

# Database Systems Lab



## Lab # 08

### Views and SQL Functions

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A **view** is a virtual table based on a SELECT query. The query can contain columns, computed columns, aliases, and aggregate functions from one or more tables. The tables on which the view is based are called **base tables**. You can create a view by using the **CREATE VIEW** command:

```
CREATE VIEW viewname AS SELECT query
```

The CREATE VIEW statement is a data definition command that stores the subquery specification—the SELECT statement used to generate the virtual table—in the data dictionary. For example, to create a view to display the employees first and last name (EMP\_FNAME and EMP\_LNAME), the attraction number (ATTRACT\_NO) and the date worked, you would do so as follows:

```
CREATE VIEW EMP_WORKED AS  
SELECT E.EMP_LNAME, E.EMP_FNAME, H.ATTRACT_NO, H.DATE_WORKED  
FROM employee E JOIN hours H  
ON E.EMP_NUM = H.EMP_NUM;
```

To display the contents of this view you would type

```
SELECT * FROM EMP_WORKED;
```

The created view can be seen in figure 78.

```
mysql> CREATE VIEW EMP_WORKED AS
-> SELECT E.EMP_LNAME,E.EMP_FNAME,H.ATTRACT_NO,H.DATE_WORKED FROM
-> employee E JOIN hours H ON E.EMP_NUM = H.EMP_NUM;
Query OK, 0 rows affected (0.11 sec)

mysql> DESCRIBE EMP_WORKED;
+-----+-----+-----+-----+-----+-----+
| Field      | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| EMP_LNAME  | varchar(15)   | NO   |     | NULL    |       |
| EMP_FNAME  | varchar(15)   | NO   |     | NULL    |       |
| ATTRACT_NO | decimal(10,0) | NO   |     | NULL    |       |
| DATE_WORKED | date          | NO   |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql> SELECT * FROM EMP_WORKED;
+-----+-----+-----+-----+
| EMP_LNAME | EMP_FNAME | ATTRACT_NO | DATE_WORKED |
+-----+-----+-----+-----+
| Calderdale | Emma      | 10034      | 2007-05-18  |
| Calderdale | Emma      | 10034      | 2007-05-20  |
| Ricardo    | Marshel   | 10034      | 2007-05-18  |
| Arshad     | Arif      | 30012      | 2007-05-23  |
| Arshad     | Arif      | 30044      | 2007-05-21  |
| Arshad     | Arif      | 30044      | 2007-05-22  |
| Denver     | Enrica    | 30011      | 2007-05-21  |
| Denver     | Enrica    | 30012      | 2007-05-22  |
| Namowa     | Mirrelle  | 10078      | 2007-05-18  |
| Namowa     | Mirrelle  | 10098      | 2007-05-18  |
| Namowa     | Mirrelle  | 10098      | 2007-05-19  |
+-----+-----+-----+-----+
11 rows in set (0.02 sec)
```

Figure 78 Creating the EMP\_WORKED view.

**Task 1** Create the EMP\_WORKED view.

Relational view has several special characteristics. These are:

- You can use the name of a view anywhere a table name is expected in a SQL statement
- Views are dynamically updated. That is, the view is re-created on demand each time it is invoked.
- Views provide a level of security in the database because the view can restrict users to only specified columns and specified rows in a table

To remove the view EMP\_WORKED you could issue the following command

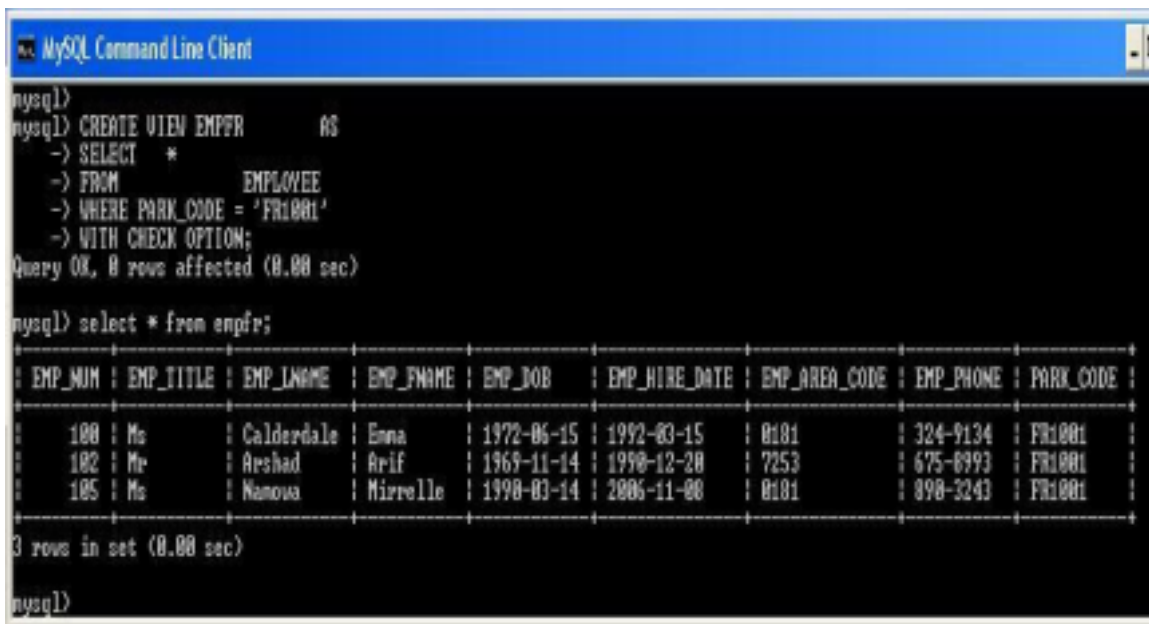
DROP VIEW EMP\_WORKED;

## 1.1. Views – using the WITH CHECK OPTION

It is possible to perform referential integrity constraints through the use of a view so that database constraints can be enforced. The following view DISPLAYS employees who work in Theme Park FR1001 using the WITH CHECK OPTION clause. This clause ensures that INSERTs and UPDATEs cannot be performed on any rows that the view has not selected. The results of creating this view can be seen in Figure 79.

