
Table of Contents

Preface.....	xi
1. Using the mysql Client Program.....	1
1.1. Setting Up a MySQL User Account	2
1.2. Creating a Database and a Sample Table	4
1.3. What to Do if mysql Cannot Be Found	6
1.4. Specifying mysql Command Options	8
1.5. Executing SQL Statements Interactively	13
1.6. Executing SQL Statements Read from a File or Program	15
1.7. Controlling mysql Output Destination and Format	17
1.8. Using User-Defined Variables in SQL Statements	22
2. Writing MySQL-Based Programs.....	25
2.1. Connecting, Selecting a Database, and Disconnecting	29
2.2. Checking for Errors	42
2.3. Writing Library Files	51
2.4. Executing Statements and Retrieving Results	65
2.5. Handling Special Characters and NULL Values in Statements	79
2.6. Handling Special Characters in Identifiers	89
2.7. Identifying NULL Values in Result Sets	91
2.8. Techniques for Obtaining Connection Parameters	95
2.9. Conclusion and Words of Advice	103
3. Selecting Data from Tables.....	105
3.1. Specifying Which Columns and Rows to Select	106
3.2. Naming Query Result Columns	108
3.3. Sorting Query Results	112
3.4. Removing Duplicate Rows	113
3.5. Working with NULL Values	114

3.6. Writing Comparisons Involving NULL in Programs	116
3.7. Using Views to Simplify Table Access	117
3.8. Selecting Data from Multiple Tables	119
3.9. Selecting Rows from the Beginning, End, or Middle of Query Results	121
3.10. What to Do When LIMIT Requires the “Wrong” Sort Order	124
3.11. Calculating LIMIT Values from Expressions	125
4. Table Management.....	127
4.1. Cloning a Table	127
4.2. Saving a Query Result in a Table	128
4.3. Creating Temporary Tables	131
4.4. Generating Unique Table Names	133
4.5. Checking or Changing a Table Storage Engine	135
4.6. Copying a Table Using mysqldump	136
5. Working with Strings.....	139
5.1. String Properties	140
5.2. Choosing a String Data Type	144
5.3. Setting the Client Connection Character Set	146
5.4. Writing String Literals	148
5.5. Checking or Changing a String’s Character Set or Collation	150
5.6. Converting the Lettercase of a String	153
5.7. Controlling Case Sensitivity in String Comparisons	155
5.8. Pattern Matching with SQL Patterns	158
5.9. Pattern Matching with Regular Expressions	160
5.10. Breaking Apart or Combining Strings	165
5.11. Searching for Substrings	168
5.12. Using Full-Text Searches	169
5.13. Using a Full-Text Search with Short Words	173
5.14. Requiring or Prohibiting Full-Text Search Words	175
5.15. Performing Full-Text Phrase Searches	177
6. Working with Dates and Times.....	179
6.1. Choosing a Temporal Data Type	180
6.2. Using Fractional Seconds Support	182
6.3. Changing MySQL’s Date Format	183
6.4. Setting the Client Time Zone	187
6.5. Shifting Temporal Values Between Time Zones	189
6.6. Determining the Current Date or Time	190
6.7. Using TIMESTAMP or DATETIME to Track Row-Modification Times	191
6.8. Extracting Parts of Dates or Times	194
6.9. Synthesizing Dates or Times from Component Values	199

6.10. Converting Between Temporal Values and Basic Units	201
6.11. Calculating Intervals Between Dates or Times	205
6.12. Adding Date or Time Values	210
6.13. Calculating Ages	215
6.14. Finding the First Day, Last Day, or Length of a Month	216
6.15. Calculating Dates by Substring Replacement	219
6.16. Finding the Day of the Week for a Date	220
6.17. Finding Dates for Any Weekday of a Given Week	221
6.18. Performing Leap-Year Calculations	224
6.19. Canonizing Not-Quite-ISO Date Strings	227
6.20. Selecting Rows Based on Temporal Characteristics	228
7. Sorting Query Results.....	233
7.1. Using ORDER BY to Sort Query Results	234
7.2. Using Expressions for Sorting	238
7.3. Displaying One Set of Values While Sorting by Another	239
7.4. Controlling Case Sensitivity of String Sorts	243
7.5. Date-Based Sorting	246
7.6. Sorting by Substrings of Column Values	250
7.7. Sorting by Fixed-Length Substrings	250
7.8. Sorting by Variable-Length Substrings	254
7.9. Sorting Hostnames in Domain Order	258
7.10. Sorting Dotted-Quad IP Values in Numeric Order	261
7.11. Floating Values to the Head or Tail of the Sort Order	263
7.12. Defining a Custom Sort Order	266
7.13. Sorting ENUM Values	267
8. Generating Summaries.....	271
8.1. Basic Summary Techniques	273
8.2. Creating a View to Simplify Using a Summary	279
8.3. Finding Values Associated with Minimum and Maximum Values	280
8.4. Controlling String Case Sensitivity for MIN() and MAX()	282
8.5. Dividing a Summary into Subgroups	283
8.6. Summaries and NULL Values	287
8.7. Selecting Only Groups with Certain Characteristics	290
8.8. Using Counts to Determine Whether Values Are Unique	291
8.9. Grouping by Expression Results	292
8.10. Summarizing Noncategorical Data	293
8.11. Finding Smallest or Largest Summary Values	296
8.12. Date-Based Summaries	298
8.13. Working with Per-Group and Overall Summary Values Simultaneously	300
8.14. Generating a Report That Includes a Summary and a List	303

