In computer science, a query is essentially the same thing, the only difference is the answer or retrieved information comes from a database.

বিভিন্ন প্রকার কুয়েরি

- ডেটাবেজের ডেটা টেবিল থেকে ফিল্ড বা কলাম নির্বাচন করে যে কুয়েরি করা হয় তাকে সিলেক্ট কুয়েরি বলে ।
- কুয়েরিকৃত ডেটাকে সাম্মারি বা গ্রুপ আকারে উপস্থাপনের জন্য যে কুয়েরি পরিচালনা করা হয়, তাকে ক্রসট্যাব কুয়েরি বলে ।
- কোন শর্তের উপর ভিত্তি করে একটি টেবিল এর রেকর্ড অন্য ডেটা টেবিলের সাথে সামঞ্জস্য না হলে unmatched ডেটাগুলো খুঁজে বের করার জন্য যে কুয়েরি ব্যবহার করা হয়, তাকে Unmatched Query.

- কোন কুয়েরির ফলাফল দিয়ে যখন টেবিলের ডেটাসমূহের কোন পরিবর্তন সাধন করা হয়, তখন তাকে Action Query বলে ।
- Action Query চার প্রকার ।
 1. Make Table Query
 2. Append Query (সংযোজন করা)
 3. Delete Query
 4. Update Query

What is Query Language Mean?

It works on user entered structured and formal programming command based queries to find and extract data from host databases.

Type of Query Language?

- I. QUEL (Query Language)
- II. QBE (Query By Example)
- III. SQL (Structured Query Language)

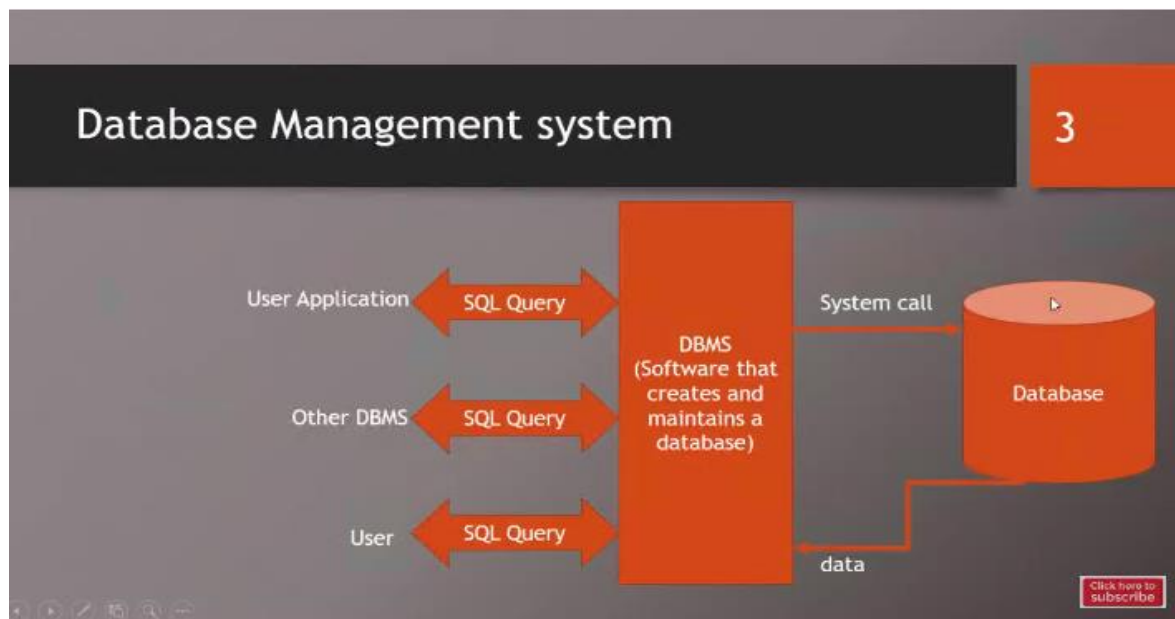
SQL Specialty?

