

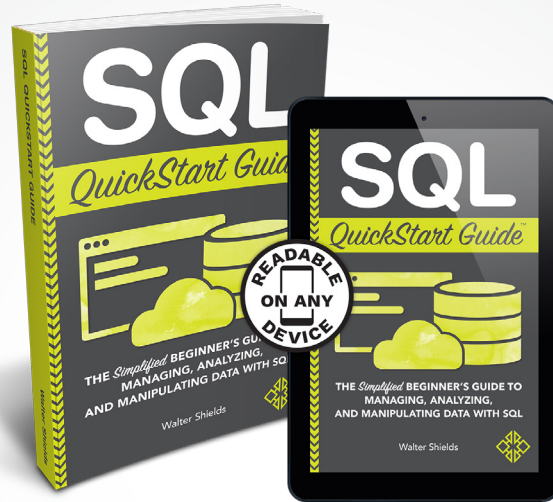
SQL

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INTRODUCTION

fig. 1

THE PHENOMENAL REALITY OF BIG DATA



GOOGLE

- Processes 40,000 search queries every second.
- Processed 27.5 billion search queries in 2001 compared to 1.2 trillion in 2012 and growing.



YOUTUBE

- 6 hours of video content was uploaded every minute in 2007 compared to 400 hours per minute in 2015 and growing.



FACEBOOK

- Brands and organizations receive a cumulative 34,722 Likes every minute of the day.
- Every month, 30 billion pieces of content are shared.



AMAZON

- Stores data from 152 million customers in 1.4 million servers spread throughout several data centers.

CHAPTER 1

Understanding Database Structure

fig. 2

This is a table

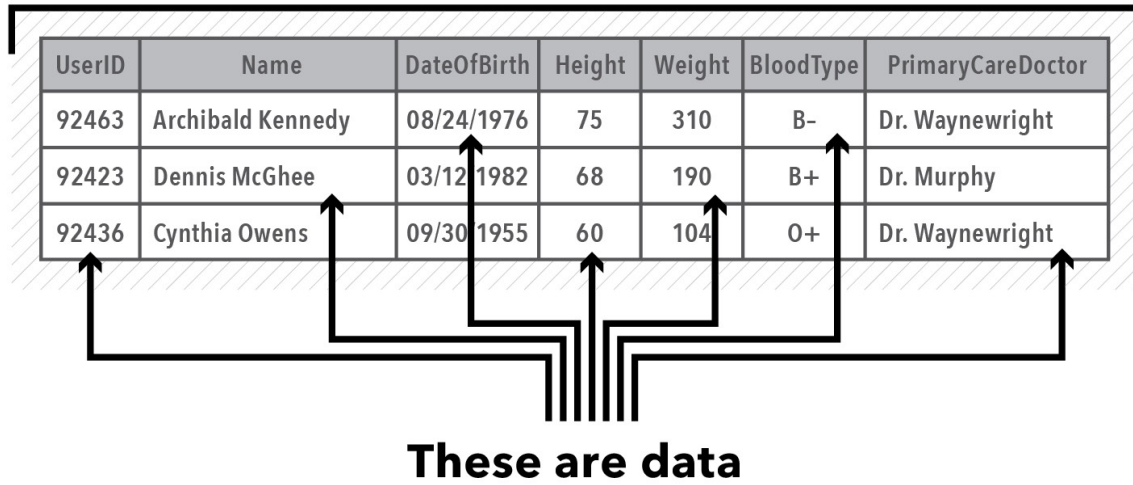


fig. 3



fig. 4

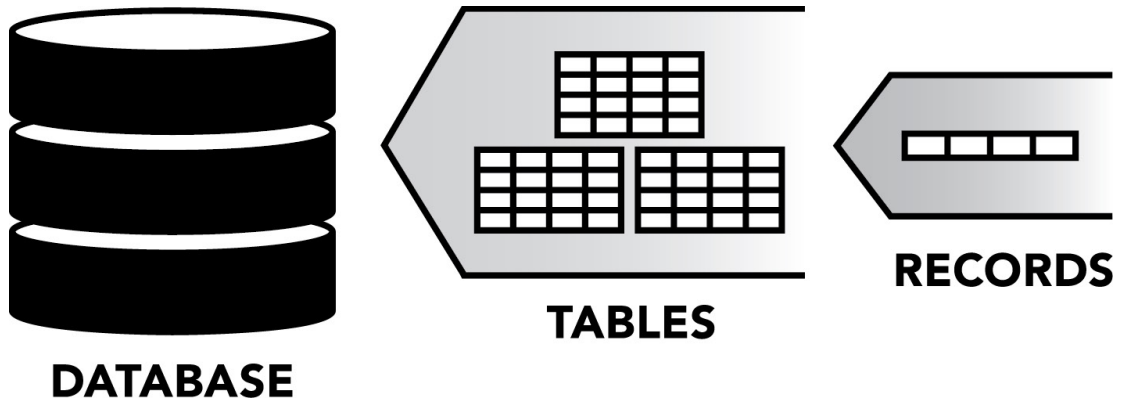


fig. 5

TERMINOLOGY SUMMARY

Terms we will use throughout this book:	May be referred to elsewhere as:
Record, Row	Tuple
Field, Column	Attribute
Table	Relation, Base Relvar

fig. 6

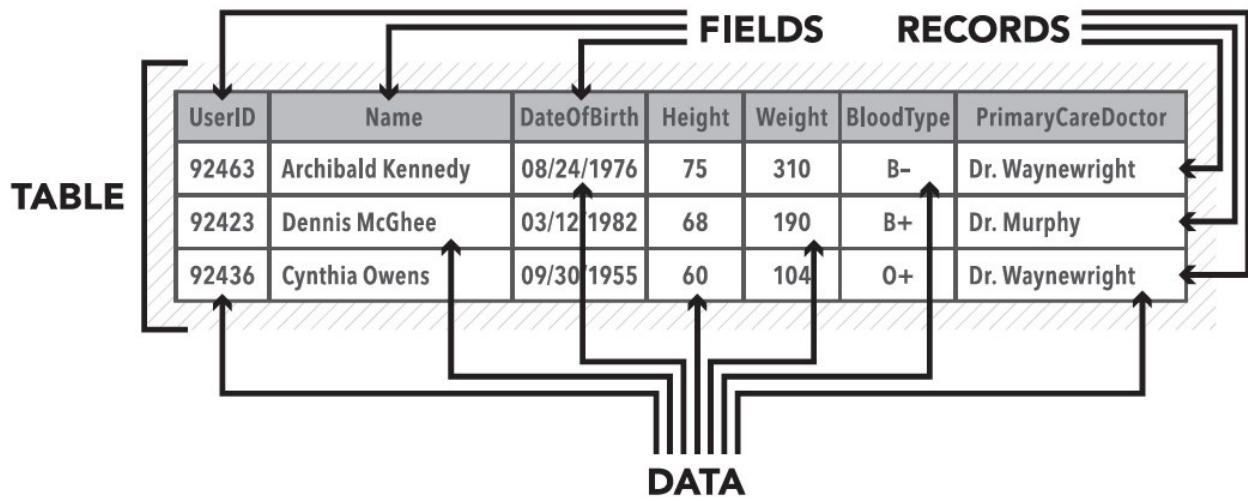


fig. 7

PRIMARY KEY FIELD

FOREIGN KEY FIELD

PatientID	PatientName	PrimaryCareDoctorID	PrimaryCareDoctorName	DateOfBirth	Height	Weight	BloodType
92463	Archibald Kennedy	106547	Dr. Waynewright	8/24/1976	75	310	B-
92425	Dennis McGhee	106474	Dr. Murphy	3/12/1982	68	190	B+
92443	Cynthis Owens	106547	Dr. Waynewright	9/30/1955	60	104	O+
92478	William Hampton	106437	Dr. Salazar	6/5/1973	73	175	AB-
92392	Hilda Bass	106783	Dr. Dean	6/10/1997	68	152	B+
92436	Frankie Stone	106437	Dr. Salazar	5/28/1979	68	106	O+
92403	Verna Sullivan	106984	Dr. Conner	7/17/2010	66	125	O+
92398	Merle Doyle	106439	Dr. Frank	1/8/1962	65	143	B-
92442	Ruth Swanson	106954	Dr. Hines	2/15/1970	61	160	O-
92384	Johnathan Singleton	106474	Dr. Murphy	6/2/1970	61	232	AB+
92405	WM Patrick	106439	Dr. Frank	6/11/1955	69	196	O+
92376	Mona Norris	106984	Dr. Conner	10/15/1932	60	98	B+
92399	Rick Gordon	106366	Dr. Hart	1/25/2002	68	149	B+
92408	Don Rivera	106437	Dr. Salazar	7/26/1954	72	185	A-
92389	Sheri Griffin	106211	Dr. Harvey	12/16/1987	78	132	AB-
92466	Guillermo Lawrence	106954	Dr. Hines	2/8/1978	60	219	O+
92310	Felipe Parker	106474	Dr. Murphy	12/10/1998	61	165	O-
92413	Brandi Carlson	106399	Dr. Flowers	11/20/2000	66	112	B+
92398	Floyd Casey	106783	Dr. Dean	12/14/1986	61	203	A-
92439	Patrick Walton	106366	Dr. Hart	8/11/1973	76	189	O+
92421	Vicki Klein	106954	Dr. Hines	11/28/1980	65	98	O+
92381	Cathy Harrison	106474	Dr. Murphy	11/16/1946	78	203	AB-
92393	Ann Guerrero	106783	Dr. Dean	6/25/1974	61	142	B-
92437	Gustavo Bates	106399	Dr. Flowers	2/25/2001	78	165	A-

