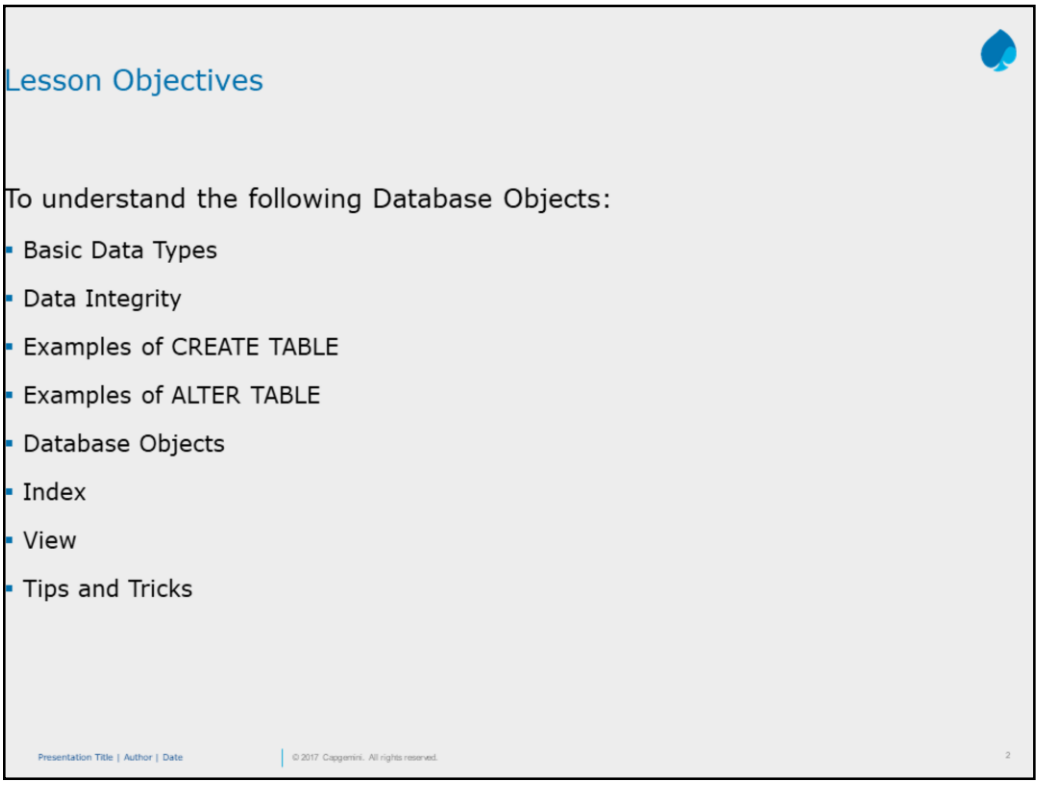

DBMS/SQL
Lesson 07 Database Objects
Capgemini


Lesson Objectives
To understand the following Database Objects:
Basic Data Types
Data Integrity
Examples of CREATE TABLE
Examples of ALTER TABLE
Database Objects
Index
View
Tips and Tricks
Presentation Title | Author | Date
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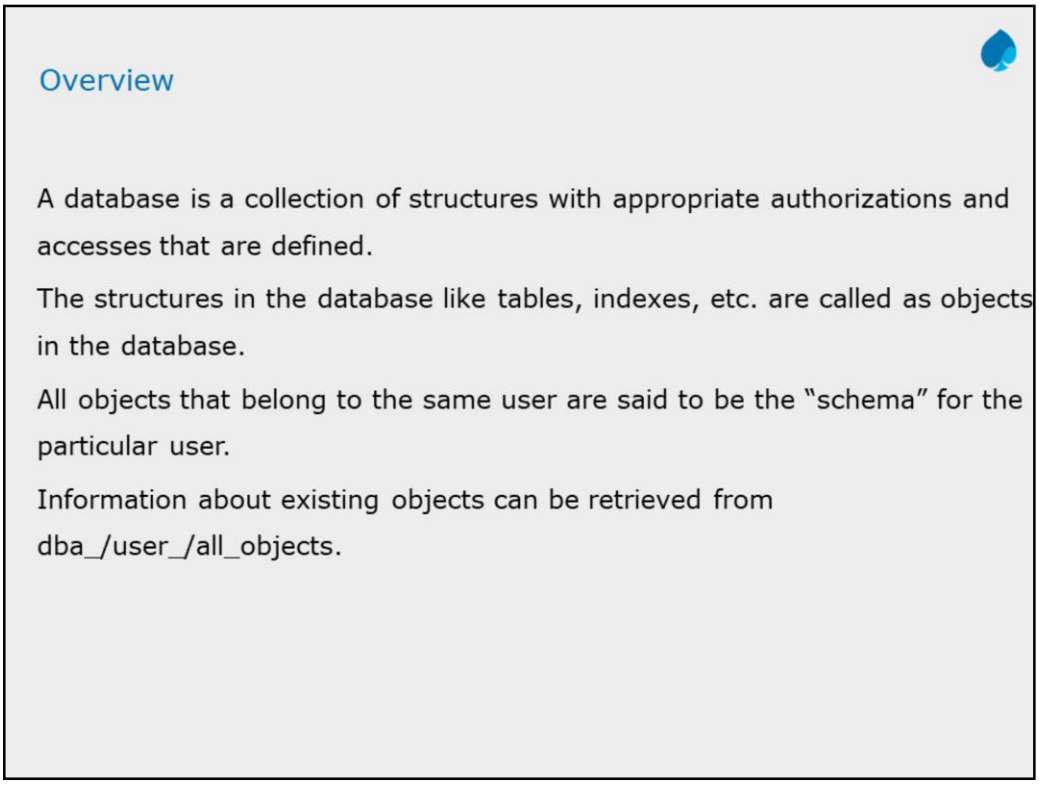
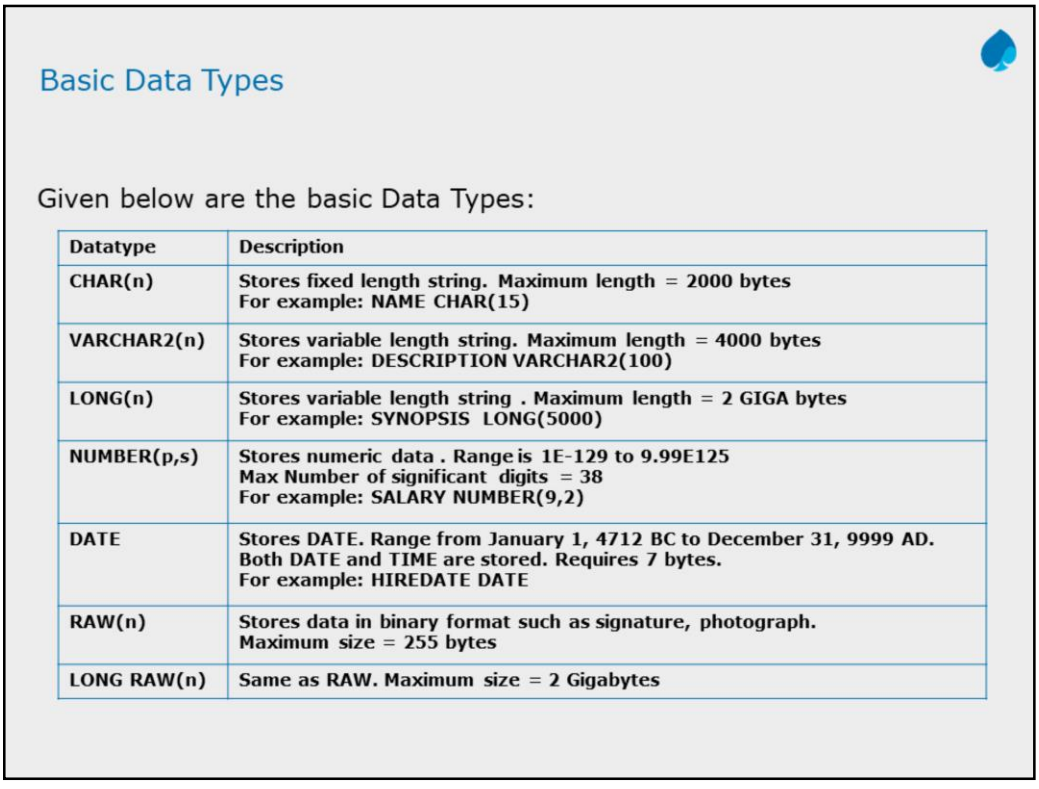


Database Objects:
Following is a list of Database objects:

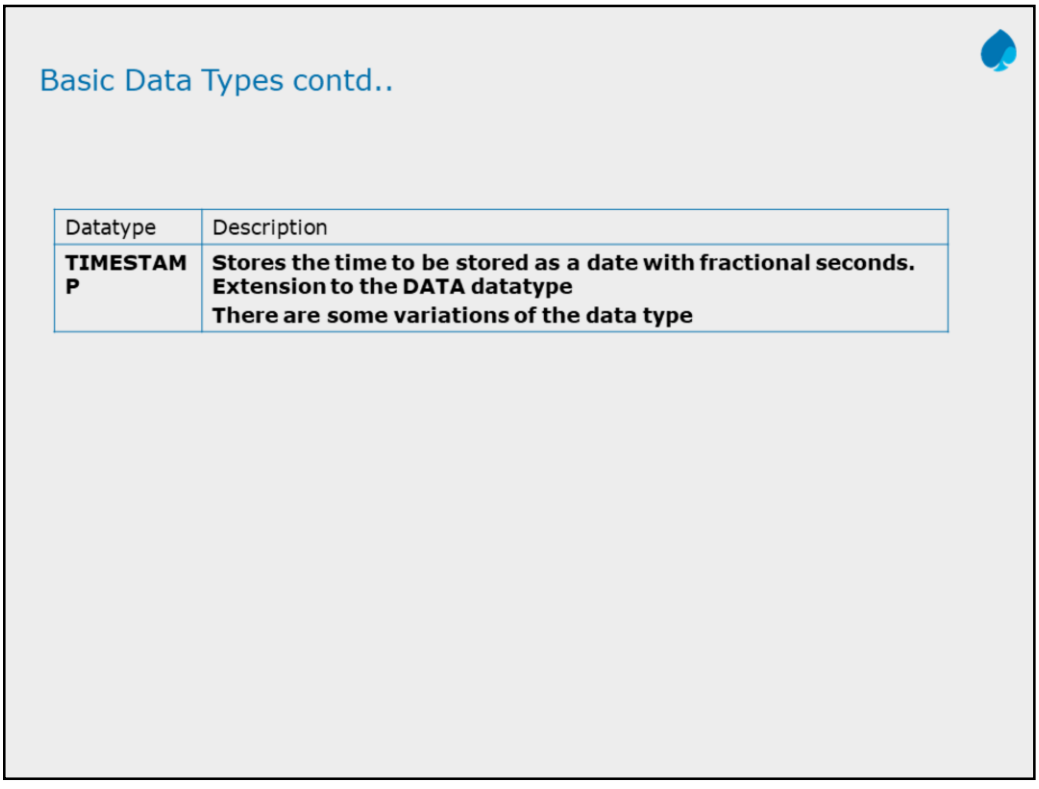
- Tables
- Views
- Indexes
- Clusters
- Synonyms
- Sequences
- Procedures
- Functions
- Packages
- Triggers .



