Creating Schema Objects

Using DDL Statements to Create and Manage Tables

Preview

- Objects and Data Types
- Managing Tables
- Advanced Creation
- Constraints: presentation
- `NOT NULL`
- `UNIQUE`
- `PRIMARY KEY`
- `FOREIGN KEY`
- `CHECK`
- How to use

Objects and Data Types

Database Objects

Object	Description
`Table`	Basic unit of storage; composed of rows
`View`	Logically represents subsets of data from one or more tables
`Sequence`	Generates numeric values
`Index`	Improves the performance of some queries
`Synonym`	Gives alternative names to objects

Objects and Data Types

Data Types

Data Type	Description
VARCHAR2(size)	Variable-length character data
CHAR(size)	Fixed-length character data
NUMBER(p,s)	Variable-length numeric data
DATE	Date and time values
LONG	Variable-length character data (up to 2 GB)
CLOB	Character data (up to 4 GB)

Objects and Data Types

Data Types (continued)

Data Type	Description
RAW and LONG RAW	Raw binary data
BLOB	Binary data (up to 4 GB)
BFILE	Binary data stored in an external file (up to 4 GB)
ROWID	A base-64 number system representing the unique address of a row in its table

Objects and Data Types

Datetime Data Types

Data Type	Description
`TIMESTAMP`	Variable-length character data
`INTERVAL YEAR TO MONTH`	Stored as an interval of years and months
`INTERVAL DAY TO SECOND`	Stored as an interval of days, hours, minutes, and seconds

Managing Tables

Naming Rules

- Table names and column names:
  - Must begin with a letter
  - Must be 1–30 characters long
  - Must contain only A–Z, a–z, 0–9, _, $, and #
  - Must not duplicate the name of another object owned by the same user
  - Must not be an Oracle server reserved word

Managing Tables

CREATE TABLE Statement

- You must have:
  - **CREATE TABLE** privilege
  - A storage area

```
CREATE TABLE [schema.]table
      (column datatype [DEFAULT expr][, ...]);
```

- You specify:
  - Table name
  - Column name, column data type, and column size

Managing Tables

DEFAULT Option

- Specify a default value for a column during an insert.

```
... hire_date DATE DEFAULT SYSDATE, ...
```

- Literal values, expressions, or SQL functions are legal values.
- Another column’s name or a pseudocolumn are illegal values.
- The default data type must match the column data type.

```
CREATE TABLE hire_dates
      (id NUMBER(8),
       hire_date DATE DEFAULT SYSDATE );
```

```
Table created.
```

Managing Tables

Creating Tables

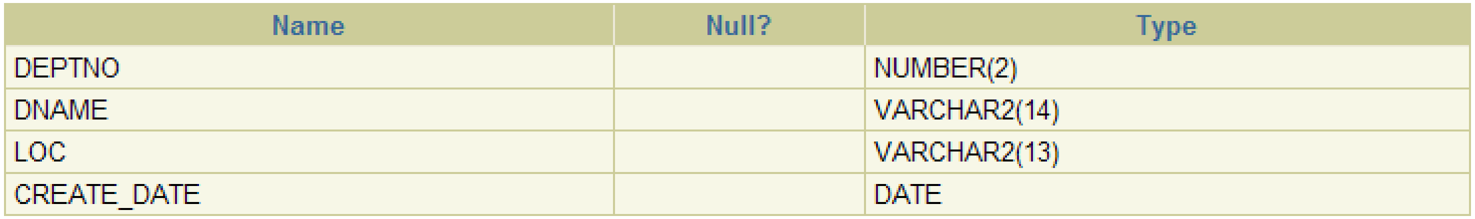
- Create the table.

```
CREATE TABLE  dept
      (deptno NUMBER(2),
       dname VARCHAR2(14),
       loc VARCHAR2(13),
       create_date DATE DEFAULT SYSDATE );
```

```
Table created.
```

- Confirm table creation.

```
DESCRIBE dept
```



Name	Null?	Type
DEPTNO		NUMBER(2)
DNAME		VARCHAR2(14)
LOC		VARCHAR2(13)
CREATE_DATE		DATE

Managing Tables

`ALTER TABLE` Statement

- Use the **`ALTER TABLE`** statement to:
  - Add a new column
  - Modify an existing column
  - Define a default value for the new column
  - Drop a column

Managing Tables

Dropping a table:

- All data and structure in the table are deleted.
- Any pending transactions are committed.
- All indexes are dropped.
- All constraints are dropped.
- You cannot roll back the **DROP TABLE** statement.

```
DROP TABLE dept80;
```

```
Table dropped.
```

Advanced Creation

Creating a Table by Using a Subquery

- Create a table and insert rows by combining the **`CREATE TABLE`** statement and the **`AS`** subquery option.

```
CREATE TABLE table [(column, column...)]
AS           subquery;
```

- Match the number of specified columns to the number of subquery columns.
- Define columns with column names and default values.

