Subject : DBMS
Topic:CURSOR

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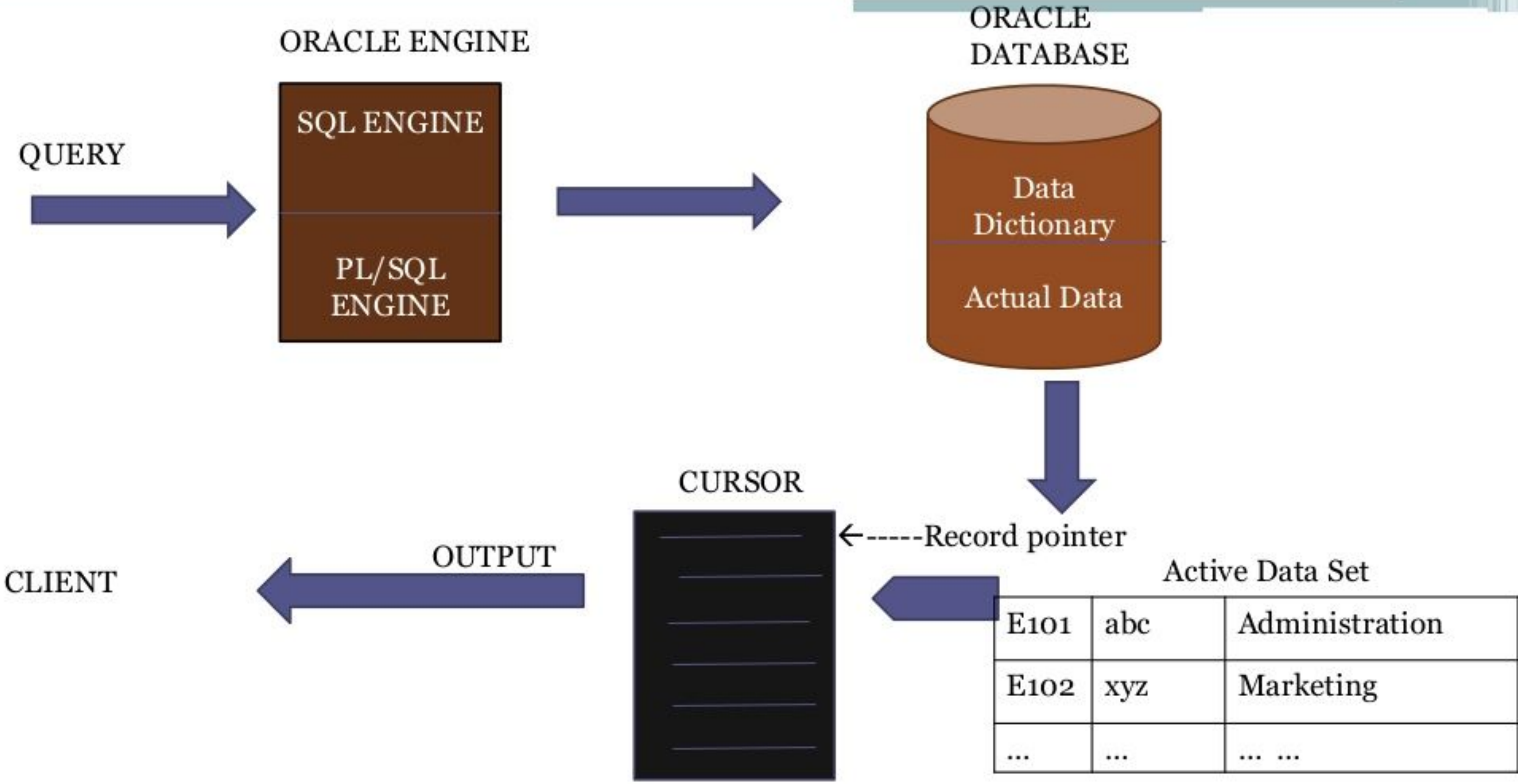
CURSOR

CURSOR ?

