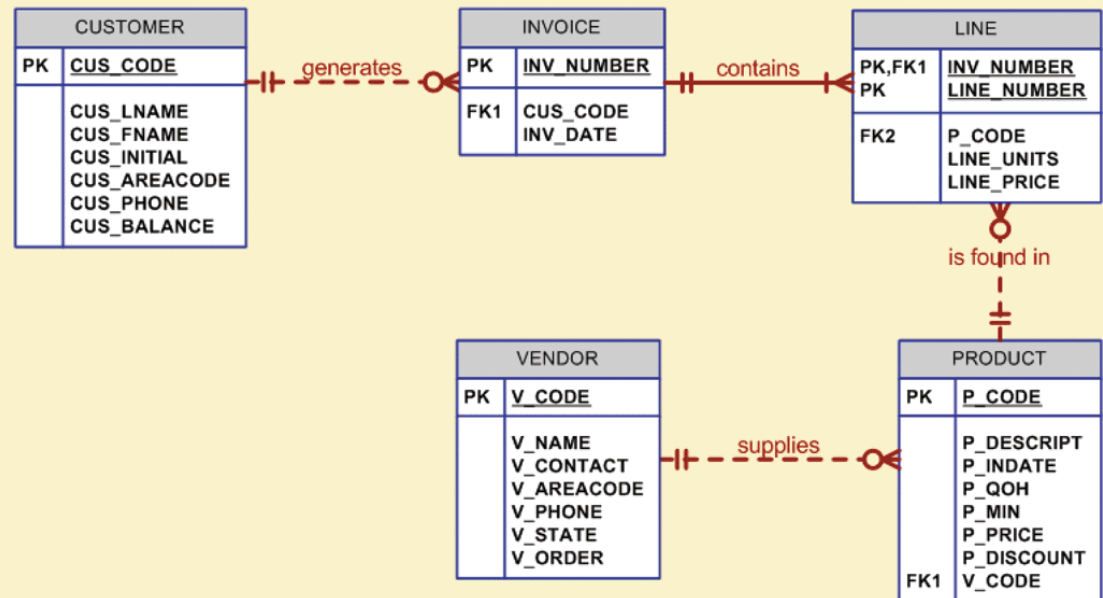# CS 309A- Database Management Systems

# Database model

◇ We will use a simple database (sale) with the following tables to illustrate commands:

- CUSTOMER
- INVOICE
- LINE
- PRODUCT
- VENDOR



FIGURE 7.1 The database model

SOURCE: Course Technology/Cengage Learning

# Add columns

◇ Add new column to table

  ▪ Syntax

    ```
    ALTER TABLE tablename
    ADD(columnname data_type [constraints]);
    ```

```
mysql> alter table customer
    -> add (CUS_DOB date);
Query OK, 0 rows affected (0.27 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> describe customer;
+--------------+--------------+------+-----+---------+-------+
| Field        | Type         | Null | Key | Default | Extra |
+--------------+--------------+------+-----+---------+-------+
| CUS_CODE     | int(11)      | NO   | PRI | NULL    |       |
| CUS_LNAME    | varchar(15)  | NO   | MUL | NULL    |       |
| CUS_FNAME    | varchar(15)  | NO   |     | NULL    |       |
| CUS_INITIAL  | varchar(1)   | YES  |     | NULL    |       |
| CUS_AREACODE | varchar(3)   | NO   |     | 615     |       |
| CUS_PHONE    | varchar(8)   | NO   |     | NULL    |       |
| CUS_BALANCE  | decimal(8,2) | YES  |     | 0.00    |       |
| CUS_DOB      | date         | YES  |     | NULL    |       |
+--------------+--------------+------+-----+---------+-------+
8 rows in set (0.02 sec)
```