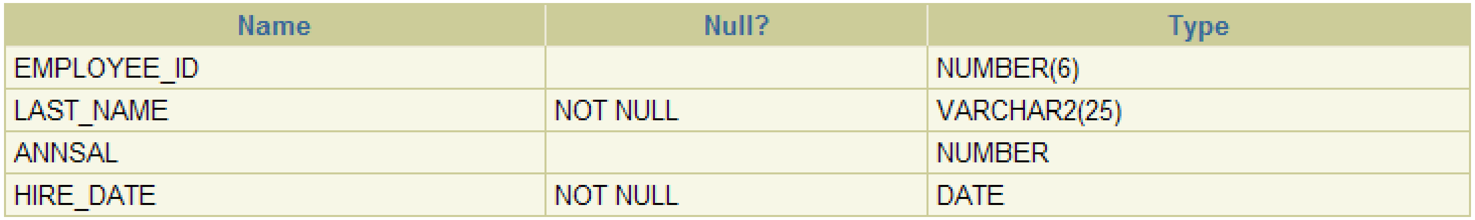
Advanced Creation

Creating a Table by Using a Subquery

```
CREATE TABLE dept80 AS
     SELECT employee_id, last_name,
            salary*12 ANNSAL, hire_date
     FROM employees
     WHERE department_id = 80;
```

```
Table created.
```

```
DESCRIBE dept80
```



Name	Null?	Type
EMPLOYEE_ID		NUMBER(6)
LAST_NAME	NOT NULL	VARCHAR2(25)
ANNSAL		NUMBER
HIRE_DATE	NOT NULL	DATE

Constraints: presentation

Including Constraints

- Constraints enforce rules at the table level.
- Constraints prevent the deletion of a table if there are dependencies.
- The following constraint types are valid:
  - `NOT NULL`
  - `UNIQUE`
  - `PRIMARY KEY`
  - `FOREIGN KEY`
  - `CHECK`

Constraints: presentation

Constraint Guidelines

- You can name a constraint, or the Oracle server generates a name by using the SYS_C*n* format.
- Create a constraint at either of the following times:
  - At the same time as the table is created
  - After the table has been created
- Define a constraint at the column or table level.
- View a constraint in the data dictionary.

Constraints: presentation

Defining Constraints

- Syntax:

```
CREATE TABLE [schema.]table
    (column datatype [DEFAULT expr]
         [column_constraint],
     ...
     [table_constraint][,...]);
```

- Column-level constraint:

```
column [CONSTRAINT constraint_name] constraint_type,
```

- Table-level constraint:

```
column,...
    [CONSTRAINT constraint_name]
     constraint_type (column, ...),
```

Constraints: presentation

Defining Constraints

Column-level constraint:

```
CREATE TABLE employees(
     employee_id NUMBER(6)
          CONSTRAINT emp_emp_id_pk PRIMARY KEY,
     first_name VARCHAR2(20),
     ...);
```

Table-level constraint:

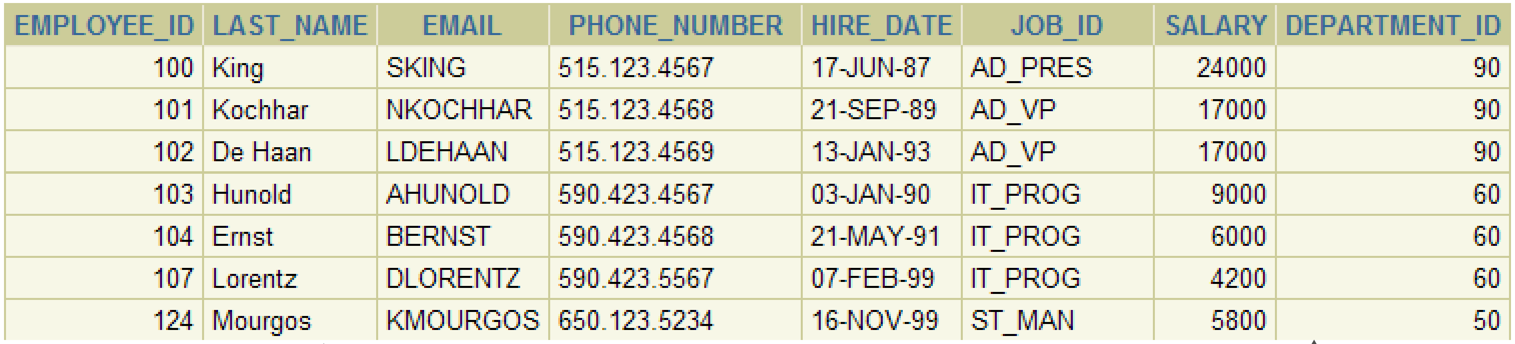
```
CREATE TABLE employees(
     employee_id NUMBER(6),
     first_name VARCHAR2(20),
     ...
     job_id VARCHAR2(10) NOT NULL,
     CONSTRAINT emp_emp_id_pk
          PRIMARY KEY (EMPLOYEE_ID));
```