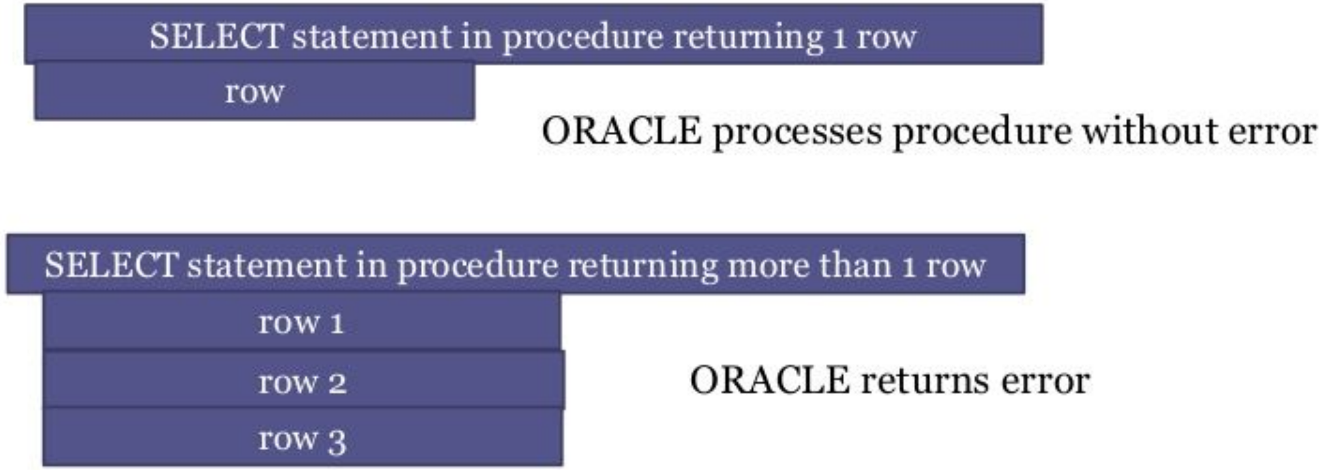
- A cursor is a temporary work area created in the system memory when a SQL statement is executed.
- A cursor contains information on a select statement and the rows of data accessed by it.
- This temporary work area is used to store the data retrieved from the database, and perform intermediate operations before output is displayed to the client.
- A cursor can hold more than one row, but can process only one row at a time.



E101	abc	Administration
E102	xyz	Marketing
...	...	... ...

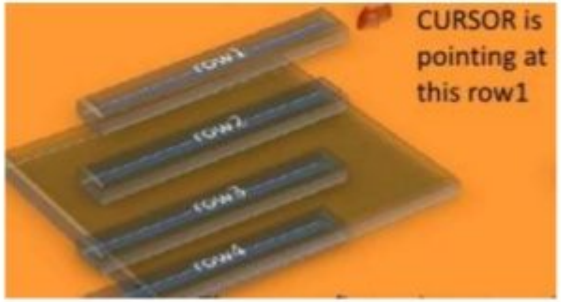
NEED FOR CURSORS?

We cannot use sub-programs of PL/SQL with a simple select statement to retrieve more than one row.


SELECT statement in procedure returning 1 row
row
ORACLE processes procedure without error
SELECT statement in procedure returning more than 1 row
row 1
row 2
row 3
ORACLE returns error

So, PL/SQL requires a special compatibility to retrieve and process more than one row