# Delete columns

◇ Delete a column from table

- Data stored in deleted column removed from database
- Syntax

```
ALTER TABLE tablename
DROP COLUMN columnname;
```

```
mysql> alter table customer
    -> drop column CUS_DOB;
Query OK, 0 rows affected (0.17 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> describe customer;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| CUS_CODE    | int(11)     | NO   | PRI | NULL    |       |
| CUS_LNAME   | varchar(15) | NO   | MUL | NULL    |       |
| CUS_FNAME   | varchar(15) | NO   |     | NULL    |       |
| CUS_INITIAL | varchar(1)  | YES  |     | NULL    |       |
| CUS_AREACODE| varchar(3)  | NO   |     | 615     |       |
| CUS_PHONE   | varchar(8)  | NO   |     | NULL    |       |
| CUS_BALANCE | decimal(8,2)| YES  |     | 0.00    |       |
+-------------+-------------+------+-----+---------+-------+
7 rows in set (0.00 sec)
```

# Modifying columns

◇ Modify existing column's data type

- Syntax

```
ALTER TABLE tablename
MODIFY(columnname new_data_type);
```



```
mysql> describe product;
+------------+--------------+------+-----+---------+-------+
| Field      | Type         | Null | Key | Default | Extra |
+------------+--------------+------+-----+---------+-------+
| P_CODE     | varchar(10)  | NO   | PRI | NULL    |       |
| P_DISCRIPT | varchar(35)  | YES  |     | NULL    |       |
| P_INDATE   | date         | YES  |     | NULL    |       |
| P_QOH      | int(11)      | YES  |     | NULL    |       |
| P_MIN      | int(11)      | YES  |     | NULL    |       |
| P_PRICE    | decimal(8,2) | YES  |     | NULL    |       |
| P_DISCOUNT | decimal(5,2) | YES  |     | NULL    |       |
| V_CODE     | int(11)      | YES  | MUL | NULL    |       |
+------------+--------------+------+-----+---------+-------+
8 rows in set (0.06 sec)
```



```
mysql> alter table product modify P_QOH smallint;
Query OK, 0 rows affected (0.17 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> describe product;
+------------+--------------+------+-----+---------+-------+
| Field      | Type         | Null | Key | Default | Extra |
+------------+--------------+------+-----+---------+-------+
| P_CODE     | varchar(10)  | NO   | PRI | NULL    |       |
| P_DISCRIPT | varchar(35)  | YES  |     | NULL    |       |
| P_INDATE   | date         | YES  |     | NULL    |       |
| P_QOH      | smallint(6)  | YES  |     | NULL    |       |
| P_MIN      | int(11)      | YES  |     | NULL    |       |
| P_PRICE    | decimal(8,2) | YES  |     | NULL    |       |
| P_DISCOUNT | decimal(5,2) | YES  |     | NULL    |       |
| V_CODE     | int(11)      | YES  | MUL | NULL    |       |
+------------+--------------+------+-----+---------+-------+
8 rows in set (0.02 sec)
```

# Modifying columns

◇ Renaming a column

- ▪ Syntax

  ALTER TABLE *tablename*
  CHANGE *old_columnname new_columnname data_type*;

```
mysql> alter table product change P_DISCRIPT P_DESCIPT varchar(35);
Query OK, 0 rows affected (0.06 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> describe product;
+------------+--------------+------+-----+---------+-------+
| Field      | Type         | Null | Key | Default | Extra |
+------------+--------------+------+-----+---------+-------+
| P_CODE     | varchar(10)  | NO   | PRI | NULL    |       |
| P_DESCIPT  | varchar(35)  | YES  |     | NULL    |       |
| P_INDATE   | date         | YES  |     | NULL    |       |
| P_QOH      | smallint(6)  | YES  |     | NULL    |       |
| P_MIN      | int(11)      | YES  |     | NULL    |       |
| P_PRICE    | decimal(8,2) | YES  |     | NULL    |       |
| P_DISCOUNT | decimal(5,2) | YES  |     | NULL    |       |
| V_CODE     | int(11)      | YES  | MUL | NULL    |       |
+------------+--------------+------+-----+---------+-------+
8 rows in set (0.00 sec)
```

