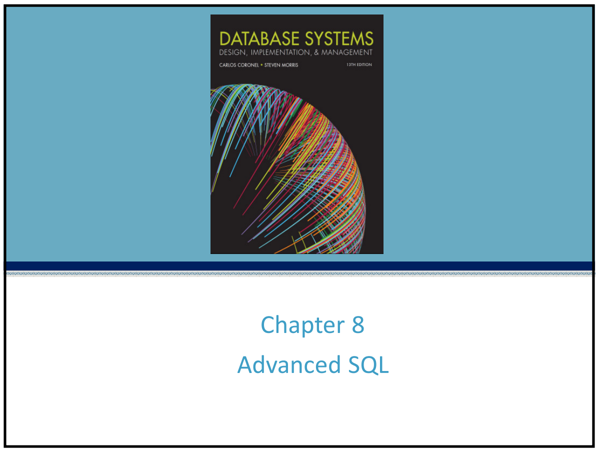
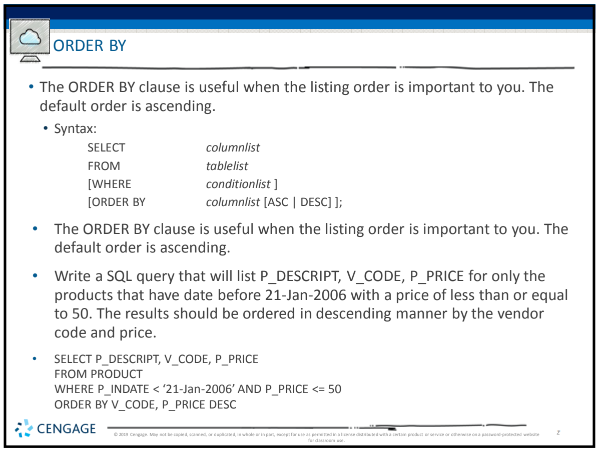


DATABASE SYSTEMS
DESIGN, IMPLEMENTATION, & MANAGEMENT
CARLOS CORONEL • STEVEN MORRIS
13TH EDITION

Chapter 8

Advanced SQL



ORDER BY

- The ORDER BY clause is useful when the listing order is important to you. The default order is ascending.
  - Syntax:

```
SELECT      columnlist
FROM        tablelist
[WHERE      conditionlist ]
[ORDER BY   columnlist [ASC | DESC] ];
```

- The ORDER BY clause is useful when the listing order is important to you. The default order is ascending.
- Write a SQL query that will list P_DESCRIPT, V_CODE, P_PRICE for only the products that have date before 21-Jan-2006 with a price of less than or equal to 50. The results should be ordered in descending manner by the vendor code and price.
- SELECT P_DESCRIPT, V_CODE, P_PRICE
  FROM PRODUCT
  WHERE P_INDATE < ‘21-Jan-2006’ AND P_PRICE <= 50
  ORDER BY V_CODE, P_PRICE DESC

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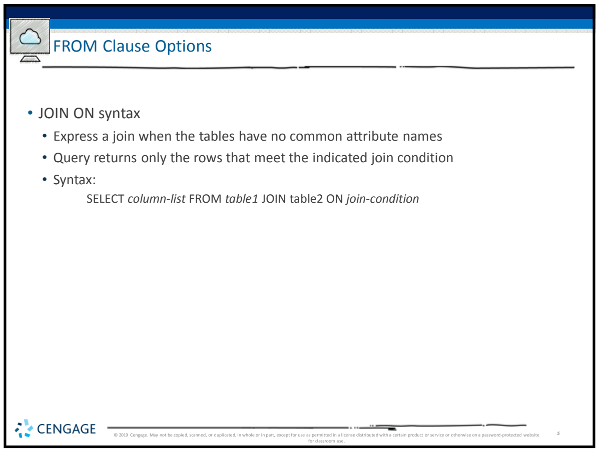

FROM Clause Options

- JOIN ON syntax
  - Express a join when the tables have no common attribute names
  - Query returns only the rows that meet the indicated join condition
  - Syntax:

    SELECT *column-list* FROM *table1* JOIN table2 ON *join-condition*

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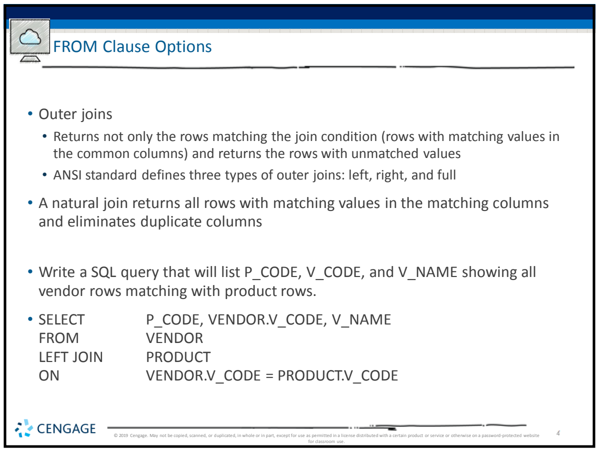
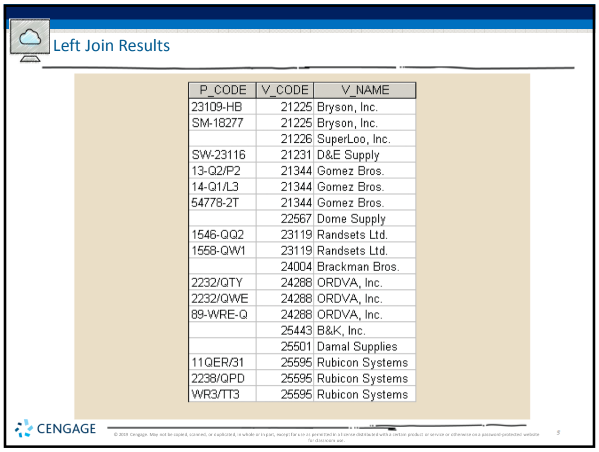


FROM Clause Options

- Outer joins
  - Returns not only the rows matching the join condition (rows with matching values in the common columns) and returns the rows with unmatched values
  - ANSI standard defines three types of outer joins: left, right, and full
- A natural join returns all rows with matching values in the matching columns and eliminates duplicate columns
- Write a SQL query that will list P_CODE, V_CODE, and V_NAME showing all vendor rows matching with product rows.

-
  ```
  SELECT       P_CODE, VENDOR.V_CODE, V_NAME
  FROM         VENDOR
  LEFT JOIN    PRODUCT
  ON           VENDOR.V_CODE = PRODUCT.V_CODE
  ```

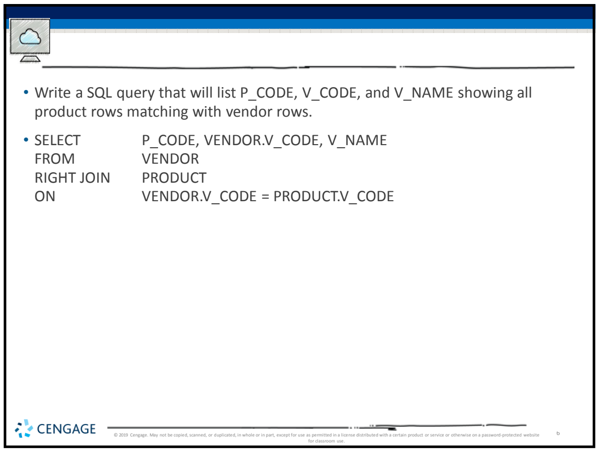
CENGAGE



Left Join Results

P_CODE	V_CODE	V_NAME
23109-HB	21225	Bryson, Inc.
SM-18277	21225	Bryson, Inc.
	21226	SuperLoo, Inc.
SW-23116	21231	D&E Supply
13-Q2/P2	21344	Gomez Bros.
14-Q1/L3	21344	Gomez Bros.
54778-2T	21344	Gomez Bros.
	22567	Dome Supply
1546-QQ2	23119	Randsets Ltd.
1558-QW1	23119	Randsets Ltd.
	24004	Brackman Bros.
2232/QTY	24288	ORDVA, Inc.
2232/QWE	24288	ORDVA, Inc.
89-WRE-Q	24288	ORDVA, Inc.
	25443	B&K, Inc.
	25501	Damal Supplies
11QER/31	25595	Rubicon Systems
2238/QPD	25595	Rubicon Systems
WR3/TT3	25595	Rubicon Systems

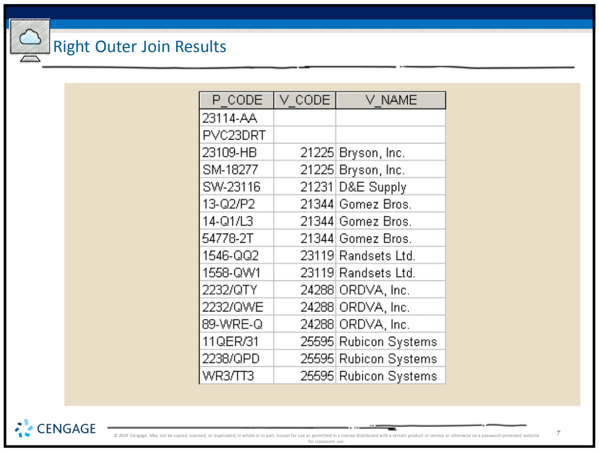
CENGAGE



- Write a SQL query that will list P_CODE, V_CODE, and V_NAME showing all product rows matching with vendor rows.