Basic Data Types supported in SQL:

Scalar Data Types:

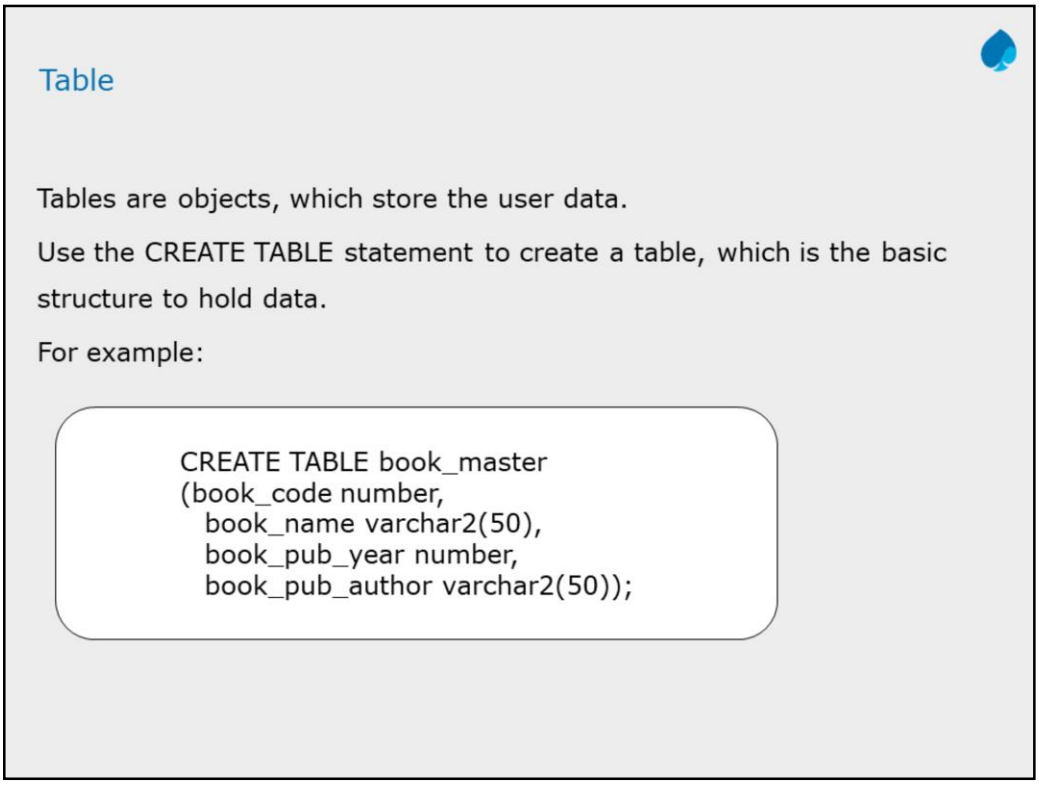
- The traditional Data Types are called “Scalar Data Types”. The slide discusses some of the Scalar Data Types.



Basic Data Types supported in SQL:

The TimeStamp data type is introduced in Oracle 9i. This data type provides support for time zones. It is an extension of the DATE datatype.

TIMESTAMP [(fractional_seconds_precision)] – It stores the year, month & day of the date data type. In addition to that it also stores hour, minute, second and fractional second value.



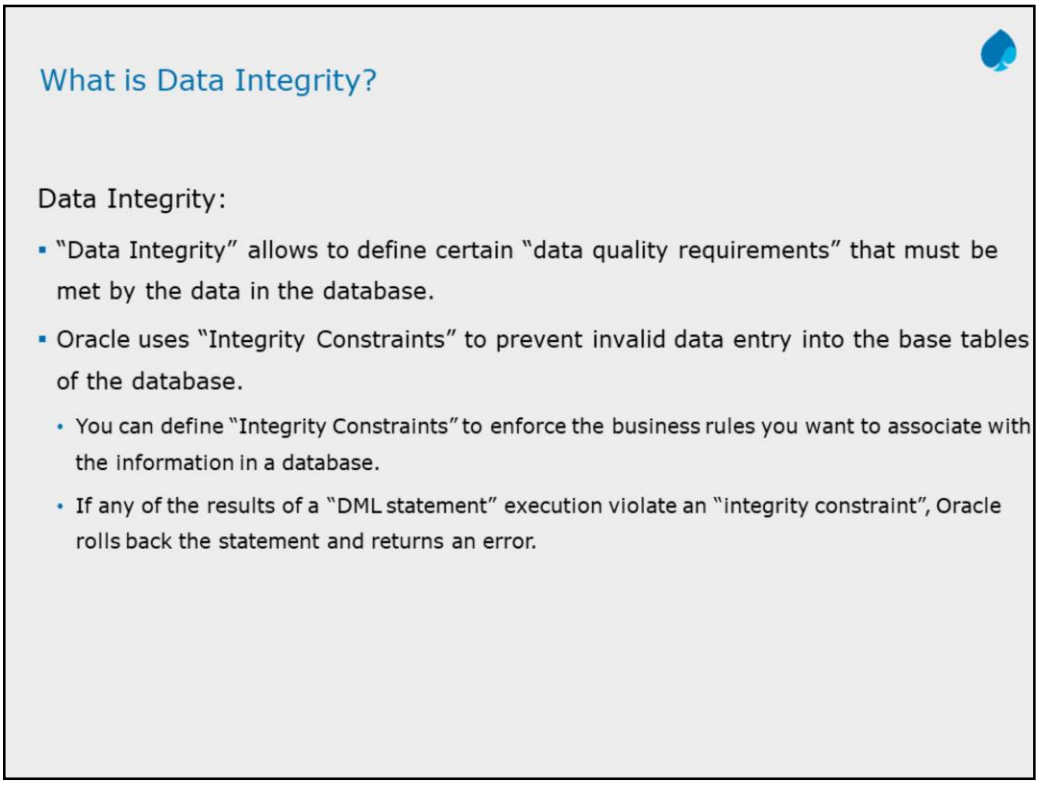
Creating tables is done with the create table command. You can add rows to a table with the INSERT statement, after creating a table.
The above create table command does the following:

- Defines the table name
- Defines the columns in the table and the datatypes of those columns

In above example, we create a table called BOOK_MASTER which has 4 columns. The first column and third column is defined as NUMBER datatype. This means we will be storing numbers in this column. The second and fourth columns are of VARCHAR2 datatype. We will be storing text data in these columns
Syntax:

```
CREATE TABLE table_name
(
{col_name.col_datatype [[CONSTRAINT
const_name][col_constraint]]},...
[table_constraint],...
)
[AS query]
```

- If a table is created as shown in the slide, then there is no restriction on the data that can be stored in the table.
- However, if we wish to put some restriction on the data, which can be stored in the table, then we must supply some “constraints” for the columns. We will see the Constraints as next topic.