fig. 8

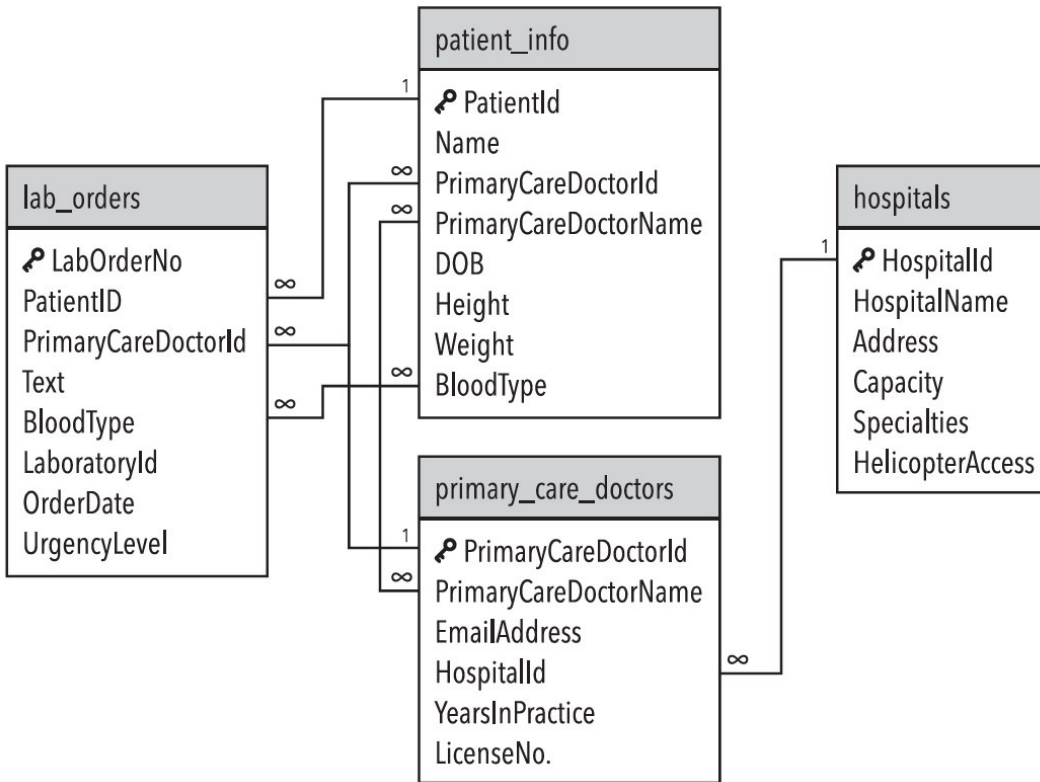


fig. 9

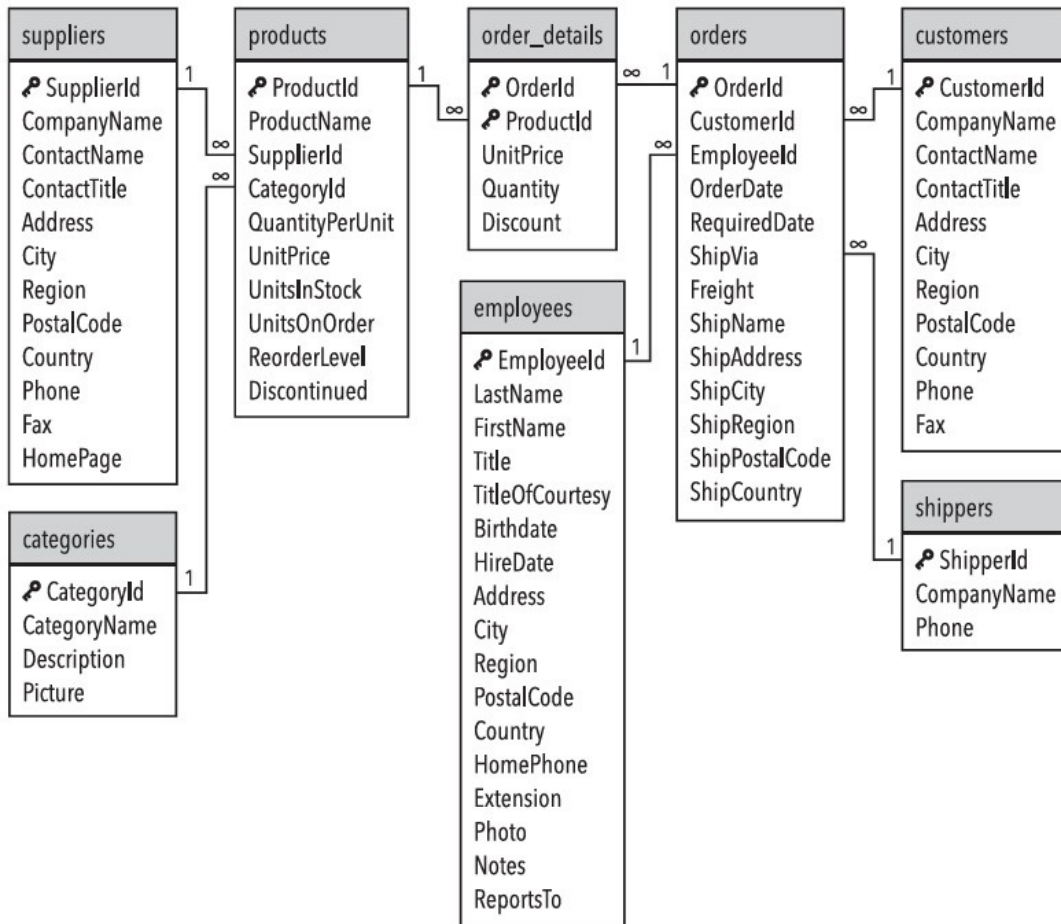


fig. 10

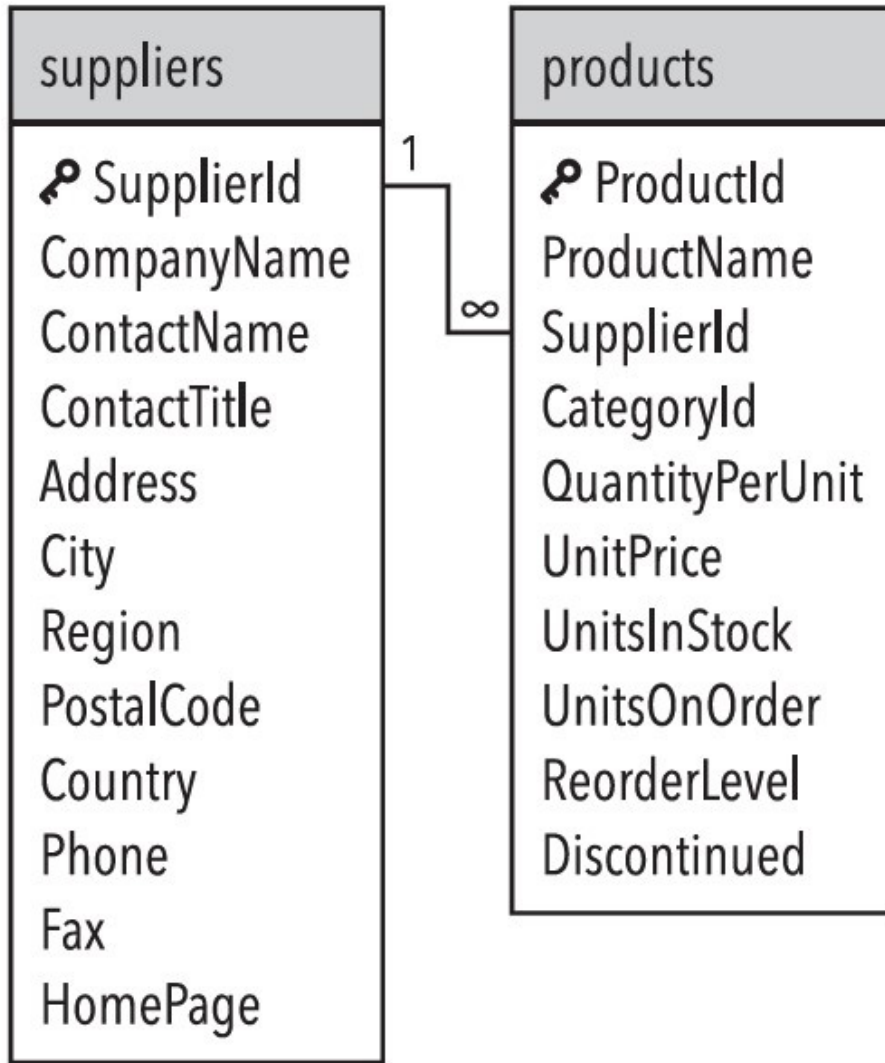


fig. 11


SUPPLIERS

🔑

SupplierId	CompanyName	ContactName	ContactTitle	Address	City	etc.
S-101	Van Eck Industries	Bruce Davidson	Vp Operations	2158 Del Dew Drive	Temple Hills	...
S-102	Wright & Gate Co	Wilma Joy	Supply Chain Supervisor	291 Creekside Lane	Ventura	...
S-103	Olivias Supply	Brad Pence	Site Manager, Baton Rouge	4353 Locust View Drive	Baton Rouge	...
S-104	Cantor Corporation	Orville Bedford	President	2811 West Drive	Chicago	...
S-105	Bellagio Finland	Wallace Grim	Distributions Supervisor	4939 Breezewood Court	Chanute	...
S-106	Decks Materials	John Tuck	VP Operations	4529 Counts Lane	Lextington	...
S-107	Lennor Co	Rachel Durst	Site Manager, Jackson	2216 Rhapsody Street	Gainesville	...

fig. 12


PRODUCTS



ProductId	ProductName	SupplierId	CategoryId	QuantityPerUnit	UnitPrice	etc.
P001	Welding goggles	S102	SA-432	1	\$12.99	...
P002	Welding helmet	S102	SA-432	1	\$41.49	...
P003	Stick electrodes	S104	WE-214	40	\$7.00	...
P004	Magnetic clamp	S101	WE-220	1	\$11.86	...
P005	Heat resistant blanket	S104	WE-212	1	\$3.73	...
P006	Work table	S105	GE-100	1	\$1,386.67	...
P007	Replacement plates	S105	GE-100	1	\$396.00	...
P008	Welding wire	S104	WE-214	1	\$112.86	...
P009	Welding coveralls	S102	SA-435	1	\$60.27	...
P010	Welding nozzle	S103	WE-214	1	\$141.65	...
P011	Gas regulator	S106	AU-100	1	\$166.25	...
P012	Welding hoods	S102	SA-432	1	\$42.37	...
P013	Spot welding electrode	S104	WE-212	1	\$2.35	...
P014	Plasma cutter	S107	PL-100	1	\$1,645.91	...
P015	Plasma cutter cutting tip	S107	PL-100	1	\$9.27	...


fig. 13

PRODUCTS



ProductId	ProductName	SupplierId	CategoryId	QuantityPerUnit	UnitPrice	etc.
P001	Welding goggles	S102	SA-432	1	\$12.99	...
P002	Welding helmet	S102	SA-432	1	\$41.49	...
P003	Stick electrodes	S104	WE-214	40	\$7.00	...
P004	Magnetic clamp	S101	WE-220	1	\$11.86	...
P005	Heat resistant blanket	S104	WE-212	1	\$3.73	...
P006	Work table	S105	GE-100	1	\$1,386.67	...
P007	Replacement plates	S105	GE-100	1	\$396.00	...
P008	Welding wire	S104	WE-214	1	\$112.86	...
P009	Welding coveralls	S102	SA-435	1	\$60.27	...
P010	Welding nozzle	S103	WE-214	1	\$141.65	...
P011	Gas regulator	S106	AU-100	1	\$166.25	...
P012	Welding hoods	S102	SA-432	1	\$42.37	...
P013	Spot welding electrode	S104	WE-212	1	\$2.35	...
P014	Plasma cutter	S107	PL-100	1	\$1,645.91	...
P015	Plasma cutter cutting tip	S107	PL-100	1	\$9.27	...

SUPPLIERS

SupplierId	CompanyName	ContactName	ContactTitle	Address	City	etc.
S-101	Van Eck Industries	Bruce Davidson	Vp Operations	2158 Del Dew Drive	Temple Hills	...
S-102	Wright & Gate Co	Wilma Joy	Supply Chain Supervisor	291 Creekside Lane	Ventura	...
S-103	Olivias Supply	Brad Pence	Site Manager, Baton Rouge	4353 Locust View Drive	Baton Rouge	...
S-104	Cantor Corporation	Orville Bedford	President	2811 West Drive	Chicago	...
S-105	Bellagio Finland	Wallace Grim	Distributions Supervisor	4939 Breezewood Court	Chanute	...
S-106	Decks Materials	John Tuck	VP Operations	4529 Counts Lane	Lextington	...
S-107	Lennor Co	Rachel Durst	Site Manager, Jackson	2216 Rhapsody Street	Gainesville	...

fig. 14

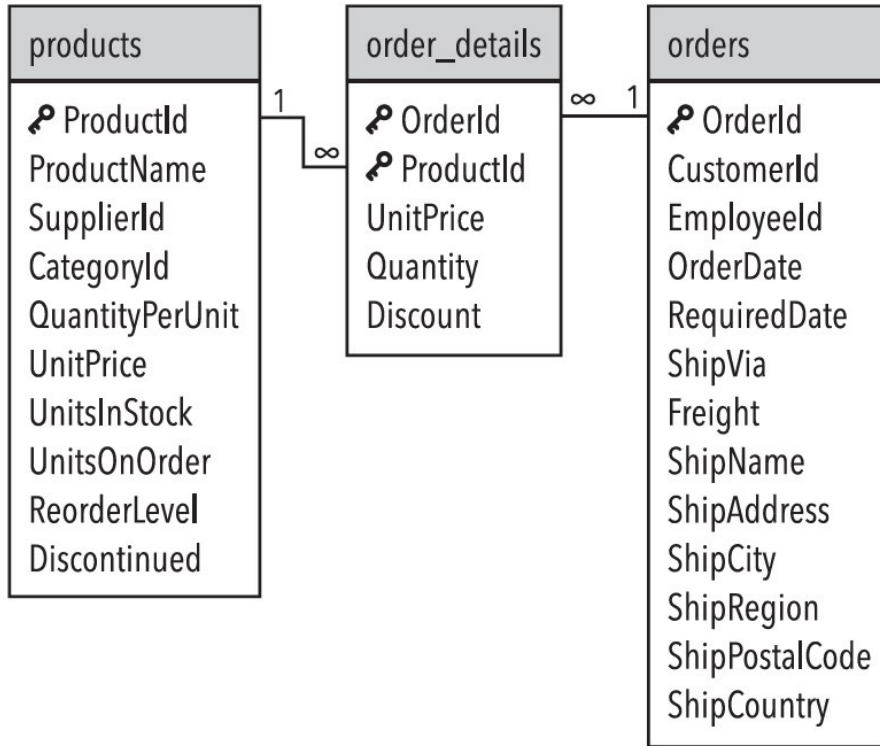


fig. 15

COMPOSITE KEY

OrderId	ProductId	UnitPrice	Quantity	Discount
101	P006	\$1,386.67	1	NULL
101	P003	\$7.00	3	NULL
101	P005	\$3.73	1	10%
102	P011	\$166.23	1	NULL
102	P013	\$2.35	1	NULL
103	P014	\$1,645.91	1	NULL
104	P001	\$12.99	3	NULL
104	P012	\$42.37	3	NULL
104	P011	\$166.23	2	10%
104	P003	\$7.00	5	NULL
105	P010	\$141.65	1	NULL
105	P004	\$11.86	3	NULL
105	P003	\$7.00	2	NULL
106	P014	\$1,645.91	1	NULL

fig. 16

NUMERIC DATA

INTEGER	DECIMAL
5	30.5
6176	14.65
47261	5.634
531	365.1
90	0.437
1	15347.45

fig. 17

CHARACTER and TEXT-BASED DATA

CanadianZipCode	FirstName	LastName
L4K8R3	Ronald	Dalton
V0S0N2	Clara	Abramson
H7L9N0	Joseph	Scalia
L3M0L7	Benjamin	Dreadnaught
E6K5T8	Harold	Mercedes
E7K3C5	James	Rockefeller

fig. 18

DATE and TIME DATA

DateOfBirth	CreditCardExpiration	TimeOfDelivery
01/25/1977	08/2023	2019-04-21 08:25;55
09/30/2003	05/2025	2020-12-05 13:30;15
08/15/1999	01/2023	2020-05-10 22:20;36
02/25/1962	11/2022	2019-01-17 10:20;01
09/12/1998	05/2026	2021-06-29 15:21;59
11/03/1959	03/2023	2022-09-03 16:42;26