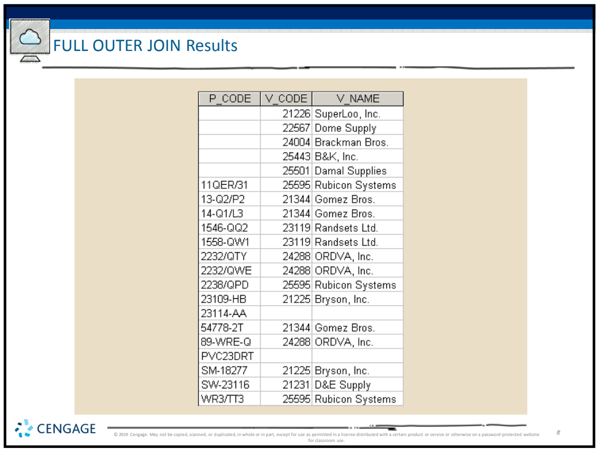
-
  ```
  SELECT       P_CODE, VENDOR.V_CODE, V_NAME
  FROM         VENDOR
  RIGHT JOIN   PRODUCT
  ON           VENDOR.V_CODE = PRODUCT.V_CODE
  ```

CENGAGE



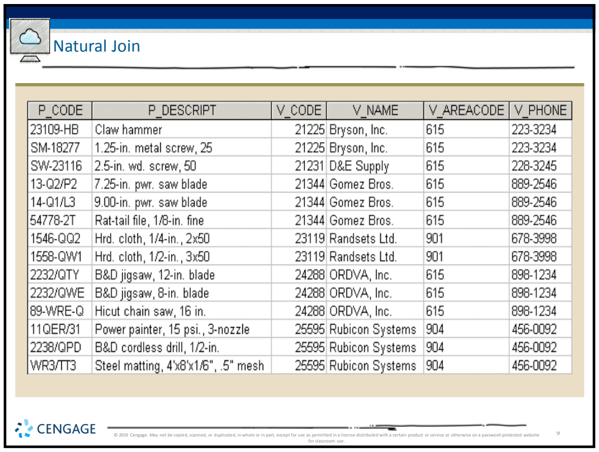
Right Outer Join Results

P_CODE	V_CODE	V_NAME
23114-AA		
PVC23DRT		
23109-HB	21225	Bryson, Inc.
SM-18277	21225	Bryson, Inc.
SW-23116	21231	D&E Supply
13-Q2/P2	21344	Gomez Bros.
14-Q1/L3	21344	Gomez Bros.
54778-2T	21344	Gomez Bros.
1546-QQ2	23119	Randsets Ltd.
1558-QW1	23119	Randsets Ltd.
2232/QTY	24288	ORDVA, Inc.
2232/QWE	24288	ORDVA, Inc.
89-WRE-Q	24288	ORDVA, Inc.
11QER/31	25595	Rubicon Systems
2238/QPD	25595	Rubicon Systems
WR3/TT3	25595	Rubicon Systems



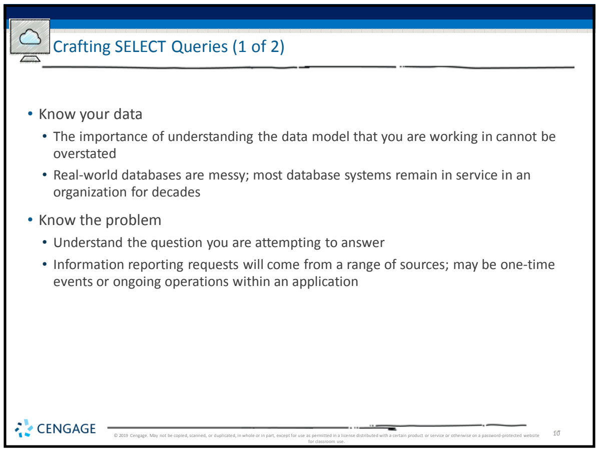
FULL OUTER JOIN Results

P_CODE	V_CODE	V_NAME
	21226	SuperLoo, Inc.
	22567	Dome Supply
	24004	Brackman Bros.
	25443	B&K, Inc.
	25501	Damal Supplies
11QER/31	25595	Rubicon Systems
13-Q2/P2	21344	Gomez Bros.
14-Q1/L3	21344	Gomez Bros.
1546-QQ2	23119	Randsets Ltd.
1558-QW1	23119	Randsets Ltd.
2232/QTY	24288	ORDVA, Inc.
2232/QWE	24288	ORDVA, Inc.
2238/QPD	25595	Rubicon Systems
23109-HB	21225	Bryson, Inc.
23114-AA		
54778-2T	21344	Gomez Bros.
89-WRE-Q	24288	ORDVA, Inc.
PVC23DRT		
SM-18277	21225	Bryson, Inc.
SW-23116	21231	D&E Supply
WR3/TT3	25595	Rubicon Systems