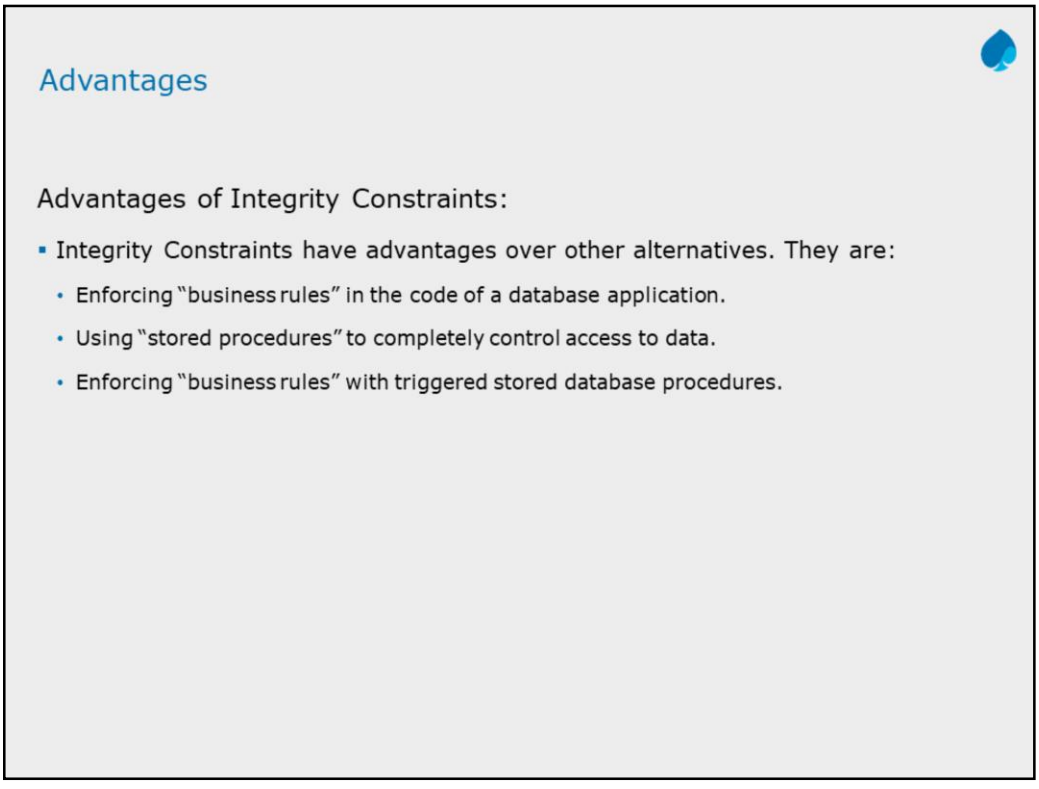


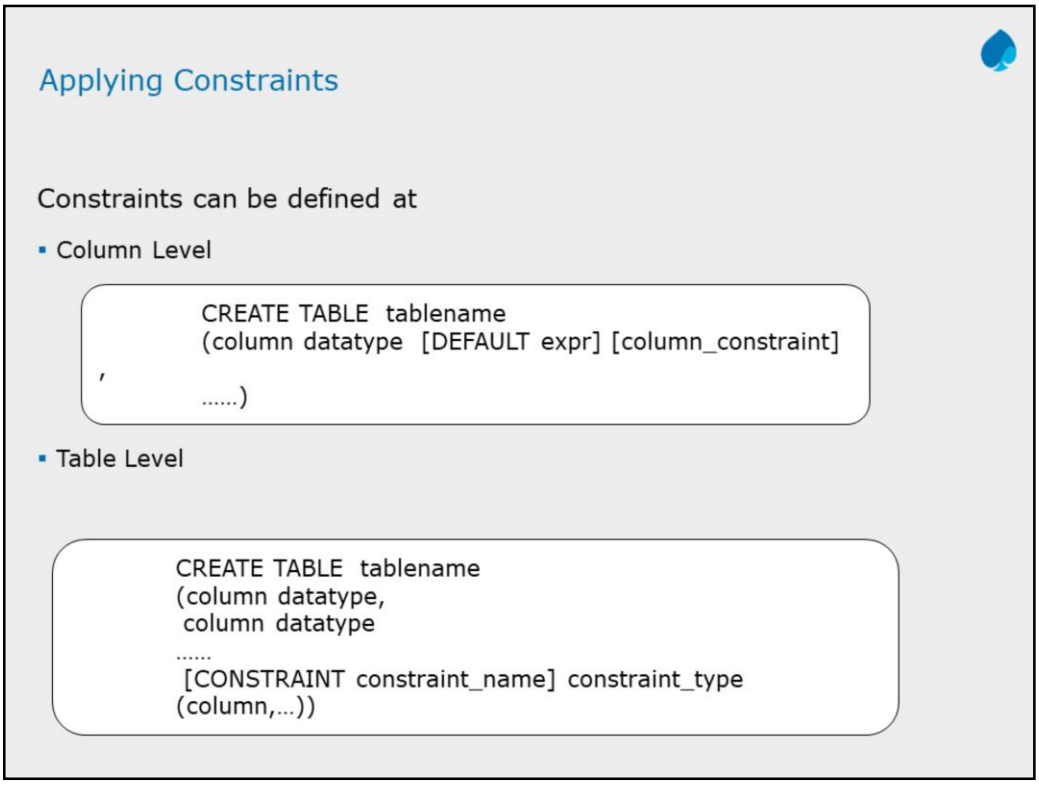
Data Integrity: Integrity Constraint

- An Integrity Constraint is a declarative method of defining a rule for a column of a table.

Example of Data Integrity:

- Assume that you define an "Integrity Constraint" for the Staff_Sal column of the Staff_Master table.
- This Integrity Constraint enforces the rule that "no row in this table can contain a numeric value greater than 10,000 in this column".
- If an INSERT or UPDATE statement attempts to violate this "Integrity Constraint", Oracle rolls back the statement and returns an "information error" message.


Advantages
Advantages of Integrity Constraints:
Integrity Constraints have advantages over other alternatives. They are:
Enforcing "business rules" in the code of a database application.
Using "stored procedures" to completely control access to data.
Enforcing "business rules" with triggered stored database procedures.

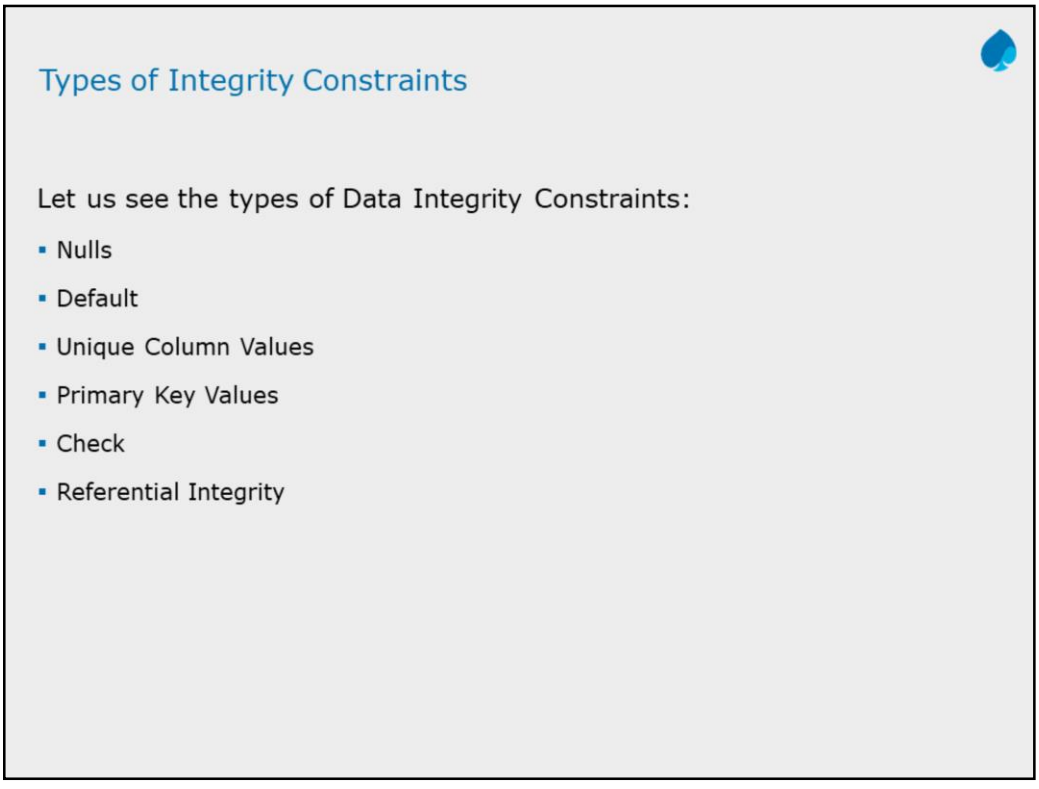


Applying Constraints:

In Oracle you can apply constraints

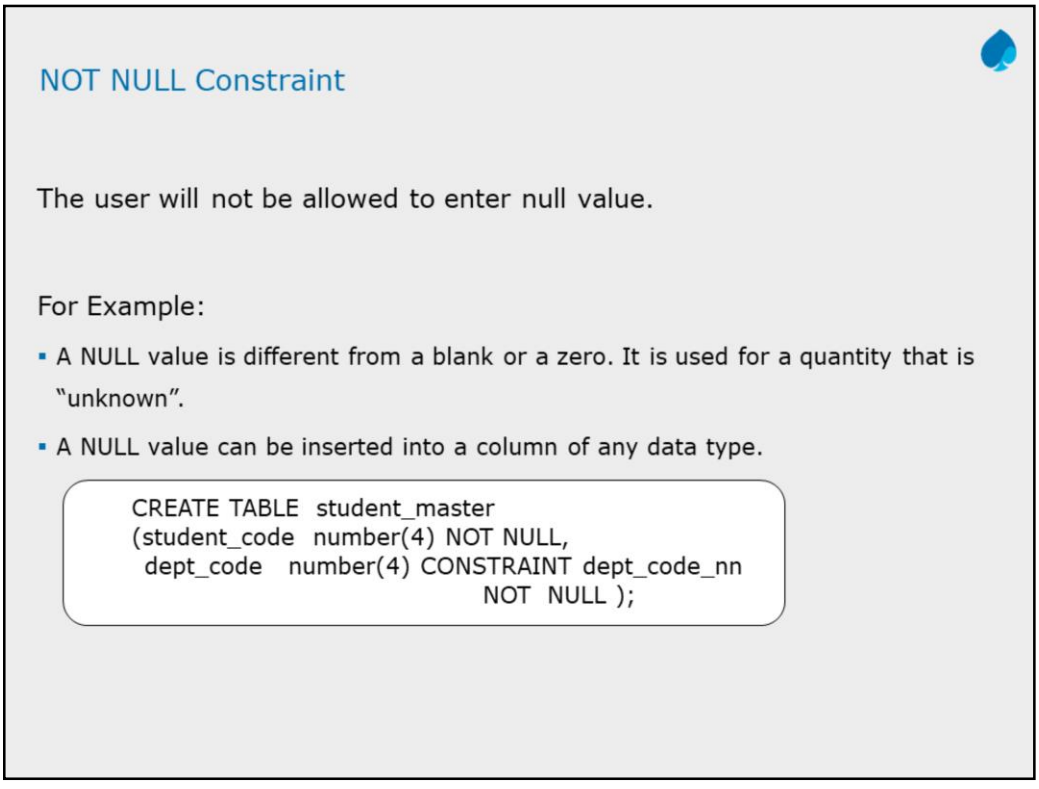
Column Level - References a single column and is defined within a specification for the owning column; can be any type of integrity constraint

Table Level - References one or more columns and is defined separately from the definitions of the columns in the table; can define any constraints except NOT NULL



Types of Data Integrity:

- Oracle supports the following Integrity Constraints:
  - NOT NULL constraints for the rules associated with nulls in a column. "Null" is a rule defined on a single column that allows or disallows, inserts or updates on rows containing a "null" value (the absence of a value) in that column.
  - UNIQUE key constraints for the rule associated with unique column values. A "unique value" rule defined on a column (or set of columns) allows inserting or updating a row only if it contains a "unique value" in that column (or set of columns).
  - PRIMARY KEY constraints for the rule associated with primary identification values. A "primary key" value rule defined on a key (a column or set of columns) specifies that "each row in the table can be uniquely identified by the values in the key".
  - FOREIGN KEY constraints for the rules associated with referential integrity. A "Referential Integrity" rule defined on a key (a column or set of columns) in one table guarantees that "the values in that key, match the values in a key in a related table (the referenced value)". Oracle currently supports the use of FOREIGN KEY integrity constraints to define the referential integrity actions, including:
    - update and delete No Action
    - delete CASCADE
    - delete SET NULL
  - CHECK constraints for complex integrity rules



NOT NULL constraint:

- Often there may be records in a table that do not have values for every field.
  - This could be because the information is not available at the time of the data entry or because the field is not applicable in every case.
- If the column is created as NULLABLE, in the absence of a user-defined value the DBMS will place a NULL value in the column.
- A NULL value is different from a blank or a zero. It is used for a quantity that is "unknown".
- "Null" is a rule defined on a single column that allows or disallows, inserts or updates on rows containing a "null" value (the absence of a value) in that column.
- A NULL value can be inserted into a column of any data type.
- **Principles of NULL values:**
  - Setting a NULL value is appropriate when the "actual value" is unknown, or when a value is not meaningful.
  - A NULL value is not equivalent to the value of "zero" if the data type is number, and it is not equivalent to "spaces" if the data type is character.
  - A NULL value will evaluate to NULL in any expression
    For example: NULL multiplied by 10 is NULL.
  - NULL value can be inserted into columns of any data type.
  - If the column has a NULL value, Oracle ignores any UNIQUE, FOREIGN KEY, and CHECK constraints that may be attached to the column.

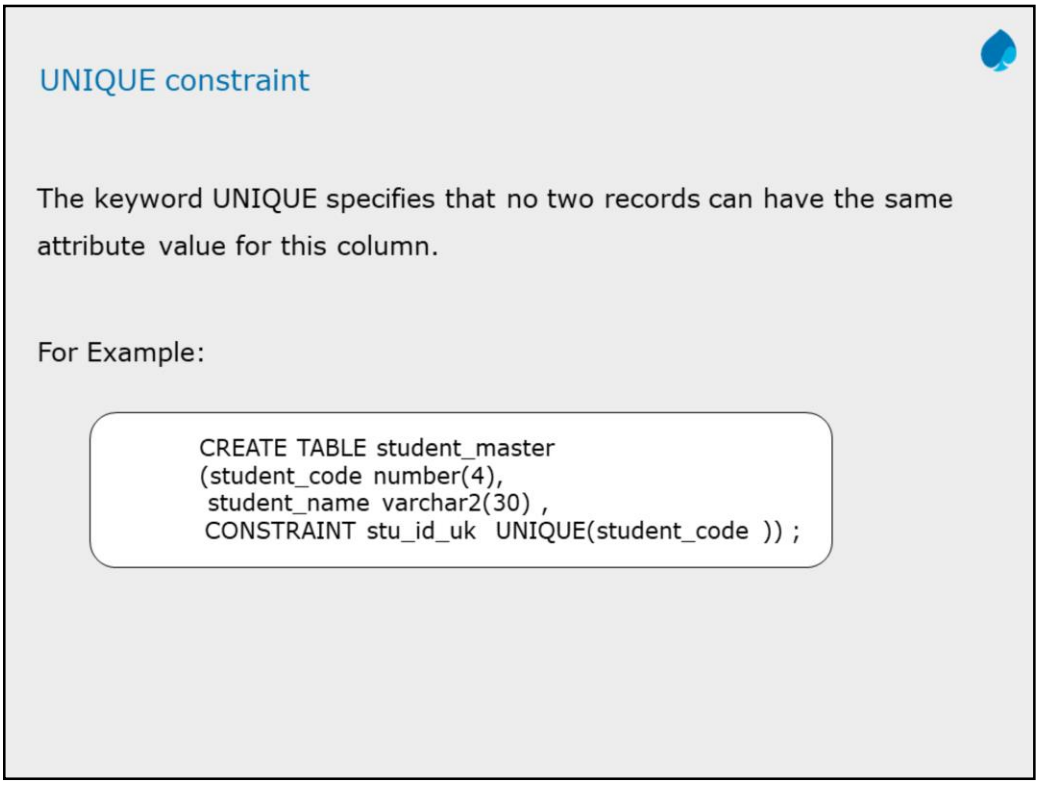
DEFAULT clause

If no value is given, then instead of using a "Not Null" constraint, it is sometimes useful to specify a default value for an attribute.

For Example:

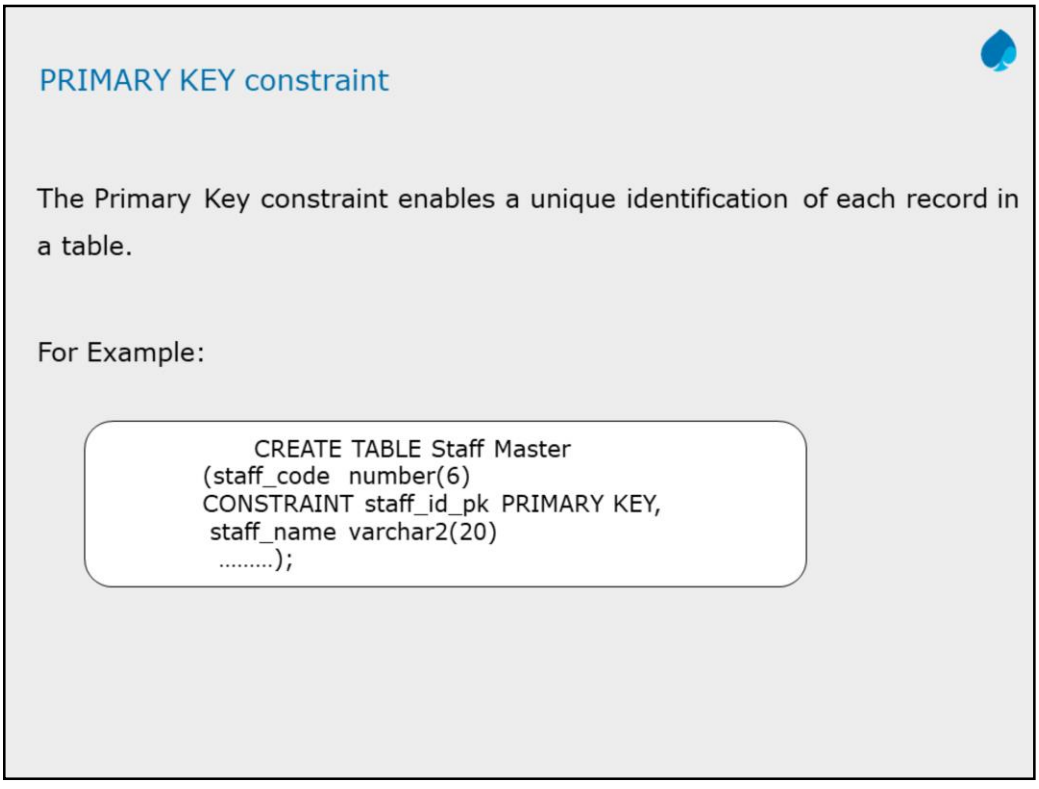
- When a record is inserted the default value can be considered.

```
CREATE TABLE  staff_master(
Staff_Code number(8) PRIMARY KEY,
Staff_Name varchar2(50) NOT NULL,
Staff_dob date,
Hiredate date DEFAULT sysdate,
…..)
```



UNIQUE constraint:

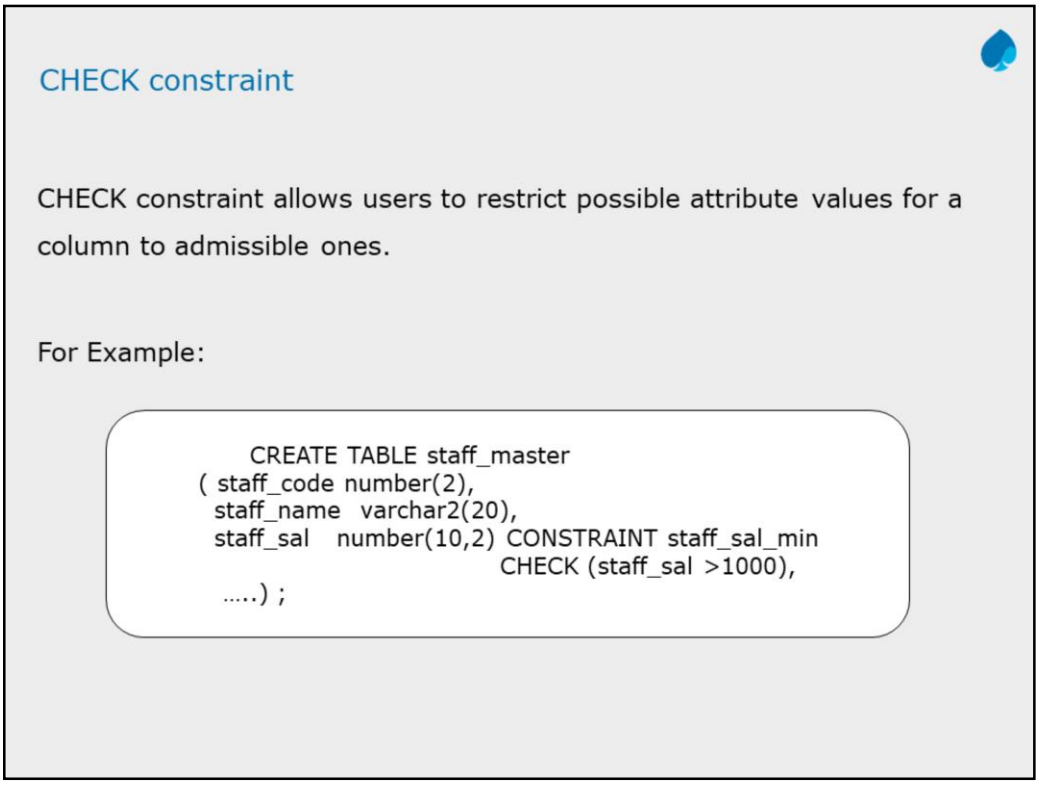
- The UNIQUE constraint does not allow duplicate values in a column.
  - If the UNIQUE constraint encompasses two or more columns, then two equal combinations are not allowed.
  - However, if a column is not explicitly defined as NOT NULL, then NULLS can be inserted multiple number of times.
- A UNIQUE constraint can be extended over multiple columns.
- A “unique value” rule defined on a column (or set of columns) allows inserting or updating a row only if it contains a “unique value” in that column (or set of columns).