### Task 2

```
CREATE VIEW EMPFR AS
SELECT *
FROM EMPLOYEE
WHERE PARK_CODE = 'FR1001'
WITH CHECK OPTION;
```



```
mysql>
mysql> CREATE VIEW EMPFR AS
-> SELECT *
-> FROM EMPLOYEE
-> WHERE PARK_CODE = 'FR1001'
-> WITH CHECK OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql> select * from empfr;
```

EMP_NUM	EMP_TITLE	EMP_LNAME	EMP_FNAME	EMP_DOB	EMP_HIRE_DATE	EMP_AREA_CODE	EMP_PHONE	PARK_CODE
100	Ms	Calderdale	Emma	1972-06-15	1992-03-15	0101	324-9134	FR1001
102	Mr	Arshad	Arif	1969-11-14	1998-12-20	7253	675-6993	FR1001
105	Ms	Namova	Mirrelle	1998-03-14	2006-11-08	0101	898-3243	FR1001

```
3 rows in set (0.00 sec)

mysql>
```

Figure 79 Creating the EMPFR view

So for example if employee ‘Emma Caulderdale’ was to leave the park and move to park ‘UK3452’, we would want to update her information with the following query:

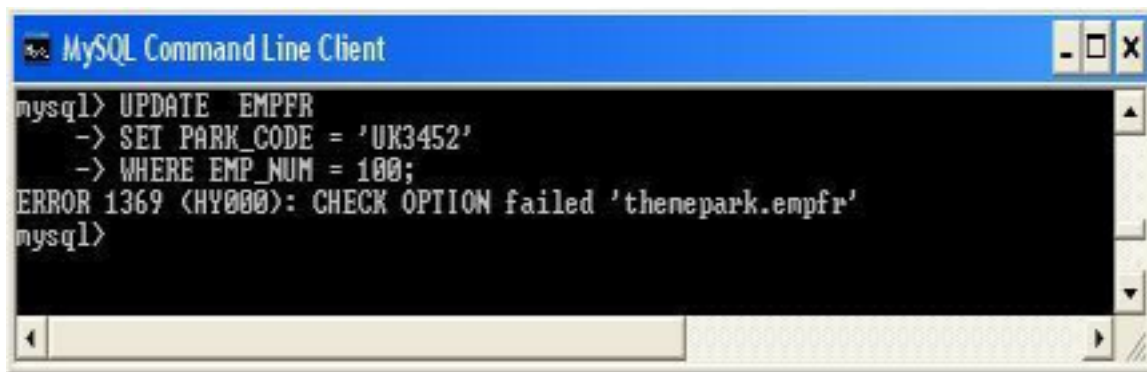
### Task 3

```
UPDATE EMPFR
```

```
SET PARK_CODE = 'UK3452'
```

```
WHERE EMP_NUM = 100;
```

However running this update gives the errors shown in Figure 80. This is because if the update was to occur, the view would no longer be able to see this employee.