Natural Join

P_CODE	P_DESCRIPT	V_CODE	V_NAME	V_AREACODE	V_PHONE
23109-HB	Claw hammer	21225	Bryson, Inc.	615	223-3234
SM-18277	1.25-in. metal screw, 25	21225	Bryson, Inc.	615	223-3234
SW-23116	2.5-in. wd. screw, 50	21231	D&E Supply	615	228-3245
13-Q2/P2	7.25-in. pwr. saw blade	21344	Gomez Bros.	615	889-2546
14-Q1/L3	9.00-in. pwr. saw blade	21344	Gomez Bros.	615	889-2546
54778-2T	Rat-tail file, 1/8-in. fine	21344	Gomez Bros.	615	889-2546
1546-QQ2	Hrd. cloth, 1/4-in., 2x50	23119	Randsets Ltd.	901	678-3998
1558-QW1	Hrd. cloth, 1/2-in., 3x50	23119	Randsets Ltd.	901	678-3998
2232/QTY	B&D jigsaw, 12-in. blade	24288	ORDVA, Inc.	615	898-1234
2232/QWE	B&D jigsaw, 8-in. blade	24288	ORDVA, Inc.	615	898-1234
89-WRE-Q	Hicut chain saw, 16 in.	24288	ORDVA, Inc.	615	898-1234
11QER/31	Power painter, 15 psi., 3-nozzle	25595	Rubicon Systems	904	456-0092
2238/QPD	B&D cordless drill, 1/2-in.	25595	Rubicon Systems	904	456-0092
WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	25595	Rubicon Systems	904	456-0092



Crafting SELECT Queries (1 of 2)

- Know your data
  - The importance of understanding the data model that you are working in cannot be overstated
  - Real-world databases are messy; most database systems remain in service in an organization for decades
- Know the problem
  - Understand the question you are attempting to answer
  - Information reporting requests will come from a range of sources; may be one-time events or ongoing operations within an application

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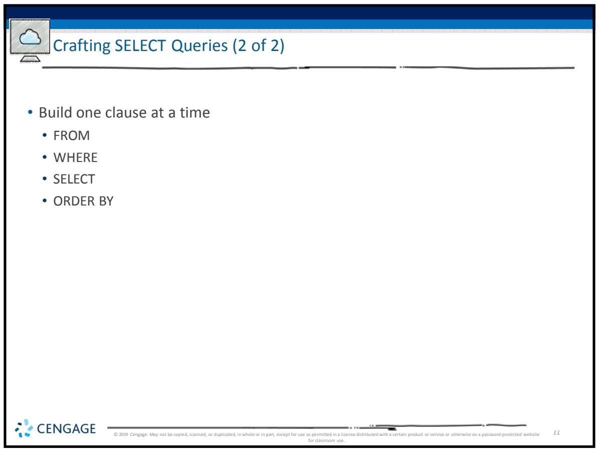

Crafting SELECT Queries (2 of 2)

- Build one clause at a time
  - FROM
  - WHERE
  - SELECT
  - ORDER BY

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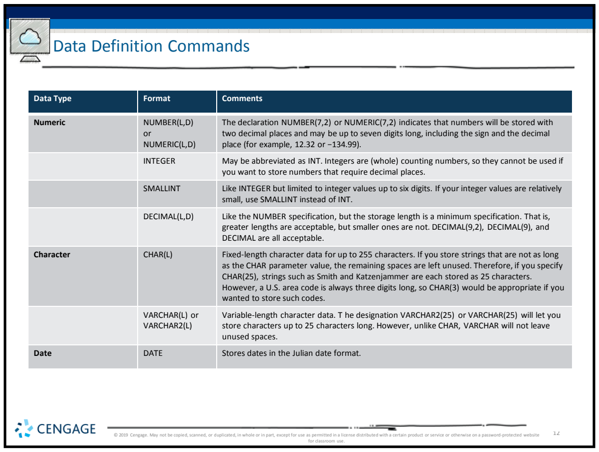

Data Definition Commands

Data Type	Format	Comments

Numeric	NUMBER(L,D)
	or
	NUMERIC(L,D)
		The declaration NUMBER(7,2) or NUMERIC(7,2) indicates that numbers will be stored with two decimal places and may be up to seven digits long, including the sign and the decimal place (for example, 12.32 or −134.99).