PRIMARY KEY constraint:

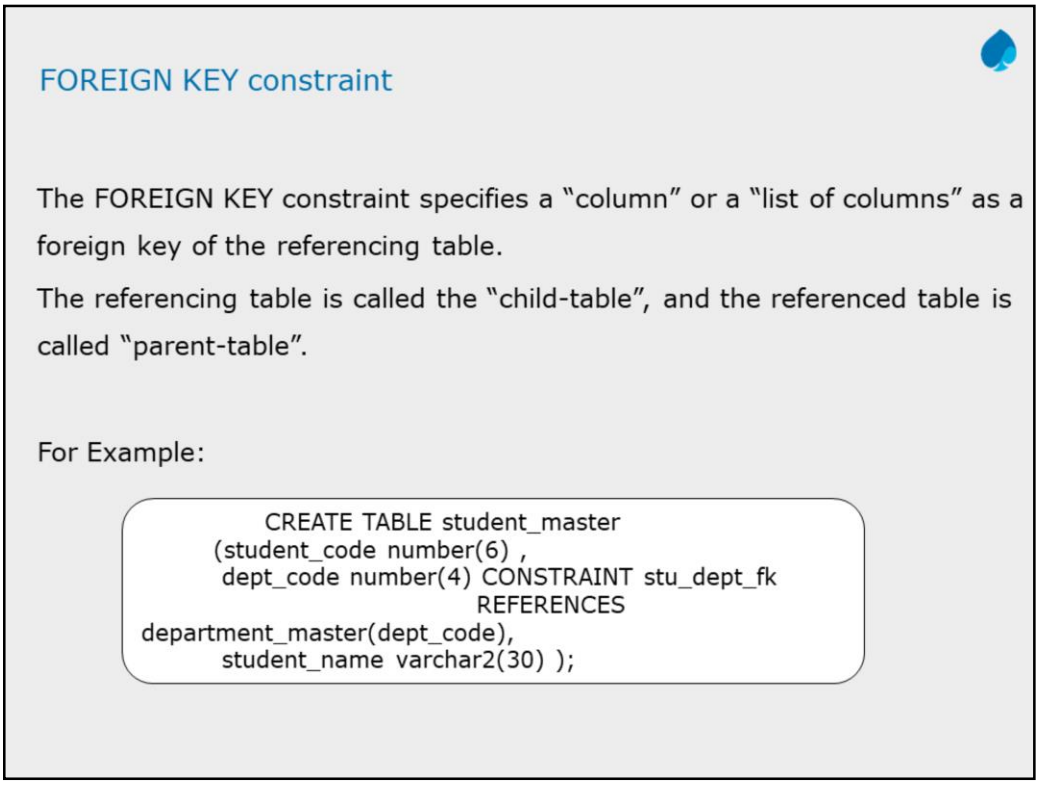
- On a technical level, a PRIMARY KEY combines a UNIQUE constraint and a NOT NULL constraint.
- Additionally, a table can have at the most one PRIMARY KEY.
- After creating a PRIMARY KEY, it can be referenced by a FOREIGN KEY.
- A “primary key” value rule defined on a key (a column or set of columns) specifies that “each row in the table can be uniquely identified by the values in the key”.
- The example on the slide defines the primary key constraint at the column level. The same example is seen below with the constraint defined at table level

```
CREATE TABLE Staff Master
(staff_code  number(6) ,
 staff_name varchar2(20),
  ……
CONSTRAINT staff_id_pk  PRIMARY KEY
(staff_code))
;
```



CHECK constraint:

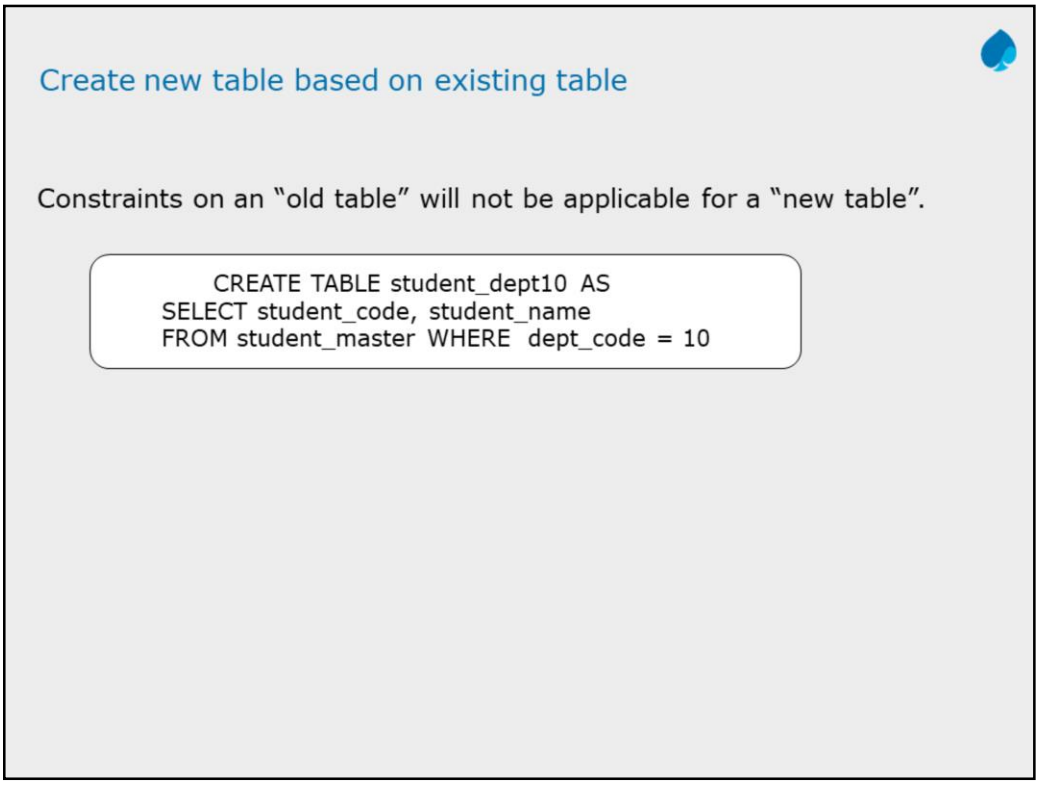
- A CHECK constraint allows to state a minimum requirement for the value in a column.
- If more complicated requirements are desired, an INSERT trigger must be used.



FOREIGN KEY Constraint Keywords:

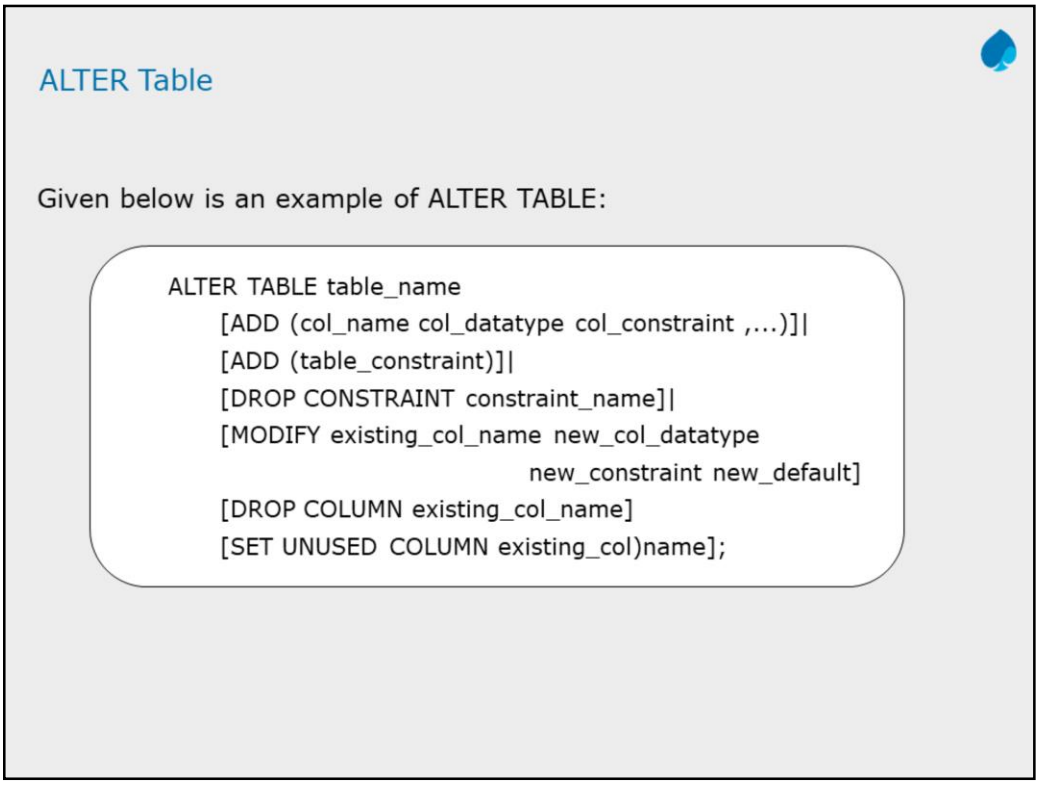
- Given below are a few Foreign Key constraint keywords:
  - FOREIGN KEY: Defines the column in the child table at the table constraint level.
  - REFERENCES: Identifies the table and column in the parent table.
  - ON DELETE CASCADE: Deletes the dependent rows in the child table when a row in the parent table is deleted.
  - ON DELETE SET NULL: Converts dependent FOREIGN KEY values to NULL.
- You can query the USER_CONSTRAINTS table to view all constraint definitions and names.
- You can view the columns associated with the constraint names in the USER_CONS_COLUMNS view.