- SQL স্টেটমেন্ট এর বৈশিষ্ট্য
- I. কেস সেনসিটিভ নয় । `SELECT / select`
- II. স্টেটমেন্ট এর শেষে সেমিকোলন (;) দিতে হয় ।
- III. স্টেটমেন্টকে ভেঙ্গে একাধিক লাইনে লেখা যায় ।

Type of SQL Statement?



DBMS User flowchart



SQL Statement?

Database Show Command

-> SHOW DATABASES;

Database Create Command

-> CREATE DATABASES **TESTDATABASE**;

Database Delete Command

-> DROP DATABASE **TESTDATABASE**;

Data Type

<ul style="list-style-type: none">• Numeric data type• -----• SMALLINT• INT• BIGINT• FLOAT• DOUBLE(M,D)• DECIMAL(M,D)	<ul style="list-style-type: none">• Character Type• -----• Char(m)• Varchar(m)• text	<ul style="list-style-type: none">• Data and Time data Type• -----• YEAR (YYYY)• DATE (YYYY-MM-DD)• TIME(HH:MM:SS)
--	--	--

Table Create Statement

```
CREATE TABLE table_name  
(  
  column_name1 data_type(size),  
  column_name2 data_type(size),  
  column_name3 data_type(size),  
  ...  
  columnN data_type(size)  
);
```

Table Create Example

```
CREATE TABLE STUDENT  
(  
  Roll int,  
  Name varchar(15),  
  Gender varchar(10),  
  Age int(5),  
  GPA Double (3,2),  
  City varchar(15),  
  PRIMARY KEY(Roll)  
);
```

Table Rename

- RENAME command এর মাধ্যমে টেবিলের নাম পরিবর্তন করতে পারবেন।

Syntax

```
RENAME TABLE old_name TO new_name;
```

Example :

```
RENAME TABLE student TO students;
```

Table Rename Example

```
RENAME TABLE student to student_info
```

Table DROP

DROP TABLE student_info;

Database Table inserting

- টেবিল তৈরির পর Data insert করতে INSERT INTO statement ব্যবহার করা হয়।
- **Syntax for data insertion**

```
INSERT INTO table_name (column1, column2, column3, ...,columnN)  
VALUES (value1, value2, value3,...valueN);
```



```
INSERT INTO student_details (Roll,Name,Gender,Age,GPA,City)  
VALUES (101,'Rahim','Male',18,3.44,'Sylhet');
```

Example

Insert into student (Roll,Name,Gender,Age,GPA,City) Values(01,'sabbir','Male',25,3.50,'Dhaka');

Or

Insert into student Values (02,'kalam','Male',23,3.70,'Dhaka');

Multiple data insert
















Insert into student Values

(03,'kalam','Male',23,3.70,'Dhaka'),

(04,'rifat','Male',24,3.60,'Dhaka'),

(05,'mizan','Male',29,3.40,'Dhaka');

Output

<div><div><div>←</div><div>T</div><div>→</div></div></div>					Roll	Name	Gender	Age	GPA	City
<input type="checkbox"/>	 Edit	 Copy	 Delete	1	sabbir	Male	25	3.50	Dhaka	
<input type="checkbox"/>	 Edit	 Copy	 Delete	2	kalam	Male	23	3.70	Dhaka	
<input type="checkbox"/>	 Edit	 Copy	 Delete	3	kalam	Male	23	3.70	Dhaka	
<input type="checkbox"/>	 Edit	 Copy	 Delete	4	rifat	Male	24	3.60	Dhaka	
<input type="checkbox"/>	 Edit	 Copy	 Delete	5	mizan	Male	29	3.40	Dhaka	

Select Statement

SQL Statement: INSERT, UPDATE, or DELETE

- SELECT statement এর সাহায্যে টেবিল থেকে প্রয়োজনীয় তথ্য খুঁজে পাওয়া যায়।

Syntax

```
SELECT column_list  
FROM table_name;
```

Example

Single Row -> SELECT Name FROM student;

Multiple Row-> SELECT Name,AGE,City FROM Student;

