SQL Data Definition and Manipulation

Data Definition in SQL

Creating Relations is achieved with the command CREATE TABLE

For example (here domains and constraints are Oracle-specific):					
C	CREATE TABLE Account				
(accountNo NUMBER (5)	CONSTRAINT pk_acco	unt PRIMARY KEY,		
	type VARCHAR2(10)	CONSTRAINT nn_Type	NOT NULL		
		CONSTRAINT ck-Type			
		CHECK Type II	N ('Current', 'Deposit'),		
	balance NUMBER (20,2)	CONSTRAINT nn_Bal	NOT NULL,		
	dateOpened DATE,				
	inBranch NUMBER (2)	CONSTRAINT nn_InBr	NOT NULL		
	CONSTRAINT fk_Abranch				
		REFE	RENCES Branch (branchNo)		
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The Most Important Domains in Oracle Key Slide

CHAR(n)	fixed length strings, up to 2000 bytes			
VARCHAR2(n)	variable length strings, max n, up to 4000 bytes			
NUMBER(p, s)	numbers with precision p (i.e. number of significant digits) and scale s precision. p - total number of digits, from 1 to 38 scale s - number of decimal places, -84 to 127 * (-ve for rounding)			
NUMBER	NUMBER floating point with precision 38			
NUMBER(p)	NUMBER(p) integer with precision p and scale 0			
DATE	DATE dates in various formats from Jan 1, 4712 BC to Dec 31, 9999 AD			
LONG	up to two gigabytes of character data			
RAW(s)	RAW(s) binary data of up to 2000 bytes			
LONG RAW	LONG RAW binary data of up 2 gigabytes			
ROWID	WID unique identifier for a record			
 ANSI standard SQL has the following numeric types which are accepted: NUMERIC(p,s), DECIMAL(p,s), DEC(p,s) INTEGER, INT and SMALLINT FLOAT, DOUBLE PRECISION and REAL 				
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Column Constraints Kev Slide **Constraints in an Oracle Table Specification** The CONSTRAINT clause appears in the **CREATE TABLE** or the Column constraints determine the values allowed in one column **ALTER TABLE** command They can be placed: with the column declaration Constraints come in two flavours: - or at the end of the column declarations, in the same way as - column constraints limit the values taken by a particular column table constraints (next slide) - **table constraints** limit the values taken by more than one column These two are Examples placed with the column declarations: identical Constraints can be **named** which are helpful in the following cases VARCHAR2(10) CONSTRAINT nn_Type NOT NULL type in effect - if you wish to alter the constraint in the future inBranch NUMBER **CONSTRAINT fk InBranch REFERENCES** branch(branchNo) - if you get an error referring to the constraint when entering data, you can be told which constraint is violated NUMBER(8,2) CONSTRAINT salCheck (CHECK salary > 0) salary If you do NOT give the constraint a unique name, you don't need the word Example of a column constraint at the end of the column declarations (i.e. 'CONSTRAINT' either this is now a table constraint and the syntax is slightly different) : CONSTRAINT fk_AccBr FOREIGN KEY (inBranch) **REFERENCES Branch(branchNo)**

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Table Constraints



Table constraints determine the values allowed in a whole row, and are used for composite primary or foreign keys, or for cross checks

They are placed at the end of the column declarations, but still inside the enclosing parentheses

CONSTRAINT pk_Owner PRIMARY KEY (accNo, custId)

CONSTRAINT fk_ApptLocation FOREIGN KEY (HospID, BuildingName) REFERENCES Building(HOSPID, Name)

 Note, this constraint is stronger than two separate foreign keys and a direct reference to Hospital is not necessary

Constraints can be added or removed using the ALTER TABLE command

For instance, in the Bank database, the Branch Manager cannot be constrained to be a foreign key referencing the Employee table, until the Employee table has been created

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ALTER TABLE Branch ADD (CONSTRAINT fk_Manager FOREIGN KEY (manager) REFERENCES Employee(ni#))

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Multi-column Foreign Keys



Similarly, foreign keys into tables with multi-column primary keys must use table constraints

- e.g. A table for the many-to-many relationship city on river in the US Geography database:
 - The foreign key to city cannot be done with:
 CREATE TABLE On

city VARCHAR2(30) CONSTRAINT fk city

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REFERENCES City(name),

state VARCHAR2(39) CONSTRAINT fk_state REFERENCES City(State)

• since neither of the columns in City is guaranteed unique, but must be done with:

CREATE TABLE On

(city VARCHAR2(30),

state VARCHAR2(30),

CONSTRAINT fk_on FOREIGN KEY (city, state) REFERENCES City(name, state)

Multi-column Primary Keys lev Slide If a table has two (or more) columns in the primary key then you can only assert this with table constraints - e.g. A table for the weak entity City in the US Geography database • The key is city name and state name and this **cannot** be done with: CREATE TABLE City (name VARCHAR2(30) CONSTRAINT pk1_city PRIMARY KEY, state VARCHAR2(30) CONSTRAINT pk1 city PRIMARY KEY, • but must be done with: **CREATE TABLE Citv** (name VARCHAR2(30), state VARCHAR2(30) CONSTRAINT pk city PRIMARY KEY (name, state) 17/11/2009 MSc/Dip IT - ISD L17 SQL DD and DM (401-424) 406 **Altering a Table Specification** DBMSs vary in exactly what **alterations** are permitted. Oracle permits the table definition to be changed by the ALTER TABLE

Columns and integrity constraints can be added.