- In EMP table, for deptno column, if we want to allow only those values that already exist in deptno column of the DEPT table, we must enforce what is known as REFERENTIAL INTEGRITY. To enforce REFERENTIAL INTEGRITY, declare deptno field of DEPT table as PRIMARY KEY, and deptno field of EMP table as FOREIGN KEY as follows



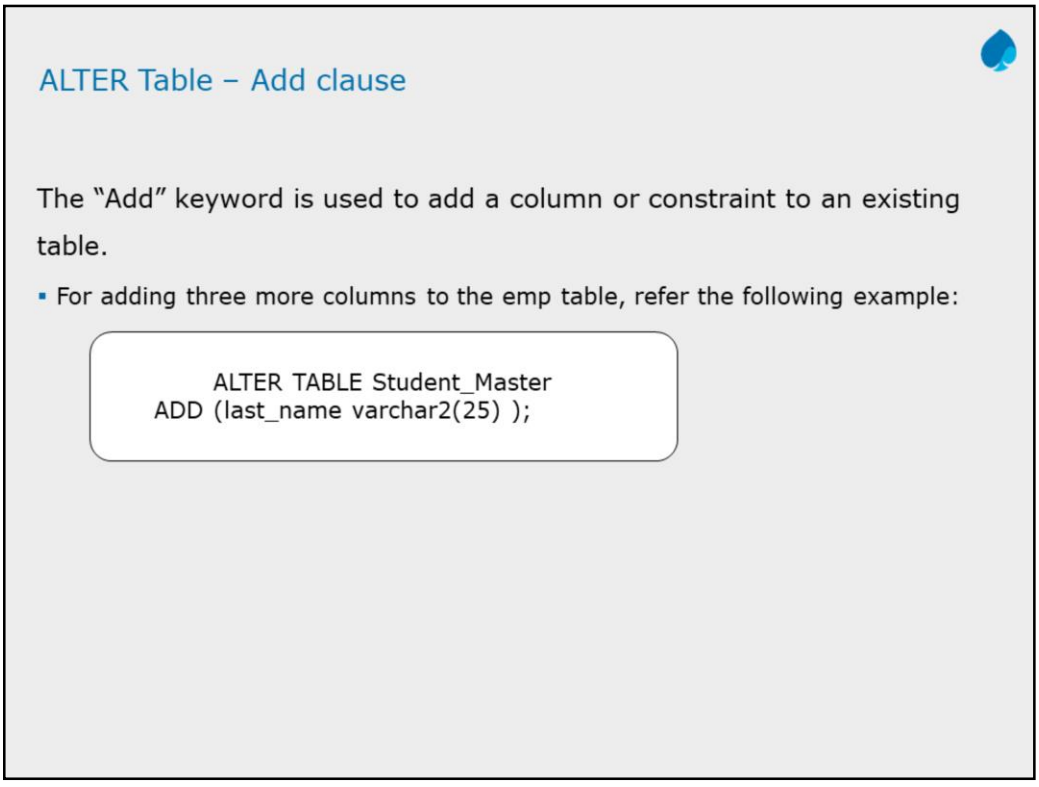
Creating new table based on an existing table:

- The example in the slide shows how to create a new table based on an existing table.
  - When the new table will be created, it will contain student information from department 10.
  - Constraints on an old table will not be applicable for the new table except NOT NULL constraint.



Examples of ALTER TABLE:

- Table_name must be an existing table.
- A column can be removed from an existing table by using ALTER TABLE.
- The uses of modifying columns are:
  - Can increase the width of a character column, any time.
  - Can increase the number of digits in a number, any time.
  - Can increase or decrease the number of decimal places in a number column, any time. Any reduction on precision and scale can be on empty columns only.
  - Can add only NOT NULL constraint by using Column constraints. All other constraints have to be specified as Table constraints.



ALTER TABLE – Add clause:

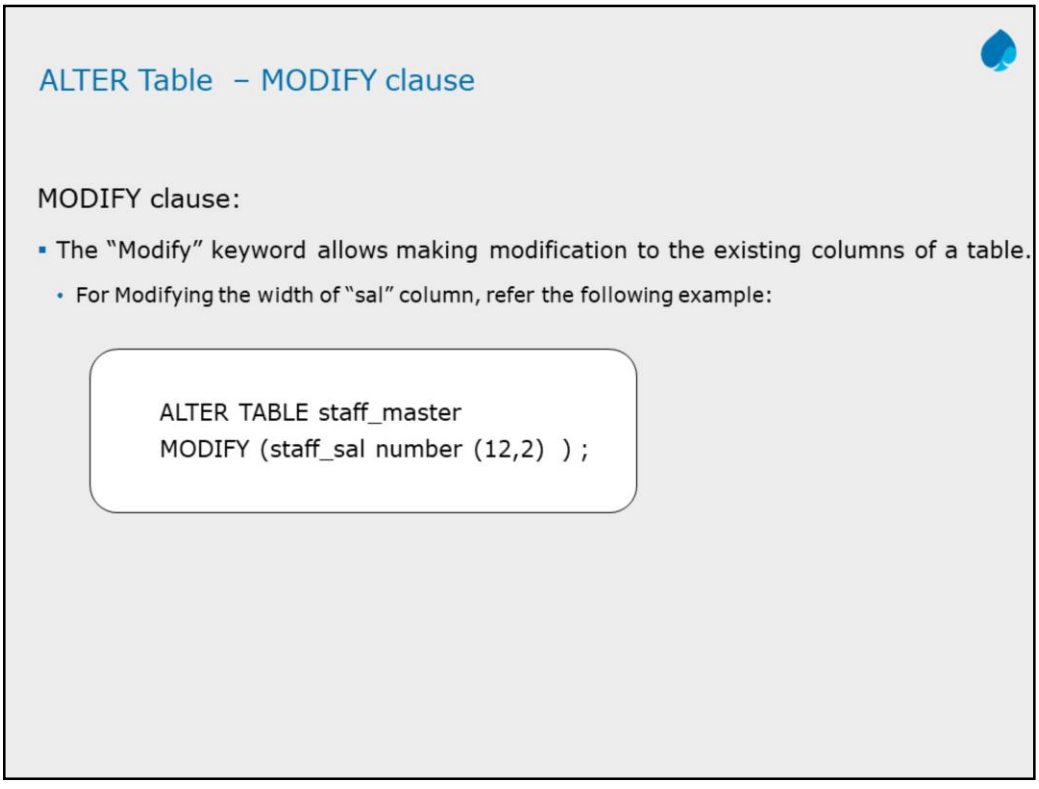
- The ADD clause allows to add a column or constraint. You can also add multiple columns in one statement separated by comma.
- A column with constraints can also be added as shown in the following example:

```
ALTER TABLE Department_Master
ADD (dept_name varchar2(10) NOT NULL);
```

ALTER Table – Add clause

For adding Referential Integrity on "mgr_code" column, refer the following example:

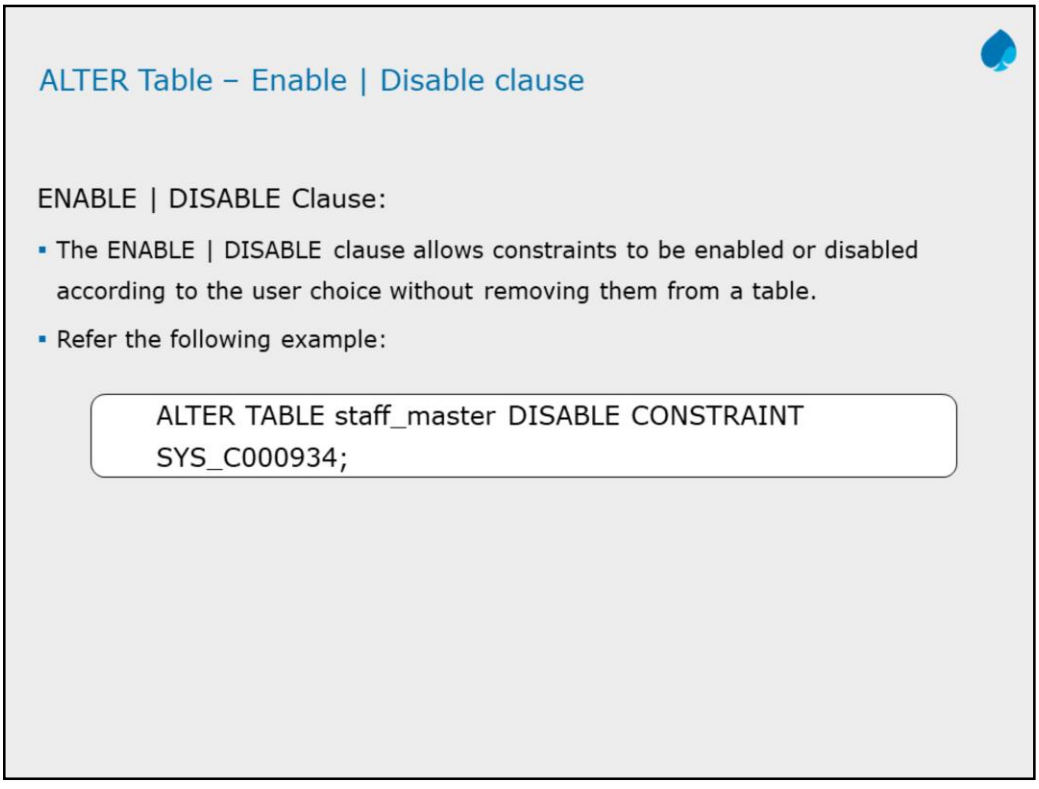
```
ALTER TABLE staff_master
  ADD CONSTRAINT FK FOREIGN KEY (mgr_code)
REFERENCES staff_master(staff_code);
```