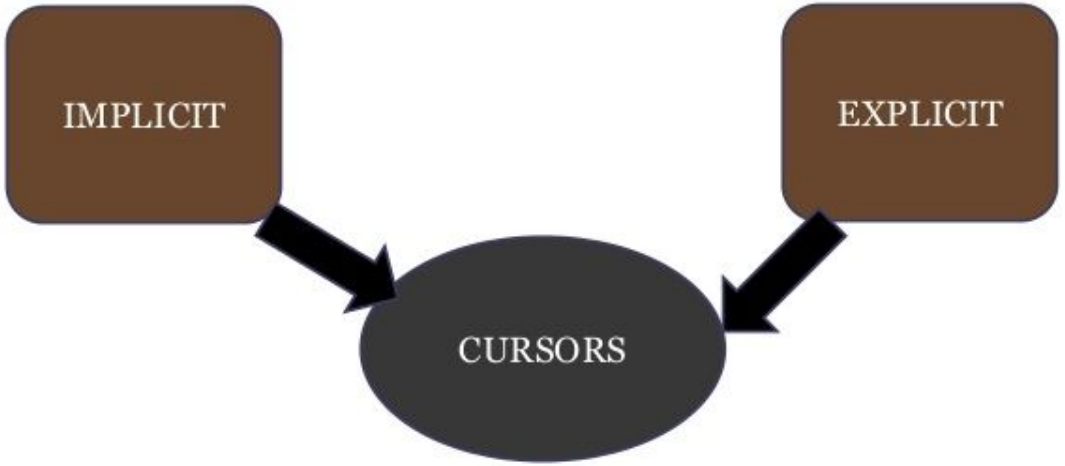
Cursor is a mechanism that provides a way to select multiple rows of data from the database and then process each row individually inside a PL/SQL program.



CURSOR is pointing at this row2 now
row1
row2
row3
row4

The cursor first points at row1 and once it is processed it then advances to row2 and so on.

TYPES OF CURSORS



Implicit cursors

- These are created by default when DML statements like, INSERT, UPDATE, and DELETE statements are executed.

- The user is not aware of this happening & will not be able to control or process the information.

- When an implicit cursor is working, DBMS performs the open, fetches and close automatically

Attribute Name	Description
%ISOPEN	Returns TRUE if cursor is open, FALSE if cursor is closed. SQL%ISOPEN always returns FALSE.
%FOUND	Returns TRUE if successful fetch has been executed, FALSE if no row was returned. SQL%FOUND is used to access it.
%NOTFOUND	Return TRUE if no row was returned, FALSE if successful fetch has been executed. SQL%NOTFOUND is used to access it.
%ROWCOUNT	Returns the number of rows affected by the query. SQL%ROWCOUNT is used to access it.

EXAMPLE:

Write a pl/sql program to update the salary of customers by Rs 500.

```
Select * from customers;

+----+----------+-----+-----------+----------+
| ID | NAME | AGE | ADDRESS | SALARY |
+----+----------+-----+-----------+----------+
| 1 | Ramesh | 32 | Ahmedabad | 2000.00 |
| 2 | Khilan   | 25 | Delhi          | 1500.00 |
| 3 | kaushik | 23 | Kota           | 2000.00 |
| 4 | Chaitali | 25 | Mumbai      | 6500.00 |
| 5 | Hardik   | 27 | Bhopal       | 8500.00 |
| 6 | Komal    | 22| MP             | 4500.00 |
+----+----------+-----+-----------+----------+
DECLARE
total_rows  number(2);
BEGIN
UPDATE customers
SET salary = salary + 500;
IF sql%notfound THEN
dbms_output.put_line('no customers selected');
ELSIF sql%found THEN
total_rows := sql%rowcount;
dbms_output.put_line( total_rows || ‘customers selected ');
END IF;
END;
```

Result:
6 customers selected
PL/SQL procedure successfully completed.

Select * from customers;

```
+----+---------+----+---------+---------+
| ID | NAME | AGE | ADDRESS | SALARY |
+----+---------+----+---------+---------+
| 1 | Ramesh | 32 | Ahmedabad | 2500.00 |
| 2 | Khilan | 25 | Delhi | 2000.00 |
| 3 | kaushik | 23 | Kota | 2500.00 |
| 4 | Chaitali | 25 | Mumbai | 7000.00 |
| 5 | Hardik | 27 | Bhopal | 9000.00 |
| 6 | Komal | 22 | MP | 5000.00 |
+----+---------+----+---------+---------+
```

