

Getting Started with SQL and Databases

Managing and Manipulating Data with SQL

Mark Simon

Getting Started with SQL and Databases

Managing and Manipulating Data with SQL

Mark Simon

Apress®

Getting Started with SQL and Databases: Managing and Manipulating Data with SQL

Mark Simon Ivanhoe VIC, VIC, Australia

ISBN-13 (pbk): 978-1-4842-9492-5 ISBN-13 (electronic): 978-1-4842-9493-2

https://doi.org/10.1007/978-1-4842-9493-2

Copyright © 2023 by Mark Simon

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

Trademarked names, logos, and images may appear in this book. Rather than use a trademark symbol with every occurrence of a trademarked name, logo, or image we use the names, logos, and images only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

The use in this publication of trade names, trademarks, service marks, and similar terms, even if they are not identified as such, is not to be taken as an expression of opinion as to whether or not they are subject to proprietary rights.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Managing Director, Apress Media LLC: Welmoed Spahr

Acquisitions Editor: Smriti Srivastava Development Editor: Laura Berendson Editorial Assistant: Mark Powers

Cover image designed by eStudioCalamar

Distributed to the book trade worldwide by Springer Science+Business Media New York, 1 New York Plaza, Suite 4600, New York, NY 10004-1562, USA. Phone 1-800-SPRINGER, fax (201) 348-4505, e-mail orders-ny@ springer-sbm.com, or visit www.springeronline.com. Apress Media, LLC is a California LLC and the sole member (owner) is Springer Science + Business Media Finance Inc (SSBM Finance Inc). SSBM Finance Inc is a **Delaware** corporation.

For information on translations, please e-mail booktranslations@springernature.com; for reprint, paperback, or audio rights, please e-mail bookpermissions@springernature.com.

Apress titles may be purchased in bulk for academic, corporate, or promotional use. eBook versions and licenses are also available for most titles. For more information, reference our Print and eBook Bulk Sales web page at http://www.apress.com/bulk-sales.

Any source code or other supplementary material referenced by the author in this book is available to readers on GitHub. For more detailed information, please visit http://www.apress.com/source-code.

Printed on acid-free paper

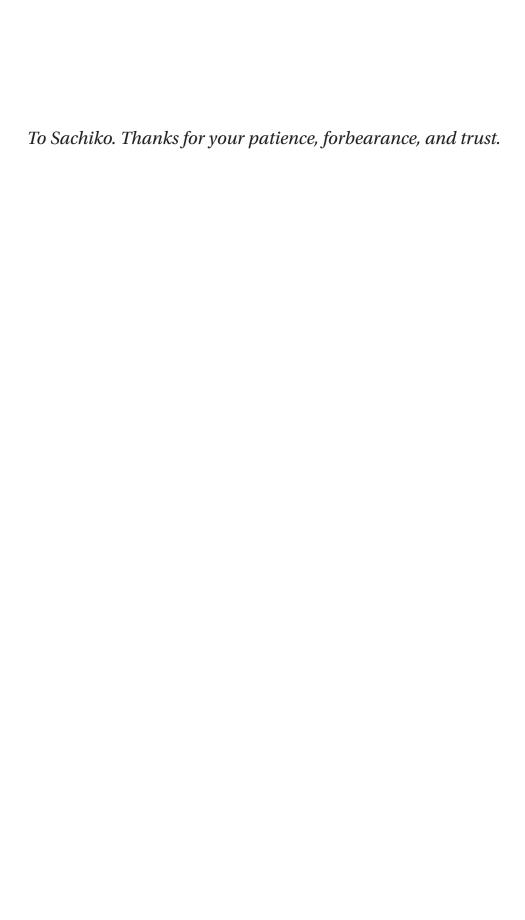


Table of Contents

About the Author	
About the Technical Reviewer	xvii
Acknowledgments	xix
Introduction	ххі
Chapter 1: Starting with SQL	1
Basic SELECT Statement	2
Case Sensitivity	3
Spacing	3
Clause Ordering	4
The Semicolon (;)	4
Selecting Specific Columns	5
Column Order	6
Layout	6
Using SELECT *	7
Calculated Columns	7
Aliases	8
Comments	9
Block Comments	10
Uses of Comments	10
Filtering Rows	11
Clause Ordering	12
Placing the Semicolon	13
Ordering the Results	13
Clause Order	14
Distinct Rows	15

Summary	18
Writing SQL	19
Columns	20
Comments	20
Filtering Data	20
Row Order	21
Clause Order	21
Coming Up	21
Chapter 2: Database	23
About the Sample Database	23
Database	24
Tables	26
Normalized Tables	27
Multiple Values	33
Summary	37
Coming Up	39
Chapter 3: Filtering Data	41
The WHERE Clause	41
Unrelated Assertions	44
All and Nothing	44
Dealing with NULL	45
Deliberately Ignoring NULLs	
Finding NULLs	
Numbers	49
Discrete vs. Continuous Values	49
Strings	
Quotes	
More on MySQL/MariaDB Modes	
More on Double and Single Quotes	
Case Sensitivity	
Trailing Spaces	