Using DDL Statements to Create and Manage Tables

NOT NULL

NOT NULL Constraint

Ensures that null values are not permitted for the column:



EMPLOYEE_ID	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	DEPARTMENT_ID
100	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000	90
101	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000	90
102	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000	90
103	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000	60
104	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	6000	60
107	Lorentz	DLORENTZ	590.423.5567	07-FEB-99	IT_PROG	4200	60
124	Mourgos	KMOURGOS	650.123.5234	16-NOV-99	ST_MAN	5800	50

...

20 rows selected

NOT NULL constraint

(No row can contain a null value for this column)

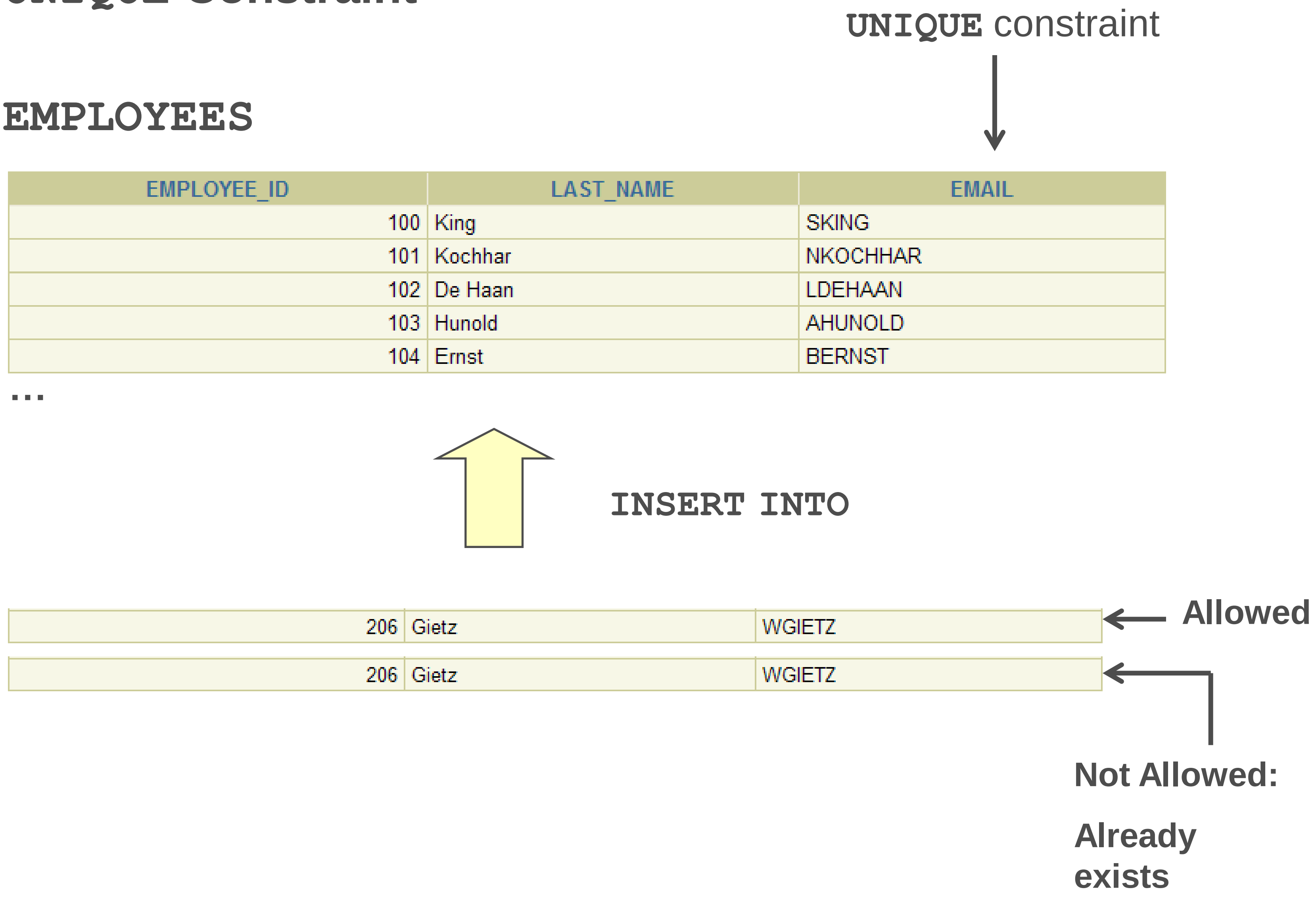