Explicit cursors

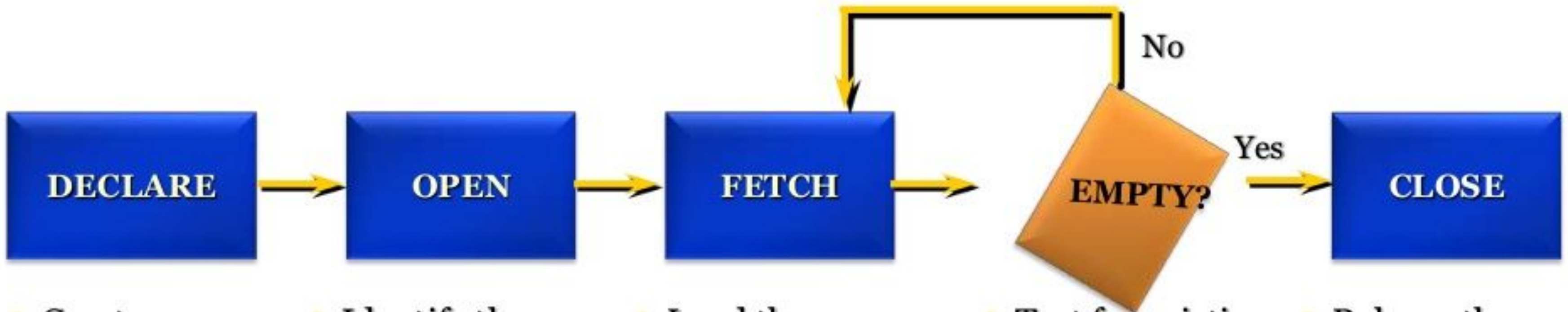
- Explicit cursors are programmer defined cursors for gaining more control over the context area.
- An explicit cursor should be defined in the declaration section of the PL/SQL Block.
- It is created on a SELECT Statement which returns more than one row.

Attribute Name	Description
%ISOPEN	Returns TRUE if cursor is open, FALSE if cursor is closed. CursorName%ISOPEN is used to access it.
%FOUND	Returns TRUE if successful fetch has been executed, FALSE if no row was returned. CursorName%FOUND is used to access it.
%NOTFOUND	Return TRUE if no row was returned, FALSE if successful fetch has been executed. CursorName%NOTFOUND is used to access it.
%ROWCOUNT	Returns the number of rows affected by the query. CursorName%ROWCOUNT is used to access it.

Explicit cursor involves four steps:

1. Declaring the cursor for initializing in the memory
2. Opening the cursor for allocating memory
3. Fetching the cursor for retrieving data
4. Closing the cursor to release allocated memory

STEPS:



- Create a named SQL area
- Identify the active set
- Load the current row into variables
- Test for existing rows
- Return to FETCH if rows found
- Release the active set

Cursor Declaration:

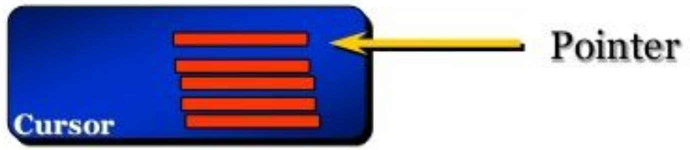
Declared as a variable in the same way as standard variables

- Identified as cursor type
- SQL included

E.g.

```
CURSOR cur_emp IS
SELECT emp_id, name, grade
FROM employee;
```

Open the cursor



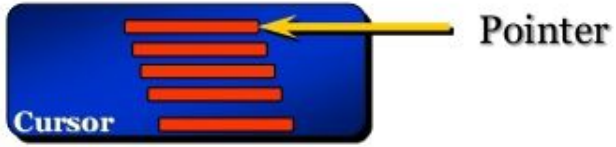
Defines a private SQL area named after the cursor name.

Executes the query associated with the cursor.

Creates the Active Data Set.

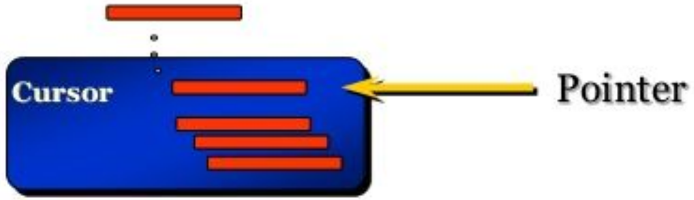
Sets the cursor row pointer in the Active Data Set to the first record.