# Other ALTER TABLE commands

◇ Reference:

[http://dev.mysql.com/doc/refman/5.7/en/alter-table.html](http://dev.mysql.com/doc/refman/5.7/en/alter-table.html)

# Add table rows

◇ INSERT

- ▪ Used to enter data into table
- ▪ Syntax:

```
INSERT INTO tablename
VALUES (value1, value2, … , valueN);
```

◇ A value is required for each column

```
mysql> insert into vendor values('21225', 'Bryson, Inc.', 'Smithson', '615', '22
3-3234', 'TN', 'Y');
Query OK, 1 row affected (0.08 sec)

mysql> insert into vendor values ('21226', 'SuperLoo, Inc.', 'Flushing', '904',
'215-8995', 'FL', 'N');
Query OK, 1 row affected (0.05 sec)
```

# Add table rows

◇ When entering values, notice that:

- Row contents are entered between parentheses
- Character and date values are entered between apostrophes
- Attribute entries are separated by commas
- A value is required for each column

◇ Use NULL for unknown values

- Attention: the NULL entry is accepted only when the attribute does not have NOT NULL constraint.

# Practice

◇ Create a table vendor with the following information.

# List table rows

◇ SELECT

- Used to list contents of table
- Syntax:
  ```
  SELECT columnlist
  FROM tablename;
  ```

◇ `Columnlist` represents one or more attributes, separated by commas

```
SELECT V_CODE, V_NAME FROM VENDOR;
```

◇ Asterisk can be used as wildcard character to list all attributes

```
SELECT * FROM VENDOR;
```

# List table rows

# Delete table rows

◇ DELETE

- Deletes a table row

- Syntax:

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

◇ WHERE condition is optional

◇ If WHERE condition is not specified, all rows from specified table will be deleted

Delete the vendor 21225 from the table vendor

```
DELETE FROM VENDOR
WHERE V_CODE = '21225';
```

Delete all vendors from the table vendor

```
DELETE FROM VENDOR;
```

# Execute a script file in MySQL

◇ You can put all SQL commands in a file with extension `.sql` (called script file) and then tell MySQL to read its input from that file.

◇ You can execute a script file with the SOURCE command.

```
SOURCE script_file
```

**Practice**

◇ Create a database called Sale from the script sale_data.sql in my public folder.

# Update table rows

◇ UPDATE

   ▪ Modify data in a table

   ▪ Syntax:

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

◇ If more than one attribute is to be updated in row,
separate corrections with commas

# Update table rows

```
UPDATE  PRODUCT

SET     P_PRICE = 15

WHERE   P_CODE = '13-Q2/P2';


UPDATE PRODUCT

SET     P_PRICE = 17.99, P_MIN = 10

WHERE   P_CODE = '13-Q2/P2';
```

◇ If you do not specify a WHERE condition, the UPDATE command will apply the changes to *all* rows in the table.

# SELECT queries

◇ Get data from table

- SELECT command

- syntax

```
SELECT column_list
FROM table_list
[WHERE search_condition]
```

The above SELECT statement retrieves all rows that match the specified condition(s) you specified in the WHERE clause.

# Using comparison operator

| SYMBOL | MEANING |
|---|---|
| = | Equal to |
| < | Less than |
| <= | Less than or equal to |
| > | Greater than |
| >= | Greater than or equal to |
| <> or != | Not equal to |

TABLE 7.6 Comparison Operators

# Example

◇ Find all the products provided by vendor 21344

```
SELECT *
FROM PRODUCT
WHERE V_CODE = 21344;
```