				Name	AGE	City
<input type="checkbox"/>				sabbir	25	Dhaka
<input type="checkbox"/>				kalam	23	Dhaka
<input type="checkbox"/>				kalam	23	Dhaka
<input type="checkbox"/>				rifat	24	Dhaka
<input type="checkbox"/>				mizan	29	Dhaka
<input type="checkbox"/>				shuvo	33	Dhaka
<input type="checkbox"/>				sihan	22	Dhaka
<input type="checkbox"/>				kamrul	24	Dhaka

SELECT * FROM Student;
















				Roll	Name	Gender	Age	GPA	City
<input type="checkbox"/>				1	sabbir	Male	25	3.50	Dhaka
<input type="checkbox"/>				2	kalam	Male	23	3.70	Dhaka
<input type="checkbox"/>				3	kalam	Male	23	3.70	Dhaka
<input type="checkbox"/>				4	rifat	Male	24	3.60	Dhaka
<input type="checkbox"/>				5	mizan	Male	29	3.40	Dhaka
<input type="checkbox"/>				6	shuvo	Male	33	3.30	Dhaka
<input type="checkbox"/>				7	sihan	Male	22	3.50	Dhaka
<input type="checkbox"/>				8	kamrul	Male	24	3.70	Dhaka

Distinct

Select Distinct City FROM Student;

Limit

Select * FROM Student Limit 5;

<div><div><div></div><div></div><div></div></div></div>				Roll	Name	Gender	Age	GPA	City
<input type="checkbox"/>		Edit	 Copy  Delete	1	sabbir	Male	25	3.50	Dhaka
<input type="checkbox"/>		Edit	 Copy  Delete	2	kalam	Male	23	3.70	Dhaka
<input type="checkbox"/>		Edit	 Copy  Delete	3	kalam	Male	23	3.70	Dhaka
<input type="checkbox"/>		Edit	 Copy  Delete	4	rifat	Male	24	3.60	Dhaka
<input type="checkbox"/>		Edit	 Copy  Delete	5	mizan	Male	29	3.40	Dhaka

Order by Clouse

Select Name FROM Student Order By Name;

Select Name FROM Student Order By DESC;

Operator in SQL

- 1/ Arithmetic Operator
- 2/ Comparison operator
- 3/ Logical Operator

WHERE | find records conditionally

- WHERE clause এর সাহায্যে একটি নির্দিষ্ট শর্ত /condition এর উপর ভিত্তি করে ডাটা খুঁজতে ব্যবহার করা হয় ।

```
SELECT column_list
FROM table_name
WHERE condition;
```

Example

```
SELECT Name From Student WHERE Roll= 101;
```

```
SELECT Roll,Name,GPA from Student WHERE Roll BETWEEN 3 AND 7;
```

Like Operator

```
SELECT * FROM student where Name LIKE 'S%';
```

```
SELECT * FROM student where Name LIKE '%S%';
```

```
SELECT * FROM student where Name LIKE '_S';
```

AS Keyword for custom name

```
SELECT name AS First_name, Roll AS ID FROM Student;
```

SQL Constraints

2

SQL constraints are used to specify rules for table data.

1. NOT NULL

2. UNIQUE - Does not allow to insert a duplicate value in a column.

4. PRIMARY KEY = NOT NULL + UNIQUE

5. CHECK - Determines whether the value is valid or not from a logical expression.

6. DEFAULT - While inserting data into a table, if no value is supplied to a column, then the column gets the value set as DEFAULT.

Click here to subscribe

Example

```
INSERT INTO Tacher (ID,NAME,SALARY) VALUES (101,'KALAM',20000);
```

				ID	NAME	SALARY
<input type="checkbox"/>		Edit		Copy		Delete
				101	KALAM	20000.00
<input type="checkbox"/>		Edit		Copy		Delete
				102	KALAM	20000.00
<input type="checkbox"/>		Edit		Copy		Delete
				103	rafat	NULL

Update Statement

```
UPDATE table_name
SET column1=value1, column2=value2, ...
WHERE condition;
```

UPDATE Tcher SET SALARY =32000 WHERE ID = 103;

DELETC Statement

DELETE FROM Tcher where ID = 103;

Database Function

Example

SELECT UPPER ('Upper Case Test'); OR SELECT UPPER (CITY) FROM Student;

SELECT LOWER ('Upper Case Test');

SELECT CONCAT (Name, 'is', age , 'years Old') FROM STUDENT;

SELECT LEAST(10,2,31,20);

SELECT GREATEST(10,2,31,20);

SELECT POW (2,5);

SELECT LOG (2);

SELECT TRUNCATE (10.831783813,2);

Aggregate Functions in SQL

- Group functions operate on sets of rows to give one result per group.

