Cursors

Cursors are used to read the data from the table row by row, and process it

Step by step procedure to use cursor

1. Declare cursor.
2. declare continue handler to stop the loop
3. open the cursor.
4. fetch the row from the cursor.
5. check whether reached to last row leave the loop
6. process the row.
7. goto step 4
8. once come out of the loop then close the cursor.

```
delimiter //

create procedure displayallemp()

begin

  declare vset,vempno int default 0;

    declare vname varchar(20);

  declare empcur cursor for select empno,ename from emp;

    declare continue handler for NOT FOUND set vset=1;

    open empcur;

    lable1: loop

            fetch empcur into vempno,vname;

            if vset=1 then

              leave lable1;

            end if;

            select vempno,vname;

    end loop;

    close empcur;

end//

delimiter ;
```

2. write a procedure to display all the employees whose sal < avg sal of its own

department

```
delimiter //
create procedure displayempbyavg()
begin
 declare vset,vempno,vdeptno int default 0;
 declare vename,vjob varchar(20);
 declare vsal,vavgsal float(9,2);
 declare empcur cursor for select empno,ename,job,sal,deptno from emp;
 declare continue handler for NOT FOUND set vset=1;
 open empcur;
 label1:loop
       fetch empcur into vempno,vename,vjob,vsal,vdeptno;
       if vset=1 then
             leave label1;
       end if;
       select avg(sal) into vavgsal
       from emp
       where deptno=vdeptno;
       if vsal<vavgsal then
            select vempno,vename,vjob,vsal,vdeptno,vavgsal;
       end if;
 end loop;
 close empcur;
end//
delimiter ;
```

to write functions in mysql, we need to set a global variable

```
    set GLOBAL log_bin_trust_function_creators=1;
```

write a function to calculate experience of employee

```
create function calculateexp(ehiredate date) returns int

  -> begin

  ->   declare vexp int;

  ->   set vexp=floor(datediff(curdate(),ehiredate)/365);

  ->   return vexp;

  -> end//
```

to call the function

```
select empno,ename,hiredate,calculateexp(hiredate)

  -> from emp;
```

write a function to generateemail

email should be 3 rd to 6 th character from ename, followed by . and 1 st 3 characters of job, followed by @muycompany.com

```
delimiter //

create function generateemail(enm varchar(20),ejob varchar(20)) returns varchar(50)

begin
```

```
  declare vemail varchar(50);
  set vemail=concat(substr(enm,3,4),'.',left(ejob,3),'@mycompany.com');
  return vemail;
end//
delimiter ;
```

To write trigger

Triggers are used for data analysis purpose or for security purpose.

1. create table to store trigger data

```
create table dept_audit(
   -> did int,
   -> dname varchar(20),
   -> old_dname varchar(20),
   -> newloc varchar(20),
   -> oldloc varchar(20),
   -> username varchar(20),
   -> chang_date date,
     action varchar(20));
```

```
      delimiter //
      create trigger updatedepttr before update
      on dept
      for each row
         insert into dept_audit values(old.deptno,new.dname,
                  old.dname,new.loc,old.loc,user(),curdate(),’update’);

      end//

      delimiter ;


      create trigger insertdepttr before insert
      on dept
      for each row
         insert into dept_audit values(new.deptno,new.dname,
                  null,new.loc,null,user(),curdate(),'insert');

      create trigger deletedepttr after delete
      on dept
      for each row
```

```
        insert into dept_audit values(old.deptno,null,
              old.dname,null,old.loc,user(),curdate(),'delete');
```

In trigger we get 2 special variables old and new

	insert	delete	update
old	null	data	existing data in the table
new	data	null	the record after changes are done