# Example

```
mysql> select *
    -> from product
    -> where v_code = 21344;
+-----------+-----------------------------+---------------------+-------+-------+
-----------+-------------+--------+
| P_CODE    | P_DESCRIPT                  | P_INDATE            | P_QOH | P_MIN |
 P_PRICE | P_DISCOUNT | V_CODE |
+-----------+-----------------------------+---------------------+-------+-------+
-----------+-------------+--------+
| 13-Q2/P2  | 7.25-in. pwr. saw blade     | 2015-12-13 00:00:00 |    32 |    15 |
    14.99 |       0.05 |  21344 |
| 14-Q1/L3  | 9.00-in. pwr. saw blade     | 2015-11-13 00:00:00 |    18 |    12 |
    17.49 |       0.00 |  21344 |
| 54778-2T  | Rat-tail file, 1/8-in. fine | 2015-12-15 00:00:00 |    43 |    20 |
     4.99 |       0.00 |  21344 |
+-----------+-----------------------------+---------------------+-------+-------+
-----------+-------------+--------+
3 rows in set (0.00 sec)
```

# Example

◇ List the products' descriptions (P_DESCRIPT), stocking dates (P_INDATE), price (P_PRICE) provided by vendor 21344

```
SELECT   P_DESCRIPT, P_INDATE, P_PRICE
FROM     PRODUCT
WHERE    V_CODE = 21344;
```

```
mysql> select p_descript, p_indate, p_price
    -> from product
    -> where v_code = 21344;
+----------------------------+---------------------+---------+
| p_descript                 | p_indate            | p_price |
+----------------------------+---------------------+---------+
| 7.25-in. pwr. saw blade    | 2015-12-13 00:00:00 |   14.99 |
| 9.00-in. pwr. saw blade    | 2015-11-13 00:00:00 |   17.49 |
| Rat-tail file, 1/8-in. fine| 2015-12-15 00:00:00 |    4.99 |
+----------------------------+---------------------+---------+
3 rows in set (0.00 sec)
```

◇ For the products which are NOT provided by vendor 21344, list their descriptions (P_DESCRIPT), stocking dates (P_INDATE), price (P_PRICE), and vendor code

```
SELECT   P_DESCRIPT, P_INDATE, P_PRICE,
V_CODE
FROM     PRODUCT
WHERE    V_CODE <> 21344;
```

# Example



```
mysql> select p_descript, p_indate, p_price, v_code
    -> from product
    -> where v_code <> 21344;
+-----------------------------------+---------------------+---------+--------+
| p_descript                        | p_indate            | p_price | v_code |
+-----------------------------------+---------------------+---------+--------+
| Power painter, 15 psi., 3-nozzle  | 2015-11-03 00:00:00 |  109.99 |  25595 |
| Hrd. cloth, 1/4-in., 2x50         | 2016-01-15 00:00:00 |   39.95 |  23119 |
| Hrd. cloth, 1/2-in., 3x50         | 2016-01-15 00:00:00 |   43.99 |  23119 |
| B&D jigsaw, 12-in. blade          | 2015-12-30 00:00:00 |  109.92 |  24288 |
| B&D jigsaw, 8-in. blade           | 2015-12-24 00:00:00 |   99.87 |  24288 |
| B&D cordless drill, 1/2-in.       | 2016-01-20 00:00:00 |   38.95 |  25595 |
| Claw hammer                       | 2016-01-20 00:00:00 |    9.95 |  21225 |
| Hicut chain saw, 16 in.           | 2016-02-07 00:00:00 |  256.99 |  24288 |
| 1.25-in. metal screw, 25          | 2016-03-01 00:00:00 |    6.99 |  21225 |
| 2.5-in. wd. screw, 50             | 2016-02-24 00:00:00 |    8.45 |  21231 |
| Steel matting, 4'x8'x1/6", .5" mesh | 2016-01-17 00:00:00 | 119.95 |  25595 |
+-----------------------------------+---------------------+---------+--------+
11 rows in set (0.00 sec)
```

# SELECT Practice

*Use SELECT queries to answer the following questions:*

◇ List all customers who live in 615 area

◇ List names, contacts and phones of vendors in Tennessee (TN)

◇ List products' descriptions, units available (QOH) and vendor codes that the prices are under $100.