	INTEGER	May be abbreviated as INT. Integers are (whole) counting numbers, so they cannot be used if you want to store numbers that require decimal places.
	SMALLINT	Like INTEGER but limited to integer values up to six digits. If your integer values are relatively small, use SMALLINT instead of INT.
	DECIMAL(L,D)	Like the NUMBER specification, but the storage length is a minimum specification. That is, greater lengths are acceptable, but smaller ones are not. DECIMAL(9,2), DECIMAL(9), and DECIMAL are all acceptable.
Character	CHAR(L)	Fixed-length character data for up to 255 characters. If you store strings that are not as long as the CHAR parameter value, the remaining spaces are left unused. Therefore, if you specify CHAR(25), strings such as Smith and Katzenjammer are each stored as 25 characters. However, a U.S. area code is always three digits long, so CHAR(3) would be appropriate if you wanted to store such codes.
	VARCHAR(L) or VARCHAR2(L)	Variable-length character data. T he designation VARCHAR2(25) or VARCHAR(25) will let you store characters up to 25 characters long. However, unlike CHAR, VARCHAR will not leave unused spaces.
Date	DATE	Stores dates in the Julian date format.

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Creating Table Structures (1 of 2)

- CREATE TABLE command

```
CREATE TABLE tablename (
column1          data type          [constraint] [,
column2          data type          [constraint] ] [,
PRIMARY KEY      (column1           [, column2]) ] [,
FOREIGN KEY      (column1           [, column2]) REFERENCES tablename] [,
CONSTRAINT       constraint ] );
```

- SQL constraints
  - FOREIGN KEY
  - NOT NULL
  - UNIQUE
  - DEFAULT
  - CHECK

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Creating Table Structures (2 of 2)

- Create a table with a SELECT statement
  - Rapidly creates a new table based on selected columns and rows of an existing table using a subquery
  - Automatically copies all of the data rows returned
- SQL indexes
  - CREATE INDEX improves the efficiency of searches and avoids duplicate column values
  - DROP Index deletes an index

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Test your knowledge

- Create the table VENDOR
- Create the table PRODUCT

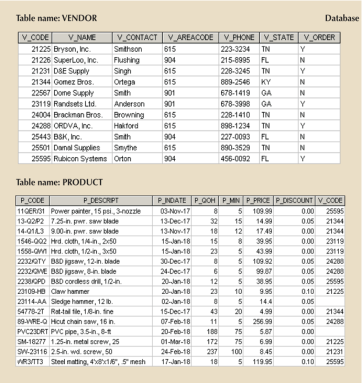

Table name: VENDOR

Database

V_CODE	V_NAME	V_CONTACT	V_AREACODE	V_PHONE	V_STATE	V_ORDER
21225	Bryson, Inc.	Smithson	615	223-3234	TN	Y
21226	SuperLoo, Inc.	Flushing	904	215-8995	FL	N
21231	D&E Supply	Singh	615	228-3245	TN	Y
21344	Gomez Bros.	Ortega	615	889-2546	KY	N
22567	Dome Supply	Smith	901	678-1419	GA	N
23119	Randsets Ltd.	Anderson	901	678-3998	GA	Y
24004	Brackman Bros.	Browning	615	228-1410	TN	N
24288	ORDVA, Inc.	Hakford	615	898-1234	TN	Y
25443	B&K, Inc.	Smith	904	227-0093	FL	N
25501	Damal Supplies	Smythe	615	890-3529	TN	N
25595	Rubicon Systems	Orton	904	456-0092	FL	Y