fig. 19

BOOLEAN DATA

ClearedForTakeOff	InDefault	ConvictedFelon
True	False	False
False	True	False
False	False	False
True	True	True
False	True	False

fig. 20



fig. 21

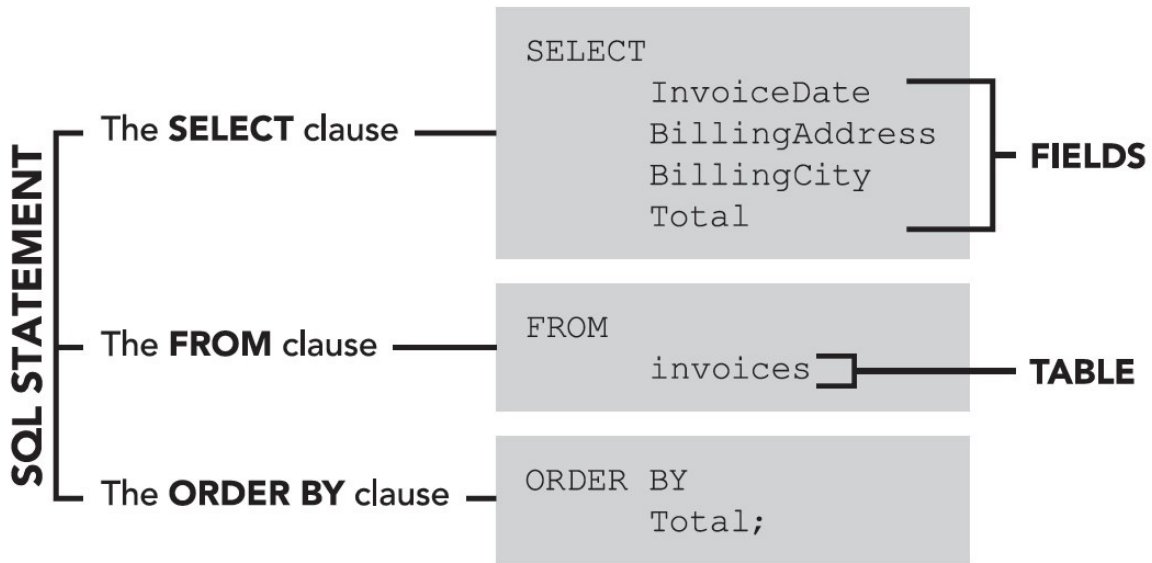


fig. 22



CHAPTER 3

Exploring a Database in SQLite

fig. 23

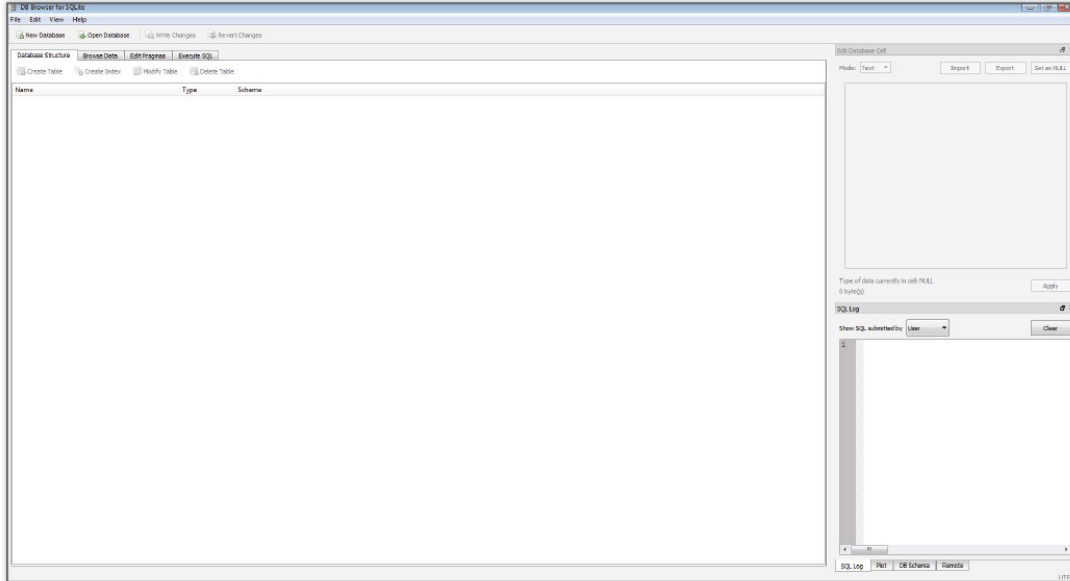


fig. 24

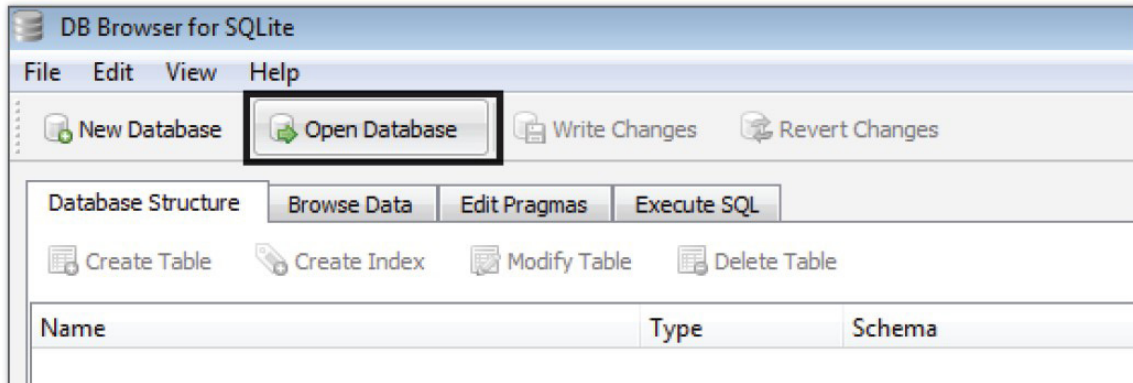


fig. 25

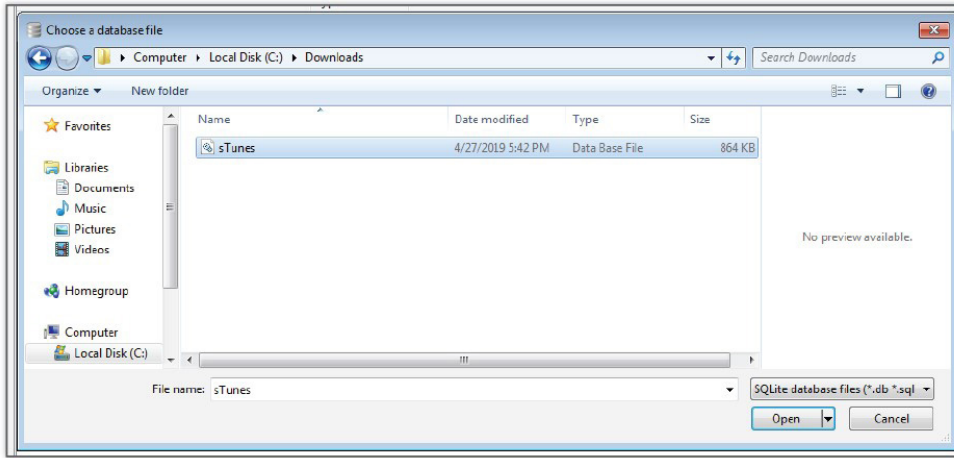


fig. 26

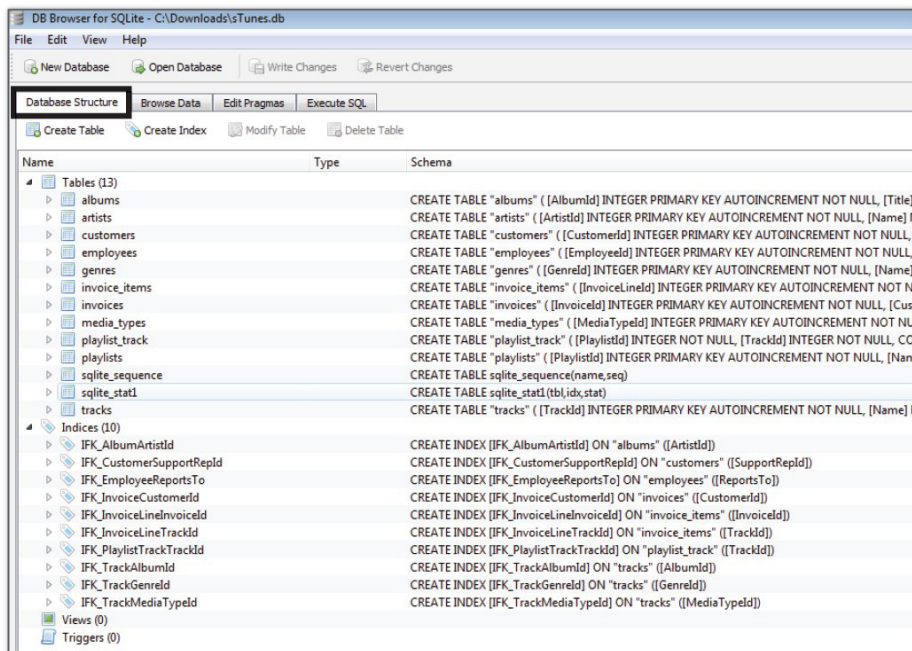


fig. 26

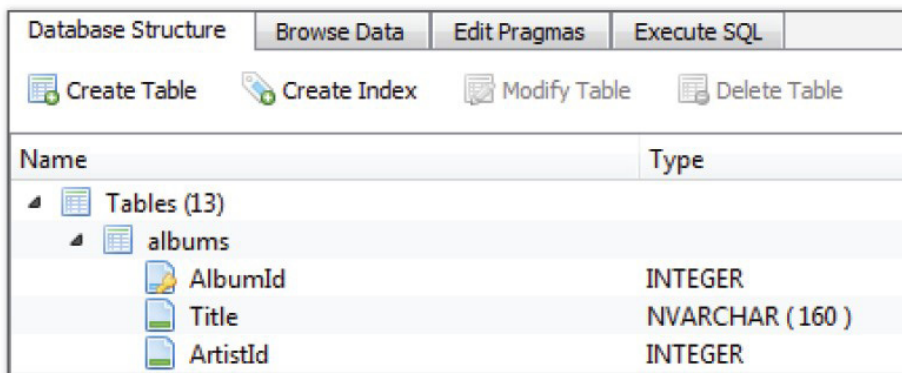


fig. 27

Database Structure		Browse Data	Edit Pragmas	Execute SQL
Create Table	Create Index	Modify Table	Delete Table	
Name				Type
▲ Tables (13)				
▲ albums				
AlbumId				INTEGER
Title				NVARCHAR (160)
ArtistId				INTEGER

fig. 28

The screenshot shows the 'albums' table in a SQLite database. The table has three columns: AlbumId, Title, and ArtistId. The data is as follows:

AlbumId	Title	ArtistId
1	For Those About To Rock We Salute You	1
2	Balls to the Wall	2
3	Restless and Wild	2
4	Let There Be Rock	1
5	Big Ones	3
6	Jagged Little Pill	4
7	Facelift	5
8	Warner 25 Anos	6
9	Plays Metalica By Four Cellos	7
10	Audioslave	8
11	Out Of Exile	8
12	BackBeat Soundtrack	9
13	The Best Of Billy Cobham	10
14	Alcohol Fueled Brevitely Live! [Disc 1]	11
15	Alcohol Fueled Brevitely Live! [Disc 2]	11
16	Black Sabbath	12
17	Black Sabbath Vol. 4 (Remaster)	12
18	Body Count	13
19	Chemical Wedding	14
20	The Best Of Buddy Guy - The Millenium Collection	15
21	Prendo Minha	16
22	Sozinho Remix Ao Vivo	16
23	Minha Historia	17