NOT NULL constraint

Absence of **NOT NULL** constraint

(Any row can contain a null value for this column.

UNIQUE

UNIQUE Constraint



UNIQUE constraint

EMPLOYEES

EMPLOYEE_ID	LAST_NAME	EMAIL
100	King	SKING
101	Kochhar	NKOCHHAR
102	De Haan	LDEHAAN
103	Hunold	AHUNOLD
104	Ernst	BERNST

…

INSERT INTO

206	Gietz	WGIETZ

Allowed

206	Gietz	WGIETZ

Not Allowed:

Already exists

UNIQUE

UNIQUE Constraint

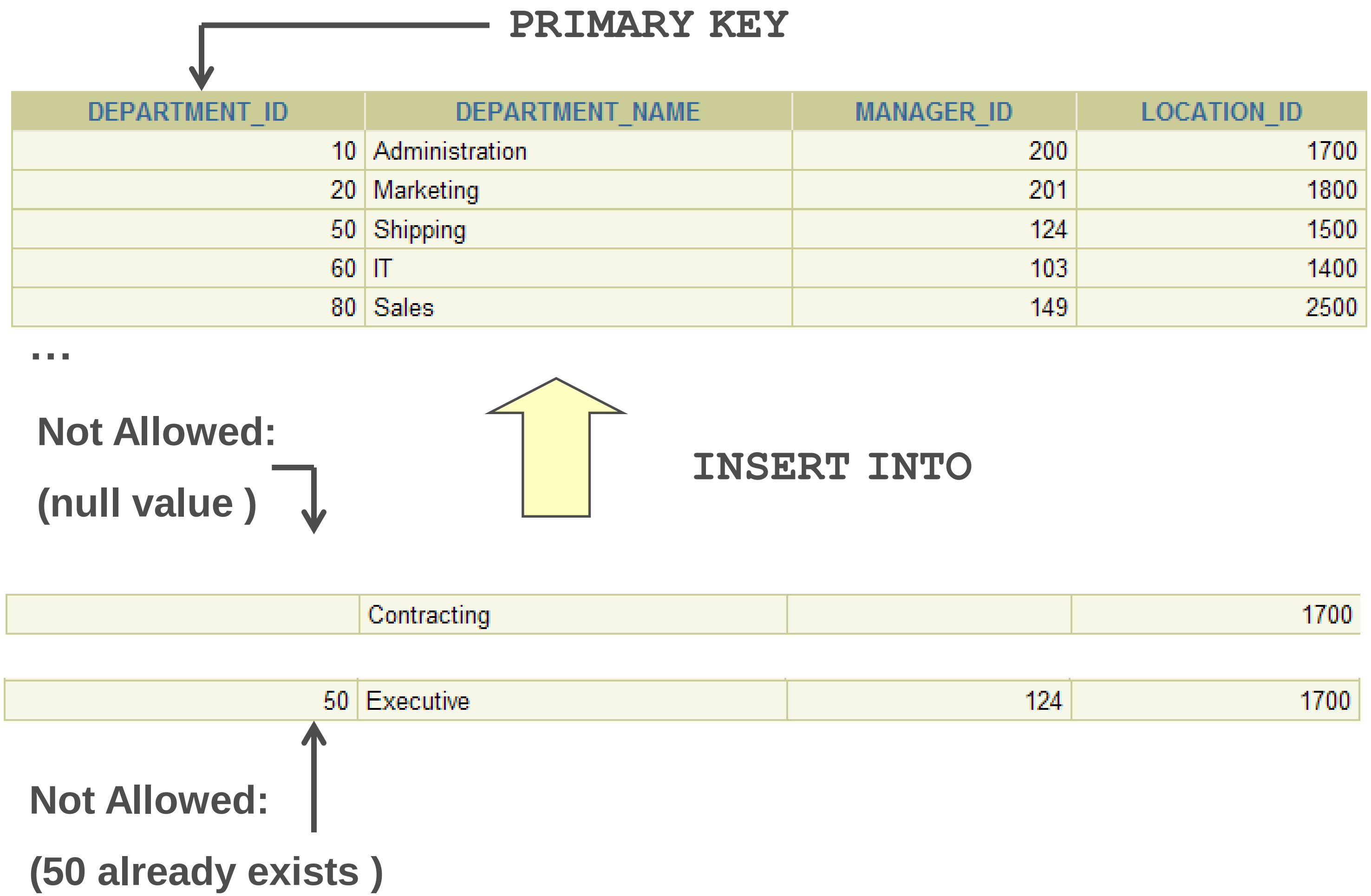
Defined at either the table level or the column level:

```
CREATE TABLE employees(
     employee_id NUMBER(6),
     last_name VARCHAR2(25) NOT NULL,
     email VARCHAR2(25),
     salary NUMBER(8,2),
     commission_pct NUMBER(2,2),
     hire_date DATE NOT NULL,
     ...
     CONSTRAINT emp_email_uk UNIQUE(email));
```