▪ syntax
```
SELECT column_list
FROM table_list
[WHERE search_condition]
```

# Comparison

You can compare characters

```
SELECT P_CODE, P_DESCRIPT, P_QOH, P_MIN, P_PRICE
FROM    PRODUCT
WHERE   P_CODE < '1558-QW1';
```

◇ String comparisons are made from left to right.

- 'Apple' > 'Anna'
- 'Apple' < 'Boy'
- '34' < '6'

# Comparison

You can also compare dates

```
SELECT P_DESCRIPT, P_QOH, P_MIN, P_PRICE, P_INDATE

FROM    PRODUCT

WHERE   P_INDATE >= '2012-01-20';
```

# Using computed columns and column aliases

◇ If we want to know the total value of each product in inventory

- We need to multiply of each product's quantity by its current price

```
SELECT P_DESCRIPT, P_QOH, P_PRICE, P_QOH*P_PRICE
FROM PRODUCT;
```

```
mysql> select p_descript, p_qoh, p_price, p_qoh * p_price
    -> from product;
+--------------------------------+-------+--------+-----------------+
| p_descript                     | p_qoh | p_price| p_qoh * p_price |
+--------------------------------+-------+--------+-----------------+
| Power painter, 15 psi., 3-nozzle|    8 | 109.99 |          879.92 |
| 7.25-in. pwr. saw blade        |    32 |  14.99 |          479.68 |
| 9.00-in. pwr. saw blade        |    18 |  17.49 |          314.82 |
| Hrd. cloth, 1/4-in., 2x50      |    15 |  39.95 |          599.25 |
| Hrd. cloth, 1/2-in., 3x50      |    23 |  43.99 |         1011.77 |
| B&D jigsaw, 12-in. blade       |     8 | 109.92 |          879.36 |
| B&D jigsaw, 8-in. blade        |     6 |  99.87 |          599.22 |
| B&D cordless drill, 1/2-in.    |    12 |  38.95 |          467.40 |
| Claw hammer                    |    23 |   9.95 |          228.85 |
| Sledge hammer, 12 lb.          |     8 |  14.40 |          115.20 |
| Rat-tail file, 1/8-in. fine    |    43 |   4.99 |          214.57 |
| Hicut chain saw, 16 in.        |    11 | 256.99 |         2826.89 |
| PVC pipe, 3.5-in., 8-ft        |   188 |   5.87 |         1103.56 |
| 1.25-in. metal screw, 25       |   172 |   6.99 |         1202.28 |
| 2.5-in. wd. screw, 50          |   237 |   8.45 |         2002.65 |
| Steel matting, 4'x8'x1/6", .5" mesh |  18 | 119.95 |        2159.10 |
+--------------------------------+-------+--------+-----------------+
16 rows in set (0.03 sec)
```

To make the output more readable, you can set an *alias* to a column or table in any SQL statement.

```
SELECT P_DESCRIPT, P_QOH, P_PRICE,
       P_QOH*P_PRICE AS TOTALVALUE
FROM PRODUCT;
```

```
mysql> select p_descript, p_qoh, p_price, p_qoh * p_price as totalvalue
    -> from product;
+-----------------------------------------+-------+---------+------------+
| p_descript                              | p_qoh | p_price | totalvalue |
+-----------------------------------------+-------+---------+------------+
| Power painter, 15 psi., 3-nozzle        |     8 |  109.99 |     879.92 |
| 7.25-in. pwr. saw blade                 |    32 |   14.99 |     479.68 |
| 9.00-in. pwr. saw blade                 |    18 |   17.49 |     314.82 |
| Hrd. cloth, 1/4-in., 2x50               |    15 |   39.95 |     599.25 |
| Hrd. cloth, 1/2-in., 3x50               |    23 |   43.99 |    1011.77 |
| B&D jigsaw, 12-in. blade                |     8 |  109.92 |     879.36 |
| B&D jigsaw, 8-in. blade                 |     6 |   99.87 |     599.22 |
| B&D cordless drill, 1/2-in.             |    12 |   38.95 |     467.40 |
| Claw hammer                             |    23 |    9.95 |     228.85 |
| Sledge hammer, 12 lb.                   |     8 |   14.40 |     115.20 |
| Rat-tail file, 1/8-in. fine             |    43 |    4.99 |     214.57 |
| Hicut chain saw, 16 in.                 |    11 |  256.99 |    2826.89 |
| PVC pipe, 3.5-in., 8-ft                 |   188 |    5.87 |    1103.56 |
| 1.25-in. metal screw, 25                |   172 |    6.99 |    1202.28 |
| 2.5-in. wd. screw, 50                   |   237 |    8.45 |    2002.65 |
| Steel matting, 4'x8'x1/6", .5" mesh     |    18 |  119.95 |    2159.10 |
+-----------------------------------------+-------+---------+------------+
16 rows in set (0.05 sec)
```

