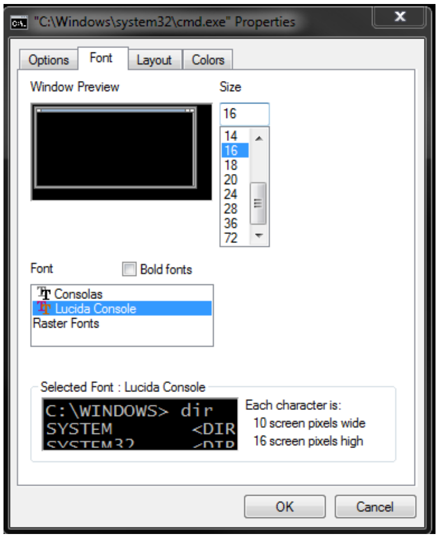
In Class Lab #1 [Part 1] - MySQL DBMS

Purpose:	This lab gives you hands-on experience with the MySQL database management system.
Turn-ins:	A single text file containing all of the output required in the lab directions.
Resources:	Lab computer (with XAMPP and MySQL installed), Lecture notes/handouts, Text Book

Initial Setup:

1. Starting the MySQL service in Windows using XAMPP.
   a. In the search box of the Start Menu, type "XAMPP" and select "XAMPP Control Panel (Beta)" in the search list.
   b. In the XAMPP control panel, click "START" next to MySQL.
   c. Ensure the MySQL service starts properly and that it is given a PID and PORT.

2. Configuring the Windows Command Shell.
   a. In the search box of the Start Menu, type "cmd" and select the cmd application that appears in the search list.
   b. Click in the top menu bar of the cmd window and select Properties
   c. Under the Font tab, change the font used to "Lucida Console". (You may make the font size larger.)
   d. Under the Layout tab, change the Screen Buffer Size (W=175,H=9000) and Window Size (W=175,H=55)


"C:\Windows\system32\cmd.exe" Properties

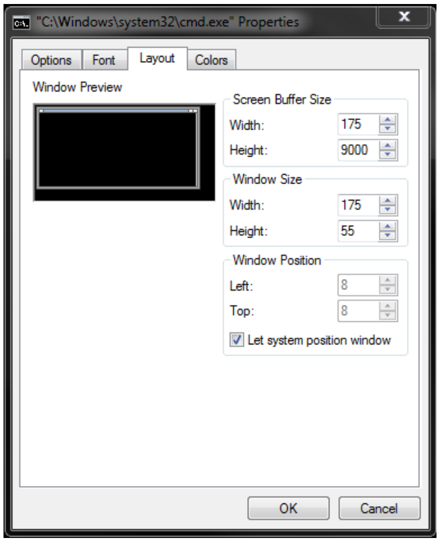
Size: 16

Font: Lucida Console

Selected Font : Lucida Console

```
C:\WINDOWS> dir
SYSTEM         <DIR
SYSTEM32       <DIR
```

Each character is:
10 screen pixels wide
16 screen pixels high


"C:\Windows\system32\cmd.exe" Properties

Screen Buffer Size
Width: 175
Height: 9000

Window Size
Width: 175
Height: 55

Window Position
Left: 8
Top: 8

☑ Let system position window

Throughout the lab you will be required to copy text from the command window to Notepad++. You will see "**<u>OUTPUT</u>**" in the directions. Copy the output of this step to your text file. Ensure the line before your copied output contains the Step #.

HOW TO: *Right-clicking in the command window will produce a menu where you can choose "Mark". This allows you to highlight text in the command window (makes the background color white). When you have finished marking the desired area, simply press ENTER on the keyboard and the text is automatically copied to the clipboard. You can then paste into Notepad.*

Please periodically save your output Notepad++ text file to your G: drive during the lab.

Starting MySQL:

Switch to the C: Drive with the following command: `C:`

3. Navigate the directory that contains the MySQL application with: `cd c:\xampp\mysql\bin`
4. Start the MySQL command-line application with the following command: `mysql –h localhost –u root`
5. Ensure that you are properly connected to the MySQL service by displaying all databases: `SHOW DATABASES;`
    a. After running the command, a list of database should appear including one called "mysql".
    b. If you receive an error or no output, close the application (CTRL-C) and then try to open (Step 4) or yell for help!

Importing a database with an SQL source file:

6. It is possible to create an SQL source file that contains all of the commands necessary to create and populate a database. In this part of the lab, you will download and import an SQL file that is already created.
    a. On the course's Sakai website, you will find a file called "**company.sql**" under Resources->Lab #1.
    b. Save the file by right-clicking on the link and selecting "Save link as" or "Save file as". Ensure that you save the file to the following directory for easy importing: `C:\xampp\mysql\bin`
7. Open the downloaded file in a NEW Notepad++ window.
    a. Examine the SQL source file's contents.
8. Import the SQL source file into the MySQL database system with the following command: `source company.sql`
    a. The SQL source file is automatically processed by the MySQL system.
9. Run the following SELECT queries.
    a. **__OUTPUT__:** Copy each of your SELECT commands and its output to the text file.
    b. Queries:

```
  i. SELECT       Fname, Lname, Address FROM EMPLOYEE,DEPARTMENT
     WHERE        Dname='Research' AND Dnumber=Dno;

 ii. SELECT  *   FROM   EMPLOYEE
     WHERE   (Salary BETWEEN 30000 AND 40000) AND Dno=5;

iii. SELECT       Pnumber, Dnum, Lname, Address, Bdate
     FROM         PROJECT,DEPARTMENT,EMPLOYEE
     WHERE        Dnum=Dnumber AND  Mgr_ssn=Ssn AND Plocation='Stafford';

 iv. SELECT       D.Dname, E.Lname, E.Fname, P.Pname
     FROM         DEPARTMENT D, EMPLOYEE E, WORKS_ON W, PROJECT P
     WHERE        D.Dnumber=E.Dno AND E.Ssn=W.Essn AND W.Pno=P.Pnumber
     ORDER BY     D.Dname, E.Lname, E.Fname;
```

Creating a Database in MySQL:

10. You will now create a new database in MySQL called **university**. This simple database, which we discussed at the start of the semester, will contain information about courses/students at a university.
    a. Grant the root user all privileges for this new database with the following command:
    `GRANT ALL ON university.* to 'root'@'localhost';`
    b. Create the empty database with this command: `CREATE DATABASE university;`
    c. **__OUTPUT__:** Copy the output of the following command to your text file: `SHOW DATABASES;`
    d. Start using the new database with the following command: `USE university;`

Creating Tables in the university DB:

11. The relational model for the university DB is shown below. Before you can run the CREATE TABLE commands, you need to identify primary keys, foreign keys, NOT NULL constraints, etc. On the following partial relational model, underline the attributes that you believe to be primary key attributes and using arrows draw the relationships that require foreign keys in your tables.

    You now must determine the attribute data types and any constraints on the attributes. You may want to refer to the data that you will be importing on the following page.

STUDENT

Name	Student_number	Class	Major

COURSE

Course_name	Course_number	Credit_hours	Department

PREREQUISITE

Course_number	Prerequisite_number

SECTION

Section_identifier	Course_number	Semester	Year	Instructor

GRADE_REPORT

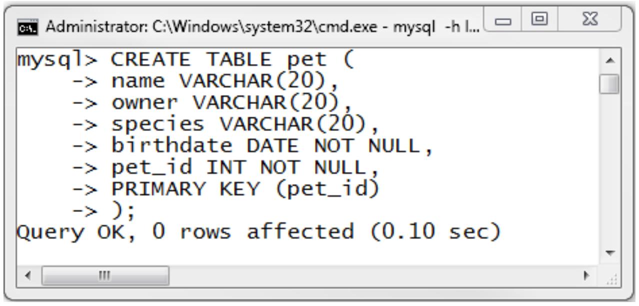
Student_number	Section_identifier	Grade

12. Write the CREATE TABLE commands for each relation in the model. The attribute names are already given in the diagram and you can decide the proper data type. You must include any NOT NULL, Primary Key, and Foreign Key constraints.

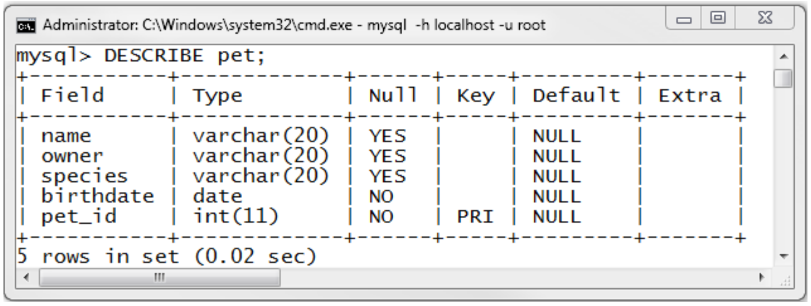
    a. You can write your CREATE TABLE commands on multiple lines (just remember to end your last line with a semi-colon). An example is shown on the next page (top left).

    You may find it easier to write your command in a separate Notepad++ file and then copy/paste them into MySQL.

    b. **<u>OUTPUT</u>:** Copy your completed CREATE TABLE statements to the output text file.



```
mysql> CREATE TABLE pet (
    -> name VARCHAR(20),
    -> owner VARCHAR(20),
    -> species VARCHAR(20),
    -> birthdate DATE NOT NULL,
    -> pet_id INT NOT NULL,
    -> PRIMARY KEY (pet_id)
    -> );
Query OK, 0 rows affected (0.10 sec)
```


Administrator: C:\Windows\system32\cmd.exe - mysql -h localhost -u root

```
mysql> DESCRIBE pet;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| name      | varchar(20) | YES  |     | NULL    |       |
| owner     | varchar(20) | YES  |     | NULL    |       |
| species   | varchar(20) | YES  |     | NULL    |       |
| birthdate | date        | NO   |     | NULL    |       |
| pet_id    | int(11)     | NO   | PRI | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
5 rows in set (0.02 sec)
```

13. Ensure that your CREATE TABLE commands worked properly by using the DESCRIBE command for each of your tables. (As illustrated in the above right screen shot.)

    a. **<u>OUTPUT</u>:** Copy the output of each DESCRIBE command to the text file.