PRIMARY KEY

PRIMARY KEY Constraint

DEPARTMENTS



PRIMARY KEY

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500

…

Not Allowed:

(null value)

INSERT INTO

	Contracting		1700

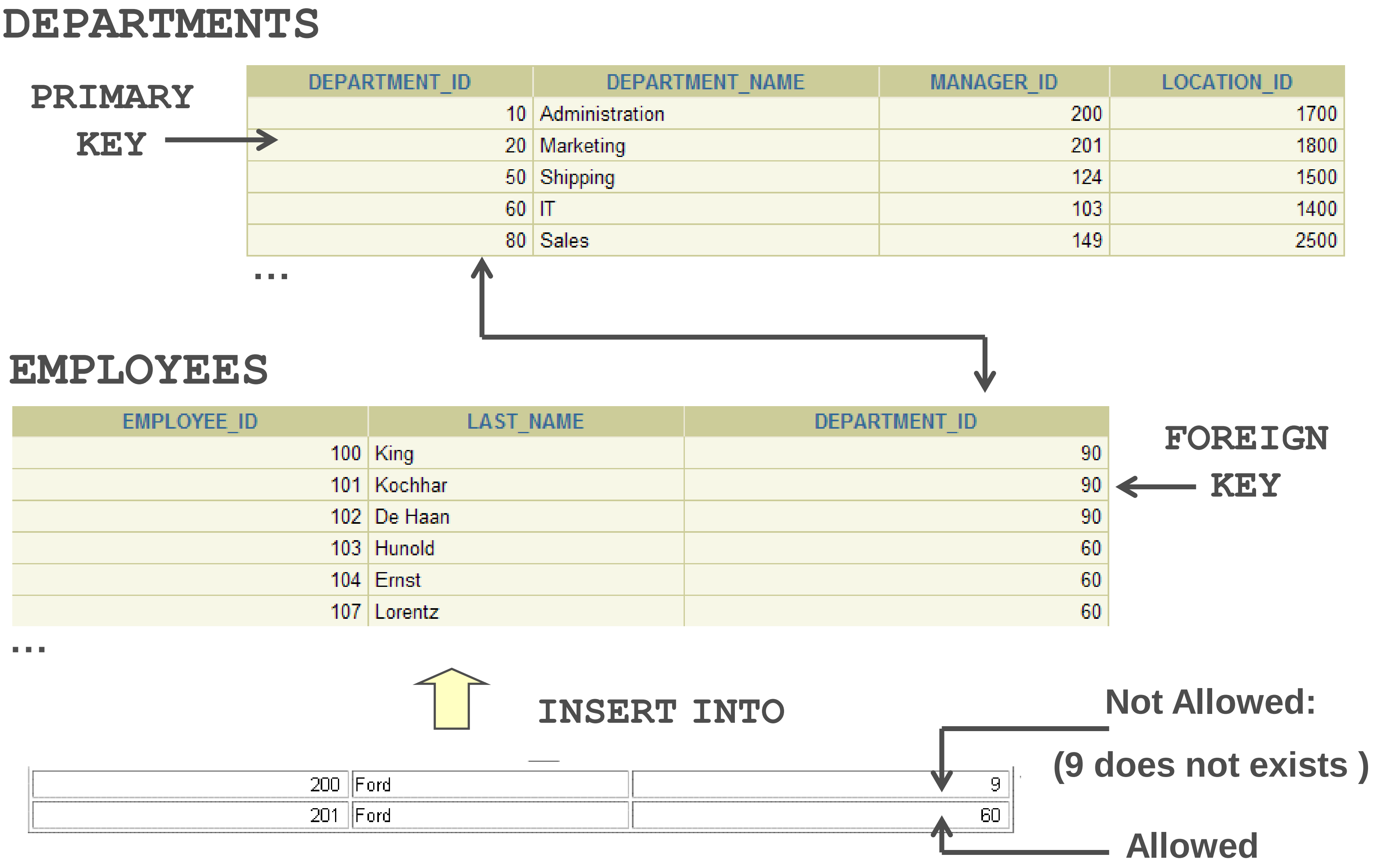
50	Executive	124	1700

Not Allowed:

(50 already exists)

FOREIGN KEY

FOREIGN KEY Constraint



DEPARTMENTS

PRIMARY KEY

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500

...

EMPLOYEES

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
100	King	90
101	Kochhar	90
102	De Haan	90
103	Hunold	60
104	Ernst	60
107	Lorentz	60

FOREIGN KEY

...

INSERT INTO

200	Ford	9
201	Ford	60

Not Allowed:

(9 does not exists)

Allowed

FOREIGN KEY

FOREIGN KEY Constraint

Defined at either the table level or the column level:

```
CREATE TABLE employees(
     employee_id    NUMBER(6),
     last_name      VARCHAR2(25) NOT NULL,
     email          VARCHAR2(25),
     salary         NUMBER(8,2),
     commission_pct NUMBER(2,2),
     hire_date DATE NOT NULL,
     ...
     department_id  NUMBER(4),
     CONSTRAINT emp_dept_fk
     FOREIGN KEY(department_id)
     REFERENCES departments(department_id),
     CONSTRAINT emp_email_uk UNIQUE(email));
```

FOREIGN KEY

`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

CHECK

CHECK Constraint

- Defines a condition that each row must satisfy
- The following expressions are not allowed:
    - References to **CURRVAL**, **NEXTVAL**, **LEVEL**, and **ROWNUM** pseudocolumns
    - Calls to **SYSDATE**, **UID**, **USER**, and **USERENV** functions
    - Queries that refer to other values in other rows

```
..., salary NUMBER(2)
       CONSTRAINT emp_salary_min