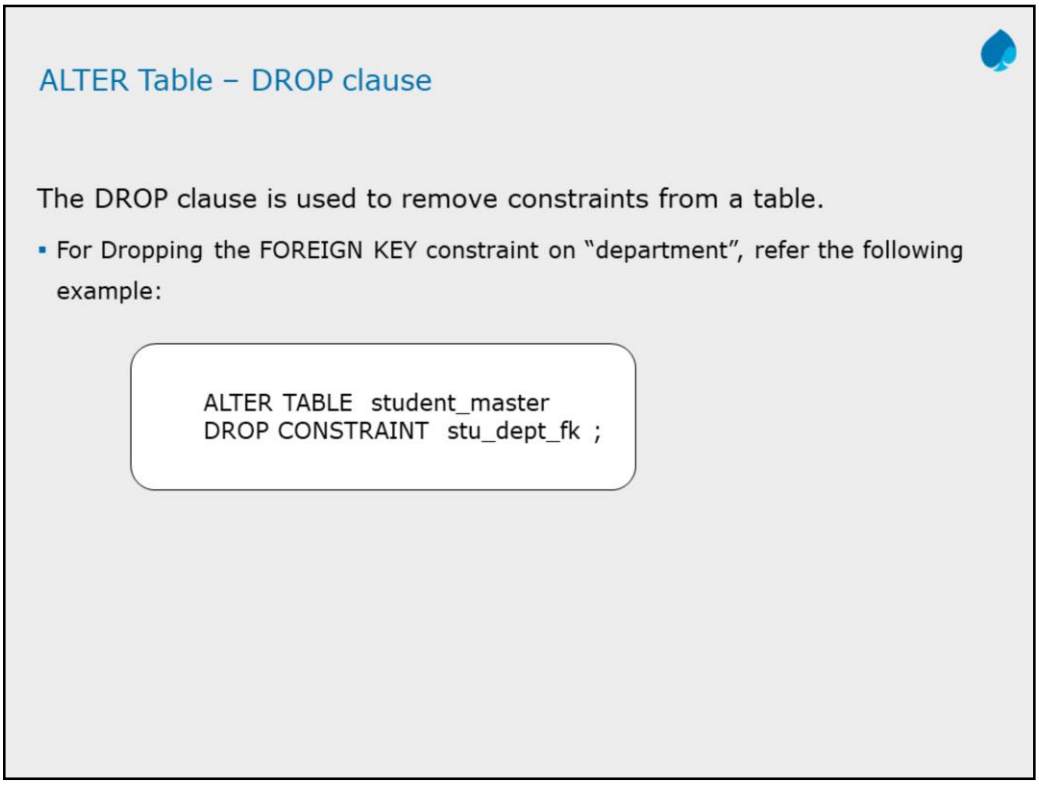


ALTER TABLE- Modify Clause

The use of modifying the columns with the Enable | Disable clause are:

- Can increase "column width" of a character any time.
- Can increase the "number of digits" in a number at any time.
- Can increase or decrease the "number of decimal places" in a number column at any time. Any reduction on "precision" and "scale" can only be on empty columns.
- Can only add the NOT NULL constraint by using "column constraints". Rest all other constraints have to be specified as "table constraints".

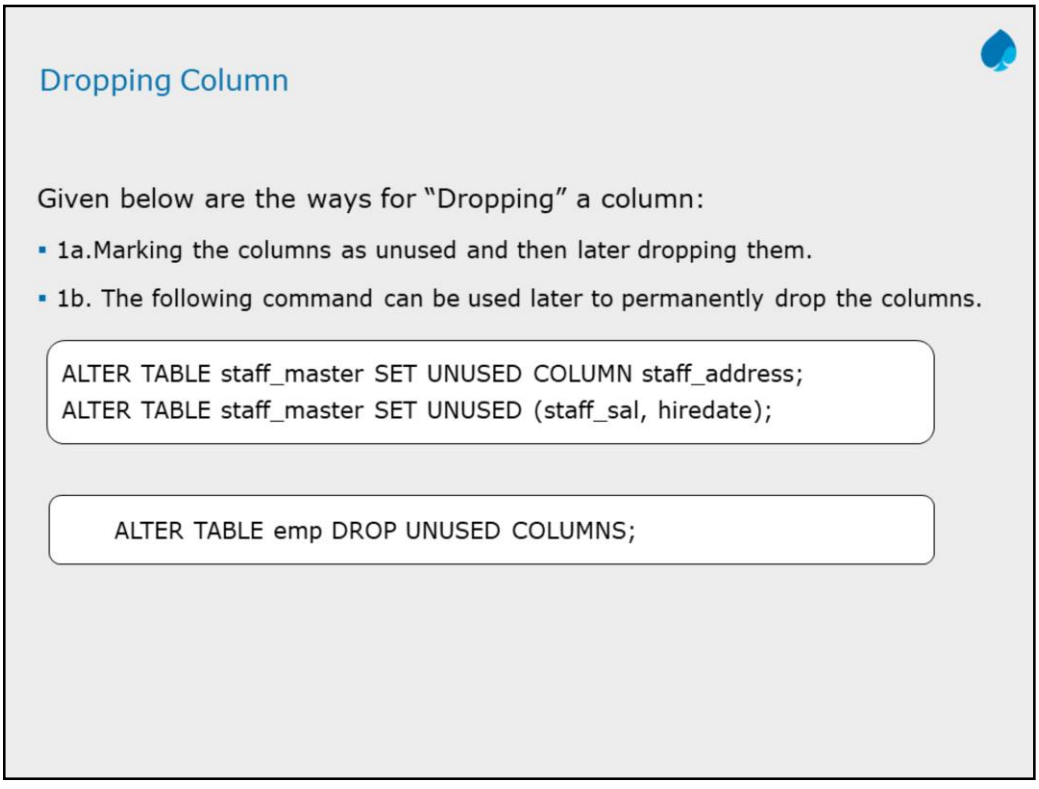

ALTER Table – Enable | Disable clause
ENABLE | DISABLE Clause:
The ENABLE | DISABLE clause allows constraints to be enabled or disabled according to the user choice without removing them from a table.
Refer the following example:
ALTER TABLE staff_master DISABLE CONSTRAINT SYS_C000934;



ALTER TABLE – Drop Clause

- To remove the PRIMARY KEY constraint on the DEPARTMENT table and drop the associated FOREIGN KEY constraint on the DEPT_CODE column.

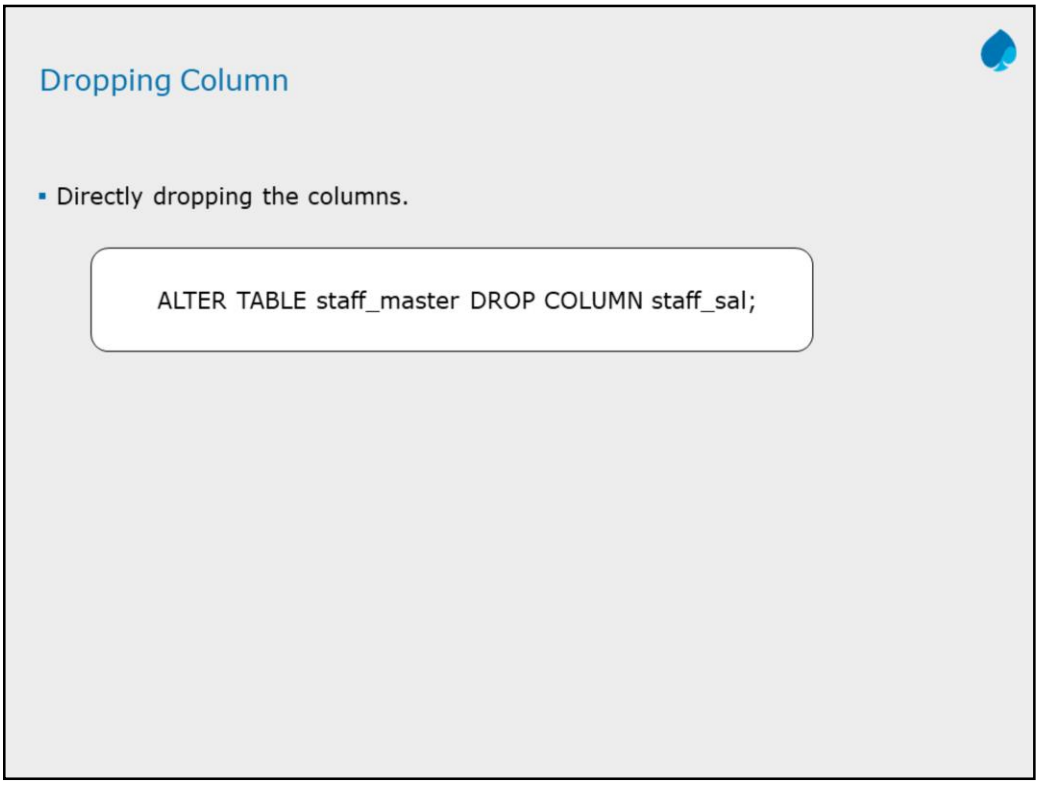
```
ALTER TABLE department_master
DROP PRIMARY KEY CASCADE;
```



Ways for "Dropping" a column:

1. **Marking the columns as "Unused" and then later dropping them:**

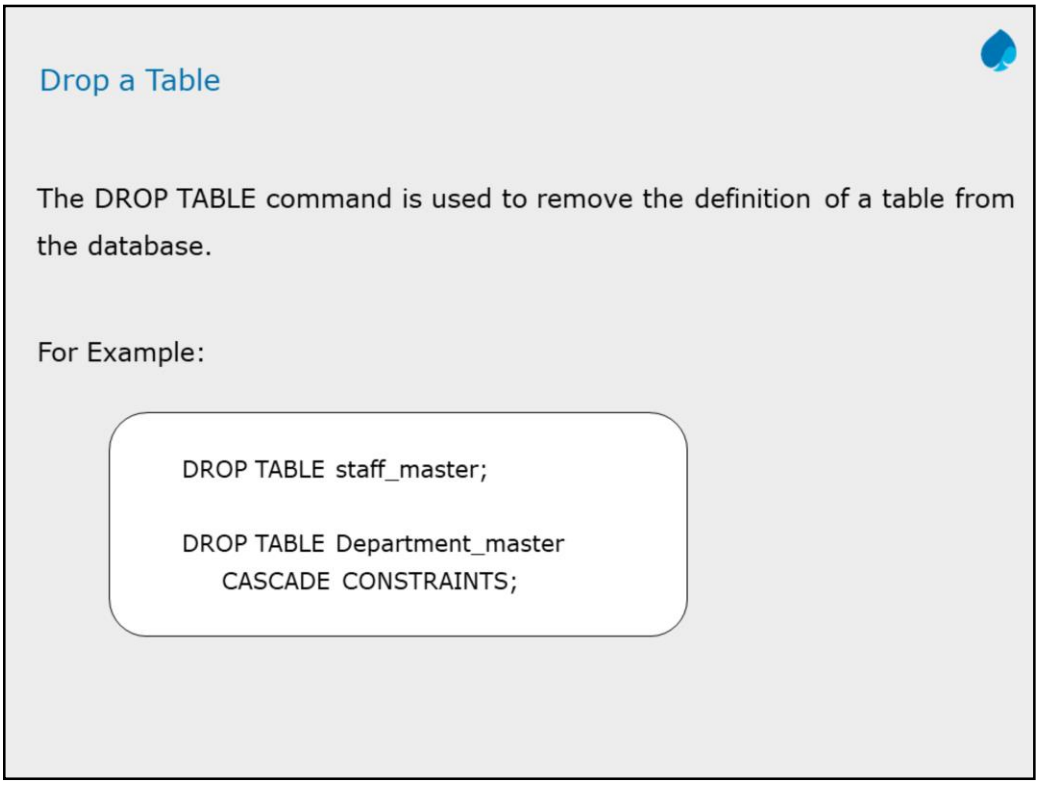
- Oracle onwards a new feature to "drop" and "set" the "unused columns" in a table is added
  - First command as shown in the slide, allows you to mark a column as unused and
  - Second command as shown in the following slide, lets you drop the unused column from the table to create more free space.
    - This feature drops the column from a table and releases any space back to the segment.
- **Note that:**
  - Columns once marked as unused cannot be recovered.
  - Marking the columns as unused does not release the space occupied by them back to the database.
    - Until you actually drop these columns, they continue to count towards the absolute limit of 1000 columns per table.
    - If you mark a column of data type LONG as UNUSED, you cannot add another LONG column to the table until you actually drop the unused LONG column.
- The advantage of the marking column as "unused" and then dropping them is that marking the columns is much faster process than dropping the columns.
- You can refer to the data dictionary table USER_UNUSED_COL_TABS to get information regarding the tables with columns marked as unused.



Ways for "Dropping" a column (contd.):

2. DROP COLUMN:

- This feature allows directly dropping the column.
- For DROP COLUMN command shown in the slide, to work successfully, the table should be exclusively locked by the user by giving the command.
  - All "indexes" defined on any of the target columns are also dropped.
  - All "constraints" that reference a target column are removed.
- Note that this command should be used with caution.
- The CASCADE CONSTRAINTS clause is used along with the DROP COLUMN clause.
- The CASCADE CONSTRAINTS clause drops all referential integrity constraints that refer to the primary and unique keys defined on the dropped columns.
- The CASCADE CONSTRAINTS clause also drops all multicolumn constraints defined on the dropped columns



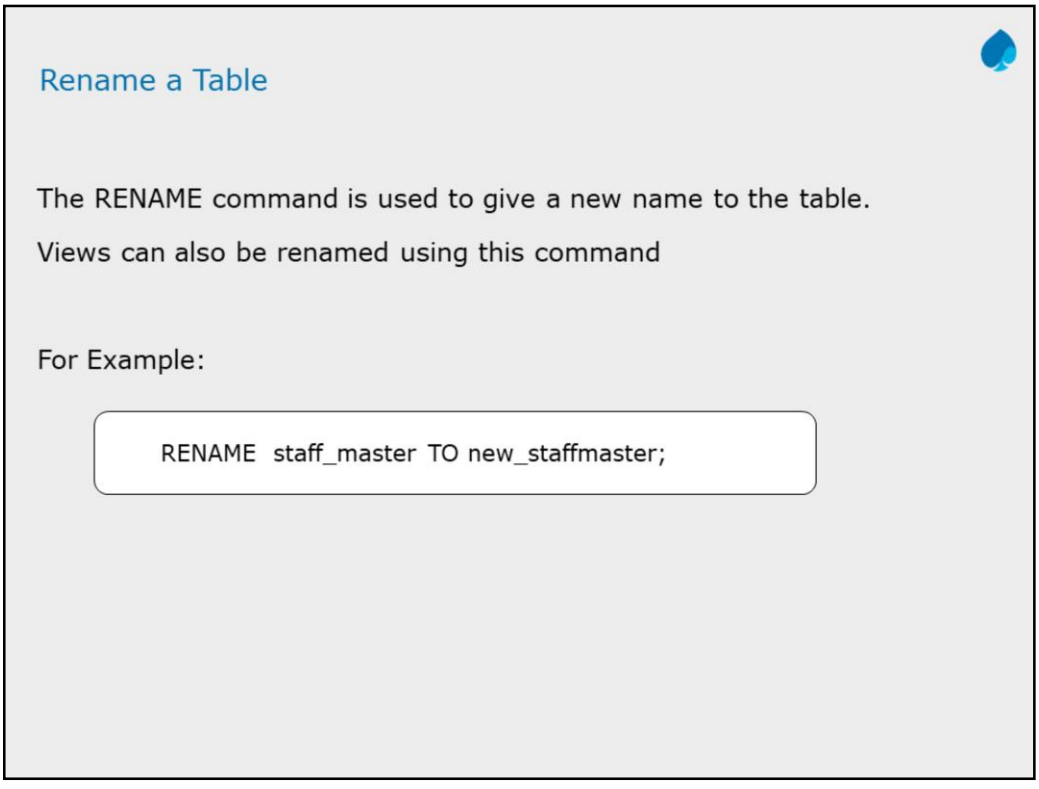
Deleting Database Objects: Tables

- Deleting objects that exist in the database is an easy task. Just say:

```
DROP Obj_Type obj_name;
```

- A table that is dropped cannot be recovered. When a table is dropped, dependent objects such as indexes are automatically dropped. Synonyms and views created on the table remain, but give an error if they are referenced.
- You cannot delete a table that is being referenced by another table. To do so use the following:

```
DROP  TABLE table-name CASCADE CONSTRAINTS;
```

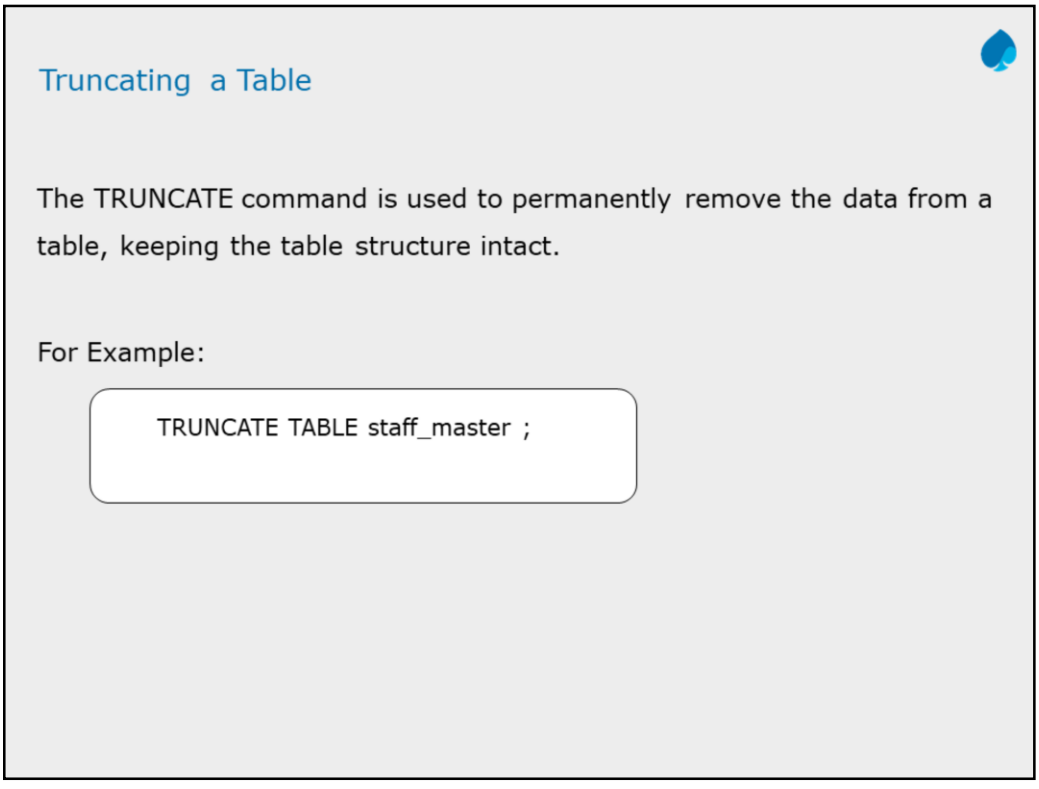


Renaming Database Objects: Tables

- Renaming objects that exist in the database is an easy task. Just say:

```
RENAME Existing_TableName TO new_tablename;
```

- You can RENAME a table that is being referenced by another table.



Truncating Database Objects: Tables

- Truncating objects that exist in the database is an easy task. Just say:

```
TRUNCATE TABLE  Existing_TableName
```

7.9: Tips and Tricks

Guidelines

When creating tables based on subquery the number of specified columns if defined for the table should match to the number of columns in the subquery.

Create an index if

- A column contains a wide range of values
- A column contains a large number of null values
- One or more columns are frequently used together in a WHERE clause or a join condition
- The table is large and most queries are expected to retrieve less than 2 to 4 percent of the rows

7.9: Tips and Tricks

Guidelines

An Index is not very useful if :

- The table is small
- The columns are not often used as a condition in the query
- Most queries are expected to retrieve more than 2 to 4 percent of rows in the table
- The table is updated frequently
- The indexed columns are referenced as part of an expression

Summary

In this lesson, you have learnt:

- What are Database Objects?
- Basic Data Types
- Data Integrity
- Different types of Database Objects:
- Modification of Database Objects

Review – Questions

Question 1: Indexes can be created _____ or _____