fig. 29

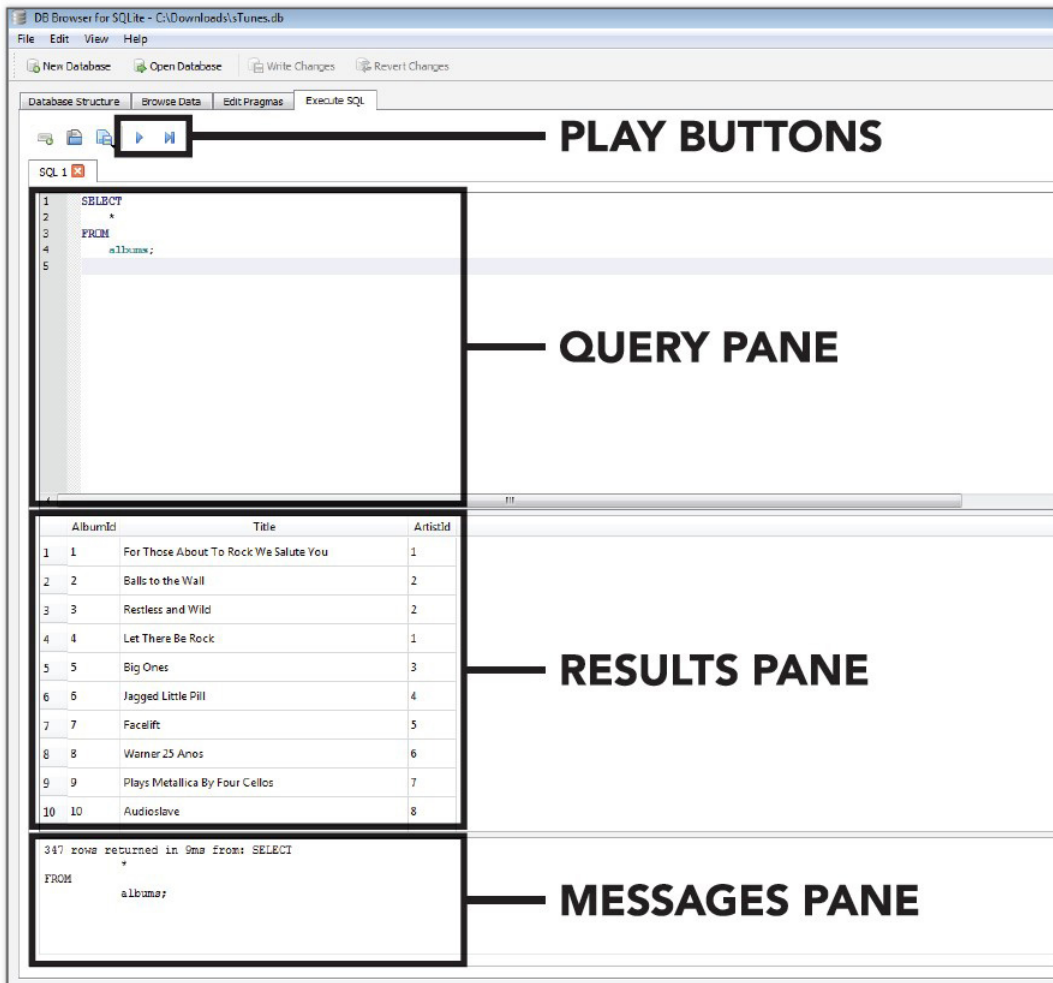


fig. 30

	AlbumId	Title	ArtistId	
1	1	For Those About To Rock We Salute You	1	
2	2	Balls to the Wall	2	
3	3	Restless and Wild	2	
4	4	Let There Be Rock	1	
5	5	Big Ones	3	

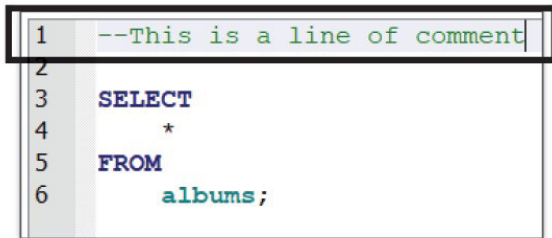
fig. 31

```
347 rows returned in 9ms from: SELECT
      *
FROM
      albums;
```

CHAPTER 4

Getting Started with Queries

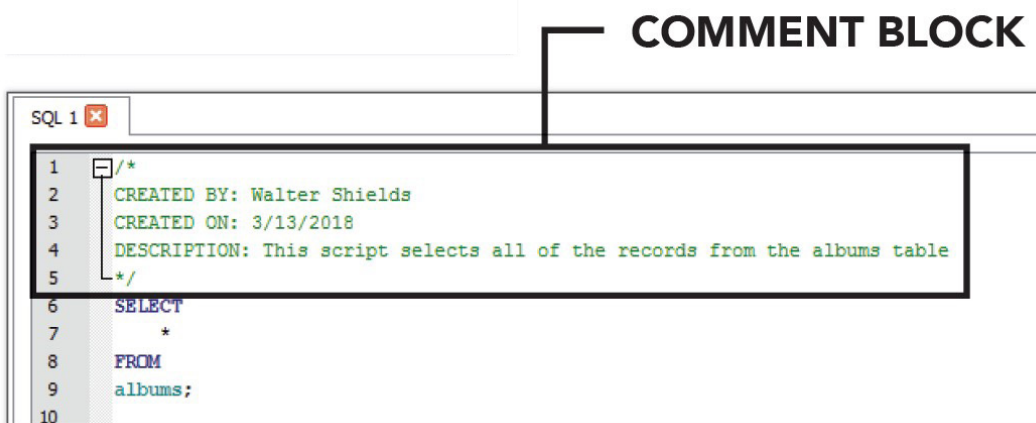
fig. 32



```
1  --This is a line of comment
2
3  SELECT
4      *
5  FROM
6      albums;
```

LINE OF COMMENT

fig. 33



```
1  /*
2  CREATED BY: Walter Shields
3  CREATED ON: 3/13/2018
4  DESCRIPTION: This script selects all of the records from the albums table
5  */
6  SELECT
7      *
8  FROM
9      albums;
```

COMMENT BLOCK

fig. 34



fig. 35

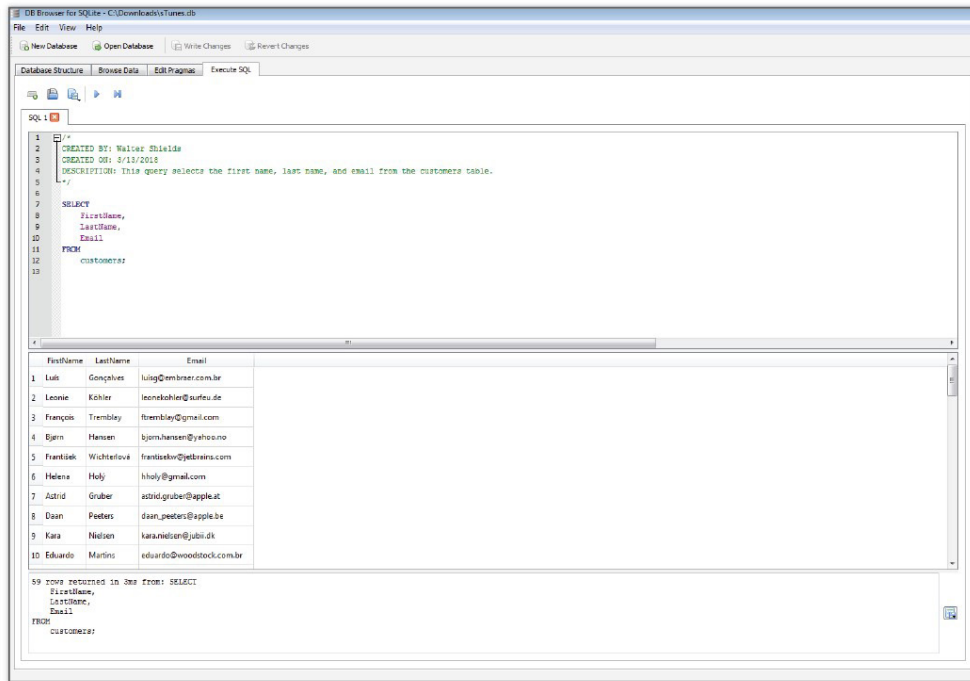


fig. 36

WITHOUT ALIASES

	FirstName	LastName	Email	Phone
1	Luís	Gonçalves	luisg@embraer.com.br	+55 (12) 3923-5555
2	Leonie	Köhler	leonekohler@surfeu.de	+49 0711 2842222
3	François	Tremblay	ftremblay@gmail.com	+1 (514) 721-4711
4	Björn	Hansen	bjorn.hansen@yahoo.no	+47 22 44 22 22
5	František	Wichterlová	frantisekw@jetbrains.com	+420 2 4172 5555
6	Helena	Holý	hholy@gmail.com	+420 2 4177 0449
7	Astrid	Gruber	astrid.gruber@apple.at	+43 01 5134505
8	Daan	Peeters	daan_peeters@apple.be	+32 02 219 03 03
9	Kara	Nielsen	kara.nielsen@jubii.dk	+453 3331 9991
10	Eduardo	Martins	eduardo@woodstock.com.br	+55 (11) 3033-5446

WITH ALIASES

	First Name	Last Name	EMAIL	CELL
1	Luís	Gonçalves	luisg@embraer.com.br	+55 (12) 3923-5555
2	Leonie	Köhler	leonekohler@surfeu.de	+49 0711 2842222
3	François	Tremblay	ftremblay@gmail.com	+1 (514) 721-4711
4	Björn	Hansen	bjorn.hansen@yahoo.no	+47 22 44 22 22
5	František	Wichterlová	frantisekw@jetbrains.com	+420 2 4172 5555
6	Helena	Holý	hholy@gmail.com	+420 2 4177 0449
7	Astrid	Gruber	astrid.gruber@apple.at	+43 01 5134505
8	Daan	Peeters	daan_peeters@apple.be	+32 02 219 03 03
9	Kara	Nielsen	kara.nielsen@jubii.dk	+453 3331 9991
10	Eduardo	Martins	eduardo@woodstock.com.br	+55 (11) 3033-5446

fig. 39

The screenshot shows a SQL browser interface with the following components:

- SQL Editor:** Contains a query with the following text:

```
1 /*
2 CREATED BY: Walter Shields
3 CREATED ON: 3/13/2018
4 DESCRIPTION: This query selects the first 10 records from the customers table, ordered by first name (ascending), then last name (descending).
5 */
6
7 SELECT
8   FirstName AS [First Name],
9   LastName AS [Last Name],
10  Email AS [EMAIL]
11 FROM
12   customers
13 ORDER BY
14   FirstName ASC,
15   LastName DESC
16 LIMIT 10
```
- Results Table:** A table with 10 rows and 3 columns: First Name, Last Name, and EMAIL. The data is as follows:

First Name	Last Name	EMAIL
1 Aaron	Mitchell	aaronmitchell@yahoo.ca
2 Alexandre	Rocha	alexro@uol.com.br
3 Astrid	Gruber	astrid.gruber@apple.at
4 Bjørn	Hansen	bjorn.hansen@yahoo.no
5 Camille	Bernard	camille.bernard@yahoo.fr
6 Dean	Peeters	dean_peeters@apple.be
7 Dan	Miller	dmiller@comcast.com
8 Diego	Gubierrez	diego.gubierrez@yahoo.ar
9 Dominique	Lefebvre	dominiquedefebvre@gmail.com
10 Eduardo	Martins	eduardo@woodstock.com
- Callout Box 1 (Bottom Left):** A box containing the SQL code for the first 10 rows of the results table, matching the query in the editor.
- Callout Box 2 (Middle Right):** A box containing the SQL code for the last 10 rows of the results table, matching the query in the editor.

CHAPTER 5

Turning Data into Information

fig. 40

Result set containing only three rows

	InvoiceDate	BillingAddress
1	1/1/2009 0:00	Theodor-Heuss-Straße 34
2	2/1/2009 0:00	Barbarossastraße 19
3	2/1/2009 0:00	8, Rue Hanovre
	3 rows returned in 3ms	

Result set containing more than three rows, but only displaying the first three

	InvoiceDate	BillingAddress
1	1/1/2009 0:00	Theodor-Heuss-Straße 34
2	2/1/2009 0:00	Barbarossastraße 19
3	2/1/2009 0:00	8, Rue Hanovre
...	150 rows returned in 3ms	

fig. 41

TYPES OF OPERATORS

COMPARISON	LOGICAL	ARITHMETIC
= Equal To	BETWEEN	+ Add
> Greater Than	IN	- Subtract
< Less Than	LIKE	/ Divide
>= Greater Than or Equal To	AND	* Multiply
<= Less Than or Equal To	OR	% Modulo
<> Not Equal To		

fig. 42

	Original Amount	Addition Operator	Subtraction Operator	Division Operator	Multiplication Operator	Modulo Operator
1	25.86	35.86	15.86	2.586	258.6	5
2	23.86	33.86	13.86	2.386	238.6	3
3	21.86	31.86	11.86	2.186	218.6	1
4	21.86	31.86	11.86	2.186	218.6	1
5	18.86	28.86	8.86	1.886	188.6	8
...	412 results in 42ms					

fig. 43

The screenshot shows the DB Browser for SQLite interface with the 'tracks' table selected. The table contains 20 rows of data with columns: Trackid, Name, Albumid, MediaTypeId, Genreid, Composer, Milliseconds, Bytes, and UnitPrice.

Trackid	Name	Albumid	MediaTypeId	Genreid	Composer	Milliseconds	Bytes	UnitPrice
3161	Minha Fé	248	1	7	Murilo	206994	6981474	0.99
3162	Lua de Ogum	248	1	7	Ratinho/Zeca ...	168463	5719129	0.99
3163	Samba pras ...	248	1	7	Grazielle/Roq...	152816	5121366	0.99
3164	Verdade	248	1	7	Carlinhos San...	332826	11120708	0.99
3165	The Brig	229	3	21	NULL	2617325	488919543	1.99
3166	.07%	228	3	21	NULL	2585794	541715199	1.99
3167	Five Years Gone	228	3	21	NULL	2587712	530551890	1.99
3168	The Hard Part	228	3	21	NULL	2601017	475996611	1.99
3169	The Man Behl...	229	3	21	NULL	2615590	493951081	1.99
3170	Greatest Hits	229	3	21	NULL	2617117	522102916	1.99
3171	Landslide	228	3	21	NULL	2600725	518677861	1.99
3172	The Office: A...	249	3	19	NULL	1380833	290482361	1.99
3173	Diversity Day	249	3	19	NULL	1306416	257879716	1.99
3174	Health Care	249	3	19	NULL	1321791	260493577	1.99
3175	The Alliance	249	3	19	NULL	1317125	266203162	1.99
3176	Basketball	249	3	19	NULL	1323541	267464180	1.99

fig. 44

The screenshot shows the DB Browser for SQLite interface with the 'invoices' table selected. The table contains 10 rows of data with columns: InvoiceId, CustomerId, InvoiceDate, BillingAddress, BillingCity, BillingState, BillingCountry, BillingPostalCode, and Total.