**Figure 80 Creating the EMPFR view**

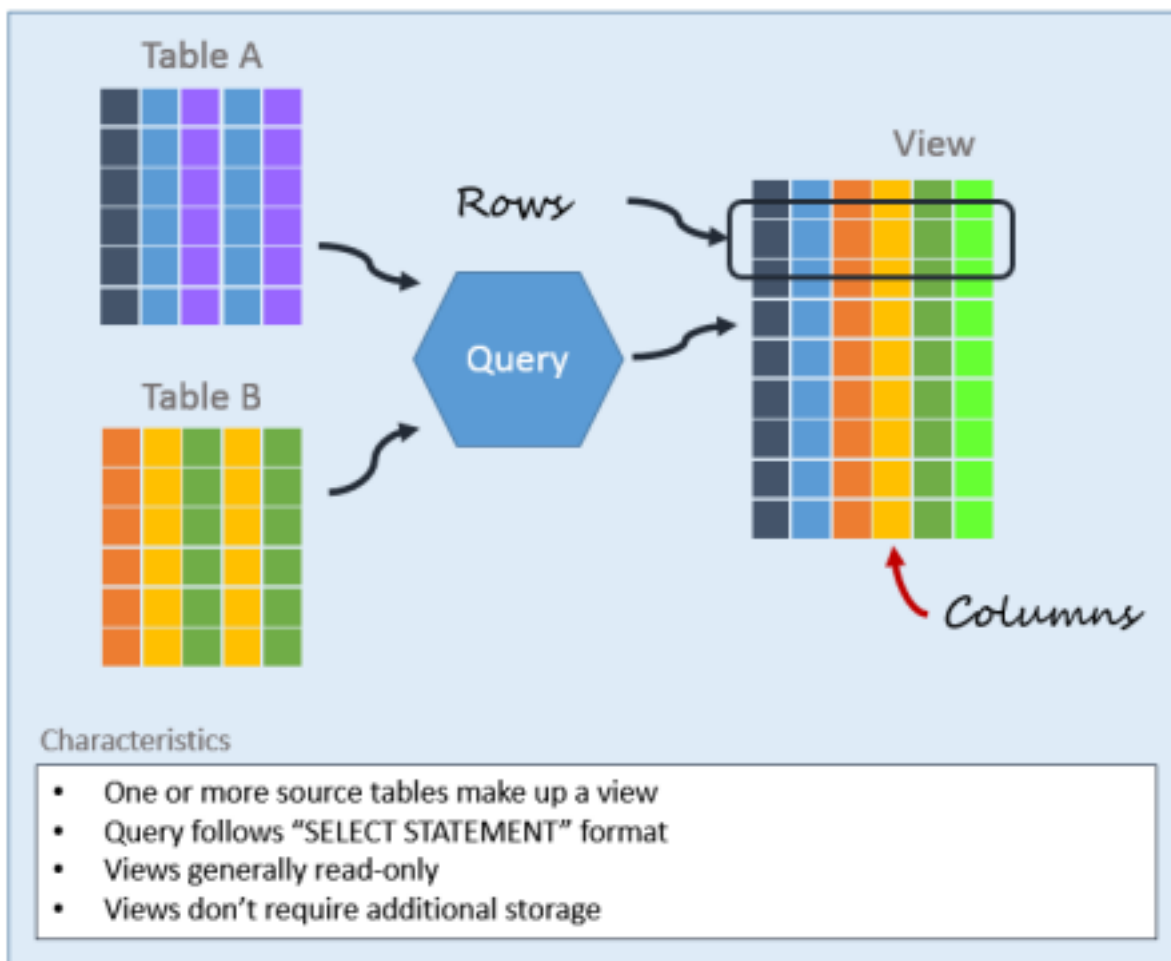
### **Advantages of Views:**

#### **I. Simplify complex Query:**

Views help simplify complex queries. If you have any frequently used complex query, you can create a view based on it so that you can reference to the view by using a simple `SELECT` statement instead of typing the query all over again.

#### **II. Add extra security layers:**

### Anatomy of a View



A table may expose a lot of data including sensitive data such as personal and banking information. By using views and privileges, you can limit which data users can access by exposing only the necessary data to them.

## 2. SQL Functions:

There are many types of SQL functions, such as arithmetic, trigonometric, string, date, and time functions. This Lab will cover a selection of these SQL functions that are implemented in MySQL in detail. Functions always use a numerical, date, or string value. The value may be part of the command itself (a constant or literal) or it may be an attribute located in a table. Therefore, a function may appear anywhere in a SQL statement where a value or an attribute can be used.

### 2.1. Date and Time Functions

In MySQL there are a number of useful date and time functions. However, first it is important to briefly look at the main date and time types available to MySQL. These are shown in the table below:

Table 2.1 MySQL Date and Time data types

DATETIME	YYYY-MM-DD HH:MM:SS
DATE	YYYY-MM-DD
TIMESTAMP	YYYYMMDDSSMM
TIME	HH:MM:SS
YEAR	YYYY

As you can see from Table 6.1, the DATE type is stored in a special internal format that includes just the year, month and day whilst the DATETIME data type also stores the hours, minutes, and seconds. If you try to enter a date in a format other than the Year-Month-Day format then it might work, but it won't be storing them as you expect!

**Task 4** Enter the following query and examine how the date is displayed.



```
SELECT DISTINCT(SALE_DATE )  
FROM SALES;
```

It is possible to change the format of the date using the DATE\_FORMAT() function. The syntax of this function is

```
DATE_FORMAT(date,format)
```

The function formats the date value according to the format string.

For example, the following query formats the date as 18<sup>th</sup> May 2007 using ‘ date specifiers’ as shown in Figure 55.

```
SELECT DISTINCT(DATE_FORMAT(SALE_DATE, '%D %b %Y'))  
  
FROM SALES;
```

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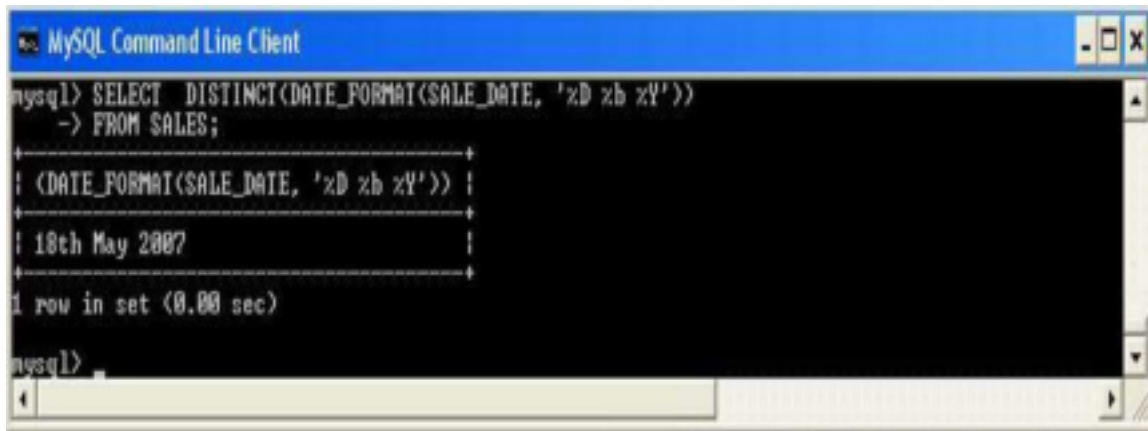


Figure 55 Formatting Dates in MySQL

Table 2.2 taken directly from the MySQL Manual 5.0 shows a complete list of specifiers

that can be used in the format string.

Specifier	Description
%a	Abbreviated weekday name (Sun..Sat)
%b	Abbreviated month name (Jan..Dec)
%c	Month, numeric (0..12)
%D	Day of the month with English suffix (0th, 1st, 2nd, 3rd, ...)
%d	Day of the month, numeric (00..31)
%e	Day of the month, numeric (0..31)
%f	Microseconds (000000..999999)
%H	Hour (00..23)
%h	Hour (01..12)
%I	Hour (01..12)
%i	Minutes, numeric (00..59)
%j	Day of year (001..366)
%k	Hour (0..23)
%l	Hour (1..12)

%M	Month name (January..December)
%m	Month, numeric (00..12)
%p	AM or PM
%r	Time, 12-hour (hh:mm:ss followed by AM or PM)
%S	Seconds (00..59)
%s	Seconds (00..59)
%T	Time, 24-hour (hh:mm:ss)
%U	Week (00..53), where Sunday is the first day of the week
%u	Week (00..53), where Monday is the first day of the week Week (01..53), where Sunday is the first day of the week; used with
%V	
%v	

	%X Week (01..53), where Monday is the first day of the week; used with %x
%W	Weekday name (Sunday..Saturday)
%w	Day of the week (0=Sunday..6=Saturday)
%X	Year for the week where Sunday is the first day of the week, numeric, four digits; used with %V
%x	Year for the week, where Monday is the first day of the week, numeric, four digits; used with %v
%Y	Year, numeric, four digits
%y	Year, numeric (two digits)
%%	A literal '%' character
%x	x, for any 'x' not listed above

You will now explore some of the main MySQL date / time functions.