Filtering with String Functions	59
Handling Quotes and Apostrophes	61
Before and After Strings	62
Dates	63
Dates Are Not Strings	64
Alternative Date Formats	65
Date Comparisons	66
Filtering with a Date Calculation	69
Multiple Assertions	70
AND and OR	70
The IN Operator	76
Derived Lists	78
Wildcard Matches	81
Case Sensitivity and Patterns	83
Pattern Characters	84
Wildcards with Non-strings	87
Extensions to Wildcards	89
A Simple Pattern Match Example	91
Summary	92
NULL	93
Numbers	93
Strings	93
Dates	94
Multiple Assertions	94
The IN Operator	94
Wildcard Matches	94
Coming Up	95
Chapter 4: Ordering Results	97
Using the ORDER BY Clause	
•	
Sort Direction	

Data Types	102
Case Sensitivity and Collation	106
Multiple Columns	107
Interdependence of Columns	109
Sort Direction on Multiple Columns	110
Sorting by Calculated Columns	112
Limiting the Number of Results	115
Paging	116
Using LIMIT OFFSET (MySQL/MariaDB, SQLite, and PostgreSQL)	117
Using TOP (MSSQL)	117
Fetching a Random Row	118
Nonalphabetical String Order	119
Special Strings	120
Summary	121
Sorting with ORDER BY	121
Limiting Results	122
Sorting Strings	122
Coming Up	122
Chapter 5: Calculating Column Values	123
Testing Calculations	125
Emulating Variables	126
Some Basic Calculations	127
Basic Number Calculations	127
Basic String Calculations	128
Basic Date Calculations	129
Working with NULL	129
Using Aliases	135
Aliases Without AS	136
Awkward Aliases	138
Calculating with Numbers	140

Arithmetic Operators	140
Integers	141
Remainder	143
Extra Decimals	144
Mathematical Functions	145
Approximation Functions	146
Formatting Functions	147
Calculating with Dates	149
Simple Calculations	149
Age Calculations	151
Extracting Parts of a Date	153
Formatting a Date	155
Strings	160
Character Functions	161
Subqueries	165
The CASE Expression	169
Casting to Different Data Types	173
The cast() Function	
Casting to a String	
Casting Date Literals	
Creating a View	
Using Views in Microsoft SQL	
Summary	
Data Types	
NULLs	
Aliases	
Subqueries	
The CASE Expression	
Casting a Value	
Views	
Coming Un	183
	183

Chapter 6: Joining Tables	185
How a Join Works	186
Joining the Tables	189
Alternative Syntax	189
Selecting the Results	191
Table Aliases	193
Developing a Price List	194
Join Types	195
The INNER JOIN	197
The LEFT OUTER JOIN and RIGHT OUTER JOIN	197
The "Preferred" Outer Join	199
Some Recommendations on JOINS	200
Finishing the Price List	201
Joining Many Tables	202
Building a Larger JOIN	204
Revisiting Some Subqueries	209
A More Complex Join	211
Using a Self-Join	216
Summary	220
Syntax	220
Table Aliases	220
The ON Clause	220
Join Types	221
Coming Up	221
Chapter 7: Aggregating Data	22 3
Counting Data	224
Counting Values	224
How Aggregates Work	225
Counting Selectively	226
Distinct Values	232

Summarizing Numbers	233
Bad Examples	235
Scales of Measurement	236
Aggregating Calculated Data	237
Other Aggregate Functions	239
Using Aggregates As Filters	240
Grouping	243
Using the GROUP BY Clause	245
GROUP BY vs. DISTINCT	250
Grouping with Multiple Tables	251
Redundant Groups	254
Preparing Data for Aggregating	256
Using CASE in a CTE	259
Using a Join in the CTE	260
Summarizing Strings	262
Filtering Grouped Results with HAVING	264
Using Results in a CTE	268
Finding Duplicates	269
Using Aggregates on Aggregates	272
Summary	275
Coming Up	276
Chapter 8: Working with Tables	277
How Tables Are Created	278
Creating a Table	279
Column Names	280
Data Type	281
Primary Keys	282
Constraints	284
NOT NULL	285
UNIQUE	286
DEFAULT	286

CHECK	287
Foreign Keys	287
Indexes	289
Adding Rows to a Table	290
Deleting Rows from a Table	292
Adding More Rows	294
Updating Rows	295
Altering the Table	297
DML in Real Life	299
Security	299
Front-End Software	300
Summary	301
Data Types	301
Constraints	301
Foreign Keys	302
Indexes	302
Manipulating Data	302
Chapter 9: Set Operations	303
Unions	303
Selective Unions	307
SELECT Clauses Must Be Compatible	309
Only Column Names from the First SELECT Statement Are Used	311
Sorting Results	312
Intersections	314
Differences	317
Some Tricks with Set Operations	321
Comparing Results	321
Virtual Tables	32 3
Mixing Aggregates	326
Summary	330

Appendix 1: Differences Between SQL Dialects	333
Appendix 2: A Crash Course in PDO	341
Appendix 3: Additional Notes	357
Index	369