9. Using Stored Routines, Triggers, and Scheduled Events.	307
9.1. Creating Compound-Statement Objects	310
9.2. Using Stored Functions to Encapsulate Calculations	312
9.3. Using Stored Procedures to “Return” Multiple Values	314
9.4. Using Triggers to Implement Dynamic Default Column Values	315
9.5. Using Triggers to Simulate Function-Based Indexes	317
9.6. Simulating TIMESTAMP Properties for Other Date and Time Types	320
9.7. Using Triggers to Log Changes to a Table	322
9.8. Using Events to Schedule Database Actions	325
9.9. Writing Helper Routines for Executing Dynamic SQL	327
9.10. Handling Errors Within Stored Programs	328
9.11. Using Triggers to Preprocess or Reject Data	332
10. Working with Metadata.	335
10.1. Determining the Number of Rows Affected by a Statement	337
10.2. Obtaining Result Set Metadata	340
10.3. Determining Whether a Statement Produced a Result Set	350
10.4. Using Metadata to Format Query Output	350
10.5. Listing or Checking Existence of Databases or Tables	354
10.6. Accessing Table Column Definitions	356
10.7. Getting ENUM and SET Column Information	361
10.8. Getting Server Metadata	363
10.9. Writing Applications That Adapt to the MySQL Server Version	364
11. Importing and Exporting Data.	367
11.1. Importing Data with LOAD DATA and mysqlimport	371
11.2. Importing CSV Files	383
11.3. Exporting Query Results from MySQL	383
11.4. Importing and Exporting NULL Values	385
11.5. Writing Your Own Data Export Programs	387
11.6. Converting Datafiles from One Format to Another	392
11.7. Extracting and Rearranging Datafile Columns	393
11.8. Exchanging Data Between MySQL and Microsoft Excel	396
11.9. Exporting Query Results as XML	398
11.10. Importing XML into MySQL	401
11.11. Guessing Table Structure from a Datafile	404
12. Validating and Reformatting Data.	409
12.1. Using the SQL Mode to Reject Bad Input Values	410
12.2. Validating and Transforming Data	411
12.3. Using Pattern Matching to Validate Data	415
12.4. Using Patterns to Match Broad Content Types	417

12.5. Using Patterns to Match Numeric Values	418
12.6. Using Patterns to Match Dates or Times	420
12.7. Using Patterns to Match Email Addresses or URLs	424
12.8. Using Table Metadata to Validate Data	425
12.9. Using a Lookup Table to Validate Data	428
12.10. Converting Two-Digit Year Values to Four-Digit Form	431
12.11. Performing Validity Checking on Date or Time Subparts	432
12.12. Writing Date-Processing Utilities	435
12.13. Importing Non-ISO Date Values	440
12.14. Exporting Dates Using Non-ISO Formats	441
12.15. Epilogue	442
13. Generating and Using Sequences.	445
13.1. Creating a Sequence Column and Generating Sequence Values	446
13.2. Choosing the Definition for a Sequence Column	449
13.3. The Effect of Row Deletions on Sequence Generation	451
13.4. Retrieving Sequence Values	453
13.5. Renumbering an Existing Sequence	457
13.6. Extending the Range of a Sequence Column	460
13.7. Reusing Values at the Top of a Sequence	460
13.8. Ensuring That Rows Are Renumbered in a Particular Order	461
13.9. Sequencing an Unsequenced Table	462
13.10. Managing Multiple Auto-Increment Values Simultaneously	464
13.11. Using Auto-Increment Values to Associate Tables	465
13.12. Using Sequence Generators as Counters	467
13.13. Generating Repeating Sequences	471
14. Using Joins and Subqueries.	473
14.1. Finding Matches Between Tables	474
14.2. Finding Mismatches Between Tables	482
14.3. Identifying and Removing Mismatched or Unattached Rows	487
14.4. Comparing a Table to Itself	490
14.5. Producing Master-Detail Lists and Summaries	494
14.6. Enumerating a Many-to-Many Relationship	497
14.7. Finding Per-Group Minimum or Maximum Values	501
14.8. Using a Join to Fill or Identify Holes in a List	504
14.9. Using a Join to Control Query Sort Order	507
14.10. Referring to Join Output Column Names in Programs	509
15. Statistical Techniques.	511
15.1. Calculating Descriptive Statistics	512
15.2. Per-Group Descriptive Statistics	515