## CURRENT DATE and CURRENT TIME

The CURRENT\_DATE function returns today's date while the CURRENT\_TIME

function returns the current time.

**Task 5** Enter the following query to display today's date and time. Notice that in MySQL the functions are called using the SELECT statement but no FROM clause is needed.

```
mysql> SELECT CURRENT_DATE(), CURRENT_TIME();
```

Note

CURRENT\_TIME and CURRENT\_DATE are synonyms for CURTIME() and CURDATE respectively.

The output for this query is shown in Figure 56.

```
MariaDB [(none)]> select current_date(),current_time();
+-----+-----+
| current_date() | current_time() |
+-----+-----+
| 2021-11-07      | 15:42:38       |
+-----+-----+
1 row in set (0.000 sec)
```

Figure 56 Displaying the current date and time.

### **MONTH, DAYOFMONTH and YEAR**

MySQL provides functions for extracting the month, day or year from any given

date. The syntax of each function is as follows:

DAYOFMONTH(date) returns the day of the month for date, in the range 0 to 31.

MONTH(date) returns the month for date, in the range 0 to 12.

YEAR(date) returns the year for date, in the range 1000 to 9999, or 0 for the “zero” date.

The following query shows how these three functions can be used to display different parts of an employee’s date of birth. The output of this query is shown in Figure 57.

```
SELECT DAYOFMONTH(EMP_DOB) AS "Day", MONTH(EMP_DOB) AS "Month",  
  
YEAR(EMP_DOB) AS "Year"  
  
FROM EMPLOYEE;
```

```

mysql>
mysql> SELECT DAYOFMONTH(EMP_DOB) AS "Day", MONTH(EMP_DOB) AS "Month", YEAR(EMP_DOB) AS "Year"
-> FROM EMPLOYEE;
+-----+-----+-----+
| Day | Month | Year |
+-----+-----+-----+
| 15 | 6 | 1972 |
| 19 | 3 | 1978 |
| 14 | 11 | 1969 |
| 16 | 10 | 1974 |
| 8 | 11 | 1980 |
| 14 | 3 | 1990 |
| 12 | 2 | 1968 |
+-----+-----+-----+
7 rows in set (0.00 sec)

mysql>

```

Figure 57 Using the MONTH, DAYOFMONTH and YEAR functions.

**Task 6** Write a query that displays all employees who were born in November. Your output should match that shown in Figure 58.

```

mysql> SELECT EMP_LNAME, EMP_FNAME, EMP_DOB,
-> DATE_FORMAT(EMP_DOB, '%b') AS MONTH
-> FROM EMPLOYEE
-> WHERE month(EMP_DOB) = '11';
+-----+-----+-----+-----+
| EMP_LNAME | EMP_FNAME | EMP_DOB | MONTH |
+-----+-----+-----+-----+
| Arshad | Arif | 1969-11-14 | Nov |
| Denver | Enrica | 1980-11-08 | Nov |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql>
mysql>
mysql>
mysql>

```

Figure 58 Output for Task 6

## DATEDIFF

The DATEDIFF function subtracts two dates and returns a value in days from one date to the other. The following example calculates the number of days between the 1st January 2008 and the 25th December 2008.

```
SELECT DATEDIFF('2008-12-25','2008-01-01');
```

**Task 7** Enter the query above and see how many days it is until the 25<sup>th</sup> December. Then modify the query to see how many days it is from today's date until 25th December 2009.

### **DATE\_ADD and DATE\_SUB**

The DATE\_ADD and DATE\_SUB functions both perform date arithmetic and allow you to either add or subtract two dates from one another. The syntax of these functions is:

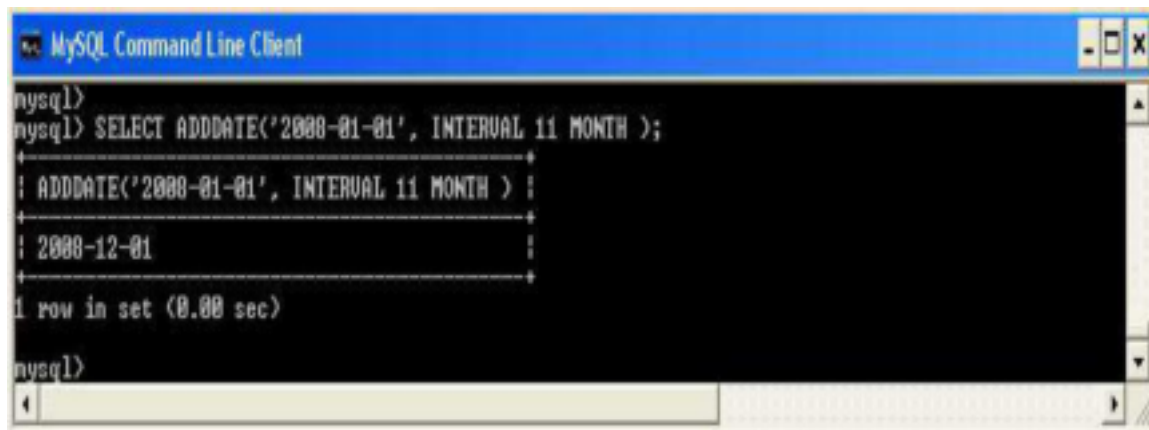
DATE\_ADD(date,INTERVAL expr unit)

DATE\_SUB(date,INTERVAL expr unit)

Where expr is an expression specifying the interval value to be added or subtracted from the starting date and unit is a keyword indicating the units in which the expression should be interpreted.