       CHECK (salary > 0),...
```

How to use

CREATE TABLE: Example

```
CREATE TABLE employees
     (employee_id    NUMBER(6)
          CONSTRAINT emp_employee_id PRIMARY KEY,
      first_name     VARCHAR2(20),
      last_name      VARCHAR2(25)
          CONSTRAINT emp_last_name_nn NOT NULL,
      email          VARCHAR2(25)
          CONSTRAINT emp_email_nn NOT NULL
          CONSTRAINT emp_email_uk UNIQUE,
      phone_number   VARCHAR2(20),
      hire_date      DATE
          CONSTRAINT emp_hire_date_nn NOT NULL,
      job_id         VARCHAR2(10)
          CONSTRAINT emp_job_nn NOT NULL,
      salary         NUMBER(8,2)
          CONSTRAINT emp_salary_ck CHECK (salary>0),
      commission_pct NUMBER(2,2),
      manager_id     NUMBER(6),
      department_id  NUMBER(4)
          CONSTRAINT emp_dept_fk
          REFERENCES departments(department_id));
```

How to use

Violating Constraints

```
UPDATE employees
SET    department_id = 55
WHERE  department_id = 110;
```

```
UPDATE employees
       *
ERROR at line 1:
ORA-02291: integrity constraint (HR.EMP_DEPT_FK)
violated - parent key not found
```

Department 55 does not exist.

How to use

Violating Constraints

You cannot delete a row that contains a primary key that is used as a foreign key in another table.

```
DELETE FROM departments
WHERE       department_id = 60;
```

```
DELETE FROM departments
            *
ERROR at line 1:
ORA-02292: integrity constraint (HR.EMP_DEPT_FK)
violated - child record found
```

Part 1 Summary

Objects and Data Types

Managing Tables

Advanced Creation

NOT NULL

FOREIGN KEY

Constraints

PRIMARY KEY

How to use

UNIQUE

CHECK