Exception handling

declare <exception-action> handler <exception> <statements>

exception action can be either continue/ exit

exception are of 3 types

- SQLEXCEPTION
- error code
- NOT FOUND

```
delimiter //

create procedure inserdept(did int, edname varchar(20),edloc varchar(20))

begin

  declare exit handler for SQLEXCEPTION select 'error occured';

  insert into dept values(did,edname,edloc);

  select did,edname,edloc,'duplicate entry';

end//

delimieter ;
```

Internally mysql stores data in tablespace,

tablespace contains many files

these files are divided into 3 types

1. control file--→table and database metadata is stored is stored in control file
2. data file-→ data is stored in data files.
3. redolog files--→ redo log files are use for roll back and commit

Normalization

1. 1NF, 2NF, 3NF, BCNF

acid	custid	cname	balance	mobile	email	gender	type	date
1000	100	Kishori	33333	454645	aa@gmail	F	Saving	1 jan 20
1001	100	Kishori	66666	5555	aa@gmail	F	current	1 jan 21
1003	100	Kishori	33333	5555	aa@gmail	F	demat	1 jan 20
1004	200	Rajan	55555	45454	r@gmail	M	saving	1 jan 19
null	201	Revati		5666	ww@gmail	F		

Revati came to bank for enquiry, but she did not open the account, so no acid is there , hence we will not be able to add her entry in the table to retain customer information, this is called insertion anamoly

If kishori changes her phone number for a/c 1000, it will not get reflected in other accounts, this is called as updation anamoly

if rajan closes the account, then bank will loose customer information along with account information, it is called as deleteion anamoly.'

acid	custid	balance	type	date
1000	100	33333	Saving	1 jan 20
1001	100	66666	current	1 jan 21
1003	100	33333	demat	1 jan 20
1004	200	55555	saving	1 jan 19
null	201			

custid	cname	mobile	email	gender
100	Kishori	6666	aa@gmail	F
200	Rajan	45454	r@gmail	M
201	Revati	5666	ww@gmail	F

1NF

According to the E.F. Codd, a relation will be in 1NF, if each cell of a relation contains only an atomic value. This normal form states that an attribute of a relation cannot hold multiple values. It should hold only single-valued attributes. Values stored in an attribute should be of the same domain.

Stud id	Sna me	cid	Cname	Fid	Fname	Email	mar ks
1	Djh	100	Database	1	Kishori	abc@gmail.com,wert@rediff.com	99
1	Djh	101	Java	2	Madhura	abc@gmail.com,wert@rediff.com	99
2	ettty	100	Database	1	Kishori	eee@gmail.com,wwww@yahoo.com,rrr@rediff.com	98
2	ettty	102	Data structure	2	Ganesh	Eee11@gmail.com,wwww123@yahoo.com	98

1	Djh	100	Database	1	Kishori	abc@gmail.com,	99
1	Djh	100	Database	1	Kishori	wert@rediff.com	99
1	Djh	101	Java	2	Madhura	wert@rediff.com	
1	Djh	101	Java	2	Madhura	abc@gmail.com	99
2	ettty	100	Database	1	Kishori	eee@gmail.com,wwww@yahoo.com,rrr@rediff.com	98
2	ettty	102	Data structure	2	Ganesh	Eee11@gmail.com,wwww123@yahoo.com	98

2NF

According to the E.F. Codd, a relation is in **2NF,** if it satisfies the following conditions:

- A relation must be in 1NF.
- And the candidate key in a relation should determine all non-prime attributes or no partial dependency should exist in the relation.