For example, the following query adds 11 months to the date 1<sup>st</sup> January 2008 to display a new date of 1<sup>st</sup> December 2008. The output for this query is shown in Figure 59.

```
SELECT ADDDATE('2008-01-01', INTERVAL 11 MONTH );
```

A screenshot of the MySQL Command Line Client window. The title bar reads "MySQL Command Line Client". The command prompt shows the user entering the command: `mysql> SELECT ADDDATE('2000-01-01', INTERVAL 11 MONTH );`. The output is displayed in a table format: 

ADDDATE('2000-01-01', INTERVAL 11 MONTH )
2000-12-01

 Below the table, it says "1 row in set (0.00 sec)". The prompt `mysql>` is visible at the bottom.

Figure 59 Adding months to a date

A full list of the different interval types can be found in the MySQL Reference Manual 5.0.

**Task 8** Enter the following query which lists the hire dates of all employees along with the date of their first work appraisal (one year from the hiredate). Check that the output is correct.

```
SELECT EMP_LNAME, EMP_FNAME, EMP_HIRE_DATE,  
ADDDATE(EMP_HIRE_DATE, INTERVAL 12 MONTH )AS "FIRST APPRAISAL"  
FROM EMPLOYEE;
```

## LAST\_DAY

The function LAST\_DAY returns the date of the last day of the month given in a date.

The syntax is

LAST\_DAY(date\_value).

**Task 9** Enter the following query which lists all sales transactions that were made in



the last 20 days of a month:

```
SELECT *  
FROM SALES  
WHERE SALE_DATE >= LAST_DAY(SALE_DATE)-20;
```

## 2.2. Numeric Functions

In this section, you will learn about MySQL single row numeric functions. Numeric functions take one numeric parameter and return one value. A description of the functions you will explore in this lab can be found in Table 4.

Note  
Do not  
confuse  
the

SQL aggregate functions you saw in the previous chapter with the numeric functions in this section. The first group operates over a set of values (multiple rows—hence, the name aggregate functions), while the numeric functions covered here operate over a single row.

Table 3 Selected Numeric Functions	
Function	Description
ABS	Returns the absolute value of a number Syntax: ABS(numeric_value)
ROUND	Rounds a value to a specified precision (number of digits) Syntax: ROUND(numeric_value, p) where p = precision
TRUNCATE	Truncates a value to a specified precision (number of digits) Syntax: TRUNC(numeric_value, p) where p = precision
MOD	Returns the remainder of division. Syntax MOD(m,n) where m is divided by n.

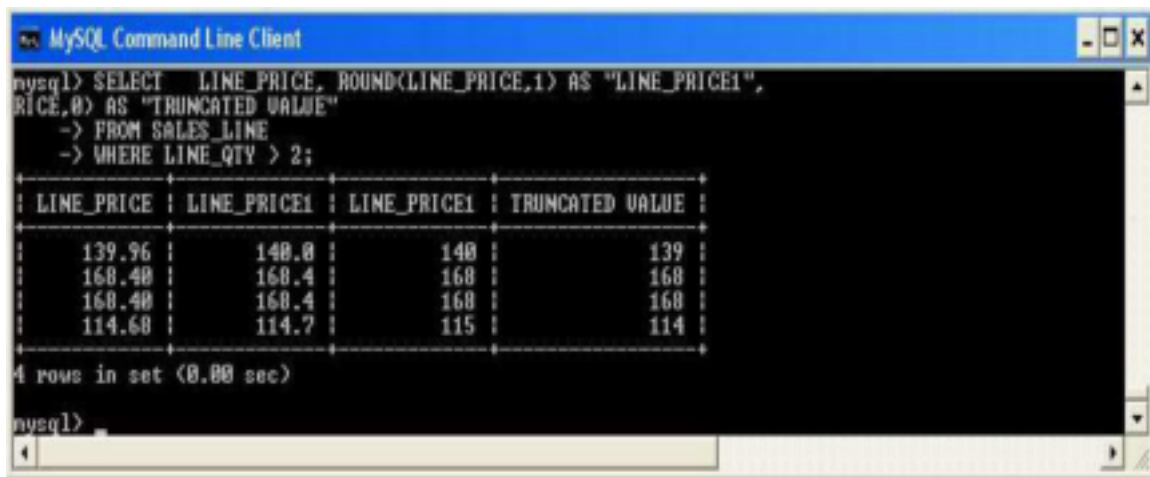
The following example displays the individual LINE\_PRICE from the sales line table, rounded to one and zero places and truncated where the quantity of tickets purchased on that line is greater than 2.

```

SELECT LINE_PRICE, ROUND(LINE_PRICE,1) AS "LINE_PRICE1",
        ROUND(LINE_PRICE,0) AS "LINE_PRICE1",
        TRUNCATE(LINE_PRICE,0) AS "TRUNCATED VALUE"
FROM SALES_LINE
WHERE LINE_QTY > 2;

```

The output for this query can be seen in Figure 60.



```
mysql> SELECT LINE_PRICE, ROUND(LINE_PRICE,1) AS "LINE_PRICE1",
TRUNC(LINE_PRICE,0) AS "TRUNCATED VALUE"
-> FROM SALES_LINE
-> WHERE LINE_QTY > 2;
```

LINE_PRICE	LINE_PRICE1	LINE_PRICE1	TRUNCATED VALUE
139.96	140.0	140	139
160.40	160.4	160	160
160.40	160.4	160	160
114.68	114.7	115	114

```
4 rows in set (0.00 sec)

mysql>
```

Figure 60 Example of ROUND and TRUNC

**Task 10** Enter the following query and execute it. Can you explain the results of this query?

```
SELECT TRANSACTION_NO, LINE_PRICE, MOD(LINE_PRICE,
```

```
10) FROM SALES_LINE
```

```
WHERE LINE_QTY > 2;
```

## 2.3. String Functions

String manipulation functions are amongst the most-used functions in

programming. Table 5 shows a subset of the most useful string manipulation

functions in MySQL. Table 5 Selected MySQL string functions.