Fetch



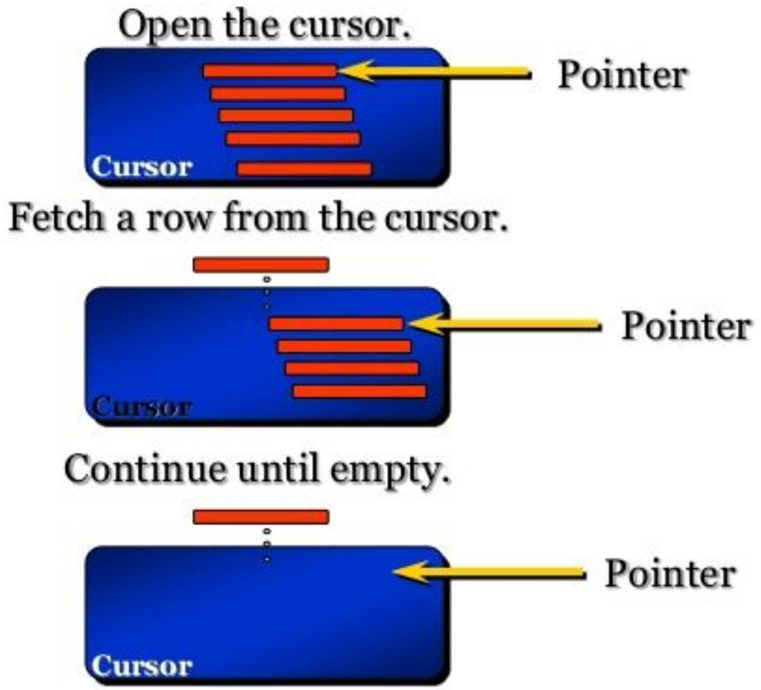
Open the cursor.

Fetch a row from the cursor.



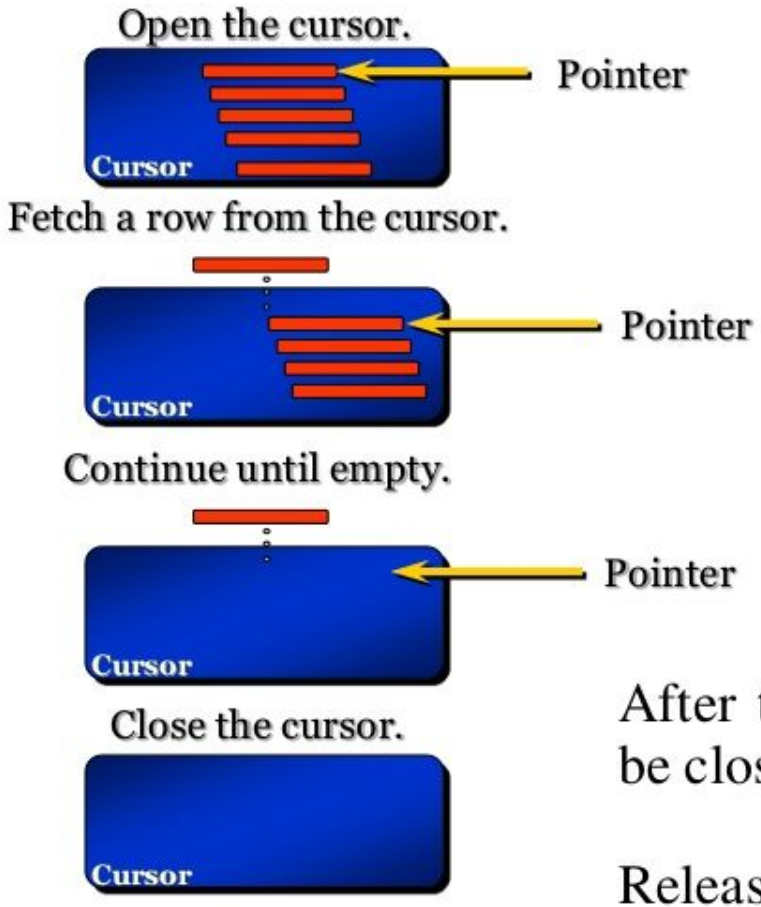
Fetch statement is placed inside a Loop … End Loop construct.