Table name: PRODUCT

P_CODE	P_DESCRIPT	P_INDATE	P_QOH	P_MIN	P_PRICE	P_DISCOUNT	V_CODE
11QER/31	Power painter, 15 psi., 3-nozzle	03-Nov-17	8	5	109.99	0.00	25595
13-Q2/P2	7.25-in. pwr. saw blade	13-Dec-17	32	15	14.99	0.05	21344
14-Q1/L3	9.00-in. pwr. saw blade	13-Nov-17	18	12	17.49	0.00	21344
1546-QQ2	Hrd. cloth, 1/4-in., 2x50	15-Jan-18	15	8	39.95	0.00	23119
1558-QW1	Hrd. cloth, 1/2-in., 3x50	15-Jan-18	23	5	43.99	0.00	23119
2232/QTY	B&D jigsaw, 12-in. blade	30-Dec-17	8	5	109.92	0.05	24288
2232/QWE	B&D jigsaw, 8-in. blade	24-Dec-17	6	5	99.87	0.05	24288
2238/QPD	B&D cordless drill, 1/2-in.	20-Jan-18	12	5	38.95	0.05	25595
23109-HB	Claw hammer	20-Jan-18	23	10	9.95	0.10	21225
23114-AA	Sledge hammer, 12 lb.	02-Jan-18	8	5	14.4	0.05	
54778-2T	Rat-tail file, 1/8-in. fine	15-Dec-17	43	20	4.99	0.00	21344
89-WRE-Q	Hicut chain saw, 16 in.	07-Feb-18	11	5	256.99	0.05	24288
PVC23DRT	PVC pipe, 3.5-in., 8-ft	20-Feb-18	188	75	5.87	0.00	
SM-18277	1.25-in. metal screw, 25	01-Mar-18	172	75	6.99	0.00	21225
SW-23116	2.5-in. wd. screw, 50	24-Feb-18	237	100	8.45	0.00	21231
WR3/TT3	Steel matting, 4'x8'x1/6", .5" mesh	17-Jan-18	18	5	119.95	0.10	25595

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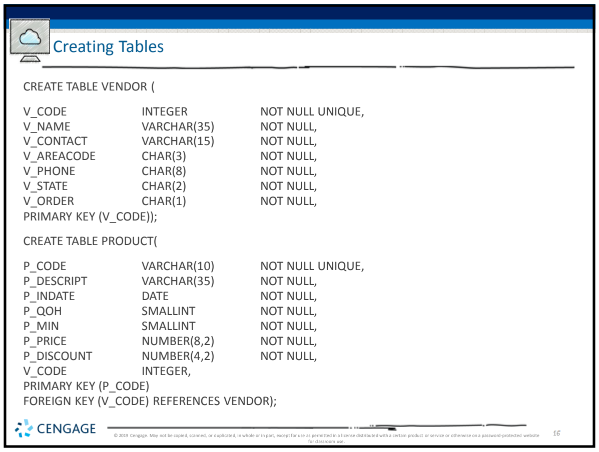

Creating Tables

```
CREATE TABLE VENDOR (
V_CODE            INTEGER           NOT NULL UNIQUE,
V_NAME            VARCHAR(35)       NOT NULL,
V_CONTACT         VARCHAR(15)       NOT NULL,
V_AREACODE        CHAR(3)           NOT NULL,
V_PHONE           CHAR(8)           NOT NULL,
V_STATE           CHAR(2)           NOT NULL,
V_ORDER           CHAR(1)           NOT NULL,
PRIMARY KEY (V_CODE));
CREATE TABLE PRODUCT(
P_CODE            VARCHAR(10)       NOT NULL UNIQUE,
P_DESCRIPT        VARCHAR(35)       NOT NULL,
P_INDATE          DATE              NOT NULL,
P_QOH             SMALLINT          NOT NULL,
P_MIN             SMALLINT          NOT NULL,
P_PRICE           NUMBER(8,2)       NOT NULL,
P_DISCOUNT        NUMBER(4,2)       NOT NULL,
V_CODE            INTEGER,
PRIMARY KEY (P_CODE)
FOREIGN KEY (V_CODE) REFERENCES VENDOR);
```

CENGAGE

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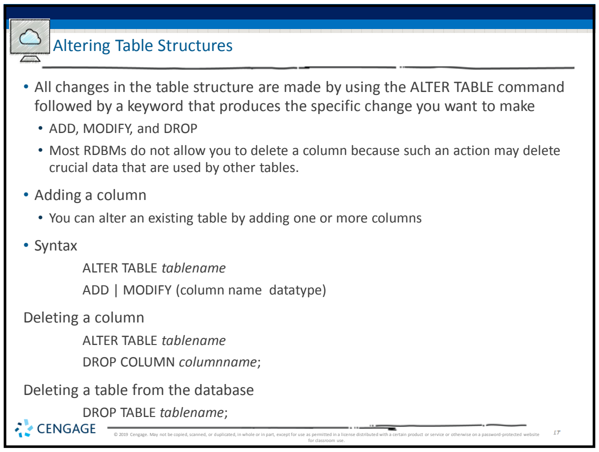

Altering Table Structures

- All changes in the table structure are made by using the ALTER TABLE command followed by a keyword that produces the specific change you want to make
  - ADD, MODIFY, and DROP
  - Most RDBMs do not allow you to delete a column because such an action may delete crucial data that are used by other tables.
- Adding a column
  - You can alter an existing table by adding one or more columns
- Syntax

  ALTER TABLE *tablename*

  ADD | MODIFY (column name datatype)