Prime attributes: The attributes which are used to form a candidate key are called prime attributes.
Non-Prime attributes: The attributes which do not form a candidate key are called non-prime attributes.
Partial Dependency: If a non-prime attribute can be determined by the part of the candidate key in a relation, it is known as a partial dependency. Or we can say that, if L.H.S is the proper subset of a candidate key and R.H.S is the non-prime attribute, then it shows a partial dependency.
Example of partial Dependency: Suppose there is a relation **R** with attributes **A, B**, and **C.**

prime attributes

sid, cid

non prime attributes

sname, cname, fid, fname, email,marks

sid--→ sname,email,

cid -→ cname

sid+cid→ marks, fid, fname, marks

student_course

Stud id	cid	Fid	Fname	marks
1	100	1	Kishori	99
1	101	2	Madhura	99
2	100	1	Kishori	98
2	102	2	Ganesh	98

student

Stud id	Sname	Email
1	Djh	abc@gmail.com
1	Djh	wert@rediff.com
2	ettty	eee@gmail.com, ,
2	ettty	wwww@yahoo.com
2	ettty	rrr@rediff.com

Course

cid	Cname
100	Database
101	Java
102	Data structure

3NF

Third Normal Form (3NF)

According to the E.F. Codd, a relation is in **third normal form (3NF)** if it satisfies the following conditions:

- A relation must be in second normal form (2NF).
- And there should be no transitive functional dependency exists for non-prime attributes in a relation.

Third Normal Form is used to achieve data integrity and reduce the duplication of data.

A relation is in 3NF if and only if any one of the following conditions will satisfy for each non-trivial functional dependency **X→ Y:**

1. X is a super key or candidate key
2. And, Y is a prime attribute, i.e., Y is a part of candidate key.

Transitive Dependency: If **X → Y and Y→ Z** are two functional dependencies, **X → Z** is called as a transitive functional dependency.

prime attribute-→non prime --→ nonprime

the following table is not in 3NF

student_course

Stud id	cid	Fid	marks
1	100	1	99
1	101	2	99
2	100	1	98
2	102	3	98

Fid	Fname
1	Kishori
2	Madhura
3	Ganesh

Stud id	Sname
1	Djh
2	ettty

Stud id	Email
1	abc@gmail.com
1	wert@rediff.com
2	eee@gmail.com, ,
2	wwww@yahoo.com
2	rrr@rediff.com

Boyce-Codd Normal Form (BCNF)

Boyce-Codd Normal Form (BCNF) is the advance version of the third normal form (3NF) that's why it is also known as a **3.5NF**

According to the E.F. Codd, a relation is in **Boyce-Codd normal form (3NF)** if it satisfies the following conditions:

- A relation is in 3NF.
- And, for every functional dependency, **X → Y,** L.H.S of the functional dependency (X) be the super key of the table.

In this example, we have a relation R with three columns: Id, Subject, and Professor. We have to find the highest normalization form, and also, if it is not in BCNF, we have to decompose it to satisfy the conditions of BCNF.

Id	Subject	Professor
101	Java	Mayank
101	C++	Kartik
102	Java	Sarthak
103	C#	Lakshay
104	Java	Mayank

Interpreting the table:

- One student can enroll in more than one subject.
    - Example: student with **Id 101** has enrolled in **Java and C++**.
- Professor is assigned to the student for a specified subject, and there is always a possibility that there can be multiple professors teaching a particular subject.

Finding the solution:

- Using Id and Subject together, we can find all unique records and also the other columns of the table. Hence, the Id and Subject together form the primary key.
- The table is in 1NF because all the values inside a column are atomic and of the same domain.
- We can't uniquely identify a record solely with the help of either the Id or the Subject name. As there is no partial dependency, the table is also in 2NF.
- There is no transitive dependency because the non-prime attribute i.e., Professor, is not deriving any other non-prime attribute column in the table. Hence, the table is also in 3NF.
- There is a point to be noted that the table is not in **BCNF (Boyce-Codd Normal Form)**.

Why is the table not in BCNF?

As we know that each professor teaches only one subject, but one subject may be taught by multiple professors. This shows that there is a dependency between the subject & the professor, and the subject is always dependent on the professor **(professor -> subject).** As we know that the professor column is a non-prime attribute, while the subject is a prime attribute. This is not allowed in BCNF in DBMS. **For BCNF, the deriving attribute (professor here) must be a prime attribute.**

How to satisfy BCNF?