InvoiceId	CustomerId	InvoiceDate	BillingAddress	BillingCity	BillingState	BillingCountry	BillingPostalCode	Total
1	2	2009-01-01 0...	Theodor-Heus...	Stuttgart	NULL	Germany	70174	1.98
2	4	2009-01-02 0...	Ullevålsveien 14	Oslo	NULL	Norway	0171	3.96
3	8	2009-01-03 0...	Grétrystraat 63	Brussels	NULL	Belgium	1000	5.94
4	14	2009-01-06 0...	8210 111 ST ...	Edmonton	AB	Canada	T6G 2C7	8.91
5	23	2009-01-11 0...	69 Salem Street	Boston	MA	USA	2113	13.86
6	37	2009-01-19 0...	Berger Straße...	Frankfurt	NULL	Germany	60316	0.99
7	38	2009-02-01 0...	Barbarossastr...	Berlin	NULL	Germany	10779	1.98
8	40	2009-02-01 0...	8, Rue Hanovre	Paris	NULL	France	75002	1.98
9	42	2009-02-02 0...	9, Place Louis...	Bordeaux	NULL	France	33000	3.96
10	46	2009-02-03 0...	3 Chatham St...	Dublin	Dublin	Ireland	NULL	5.94

fig. 45

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-01-01 00:00:00	Theodor-Heuss-Straße 34	Stuttgart	1.98
2	2009-02-01 00:00:00	Barbarossastraße 19	Berlin	1.98
3	2009-02-01 00:00:00	8, Rue Hanovre	Paris	1.98
4	2009-03-04 00:00:00	1 Microsoft Way	Redmond	1.98
5	2009-03-04 00:00:00	1 Infinite Loop	Cupertino	1.98
6	2009-04-04 00:00:00	421 Bourke Street	Sidney	1.98
7	2009-04-04 00:00:00	Calle Lira, 198	Santiago	1.98
8	2009-05-05 00:00:00	Rua a Assunção 53	Lisbon	1.98
9	2009-05-05 00:00:00	Tauentzienstraße 8	Berlin	1.98
10	2009-06-05 00:00:00	Oe 7 Bloco G	Brasília	1.98
...	111 rows returned in 7ms			

fig. 46

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-01-01 00:00:00	Theodor-Heuss-Straße 34	Stuttgart	1.98
2	2009-01-02 00:00:00	Ullevålsveien 14	Oslo	3.96
3	2009-02-01 00:00:00	Barbarossastraße 19	Berlin	1.98
4	2009-02-01 00:00:00	8, Rue Hanovre	Paris	1.98
5	2009-02-02 00:00:00	9, Place Louis Barthou	Bordeaux	3.96
6	2009-03-04 00:00:00	1 Microsoft Way	Redmond	1.98
7	2009-03-04 00:00:00	1 Infinite Loop	Cupertino	1.98
8	2009-03-05 00:00:00	801 W 4th Street	Reno	3.96
9	2009-04-04 00:00:00	421 Bourke Street	Sidney	1.98
10	2009-04-04 00:00:00	Calle Lira, 198	Santiago	1.98
...	178 rows returned in 3ms			

fig. 47

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-01-01 00:00:00	Theodor-Heuss-Straße 34	Stuttgart	1.98
2	2009-01-02 00:00:00	Ullevålsveien 14	Oslo	3.96
3	2009-02-01 00:00:00	Barbarossastraße 19	Berlin	1.98
4	2009-02-01 00:00:00	8, Rue Hanovre	Paris	1.98
5	2009-02-02 00:00:00	9, Place Louis Barthou	Bordeaux	3.96
6	2009-03-04 00:00:00	1 Microsoft Way	Redmond	1.98
7	2009-03-04 00:00:00	1 Infinite Loop	Cupertino	1.98
8	2009-03-05 00:00:00	801 W 4th Street	Reno	3.96
9	2009-04-04 00:00:00	421 Bourke Street	Sidney	1.98
10	2009-04-04 00:00:00	Calle Lira, 198	Santiago	1.98
...	168 rows returned in 2ms			

fig. 48

	InvoiceDate	BillingAddress	BillingCity	Total
1	2011-11-08 00:00:00	202 Hoxton Street	London	0.99
2	2012-03-11 00:00:00	1033 N Park Ave	Tucson	0.99
3	2012-08-13 00:00:00	8, Rue Hanovre	Paris	0.99
4	2013-01-15 00:00:00	113 Lupus St	London	0.99
5	2009-02-01 00:00:00	8, Rue Hanovre	Paris	1.98
6	2009-07-06 00:00:00	113 Lupus St	London	1.98
7	2010-04-11 00:00:00	4, Rue Milton	Paris	1.98
8	2010-09-13 00:00:00	202 Hoxton Street	London	1.98
9	2011-01-15 00:00:00	1033 N Park Ave	Tucson	1.98
10	2011-11-21 00:00:00	113 Lupus St	London	1.98
...	35 rows returned in 7ms			

fig. 49

	InvoiceDate	BillingAddress	BillingCity	Total
1	2011-11-08 00:00:00	202 Hoxton Street	London	0.99
2	2012-03-11 00:00:00	1033 N Park Ave	Tucson	0.99
3	2012-08-13 00:00:00	8, Rue Hanovre	Paris	0.99
4	2013-01-15 00:00:00	113 Lupus St	London	0.99
5	2009-02-01 00:00:00	8, Rue Hanovre	Paris	1.98
6	2009-07-06 00:00:00	113 Lupus St	London	1.98
7	2010-04-11 00:00:00	4, Rue Milton	Paris	1.98
8	2010-09-13 00:00:00	202 Hoxton Street	London	1.98
9	2011-01-15 00:00:00	1033 N Park Ave	Tucson	1.98
10	2011-11-21 00:00:00	113 Lupus St	London	1.98
...	35 rows returned in 7ms			

fig. 50

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-07-24 00:00:00	796 Dundas Street West	Toronto	0.99
2	2012-03-11 00:00:00	1033 N Park Ave	Tucson	0.99
3	2011-01-15 00:00:00	1033 N Park Ave	Tucson	1.98
4	2011-01-15 00:00:00	796 Dundas Street West	Toronto	1.98
5	2013-06-01 00:00:00	796 Dundas Street West	Toronto	1.98
6	2013-09-02 00:00:00	1033 N Park Ave	Tucson	1.98
7	2011-04-19 00:00:00	1033 N Park Ave	Tucson	3.96
8	2013-09-03 00:00:00	796 Dundas Street West	Toronto	3.96
9	2011-07-22 00:00:00	1033 N Park Ave	Tucson	5.94
10	2013-12-06 00:00:00	796 Dundas Street West	Toronto	5.94
...	14 rows returned in 1ms			

fig. 51

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-01-19 00:00:00	Berger Straße 10	Frankfurt	0.99
2	2009-02-19 00:00:00	1600 Amphitheatre Parkway	Mountain View	0.99
3	2009-07-24 00:00:00	796 Dundas Street West	Toronto	0.99
4	2010-08-31 00:00:00	Celsiusg. 9	Stockholm	0.99
5	2010-10-01 00:00:00	230 Elgin Street	Ottawa	0.99
6	2011-01-02 00:00:00	2211 W Berry Street	Fort Worth	0.99
7	2011-09-07 00:00:00	Rua dos Campeões Europeus de Viena, 4350	Porto	0.99
...	126 rows returned in 2ms			

fig. 52

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-03-22 00:00:00	110 Raeburn Pl	Edinburgh	0.99
2	2009-04-22 00:00:00	5112 48 Street	Yellowknife	0.99
3	2009-05-23 00:00:00	Praça Pio X, 119	Rio de Janeiro	0.99
4	2009-06-23 00:00:00	C/ San Bernardo 85	Madrid	0.99
5	2009-08-24 00:00:00	Grétrystraat 63	Brussels	0.99
6	2009-09-24 00:00:00	3 Chatham Street	Dublin	0.99
7	2009-10-25 00:00:00	319 N. Frances Street	Madison	0.99
8	2009-11-25 00:00:00	Ullevålsveien 14	Oslo	0.99
9	2009-12-26 00:00:00	9, Place Louis Barthou	Bordeaux	0.99
10	2010-01-26 00:00:00	801 W 4th Street	Reno	0.99
...	286 rows returned in 4ms			

fig. 53

WILDCARD USAGE	RESULT
(Where <i>T</i> is either the letter or a part of the string of letters you are looking for)	(Note again, these are not case-sensitive)
' T % '	Finds all records beginning with <i>T</i>
' % T '	Finds all records ending in <i>T</i>
' % T % '	Finds all records with <i>T</i> in the middle of a string of text
' T % T '	Finds all records beginning and ending with <i>T</i>

fig. 54

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-01-03 00:00:00	Grétrystraat 63	Brussels	5.94
	1 rows returned in 1ms			

fig. 55

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-01-03 00:00:00	Grétrystraat 63	Brussels	5.94
	1 rows returned in 2ms			

fig. 56

	InvoiceDate	BillingAddress	BillingCity	Total
1	2010-01-26 00:00:00	801 W 4th Street	Reno	0.99
2	2010-03-29 00:00:00	Barbarossastraße 19	Berlin	0.99
3	2010-04-29 00:00:00	1 Microsoft Way	Redmond	0.99
4	2010-05-30 00:00:00	421 Bourke Street	Sidney	0.99
5	2010-06-30 00:00:00	Rua da Assunção 53	Lisbon	0.99
6	2010-07-31 00:00:00	Qe 7 Bloco G	Brasília	0.99
7	2010-08-31 00:00:00	Celsiusg. 9	Stockholm	0.99
8	2010-10-01 00:00:00	230 Elgin Street	Ottawa	0.99
9	2010-11-01 00:00:00	Sønder Boulevard 51	Copenhage	0.99
10	2010-12-02 00:00:00	Via Degli Scipioni, 43	Rome	0.99
...	136 rows returned in 3ms			

fig. 57

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-09-24 00:00:00	3 Chatham Street	Dublin	0.99
2	2011-02-02 00:00:00	Klanova 9/506	Prague	0.99
3	2011-03-05 00:00:00	68, Rue Jouvence	Dijon	0.99
4	2011-09-07 00:00:00	Rua dos Campeões Europeus de Viena, 4350	Porto	0.99
5	2012-04-11 00:00:00	Rilská 3174/6	Prague	0.99
6	2012-08-13 00:00:00	8, Rue Hanovre	Paris	0.99
7	2009-02-01 00:00:00	8, Rue Hanovre	Paris	1.98
8	2009-12-08 00:00:00	Klanova 9/506	Prague	1.98
9	2010-01-08 00:00:00	68, Rue Jouvence	Dijon	1.98
10	2010-04-11 00:00:00	4, Rue Milton	Paris	1.98
...	56 rows returned in 4ms			

fig. 58

	InvoiceDate	BillingAddress	BillingCity	Total
1	2009-09-24 00:00:00	3 Chatham Street	Dublin	0.99
2	2011-03-05 00:00:00	68, Rue Jouvence	Dijon	0.99
3	2010-01-08 00:00:00	68, Rue Jouvence	Dijon	1.98
4	2010-06-12 00:00:00	12, Community Centre	Delhi	1.98
5	2011-03-18 00:00:00	3 Chatham Street	Dublin	1.98
6	2012-08-26 00:00:00	68, Rue Jouvence	Dijon	1.98
7	2012-10-27 00:00:00	12, Community Centre	Delhi	1.98
8	2013-08-02 00:00:00	3 Chatham Street	Dublin	1.98
9	2011-06-06 00:00:00	4, Rue Milton	Paris	1.99
10	2010-12-02 00:00:00	12, Community Centre	Delhi	1.99
...	43 rows returned in 2ms			

fig. 59

	InvoiceDate	BillingAddress	BillingCity	Total
1	2011-06-06 00:00:00	4, Rue Milton	Paris	1.99
2	2013-12-22 00:00:00	12, Community Centre	Dehli	1.99
3	2011-06-19 00:00:00	8, Rue Hanovre	Paris	2.98
4	2010-03-12 00:00:00	Klanova 9/506	Prague	3.96
5	2010-04-12 00:00:00	68, Rue Jouvence	Dijon	3.96
6	2010-07-14 00:00:00	4, Rue Milton	Paris	3.96
7	2010-10-15 00:00:00	Rua dos Campeões Europeus de Viena, 4350	Porto	3.96
8	2011-05-20 00:00:00	Rilská 3174/6	Prague	3.96
9	2011-09-21 00:00:00	8, Rue Hanovre	Paris	3.96
10	2013-01-29 00:00:00	12, Community Centre	Delhi	3.96
...	35 rows returned in 1ms			