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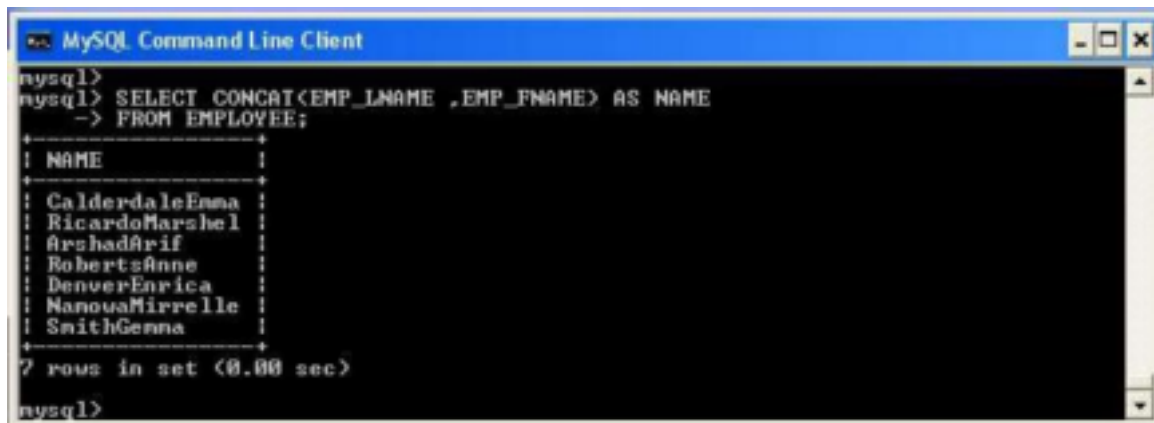
Function	Description
CONCAT	Concatenates data from two different character columns and returns a single column. Syntax: CONCAT(strg_value, strg_value)
UPPER/LOWER	Returns a string in all capital or all lowercase letters Syntax: UPPER(strg_value) , LOWER(strg_value)
SUBSTR	Returns a substring or part of a given string parameter Syntax: SUBSTR(strg_value, p, l) where p = start position and l = length of characters
LENGTH	Returns the number of characters in a string value Syntax: LENGTH(strg_value)

We will now look at examples of some of these string functions.

## CONCAT

The following query illustrates the CONCAT function. It lists all employee first and last names concatenated together. The output for this query can be seen in Figure 61.

```
SELECT CONCAT(EMP_LNAME ,EMP_FNAME) AS  
NAME FROM EMPLOYEE;
```



```

mysql>
mysql> SELECT CONCAT(EMP_LNAME ,EMP_FNAME) AS NAME
-> FROM EMPLOYEE;
+-----+
| NAME          |
+-----+
| CalderdaleEmma |
| RicardoMarshall |
| ArshadArif    |
| RobertsAnne   |
| DenverEnrica  |
| NanouaMirrelle |
| SmithGemma    |
+-----+
7 rows in set (0.00 sec)

mysql>

```

Figure 61 Concatenation of employee's first and last names

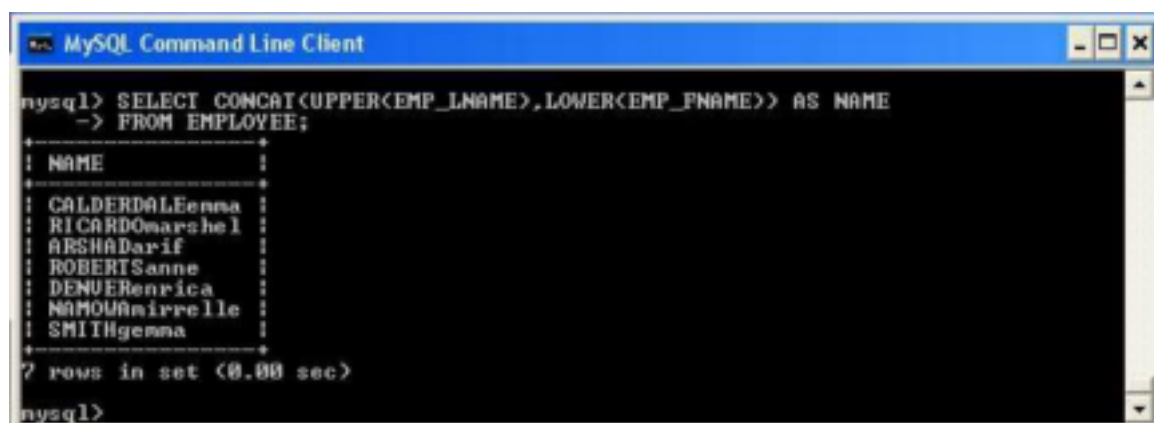
## UPPER/LOWER

The following query lists all employee last names in all capital letters and all first names in all lowercase letters. The output for the query is shown in Figure 62.

```

SELECT CONCAT(UPPER(EMP_LNAME),LOWER(EMP_FNAME)) AS
NAME FROM EMPLOYEE;

```



```

mysql> SELECT CONCAT(UPPER(EMP_LNAME),LOWER(EMP_FNAME)) AS NAME
-> FROM EMPLOYEE;
+-----+
| NAME          |
+-----+
| CALDERDALEemma |
| RICARDOMarshall |
| ARSHADarif     |
| ROBERTSanne    |
| DENVERenrica   |
| NANOUAMirrelle |
| SMITHgemma     |
+-----+
7 rows in set (0.00 sec)

mysql>

```

Figure 62 Displaying upper and lower case employee names.

## **SUBSTR**

The following example lists the first three characters of all the employees' first name.