In Example 3, we will decompose the table into two tables: the Student table and the Professor table to satisfy the conditions of BCNF.

Student Table

P_Id	S_Id	Professor
1	101	Mayank
2	101	Kartik
3	102	Sarthak
4	103	Lakshay
5	104	Mayank

Professor Table

Professor	Subject
Mayank	Java
Kartik	C++
Sarthak	Java
Lakshay	C#
Mayank	Java

Professor is now the primary key and the prime attribute column, deriving the subject column. **Hence, it is in BCNF.**

Proj	Proj	Proj	Empno	Ename	Grade	Sal	Proj	Alloc
Code	Type	Desc				scale	Join Date	Time
001	APP	LNG	46	JONES	A1	5	12/1/1998	24
001	APP	LNG	92	SMITH	A2	4	2/1/1999	24
001	APP	LNG	96	BLACK	B1	9	2/1/1999	18
004	MAI	SHO	72	JACK	A2	4	2/4/1999	6
004	MAI	SHO	92	SMITH	A2	4	5/5/1999	6

It is in 1NF

is it in 2NF

to check partial dependency

proj code--→ proj type, project description

empno-→ename, grade,sal

projcode+empno-→ joining date, allocation time

project

Proj	Proj	Proj
Code	Type	Desc
001	APP	LNG
001	APP	LNG
001	APP	LNG
004	MAI	SHO
004	MAI	SHO

employee

Empno	Ename	Grade	Sal
			scale
46	JONES	A1	5
92	SMITH	A2	4
96	BLACK	B1	9
72	JACK	A2	4
92	SMITH	A2	4

proj emp

Proj	Empno	Proj	Alloc
Code		Join Date	Time
001	46	12/1/1998	24
001	92	2/1/1999	24
001	96	2/1/1999	18
004	72	2/4/1999	6
004	92	5/5/1999	6

following table is not in 3 NF

employee

Empno	Ename	Grade	Sal
			scale
46	JONES	A1	5
92	SMITH	A2	4
96	BLACK	B1	9
72	JACK	A2	4
92	SMITH	A2	4

empno-→grade-→ salary scale

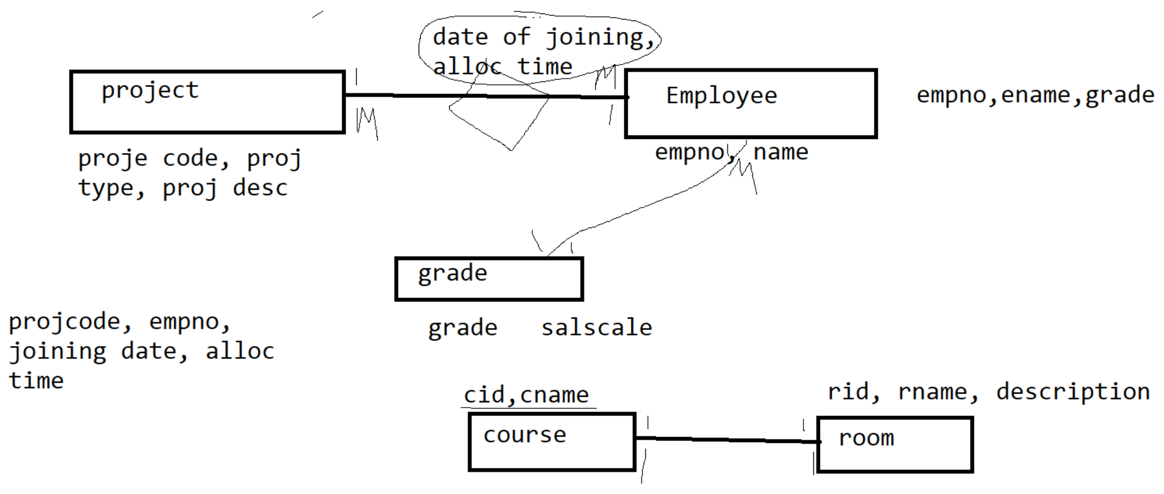
Empno	Ename	Grade
46	JONES	A1
92	SMITH	A2
96	BLACK	B1
72	JACK	A2
92	SMITH	A2

grade

Grade	Sal
	scale
A1	5
A2	4
B1	9
A2	4
A2	4

one-one	any one side key can be added into another side
one- many, many-one	add key of one side into many side table as a foreign key
many-many	create new table and add primary key of both sides