fig. 60

	InvoiceDate	BillingAddress	BillingCity	Total	PurchaseType
1	2009-05-10 00:00:00	Lijnbaansgracht 120bg	Amsterdam	8.91	Target Purchase
2	2010-12-15 00:00:00	Lijnbaansgracht 120bg	Amsterdam	1.91	Baseline Purchase
3	2011-03-19 00:00:00	Lijnbaansgracht 120bg	Amsterdam	3.96	Low Purchase
4	2011-06-21 00:00:00	Lijnbaansgracht 120bg	Amsterdam	8.94	Target Purchase
5	2012-02-09 00:00:00	Lijnbaansgracht 120bg	Amsterdam	0.99	Baseline Purchase
6	2013-08-02 00:00:00	Lijnbaansgracht 120bg	Amsterdam	1.98	Baseline Purchase
7	2013-09-12 00:00:00	Lijnbaansgracht 120bg	Amsterdam	13.86	Target Purchase
8	2009-04-05 00:00:00	3,Raj Bhavan Road	Bangalore	3.96	Low Purchase
9	2009-07-08 00:00:00	3,Raj Bhavan Road	Bangalore	5.94	Low Purchase
10	2010-02-26 00:00:00	3,Raj Bhavan Road	Bangalore	1.99	Baseline Purchase
...	412 rows returned in 17ms				

fig. 61

	InvoiceDate	BillingAddress	BillingCity	Total	PurchaseType
1	2010-02-18 00:00:00	Erzsébet krt. 58.	Budapest	21.86	Top Performers
2	2010-03-21 00:00:00	162 E Superior Street	Chicago	15.86	Top Performers
3	2012-10-06 00:00:00	68, Rue Jouvence	Dijon	16.86	Top Performers
4	2011-04-28 00:00:00	3 Chatham Street	Dublin	21.86	Top Performers
5	2012-08-05 00:00:00	2211 W Berry Street	Fort Worth	23.86	Top Performers
6	2011-05-29 00:00:00	319 N. Frances Street	Madison	18.86	Top Performers
7	2011-06-29 00:00:00	Ullevålsveien 14	Oslo	15.86	Top Performers
8	2012-09-05 00:00:00	Klanova 9/506	Prague	16.9	Top Performers
9	2013-11-13 00:00:00	Rilská 3174/6	Prague	25.9	Top Performers
10	2010-01-13 00:00:00	Calle Lira, 198	Santiago	17.9	Top Performers
...	11 rows returned in 6ms				

CHAPTER 6

Working with Multiple Tables

fig. 62

The screenshot shows a window titled 'DB Browser for SQLite - C:\Downloads\iTunes.db'. The 'Database Structure' tab is active, displaying the 'invoices' table. The table has the following columns: InvoiceId, CustomerId, InvoiceDate, BillingAddress, BillingCity, BillingState, BillingCountry, BillingPostalCode, and Total. The data is as follows:

InvoiceId	CustomerId	InvoiceDate	BillingAddress	BillingCity	BillingState	BillingCountry	BillingPostalCode	Total
1	2	2009-01-01 0...	Theodor-Heus...	Stuttgart	NULL	Germany	70174	1.98
2	4	2009-01-02 0...	Ullevålsveien 14	Oslo	NULL	Norway	0171	3.96
3	8	2009-01-03 0...	Grêtrystraat 63	Brussels	NULL	Belgium	1000	5.94
4	14	2009-01-06 0...	8210 111 ST ...	Edmonton	AB	Canada	T6G 2C7	8.91
5	23	2009-01-11 0...	69 Salem Street	Boston	MA	USA	2113	13.86
6	37	2009-01-19 0...	Berger Straße...	Frankfurt	NULL	Germany	60316	0.99
7	38	2009-02-01 0...	Barbarossastr...	Berlin	NULL	Germany	10779	1.98
8	40	2009-02-01 0...	8, Rue Hanovre	Paris	NULL	France	75002	1.98
9	42	2009-02-02 0...	9, Place Louis...	Bordeaux	NULL	France	33000	3.96
10	46	2009-02-03 0...	3 Chatham St...	Dublin	Dublin	Ireland	NULL	5.94

fig. 63

The screenshot shows the database schema for two tables: 'invoices' and 'customers'.

Table	Field Name	Field Type
invoices	InvoiceId	INTEGER
	CustomerId	INTEGER
	InvoiceDate	DATETIME
	BillingAddress	NVARCHAR (70)
	BillingCity	NVARCHAR (40)
	BillingState	NVARCHAR (40)
	BillingCountry	NVARCHAR (40)
	BillingPostalCode	NVARCHAR (10)
	Total	NUMERIC (10, ...)
customers	CustomerId	INTEGER
	FirstName	NVARCHAR (40)
	LastName	NVARCHAR (20)
	Company	NVARCHAR (80)
	Address	NVARCHAR (70)
	City	NVARCHAR (40)
	State	NVARCHAR (40)
	Country	NVARCHAR (40)
	PostalCode	NVARCHAR (10)
	Phone	NVARCHAR (24)
	Fax	NVARCHAR (24)
Email	NVARCHAR (60)	
SupportRepId	INTEGER	

fig. 64

INVOICES TABLE (3 OF 9 FIELDS SHOWN)				CUSTOMERS TABLE (4 OF 13 FIELDS SHOWN)					
	InvoiceId	CustomerId	...	Total	CustomerId	FirstName	LastName	...	SupportRepId
1	98	1	...	3.98	1	Luís	Gonçalves	...	3
2	121	1	...	3.96	1	Luís	Gonçalves	...	3
3	143	1	...	5.94	1	Luís	Gonçalves	...	3
4	195	199	1	Luís	Gonçalves	...	3
5	316	1	...	1.98	1	Luís	Gonçalves	...	3
6	327	1	...	13.86	1	Luís	Gonçalves	...	3
7	382	1	...	8.91	1	Luís	Gonçalves	...	3
8	1	2	...	1.98	2	Leonie	Köhler	...	5
9	12	2	...	13.86	2	Leonie	Köhler	...	5
10	67	2	...	8.91	2	Leonie	Köhler	...	5
...	412 rows returned in 17ms				...				

fig. 65

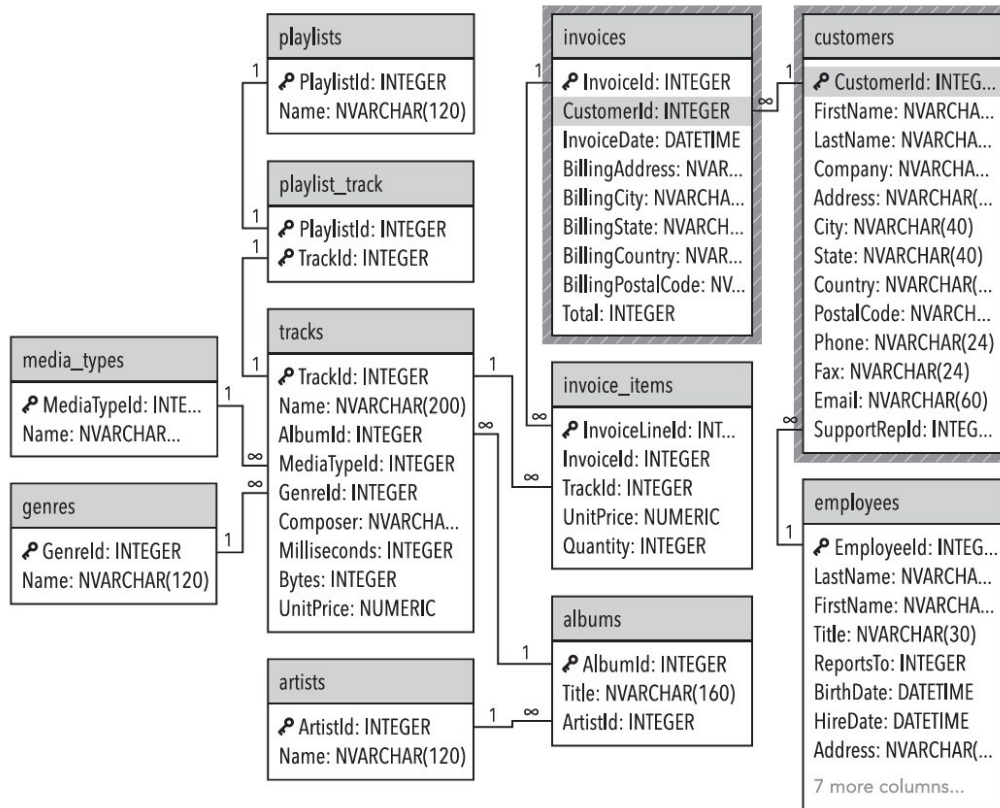


fig. 66

	LastName	FirstName	InvoiceId	CustomerId	InvoiceDate	Total
1	Almeida	Roberto	34	12	2009-05-23 00:00:00	0.99
2	Almeida	Roberto	155	12	2010-11-14 00:00:00	1.98
3	Almeida	Roberto	166	12	2010-12-25 00:00:00	13.86
4	Almeida	Roberto	221	12	2011-08-25 00:00:00	8.91
5	Almeida	Roberto	350	12	2013-03-31 00:00:00	1.98
6	Almeida	Roberto	373	12	2013-07-03 00:00:00	3.96
7	Almeida	Roberto	395	12	2013-10-05 00:00:00	5.94
8	Barnett	Julia	71	28	2009-11-07 00:00:00	1.98
9	Barnett	Julia	82	28	2009-12-18 00:00:00	13.86
10	Barnett	Julia	137	28	2010-08-18 00:00:00	8.91
...	412 rows returned in 14ms					

fig. 67

SIMPLIFIED INVOICES TABLE

InvoiceId	CustomerId	InvoiceDate	BillingAddress	Total
1	2	1/1/2018	Billing Address 2	\$1.00
2	2	2/1/2018	Billing Address 2	\$2.00
3	3	3/1/2018	Billing Address 3	\$3.00
4	4	4/1/2018	Billing Address 4	\$4.00
5	6	5/1/2017	Billing Address 6	\$5.00

SIMPLIFIED CUSTOMERS TABLE

CustomerId	Name	Address
1	Customer 1	Address 1
2	Customer 2	Address 2
3	Customer 3	Address 3
4	Customer 4	Address 4
5	Customer 5	Address 6

fig. 68

INNER JOIN

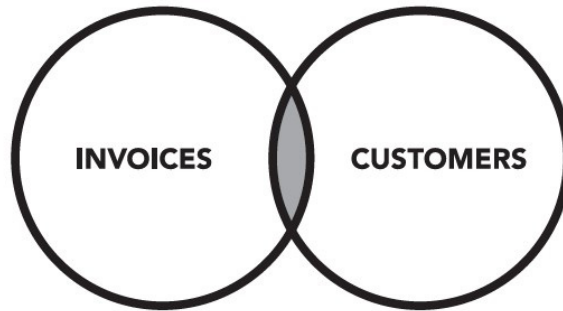


fig. 69

Simplified Invoices Table

InvoiceId	CustomerId	InvoiceDate	BillingAddress	Total
1	2	1/1/2018	Billing Address 2	\$1.00
2	2	2/1/2018	Billing Address 2	\$2.00
3	3	3/1/2018	Billing Address 3	\$3.00
4	4	4/1/2018	Billing Address 4	\$4.00
5	6	5/1/2017	Billing Address 6	\$5.00

Simplified Customers Table

CustomerId	Name	Address
1	Customer 1	Address 1
2	Customer 2	Address 2
3	Customer 3	Address 3
4	Customer 4	Address 4
5	Customer 5	Address 6