It takes the data into memory variables and process them one by one.



Loop is continued until Active Data Set becomes empty

Close



After the FETCH loop exits, the cursor must be closed by Close statement.

Releases the used memory.

Declaring the Cursor

Syntax:

CURSOR cursor_name IS select_statement;

For example:

CURSOR c_customers IS
SELECT id, name, address FROM customers;

Opening the Cursor

Syntax:

OPEN cursor_name;

Example:

OPEN c_customers;

Fetching the Cursor

Fetching the cursor involves accessing one row at a time.

Syntax:

```
FETCH cursor_name INTO record_name;
```

Example:

```
FETCH c_customers INTO c_id, c_name, c_addr;
```

Closing the Cursor

Closing the cursor means releasing the allocated memory.

Syntax:

```
CLOSE cursor_name;
```

Example:

```
CLOSE c_customers;
```

EXAMPLE:

```
DECLARE
c_id   customers.id%type;
c_name   customers.name%type;
c_addr   customers.address%type;
CURSOR c_customers  IS  SELECT id, name, address FROM customers;
BEGIN
OPEN c_customers;
LOOP
FETCH c_customers into c_id, c_name, c_addr;
EXIT WHEN c_customers%notfound;
dbms_output.put_line(c_id || ' ' || c_name || ' ' || c_addr);
END LOOP;
CLOSE c_customers;
END;
```

RESULT:

```
1    Ramesh    Ahmedabad
2    Khilan    Delhi
3    kaushik   Kota
4    Chaitali  Mumbai
5    Hardik    Bhopal
6    Komal     MP

PL/SQL procedure successfully completed.
```

Cursor for loop

CURSOR FOR LOOP is used when you want to fetch and process every record in a cursor. The CURSOR FOR LOOP will terminate when all of the records in the cursor have been fetched.

SYNTAX

```
FOR record_index in cursor_name
LOOP {...statements...}
END LOOP;
```

EXAMPLE:

```
DECLARE
 CURSOR c1
IS SELECT last_name, job_id FROM employee job_id LIKE '%CLERK%'
AND manager_id > 120
 ORDER BY last_name;
 BEGIN
 FOR item IN c1
 LOOP
DBMS_OUTPUT.PUT_LINE ('Name = ' || item.last_name || ', Job = ' ||
item.job_id);
 END LOOP;
END;
```

RESULT:

```
Name = Atkinson, Job = ST_CLERK
Name = Bell, Job = SH_CLERK
Name = Bissot, Job = ST_CLERK
 …
Name = Walsh, Job = SH_CLERK
```

Parameterized Cursors:

- Parameterized cursor pass the parameters into a cursor and use them in to query.

- Define only datatype of parameter and not need to define it's length.

- We can only pass values to the cursor and cannot pass values out of the cursor through parameters.

- The scope of the cursor parameters is local to the cursor

Syntax :

```
CURSOR cursor_name (parameter_list)  IS
         SELECT_statement;
```

For example:

```
CURSOR  c2 (subject_id_in IN varchar)  IS
         SELECT course_number
              FROM courses_tbl
                  WHERE subject_id = subject_id_in;
```

The result set of this cursor is all course_numbers whose subject_id matches the subject_id passed to the cursor via the parameter.

COMPARISION:

•Explicit cursor must be created when you are executing a SELECT statement that returns more than one row.

• NO_DATA_FOUND and TOO_MANY_ROWS exceptions are not raised when using explicit cursors, as opposed to implicit cursors.

•With explicit cursors, you have complete control over how to access information in the database.

•Implicit cursors require anonymous buffer memory. Explicit cursors can be executed again and again by using their name.

ADVANTAGES:

•Using Cursor we can perform row by row processing .

• we can perform row wise validation or operations on each row.

•Allow application to access and move around in a set of data rows, rather then merely retrieve a complete result set.

Disadvantages:

- Uses more resources
- Speed and performance issues.
- Increased network roundtrip.