ER diagram(Entity Relation diagram)



- **Orderno**
- **Orderdate**
- **Itemno**
- **Qty**
- **Price**
- **Cname**
- **Custno**
- **Email**
- **Orderamt**
- **Salespersonno**
- **Salespersonname**
- **Locationid ----------location from where item dispatched**
- **Location name**

One customer can place many order
One order contains many items
One order will be managed by one salesperson
One order belong to one customer
One order can be dispatched from different location

ORDER ID	DATE	ITEMNO	QTY	PRICE	CID	CNAME	EMAIL	AMT	SID	SNAME	LID	L NAME
1	10 APR	100	3	300	100	Kishori	aa@dkj	3000	S1	xxx	1	delhi
1	10 APR	200	4		100	kishori	aa@dkj	3000	S1	xxx	2	Mumbai
2	11apr	100	4	200	101	Revati	r@wej	5000	S2	yyy	1	Delhi
2	11 apr	200			101	Revati						

Is it in 1NF------yes

Is it in 2NF

1. It should be in 1 NF ----yes
2. Check for partial dependency
   Prime attribute ----- orderno, item no
   Orderno---→order date,cname,cno,email,orderamt,salespersonid,salespersonname,
   Itemno
   orderno, item no---→qty,price,locationid, location name

order
(Orderno,order date,cname,cno,email,orderamt,salespersonid,salespersonname

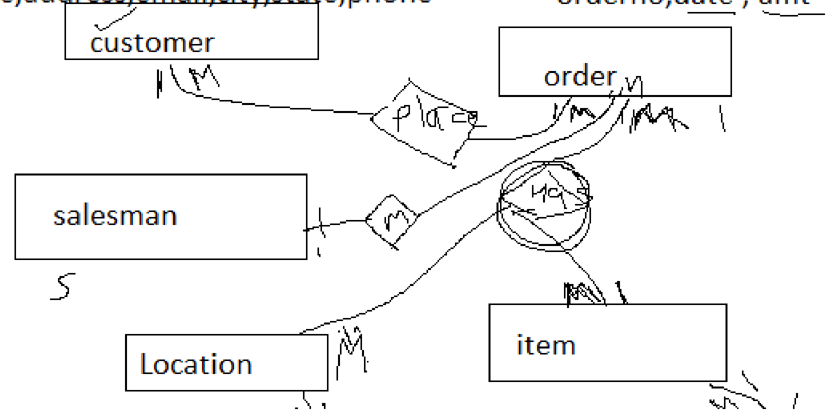
Cno--→cname,email
Salesperson id-→sname
Order_item
(orderno, item no,qty,price,locationid, location name

Check for 3NF
(Orderno,order date,cname,cno,email,orderamt,salespersonid,salespersonname
Is it in 3 NF ---no
Cno--→cname,email
Salesperson id-→sname

Customer
(cno,cname,email)
Salesman
(Salesperson id,sname)

order
(Orderno,order date, cno, ,orderamt,salespersonid)
Location(location id,lname)
Order_item
(orderno, item no,qty,price,locationid)

cno, cname,address,email,city,state,phone orderno,~~date~~, amt



Types of models

Conceptual model
If you draw ER diagram with entity name and relation

Logical model
In conceptual model if you add list of attribute then it is logical model

Physical model
In logical model if you define data types of each attribute, primary key,foreign key