INNER JOIN



fig. 70

	InvoiceId	CustomerId	Name	Address	InvoiceDate	BillingAddress	Total
1	1	2	Customer 2	Address 2	1/1/2018	Billing Address 2	\$1.00
2	2	2	Customer 2	Address 2	2/1/2018	Billing Address 2	\$2.00
3	3	3	Customer 3	Address 3	3/1/2018	Billing Address 3	\$3.00
4	4	4	Customer 4	Address 4	4/1/2018	Billing Address 4	\$4.00
	4 rows returned in 1ms						

fig. 71

LEFT OUTER JOIN

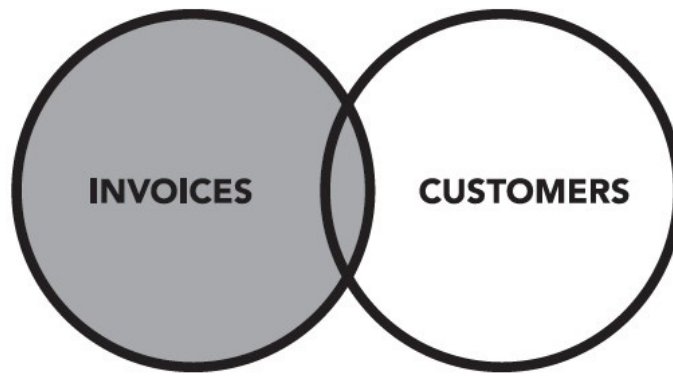


fig. 72

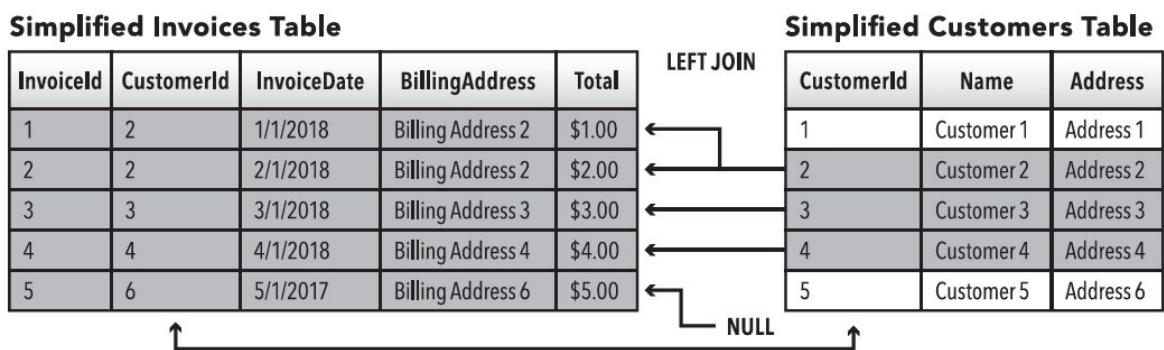


fig. 73

	InvoiceId	CustomerId	Name	Address	InvoiceDate	BillingAddress	Total
1	1	2	Customer 2	Address 2	1/1/2018	Billing Address 2	\$1.00
2	2	2	Customer 2	Address 2	2/1/2018	Billing Address 2	\$2.00
3	3	3	Customer 3	Address 3	3/1/2018	Billing Address 3	\$3.00
4	4	4	Customer 4	Address 4	4/1/2018	Billing Address 4	\$4.00
5	5	NULL	NULL	NULL	5/1/2017	Billing Address 6	\$5.00
	5 rows returned in 1ms						

fig. 74

RIGHT OUTER JOIN

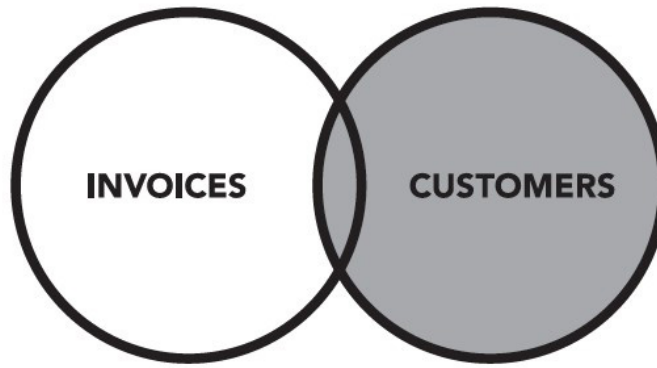


fig. 75

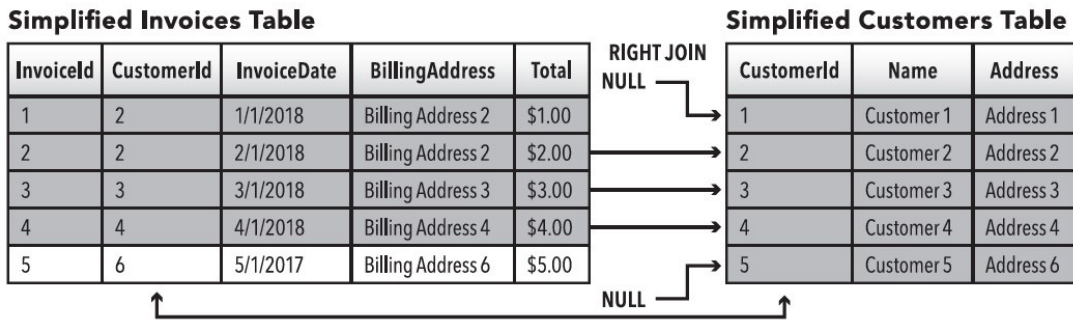


fig. 76

	Invoiceld	CustomerId	Name	Address	InvoiceDate	BillingAddress	Total
1	NULL	1	Customer 1	Address 1	NULL	NULL	NULL
2	1	2	Customer 2	Address 2	1/1/2018	Billing Address 2	\$1.00
3	2	2	Customer 2	Address 2	2/1/2018	Billing Address 2	\$2.00
4	3	3	Customer 3	Address 3	3/1/2018	Billing Address 3	\$3.00
5	4	4	Customer 4	Address 4	4/1/2017	Billing Address 4	\$4.00
6	NULL	5	Customer 5	Address 5	NULL	NULL	NULL
	6 rows returned in 2ms						

fig. 77

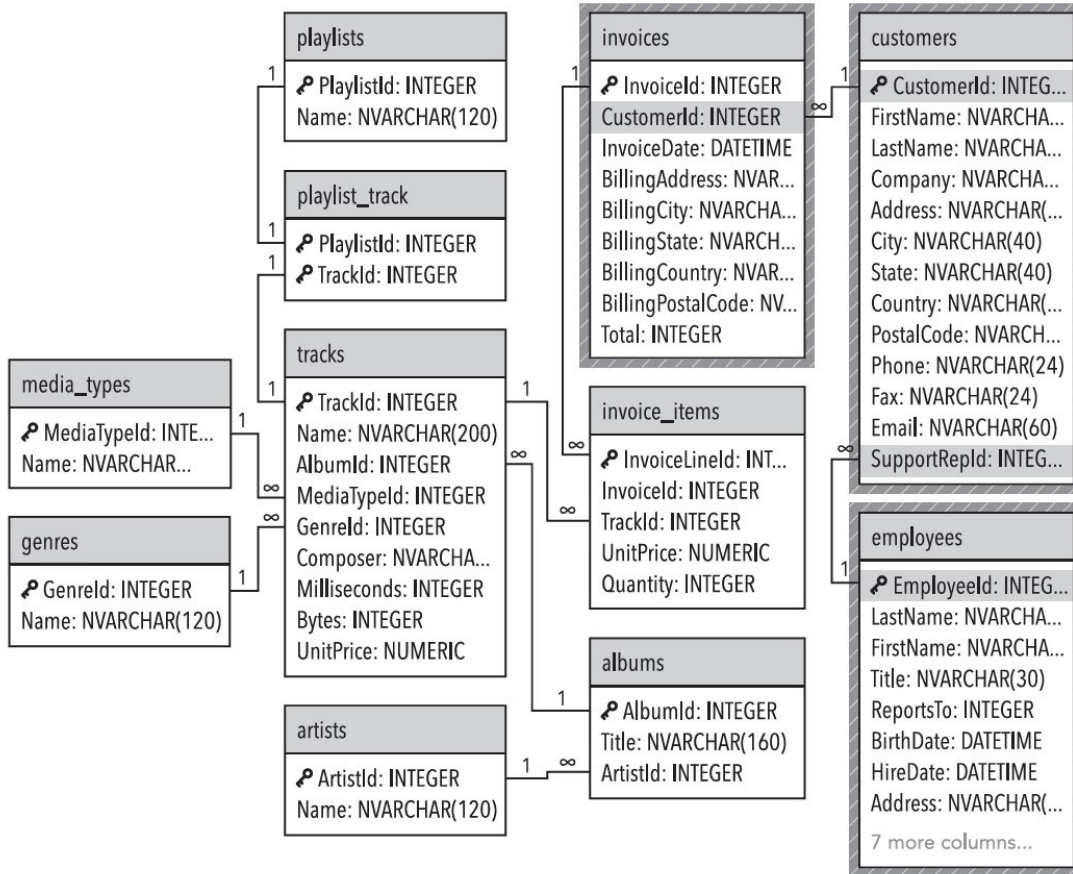


fig. 78

FIELDS WE NEED	OUR PREFERRED ALIAS SYNTAX
Employee first name, last name, employee ID (all from the <i>employees</i> table)	<code>e.FirstName,</code> <code>e.LastName,</code> <code>e.EmployeeId,</code>
Customer first name, last name, support rep ID (from the <i>customers</i> table)	<code>c.FirstName,</code> <code>c.LastName,</code> <code>c.SupportRepId,</code>
Customer ID, total purchase amount (from the <i>invoices</i> table)	<code>i.CustomerId,</code> <code>i.Total,</code>
We want to sort this query by highest invoice value and limit results to the top ten invoices	<code>i.Total DESC,</code> <code>LIMIT 10</code>

fig. 79

	FirstName	LastName	EmployeeId	FirstName	LastName	SupportRepld	CustomerId	Total
1	Steve	Johnson	5	Helena	Holý	5	6	\$25.86
2	Margaret	Park	4	Richard	Cunningham	4	26	\$23.86
3	Jane	Peacock	3	Ladislav	Kovács	3	45	\$21.86
4	Jane	Peacock	3	Hugh	O'Reilly	3	46	\$21.86
5	Steve	Johnson	5	Astrid	Gruber	5	7	\$18.86
6	Steve	Johnson	5	Victor	Stevens	5	25	\$18.86
7	Steve	Johnson	5	Luís	Rojas	5	57	\$17.91
8	Margaret	Park	4	František	Wichterlová	4	5	\$16.86
9	Jane	Peacock	3	Isabelle	Mercier	3	43	\$16.86
10	Margaret	Park	4	Bjørn	Hansen	4	4	\$15.86
	10 rows returned in 5ms							

fig. 80

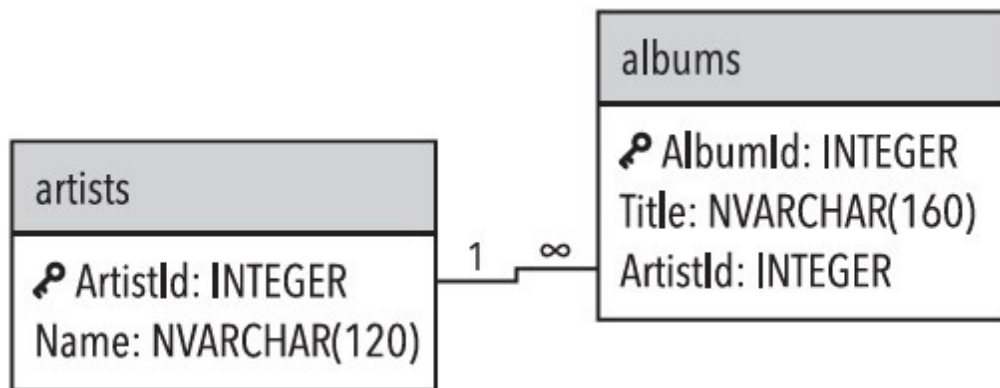


fig. 81

	ArtistId From Artists Table	ArtistId From Albums Table	Artist Name	Album	
...
51	25	NULL	Milton Nascimento & Bebeto	NULL	
52	26	NULL	Azymuth	NULL	
53	27	27	Gilberto Gil	As Canções de Eu Tu Eles	
54	27	27	Gilberto Gil	Quanta Gente Veio Ver (Live)	
55	27	27	Gilberto Gil	Quanta Gente Veio ver-Bônus De Carnaval	
56	28	NULL	João Gilberto	NULL	
57	29	NULL	Bebel Gilberto	NULL	
58	30	NULL	Jorge Vercilo	NULL	
59	31	NULL	Baby Consuelo	NULL	
60	32	NULL	Ney Matogrosso	NULL	
...	418 rows returned in 18ms				

fig. 82

	ArtistId From Artists Table	ArtistId From Albums Table	Artist Name	Album
1	25	NULL	Milton Nascimento & Bebeto	NULL
2	26	NULL	Azymuth	NULL
3	28	NULL	João Gilberto	NULL
4	29	NULL	Bebel Gilberto	NULL
5	30	NULL	Jorge Vercilo	NULL
6	31	NULL	Baby Consuelo	NULL
7	32	NULL	Ney Matogrosso	NULL
8	33	NULL	Luiz Melodia	NULL
9	34	NULL	Nando Reis	NULL
10	35	NULL	Pedro Luís & A Parede	NULL
...	71 rows returned in 1ms			

fig. 83

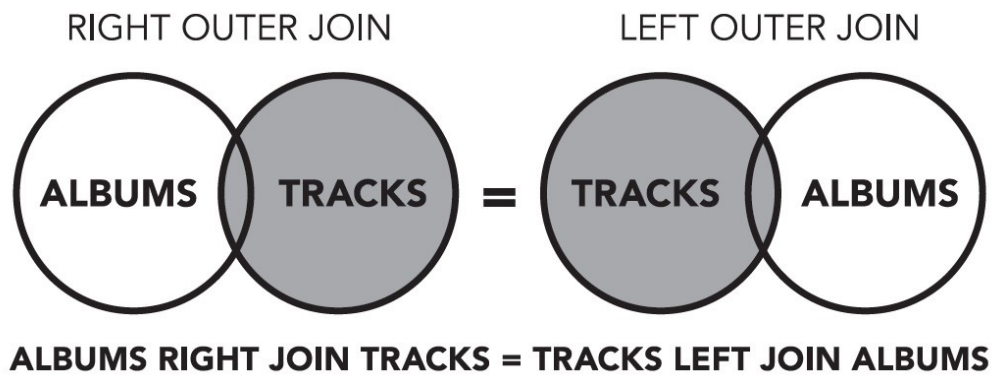


fig. 84

	TrackId	Composer	Name	AlbumId	Title
1	1	Angus Young, Malcolm Young, Brian Johnson	For Those About To Rock (We Salute You)	1	For Those About To Rock (We Salute You)
2	2	NULL	Balls to the Wall	2	Balls to the Wall
3	3	F. Baltes, S. Kaufman, U. Dirksneider & W. Hoffman	Fast As a Shark	3	Restless and Wild
4	4	F. Baltes, R.A. Smith-Diesel, S. Kaufman, U. Dirksneider & W. Hoffman	Restless and Wild	3	Restless and Wild
5	5	Deaffy & R.A. Smith-Diesel	Princess of the Dawn	3	Restless and Wild
6	6	Angus Young, Malcolm Young, Brian Johnson	Put The Finger On You	1	For Those About To Rock (We Salute You)
7	7	Angus Young, Malcolm Young, Brian Johnson	Let's Get It Up	1	For Those About To Rock (We Salute You)
8	8	Angus Young, Malcolm Young, Brian Johnson	Inject The Venom	1	For Those About To Rock (We Salute You)
9	9	Angus Young, Malcolm Young, Brian Johnson	Snowballed	1	For Those About To Rock (We Salute You)
10	10	Angus Young, Malcolm Young, Brian Johnson	Evil Walks	1	For Those About To Rock (We Salute You)
...	3503 rows returned in 25ms				