The output of this query is shown in Figure 63.

```
SELECT EMP_PHONE, SUBSTR(EMP_FNAME,1,3)

FROM EMPLOYEE;
```

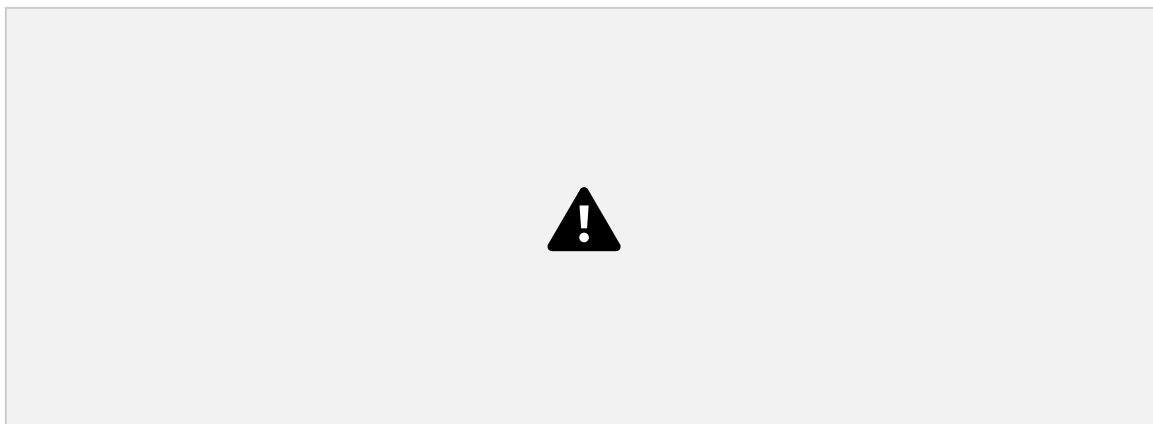


Figure 63 Displaying the first 3 characters of the employees first name

## **LENGTH**

The following example lists all attraction names and the length of their names; ordered descended by attraction name length. The output of this query is shown in Figure 65.

```
SELECT ATTRACT_NAME, LENGTH(ATTRACT_NAME) AS
```

NAMESIZE FROM ATTRACTION

ORDER BY NAMESIZE DESC;

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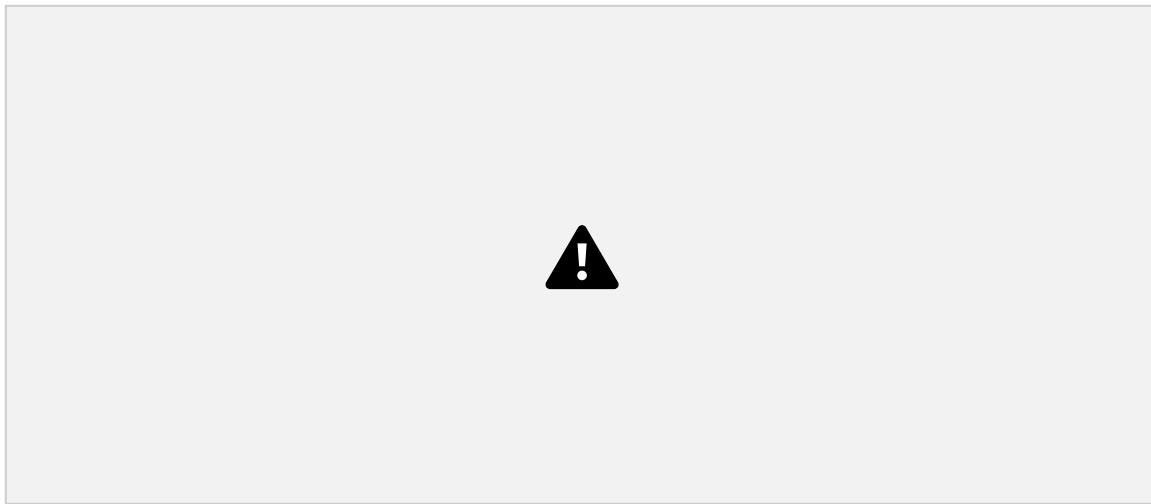


Figure 65 Displaying the length of attraction names.

## 2.4. Conversion Functions

Conversion functions allow you to take a value of a given data type and convert it to the equivalent value in another data type. In MySQL, some conversions occur implicitly. For example, MySQL automatically converts numbers to strings when needed, and vice versa.

So if you enter the following query:

```
SELECT 10 + '10'
```

MySQL would give you an answer of 20 as it would automatically convert the string

containing '10' into the number 10 (see figure 66).

If you want to explicitly convert a number to a string then you can use either the CAST or CONVERT function. However MySQL 5.0 recommends only the CAST function is used.

Let's look at an example. The following query produces the output shown in Figure 66.

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```
SELECT 10, CAST(10 AS CHAR);
```



Note  
The  
MySQL

Reference Manual 5.0 provides a set of rules that allow us to determine how the conversion will occur when using the CONVERT function on different data types.

## IFNULL

The IFNULL function lets you substitute a value when a null value is encountered in the results of a query. The syntax is:



IFNULL(expr1,expr2)

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If expr1 is not NULL, IFNULL() returns expr1; otherwise it returns expr2. It is equivalent to Oracle's NVL function. It is useful for avoiding errors caused by incorrect calculation when one of the arguments is null.

## **CASE**

The CASE function compares an attribute or expression with a series of values and returns an associated value or a default value if no match is found. There are two versions of the CASE function. The syntax of each is shown below.

```
CASE value WHEN [compare_value] THEN result [WHEN [compare_value] THEN  
result ...] [ELSE result] END
```

```
CASE WHEN [condition] THEN result [WHEN [condition] THEN result ...]  
[ELSE result] END
```

The first version returns the result where value=compare\_value. The second version returns the result for the first condition that is true. If there was no matching result value, the result after ELSE is returned, or NULL if there is no ELSE part.

Let's now look at the following example, which compares the country code in the PARK\_COUNTRY field and decodes it into the name of the country. If there is no

match, it returns the value 'Unknown'. The output is shown in Figure 68.