Deleting a column

  ALTER TABLE *tablename*

  DROP COLUMN *columnname*;

Deleting a table from the database

  DROP TABLE *tablename*;

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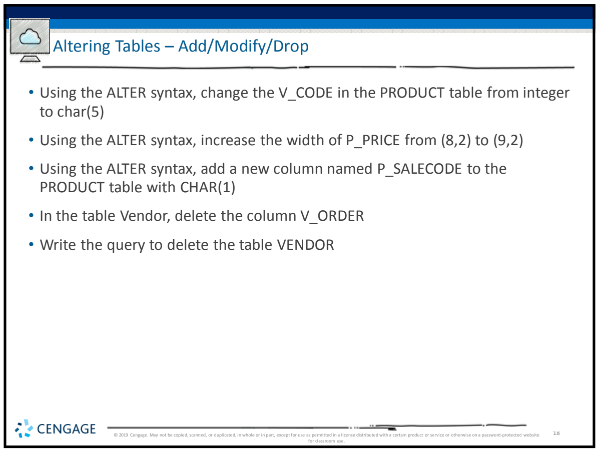

Altering Tables – Add/Modify/Drop

- Using the ALTER syntax, change the V_CODE in the PRODUCT table from integer to char(5)
- Using the ALTER syntax, increase the width of P_PRICE from (8,2) to (9,2)
- Using the ALTER syntax, add a new column named P_SALECODE to the PRODUCT table with CHAR(1)
- In the table Vendor, delete the column V_ORDER
- Write the query to delete the table VENDOR

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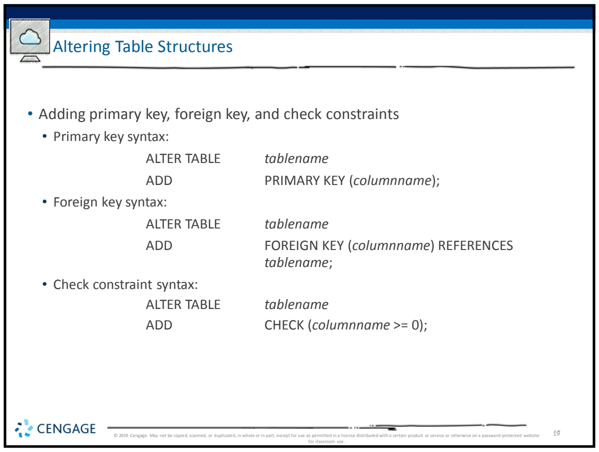


Altering Table Structures

- Adding primary key, foreign key, and check constraints
  - Primary key syntax:

```
ALTER TABLE     tablename
ADD             PRIMARY KEY (columnname);
```

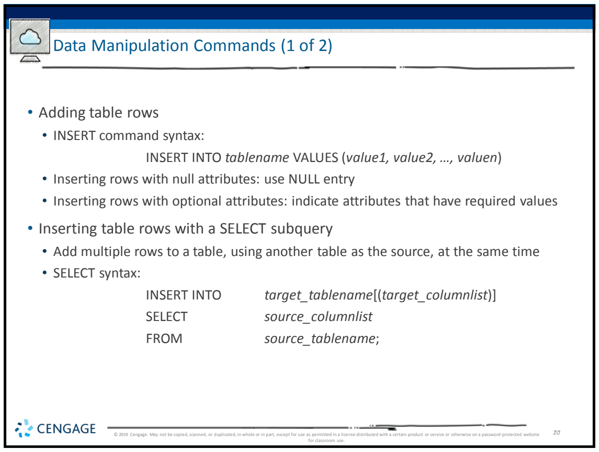
  - Foreign key syntax:

```
ALTER TABLE     tablename
ADD             FOREIGN KEY (columnname) REFERENCES
                tablename;
```

  - Check constraint syntax:

```
ALTER TABLE     tablename
ADD             CHECK (columnname >= 0);
```

CENGAGE



Data Manipulation Commands (1 of 2)

- Adding table rows
  - INSERT command syntax:

```
INSERT INTO tablename VALUES (value1, value2, …, valuen)
```

  - Inserting rows with null attributes: use NULL entry
  - Inserting rows with optional attributes: indicate attributes that have required values
- Inserting table rows with a SELECT subquery
  - Add multiple rows to a table, using another table as the source, at the same time
  - SELECT syntax:

```
INSERT INTO     target_tablename[(target_columnlist)]
SELECT          source_columnlist
FROM            source_tablename;
```