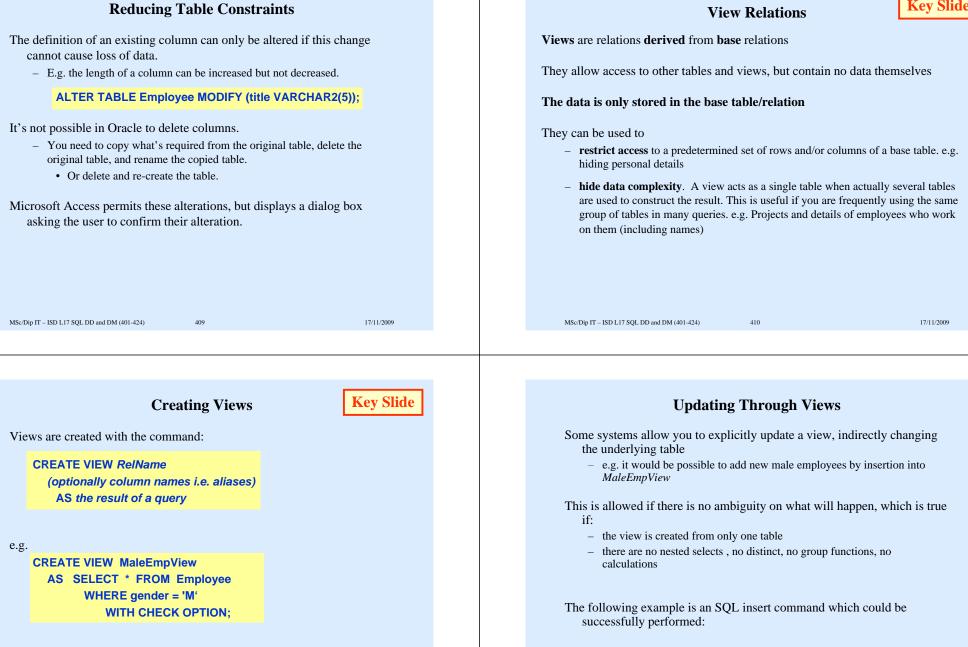
ALTER TABLE Employee

command

ADD CONSTRAINT chksal CHECK(salary > 0);

ALTER TABLE Employee ADD(title VARCHAR2(4));

Reducing Table Constraints



INSERT INTO MaleEmpView VALUES ('111', 'Smith', 'John', 'M', '1 Beech Walk', 'teacher');

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Preventing Changes to Views

Inserts and updates performed through the View **must** result in rows that the query can select

 e.g. you should not be allowed to add females to employees through the view *MaleEmpView*

The WITH CHECK OPTION enforces this

INSERT INTO MaleEmpView VALUES ('111', 'Smith', 'Joan', 'F', '1 Beech Walk', 'teacher');

This causes:

ERROR at line 1: ORA-01402: view WITH CHECK OPTION where-clause violation

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DROP TABLE Project;

a database

DROP VIEW MaleEmpView;

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Data Manipulation in SQL

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Adding New Tuples

- There are three ways of doing this, only two being available in Oracle SQL:
 - bulk loading done in SQLLoader, not in SQL in Oracle
 - inserting new values one tuple at a time
 - inserting query results

Bulk Loading and Dumping of Data

Clearly, inserting values one tuple at a time is slow, so there is a mechanism for loading many tuples at a time - this is called **bulk loading**

Some DBMS have a COPY TABLE command for copying data from/to files

In Oracle the SQLLoader loads empty tables from data in text files

There are Import and Export utilities for backing up data and moving it between Oracle databases

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Inserting Tuples

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Removing and Changing Relations

commands, it is sensible to start with a sequence of DROP commands

to get rid of the previous versions during the early stages of setting up

A base relation or view can be **removed** with the command **DROP**

Remember that in setting up a file made up of CREATE TABLE

- Although you don't want to do this after having added the data.

Key Slide

The INSERT statement does this and has three forms:

1. Inserting all the values:

INSERT INTO Employee VALUES ('GC1234', 'Richard',)

2. Inserting some of the values:

INSERT INTO Employee (ni#,IName,fName, gender) VALUES ('GC1234', 'Richard', 'Cooper', 'M');

If columns are omitted, the column default will be assigned.