15.3. Generating Frequency Distributions	517
15.4. Counting Missing Values	520
15.5. Calculating Linear Regressions or Correlation Coefficients	522
15.6. Generating Random Numbers	525
15.7. Randomizing a Set of Rows	527
15.8. Selecting Random Items from a Set of Rows	529
15.9. Calculating Successive-Row Differences	531
15.10. Finding Cumulative Sums and Running Averages	533
15.11. Assigning Ranks	538
15.12. Computing Team Standings	541
16. Handling Duplicates.....	549
16.1. Preventing Duplicates from Occurring in a Table	550
16.2. Dealing with Duplicates When Loading Rows into a Table	552
16.3. Counting and Identifying Duplicates	556
16.4. Eliminating Duplicates from a Table	560
17. Performing Transactions.....	565
17.1. Choosing a Transactional Storage Engine	566
17.2. Performing Transactions Using SQL	567
17.3. Performing Transactions from Within Programs	569
17.4. Using Transactions in Perl Programs	571
17.5. Using Transactions in Ruby Programs	573
17.6. Using Transactions in PHP Programs	574
17.7. Using Transactions in Python Programs	575
17.8. Using Transactions in Java Programs	576
18. Introduction to MySQL on the Web.....	577
18.1. Basic Principles of Web Page Generation	579
18.2. Using Apache to Run Web Scripts	581
18.3. Using Tomcat to Run Web Scripts	591
18.4. Encoding Special Characters in Web Output	596
19. Generating Web Content from Query Results.....	605
19.1. Displaying Query Results as Paragraphs	606
19.2. Displaying Query Results as Lists	608
19.3. Displaying Query Results as Tables	618
19.4. Displaying Query Results as Hyperlinks	622
19.5. Creating Navigation Indexes from Database Content	626
19.6. Storing Images or Other Binary Data	631
19.7. Serving Images or Other Binary Data	638
19.8. Serving Banner Ads	641

19.9. Serving Query Results for Download	643
20. Processing Web Input with MySQL	647
20.1. Writing Scripts That Generate Web Forms	650
20.2. Creating Single-Pick Form Elements from Database Content	653
20.3. Creating Multiple-Pick Form Elements from Database Content	669
20.4. Loading Database Content into a Form	674
20.5. Collecting Web Input	679
20.6. Validating Web Input	689
20.7. Storing Web Input in a Database	691
20.8. Processing File Uploads	694
20.9. Performing Web-Based Database Searches	700
20.10. Generating Previous-Page and Next-Page Links	703
20.11. Generating “Click to Sort” Table Headings	708
20.12. Web Page Access Counting	712
20.13. Web Page Access Logging	716
20.14. Using MySQL for Apache Logging	717
21. Using MySQL-Based Web Session Management	725
21.1. Using MySQL-Based Sessions in Perl Applications	728
21.2. Using MySQL-Based Storage in Ruby Applications	734
21.3. Using MySQL-Based Storage with the PHP Session Manager	738
21.4. Using MySQL for Session-Backing Store with Tomcat	748
22. Server Administration	757
22.1. Configuring the Server	757
22.2. Managing the Plug-In Interface	760
22.3. Controlling Server Logging	762
22.4. Rotating or Expiring Logfiles	765
22.5. Rotating Log Tables or Expiring Log Table Rows	768
22.6. Monitoring the MySQL Server	769
22.7. Creating and Using Backups	780
23. Security	783
23.1. Understanding the mysql.user Table	784
23.2. Managing User Accounts	785
23.3. Implementing a Password Policy	790
23.4. Checking Password Strength	793
23.5. Expiring Passwords	794
23.6. Assigning Yourself a New Password	795
23.7. Resetting an Expired Password	795
23.8. Finding and Fixing Insecure Accounts	796

23.9. Disabling Use of Accounts with Pre-4.1 Passwords	800
23.10. Finding and Removing Anonymous Accounts	801
23.11. Modifying “Any Host” and “Many Host” Accounts	802
Index.....	805