◇ If we want to get a list of out-of-warranty products that have stored more than 90 days.

- In that case, the P_INDATE is at least 90 days earlier than the current date

```
SELECT P_CODE, P_INDATE,
DATE_ADD(P_INDATE, INTERVAL 90 DAY) as EXPDATE
FROM PRODUCT
WHERE DATE_ADD(P_INDATE, INTERVAL 90 DAY) < CURDATE();
```

- Function DATE_ADD(*start_date, intervals*):

add time values (intervals) to a date value

- Function CURDATE():

return the current date

- References to Date and Time functions in MySQL: https://dev.mysql.com/doc/refman/5.5/en/date-and-time-functions.html

```
mysql> select p_code, p_indate, DATE_ADD(p_indate, interval 90 day) as expdate
    -> from product
    -> where DATE_ADD(p_indate, interval 90 day) < CURDATE();
+----------+---------------------+---------------------+
| p_code   | p_indate            | expdate             |
+----------+---------------------+---------------------+
| 11QER/31 | 2015-11-03 00:00:00 | 2016-02-01 00:00:00 |
| 13-Q2/P2 | 2015-12-13 00:00:00 | 2016-03-12 00:00:00 |
| 14-Q1/L3 | 2015-11-13 00:00:00 | 2016-02-11 00:00:00 |
| 1546-QQ2 | 2016-01-15 00:00:00 | 2016-04-14 00:00:00 |
| 1558-QW1 | 2016-01-15 00:00:00 | 2016-04-14 00:00:00 |
| 2232/QTY | 2015-12-30 00:00:00 | 2016-03-29 00:00:00 |
| 2232/QWE | 2015-12-24 00:00:00 | 2016-03-23 00:00:00 |
| 2238/QPD | 2016-01-20 00:00:00 | 2016-04-19 00:00:00 |
| 23109-HB | 2016-01-20 00:00:00 | 2016-04-19 00:00:00 |
| 23114-AA | 2016-01-02 00:00:00 | 2016-04-01 00:00:00 |
| 54778-2T | 2015-12-15 00:00:00 | 2016-03-14 00:00:00 |
| 89-WRE-Q | 2016-02-07 00:00:00 | 2016-05-07 00:00:00 |
| PVC23DRT | 2016-02-20 00:00:00 | 2016-05-20 00:00:00 |
| SM-18277 | 2016-03-01 00:00:00 | 2016-05-30 00:00:00 |
| SW-23116 | 2016-02-24 00:00:00 | 2016-05-24 00:00:00 |
| WR3/TT3  | 2016-01-17 00:00:00 | 2016-04-16 00:00:00 |
+----------+---------------------+---------------------+
16 rows in set (0.31 sec)
```

## SELECT Practice

◇ Get the total product value from vendor 21225

◇ Assume the invoice which has been generated over 180 days cannot be used for return. Get a list of such invoices.

# Thank you & Questions