```
SELECT PARK_CODE, PARK_COUNTRY, (CASE PARK_COUNTRY WHEN 'UK'  
THEN 'United Kingdom' WHEN 'FR' THEN 'France' WHEN 'NL' THEN 'The  
Netherlands' WHEN 'SP' THEN 'Spain' WHEN 'ZA' THEN 'South Africa' WHEN 'SW'  
THEN 'Switzerland' ELSE 'Unknown' END) AS COUNTRY  
  
FROM THEMEPARK;
```

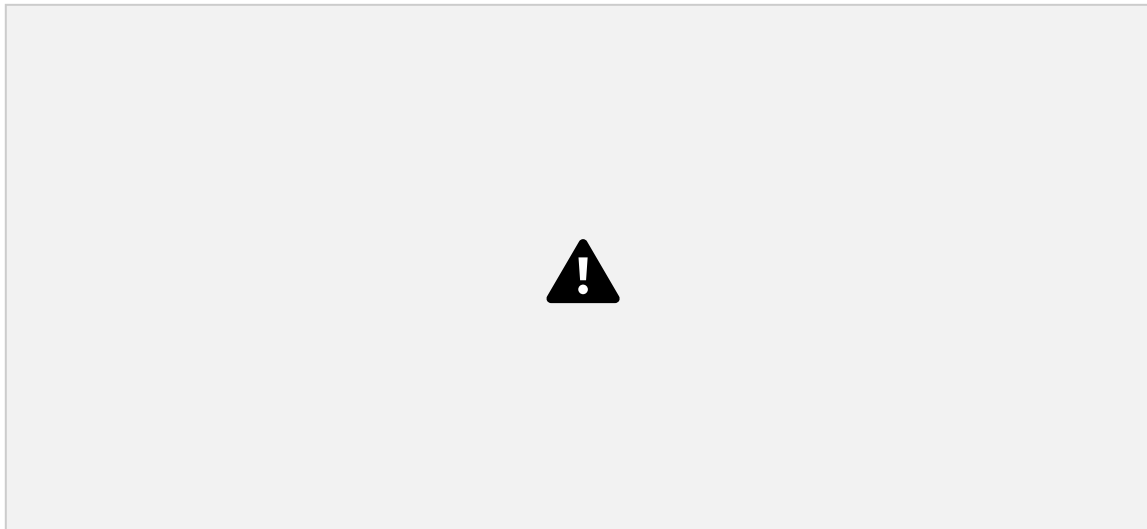


Figure 68 Displaying the names of countries using the DECODE function.

It is worth noting that the above decode statement is equivalent to the following

IF-THEN-ELSE statement:

```
IF PARK_COUNTRY = 'UK' THEN  
    result := 'United Kingdom';  
ELSIF PARK_COUNTRY = 'FR' THEN  
    result := 'FRANCE';  
ELSIF PARK_COUNTRY = 'NL' THEN  
    result := 'The Netherlands';  
ELSIF PARK_COUNTRY = 'SP' THEN  
    result := 'Spain';  
ELSIF PARK_COUNTRY = 'ZA' THEN  
    result := 'South Africa';
```

```
ELSIF PARK_COUNTRY = 'SW' THEN
    result := 'Switzerland';
ELSE
    result := 'Unknown';
END IF;
```

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## Exercises

**E6.1** Employee Emma Cauderdale (EMP\_NUM =100) has now changed her phone number to 324-9652. Update her information in the EMPFR view. Write a query to show her new phone number has been updated and then Remove the EMPFR view.

**E6.2** The Theme Park managers want to create a view called EMP\_DETAILS which contains the following information. EMP\_NO, PARK\_CODE, PARK\_NAME, EMP\_LNAME,EMP\_FNAME, EMP\_HIRE\_DATE and EMP\_DOB.

Check that the view works, by displaying its contents.



**E6.3** Using your view EMP\_DETAILS, write a query that displays all employee first and last names and the park names.

**E6.4** Create a view called TICKET\_SALES which contains details of the min, max and

average sales at each Theme Park. The name of the theme park should also be displayed.

*(Hint 1: you will need to join three tables).* Once you have created your view, write a query to display the contents.

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**E6.5** Using the date specifiers in Table 2.2, modify the query shown in Figure 55 to display the date in the format 'Fri – 18 – 5 – 07'.

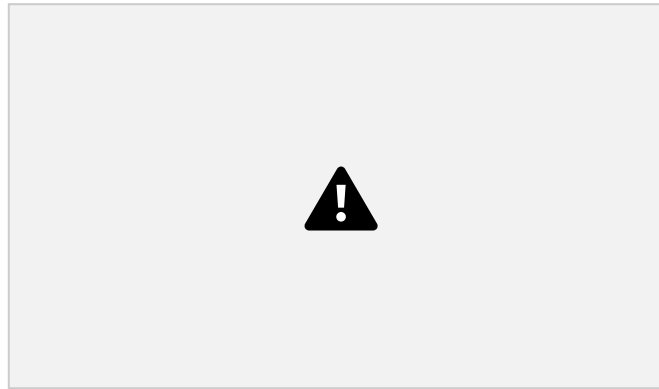
**E 6.6** Write a query which generates a list of employee user IDs, using the born month, first day of the month they were born and the first six characters of last name in UPPER case. Your query should return the results shown in below Figure.

USER ID format (**MDName**) here M= month, D= first day of month, Name= Employee last name first 6 alphabets.



**E6.7** Write a query which lists the names and dates of births of all employees born on the 14th day of the month.

**E6.8** Write a query which generates a list of employee user passwords, using the first three digits of their phone number, and the first two characters of first name in lower case. Label the column USER\_PASSWORD.



***References:***

<https://www.mysqltutorial.org/mysql-views-tutorial.aspx/>

<https://dev.mysql.com/doc/refman/8.0/en/sql-function-reference.html>