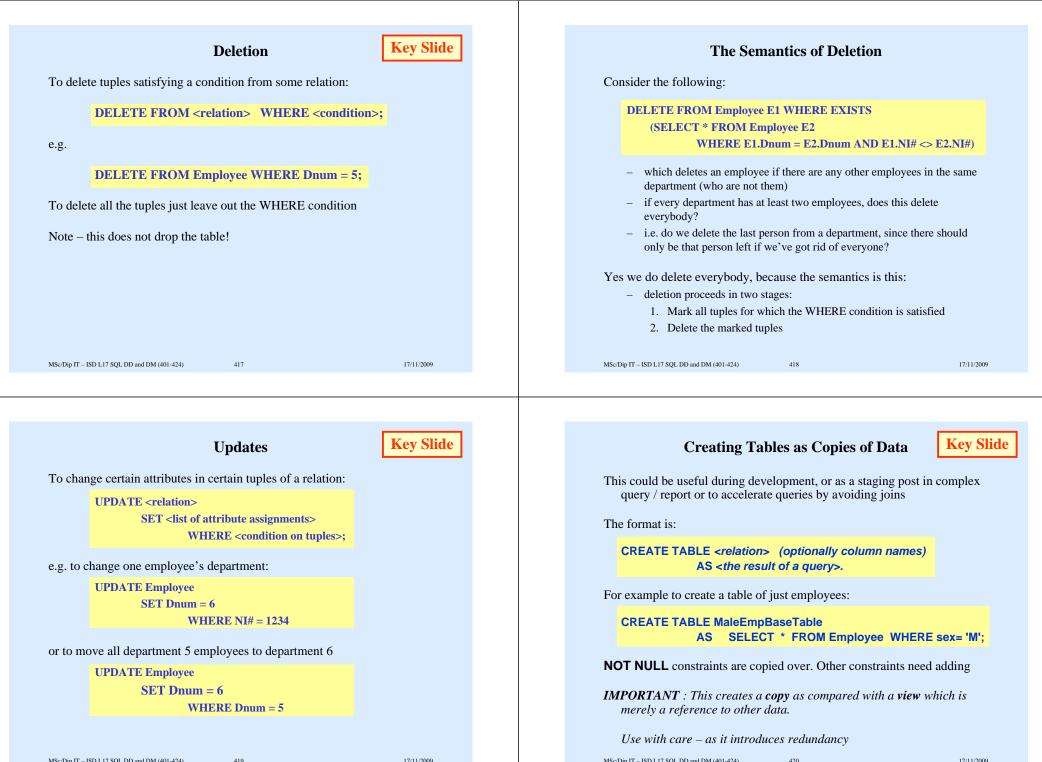
3. Inserting the results of a query:

INSERT INTO Males

SELECT * FROM Employees WHERE gender ='M';

N.B. This copies the data, like copy table, unlike making a view relation.

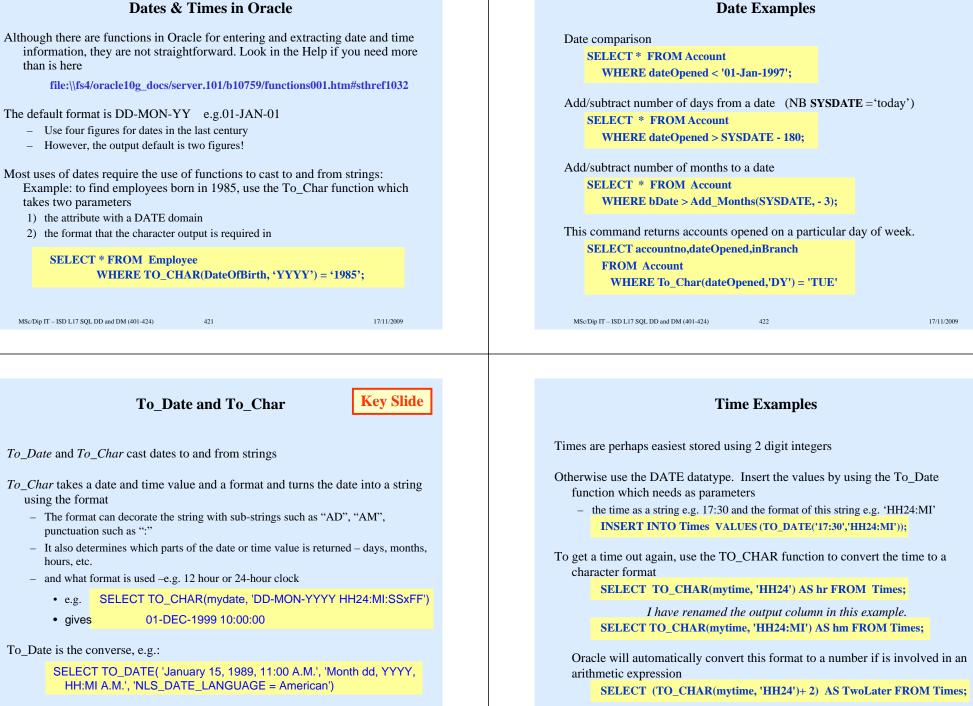
this table must already exist!



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Dates & Times in Oracle



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