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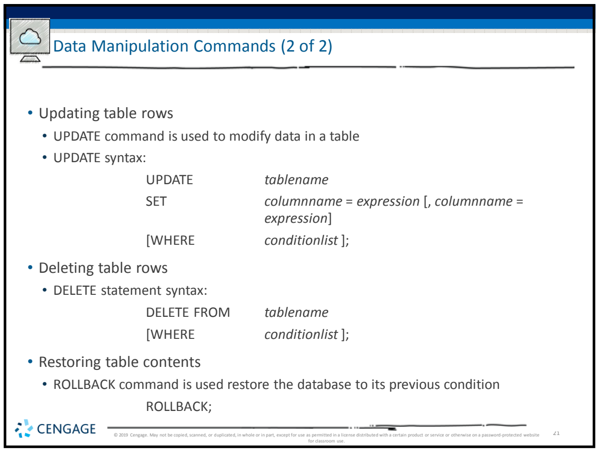


Data Manipulation Commands (2 of 2)

- Updating table rows
  - UPDATE command is used to modify data in a table
  - UPDATE syntax:

```
UPDATE          tablename
SET             columnname = expression [, columnname =
                expression]
[WHERE          conditionlist ];
```

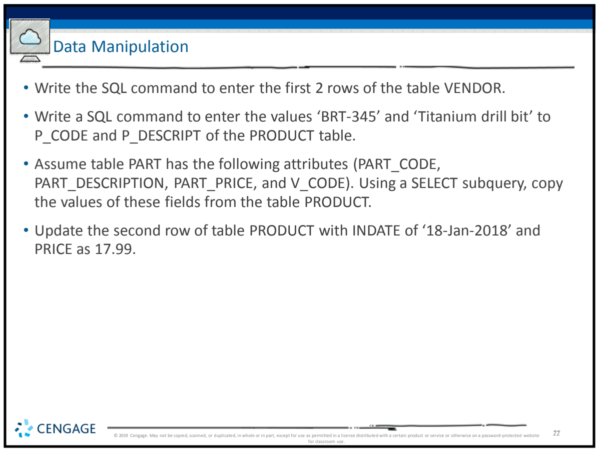
- Deleting table rows
  - DELETE statement syntax:

```
DELETE FROM     tablename
[WHERE          conditionlist ];
```

- Restoring table contents
  - ROLLBACK command is used restore the database to its previous condition

```
ROLLBACK;
```

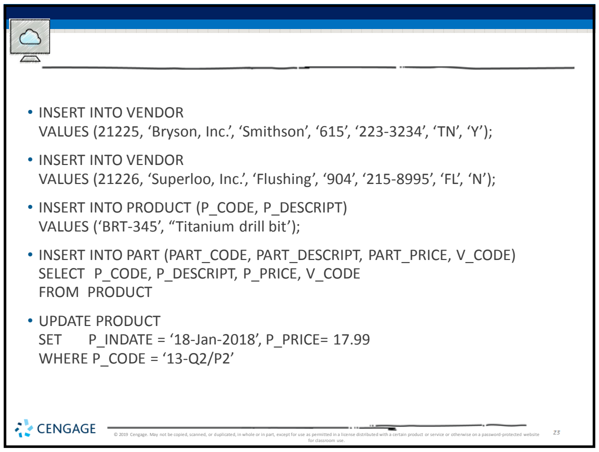
CENGAGE



Data Manipulation

- Write the SQL command to enter the first 2 rows of the table VENDOR.
- Write a SQL command to enter the values ‘BRT-345’ and ‘Titanium drill bit’ to P_CODE and P_DESCRIPT of the PRODUCT table.
- Assume table PART has the following attributes (PART_CODE, PART_DESCRIPTION, PART_PRICE, and V_CODE). Using a SELECT subquery, copy the values of these fields from the table PRODUCT.
- Update the second row of table PRODUCT with INDATE of ‘18-Jan-2018’ and PRICE as 17.99.

CENGAGE



- INSERT INTO VENDOR
  VALUES (21225, ‘Bryson, Inc.’, ‘Smithson’, ‘615’, ‘223-3234’, ‘TN’, ‘Y’);
- INSERT INTO VENDOR
  VALUES (21226, ‘Superloo, Inc.’, ‘Flushing’, ‘904’, ‘215-8995’, ‘FL’, ‘N’);
- INSERT INTO PRODUCT (P_CODE, P_DESCRIPT)
  VALUES (‘BRT-345’, “Titanium drill bit’);
- INSERT INTO PART (PART_CODE, PART_DESCRIPT, PART_PRICE, V_CODE)
  SELECT P_CODE, P_DESCRIPT, P_PRICE, V_CODE
  FROM PRODUCT
- UPDATE PRODUCT
  SET   P_INDATE = ‘18-Jan-2018’, P_PRICE= 17.99
  WHERE P_CODE = ‘13-Q2/P2’

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