AVG

COUNT

MAX

MIN

SUM

Example

```
SELECT COUNT (*) FROM STUDENT;  
SELECT MAX (GPA) FROM Student;  
SELECT AVG(GPA) FROM Student;  
SELECT MIN(GPA) FROM Student;
```

Sub query

```
1  
2 SELECT *  
3 FROM teacher  
4 WHERE Salary > (SELECT AVG(Salary)FROM teacher);
```

Adding a column (টেবিলে নতুন কলাম যুক্ত করা)

- syntax
- ALTER TABLE table_name
ADD column_name datatype[size];
- ALTER TABLE student_details
ADD Phone text(20);

Example

```
ALTER TABLE teacher ADD AGE int(5);
```

Renaming column (কোন কলামের নাম পরিবর্তন করা)

Syntax

- ALTER TABLE table_name
CHANGE oldcolumn_name newcolumn_name dataType(size);
- ALTER TABLE student_details
CHANGE phone phone_number text(15);

```
ALTER TABLE teacher CHANGE AGE VARCHAR int(5);
```


Dropping a column (কলাম delete করা)

- Syntax
- ALTER TABLE table_name
DROP COLUMN column_name;
- ALTER TABLE student_details
DROP COLUMN phone_number;

ALTER TABLE teacher DROP COLUMN DEPT;

Group By

```
SELECT    column, group_function(column)
FROM      table
[WHERE    condition]
[GROUP BY group_by_expression]
[ORDER BY column];
```

```
SELECT Department,SUM(Salary)
FROM teacher
GROUP BY Department;
```

Join Table

```
1 SELECT student_details.Roll,Reg_Number,
2 Name,Gender,Group_Name,GPA
3 FROM student_details,exam_result
4 WHERE student_details.Roll = exam_result.Roll;
```

```
1 SELECT std.Roll,exam.Reg_Number,
2 std.Name,std.Gender,
3 exam.Group_name,exam.GPA
4
5 FROM student_details AS std JOIN exam_result AS exam
6 ON std.Roll = exam.Roll;
```

Inner Join

```
1 SELECT std.Roll,exam.Reg_Number, std.Name, std.Gender, exam.GPA, exam.Group_Name
2
3 FROM student_details AS std INNER JOIN exam_result AS exam
4
5 ON std.Roll = exam.Roll;
```

Left Join

```
1 SELECT std.Roll,exam.Reg_Number, std.Name, std.Gender, exam.GPA, exam.Group_Name
2
3 FROM student_details AS std LEFT JOIN exam_result AS exam
4
5 ON std.Roll = exam.Roll;
```

Right Join

```
1 SELECT std.Roll,exam.Reg_Number, std.Name, std.Gender,
   exam.GPA, exam.Group_Name
2
3 FROM student_details AS std RIGHT JOIN exam_result AS exam
4
5 ON std.Roll = exam.Roll;
```

Union

UNION

3

Roll	Name	Gender	Age
101	Rahim	Male	18
102	Karim	Male	17
103	Sujon	Male	18
104	Rahima	Female	18

Sylhet_tour

SELECT Roll,Name,Gender
FROM Sylhet_tour

UNION
SELECT Roll,Name,Gender
FROM Dhaka_tour

Roll	Name	Gender	Age
104	Rahima	Female	18
105	Farjana	Female	17
106	Mahfuza	Female	18
107	Shakila	Female	17

Dhaka_tour

- **CREATE VIEW** view_name **AS**
SELECT column_name(s)
FROM table_name
WHERE condition;
- **CREATE VIEW** student_view **AS**
SELECT Roll, Name
FROM student_details;