Populating the tables in the university DB:

14. In order to run queries on the database, you will need to populate each table with data. The following screenshot provides a sample state of the database. Re-create this state by running INSERT INTO commands that match the data shown. (NOTE: You can insert multiple rows/tuples at one time by separating the value sets with a comma. As shown in the screenshot at the bottom of the page.)
    a. **<u>OUTPUT</u>:** Copy each of your INSERT INTO commands to the text file.

STUDENT

Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS

COURSE

Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

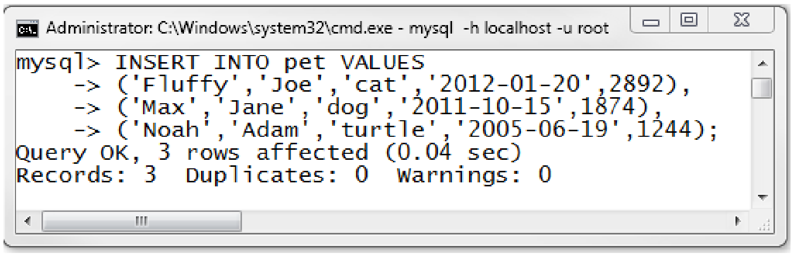
Section_identifier	Course_number	Semester	Year	Instructor
85	MATH2410	Fall	07	King
92	CS1310	Fall	07	Anderson
102	CS3320	Spring	08	Knuth
112	MATH2410	Fall	08	Chang
119	CS1310	Fall	08	Anderson
135	CS3380	Fall	08	Stone

GRADE_REPORT

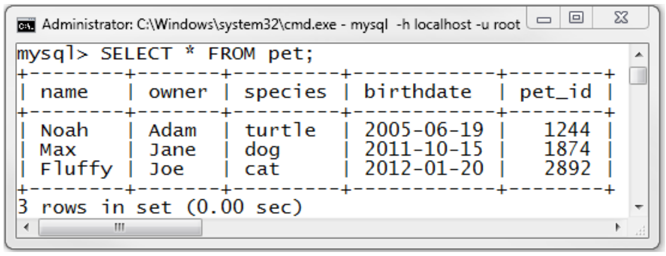
Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

PREREQUISITE

Course_number	Prerequisite_number
CS3380	CS3320
CS3380	MATH2410
CS3320	CS1310


Administrator: C:\Windows\system32\cmd.exe - mysql -h localhost -u root

```
mysql> INSERT INTO pet VALUES
    -> ('Fluffy','Joe','cat','2012-01-20',2892),
    -> ('Max','Jane','dog','2011-10-15',1874),
    -> ('Noah','Adam','turtle','2005-06-19',1244);
Query OK, 3 rows affected (0.04 sec)
Records: 3  Duplicates: 0  Warnings: 0
```


Administrator: C:\Windows\system32\cmd.exe - mysql -h localhost -u root

```
mysql> SELECT * FROM pet;
+--------+-------+---------+------------+--------+
| name   | owner | species | birthdate  | pet_id |
+--------+-------+---------+------------+--------+
| Noah   | Adam  | turtle  | 2005-06-19 |   1244 |
| Max    | Jane  | dog     | 2011-10-15 |   1874 |
| Fluffy | Joe   | cat     | 2012-01-20 |   2892 |
+--------+-------+---------+------------+--------+
3 rows in set (0.00 sec)
```

15. To ensure that your tables are properly populated, run the following command for each table: `SELECT * FROM table;`
    a. **<u>OUTPUT</u>:** Copy the output from each of your SELECT commands to the text file.

Closing MySQL and exporting a database:

16. Close MySQL by entering: `\q`

17. Since the lab machines are wiped on reboot, it may be necessary to export the contents of a database to a file. There exists a "dump" feature of MySQL, which dumps the contents of a database to a file using SQL commands. This file can later be imported to MySQL using the same source command that was used previously.

    a. IMPORTANT: The file format of the mysqldump output file differs from the SQL source file used in the previous section. DO NOT USE this dump file as a template for your Assignment #2. Use company.sql as a template.

    b. Run the following command at the windows command line prompt:

       i. `mysqldump university -u root -h localhost > university_dump.sql`

    c. Copy the `university_dump.sql` file to your G: Drive for Part 2 of the lab.

Saving your Lab Files:

18. We will continue this lab in our next class meeting. Please save your Lab Report file, your MySQL dump file and any other files that you have used in this lab. You will need them for the next part of the lab.

Helpful MySQL Commands:

• Showing all the tables created in a database:	SHOW TABLES;
• Removing an entire database:	`DROP DATABASE dbname;`
• Removing an entire table from the database:	`DROP TABLE tablename;`
• Removing all the rows/tuples from a table:	`DELETE FROM tablename;`