CHAPTER 7

Using Functions

fig. 85

	NameCount
1	4
	1 rows returned in 2ms

fig. 86

TYPES OF FUNCTIONS

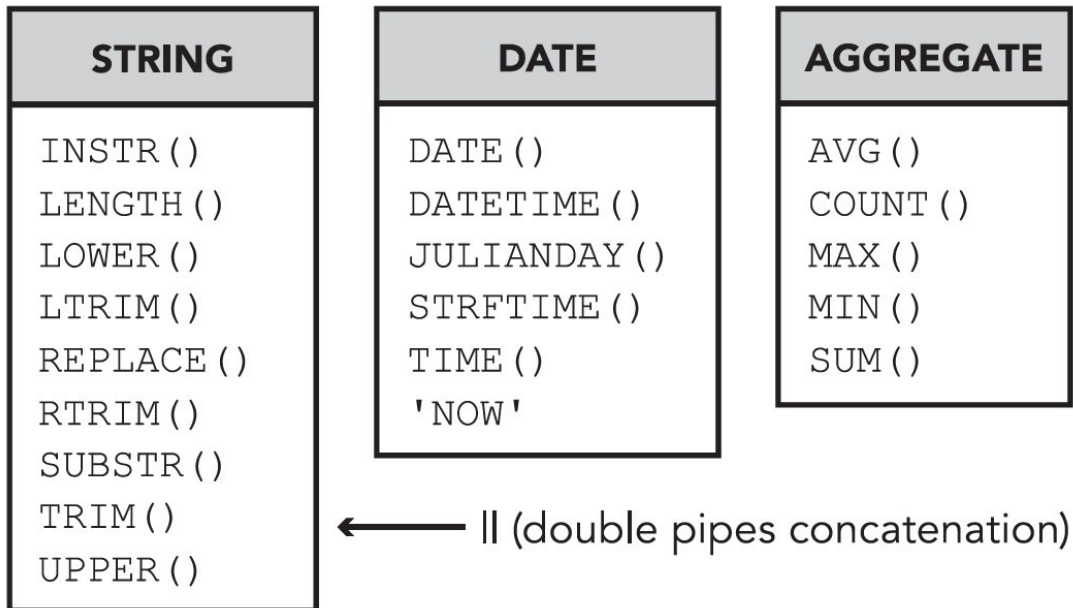


fig. 87

	FirstName	LastName	Address
1	Frank	Harris	1600 Amphitheatre Parkway
2	Jack	Smith	1 Microsoft Way
3	Michelle	Brooks	627 Broadway
4	Tim	Goyer	1 Infinite Loop
5	Dan	Miller	541 Del Medio Avenue
...	13 rows returned in 5ms		

fig. 88

	FirstName LastName
1	LuísGonçalves
	1 rows returned in 1ms

fig. 89

	FirstName	LastName	FirstName LastName
1	Frank	Harris	Frank Harris
2	Jack	Smith	Jack Smith
3	Michelle	Brooks	Michelle Brooks
4	Tim	Goyer	Tim Goyer
5	Dan	Miller	Dan Miller
...	13 rows returned in 1ms		

fig. 90

	MailingAddress
1	Frank Harris 1600 Amphitheatre Parkway, Mountain View, CA 94043-1351
2	Jack Smith 1 Microsoft Way, Redmond, WA 98052-8300
3	Michelle Brooks 627 Broadway, New York, NY 10012-2612
4	Tim Goyer 1 Infinite Loop, Cupertino, CA 95014
5	Dan Miller 541 Del Medio Avenue, Mountain View, CA 94040-111
...	13 rows returned in 5ms

fig. 91

PostalCode	Postal Code Length
94043-1351	10
98052-8300	10
10012-2612	10
95014	5
94040-111	9
89503	5
32801	5
2113	4
60611	5
53703	5
...	13 rows returned in 1ms

fig. 92

FUNCTION	DESCRIPTION
SUBSTR (X, Y)	Returns all characters through the end of the string X beginning with the Y-th.
SUBSTR (X, Y, Z)	Returns a substring of input string X that begins with the Y-th character and that is Z characters long.

fig. 93

PostalCode	Five Digit Postal Code
94043-1351	94043
98052-8300	98052
10012-2612	10012
95014	95014
94040-111	94040
89503	89503
32801	32801
2113	2113
60611	60611
53703	53703
...	13 rows returned in 1ms

fig. 94

FUNCTION	DESCRIPTION
UPPER ()	Returns a copy of input string X in which all lowercase ASCII characters are converted to their uppercase equivalent.
LOWER ()	Returns a copy of string X with all ASCII characters converted to lowercase.

fig. 95

	First Name Unmodified	First Name in UPPERCASE	First Name in lowercase	Full Name in UPPERCASE
1	Luís	LUIS	luís	LUIS GONÇALVES
2	Leonie	LEONIE	leonie	LEONIE KÖHLER
3	François	FRANÇOIS	françois	FRANÇOIS TREMBLAY
4	Bjørn	BJØRN	bjørn	BJØRN HANSEN
5	František	FRANTIŠEK	františek	FRANTIŠEK WICHTERLOVÁ
6	Helena	HELENA	helena	HELENA HOLÝ
7	Astrid	ASTRID	astrid	ASTRID GRUBER
8	Daan	DAAN	daan	DAAN PEETERS
9	Kara	KARA	kara	KARA NIELSEN
10	Eduardo	EDUARDO	eduardo	EDUARDO MARTINS
...	59 rows returned in 3ms			

fig. 96

FUNCTION	DESCRIPTION
STRFTIME()	STRFTIME(format, timestring, modifier, modifier, ...) Converts date and time to a string. STRFTIME () takes a format (or "conversion specifications"), a timestring, and as many (optional) modifiers as desired.
'NOW'	This function takes no argument. Using the NOW function returns the current time when it is executed. STRFTIME (), DATE (), and other time functions can take NOW as an argument.

fig. 97

ARGUMENTS FOR STRFTIME

In specific order: format, timestring, modifier (optional)

(format) <i>These are case-sensitive</i>	DESCRIPTION
'%d'	day of month: 00
'%f'	fractional seconds: SS.SSS
'%H'	hour: 00-24
'%j'	day of year: 001-366
'%J'	Julian day number
'%m'	month: 01-12
'%M'	minute: 00-59
'%S'	seconds since 1970-01-01
'%S'	seconds: 00-59
'%w'	day of week 0-6 with Sunday=0
'%W'	week of year: 00-53
'%Y'	year: 0000-9999

fig. 98

(timestring)	DESCRIPTION
'YYYY-MM-DD'	A date typed in Year-Month-Day format.
'now'	The current date and time.
'DATETIME' field	A database field in a date and/or time format.

fig. 99

(modifier)	DESCRIPTION
'+ X days'	Where X is the number of days to add to the result.
'+ X months'	Where X is the number of months to add to the result.
'+ X years'	Where X is the number of years to add to the result.
'- X days'/months/years	Where X is the number of days/months/years to subtract from the result.
'start of day'	Modifies the time code to represent the beginning of the day.
'start of month'	Modifies the month value to the first of the month.
'start of year'	Modifies the datecode to represent the first day of the year.

fig. 100

	Text with Conversion Specifications
1	The Year is: 2011 The Day is: 22 The Month is 05
	1 rows returned in 1ms

fig. 101

	LastName	FirstName	Birthday No Timecode	Age
1	Peacock	Jane	8/29/1973	46
2	Mitchell	Michael	7/1/1973	46
3	King	Robert	5/29/1970	49
4	Callahan	Laura	1/9/1968	51
5	Johnson	Steve	3/3/1965	54
6	Adams	Andrew	2/18/1962	57
7	Edwards	Nancy	12/8/1958	61
8	Park	Margaret	9/19/1947	72
	8 rows returned in 1ms			

fig. 102

FUNCTION	DESCRIPTION
SUM ()	Returns the sum of all non-null values.
AVG ()	Returns the average value of all non-null values.
MIN ()	Returns the minimum value of all non-null values.
MAX ()	Returns the maximum value of all non-null values.
COUNT ()	Returns a count of all non-null values.

fig. 103

	TotalSales	AverageSales	MaximumSale	MinSale	SalesCount
1	"2328.6"	"5.651941..."	"25.86"	"0.99"	"412"
	1 rows returned in 2ms				

fig. 104

FUNCTION	DESCRIPTION
ROUND (X, Y)	Returns a floating point value X rounded to Y digits to the right of the decimal point. If the Y argument is omitted, it is assumed to be 0.

fig. 105

	Average Sales	Rounded Average Sales
1	5.65194174757283	5.65
	1 rows returned in 1ms	

fig. 106

	BillingCity	AVG(Total)
1	Delhi	5.65194174757283
	1 rows returned in 1ms	

fig. 107

	BillingCity	AVG(Total)
1	Amsterdam	5.802857143
2	Bangalore	6.106666667
3	Berlin	5.374285714
4	Bordeaux	5.66
5	Boston	5.374285714
...	53 rows returned in 2ms	

fig. 108

	BillingCity	AVG(Total)
1	Lisbon	5.66
2	London	5.374285714
3	Lyon	5.374285714
	3 rows returned in 1ms	

fig. 109

	BillingCity	AVG(Total)
1	Amsterdam	5.802857143
2	Bangalore	6.106666667
3	Berlin	5.374285714
4	Bordeaux	5.66
5	Boston	5.374285714
...	53 rows returned in 2ms	

fig. 110

	BillingCity	AVG(Total)
1	Bangalore	6.106666667
2	Berlin	5.374285714
3	Bordeaux	5.66
4	Boston	5.374285714
5	Brasília	5.374285714
6	Brussels	5.374285714
7	Budapest	6.517142857
8	Buenos Aires	5.374285714
	8 rows returned in 1ms	

fig. 111

	BillingCountry	BillingCity	AVG(Total)
1	Argentina	Buenos Aires	5.374285714
2	Australia	Sidney	5.374285714
3	Austria	Sidney	6.088571429
4	Belgium	Brussels	5.374285714
5	Brazil	Brasília	5.374285714
6	Brazil	Rio de Janeiro	5.374285714
7	Brazil	São José dos Campos	5.66
8	Brazil	São Paulo	5.374285714
9	Canada	Edmonton	5.374285714
10	Canada	Halifax	5.374285714
...	53 rows returned in 6ms		

CHAPTER 8

Subqueries

fig. 112

	Average Total
1	5.65
	1 rows returned in 1ms

fig. 113

```
1 SELECT
2     InvoiceDate,
3     BillingAddress,
4     BillingCity,
5     Total
6 FROM
7     invoices
8 WHERE Total <
9     (select
10      avg(Total)
11     from
12      invoices)
13 ORDER BY
14     Total DESC
15
```

OUTER QUERY

inner query

OUTER QUERY

fig. 114

	BillingCity	City Average	Global Average
1	Amsterdam	5.802857143	5.651941748
2	Bangalore	6.106666667	5.651941748
3	Berlin	5.374285714	5.651941748
4	Bordeaux	5.66	5.651941748
5	Boston	5.374285714	5.651941748
...	53 rows returned in 5ms		

fig. 115

	MAX(Total)
1	23.86
	1 rows returned in 1ms

fig. 116

	InvoiceDate	BillingCity	Total
1	2013-11-13 00:00:00	Prague	25.86
	1 rows returned in 2ms		

fig. 117

	InvoiceDate
1	2012-01-09 00:00:00
	1 rows returned in 1ms

fig. 118

	InvoiceDate	BillingAddress	BillingCity
1	2012-01-22 00:00:00	Av. Paulista, 2022	São Paulo
2	2012-01-22 00:00:00	Qe 7 Bloco G	Brasília
3	2012-01-23 00:00:00	700 W Pender Street	Vancouver
4	2012-01-24 00:00:00	1 Infinite Loop	Cupertino
5	2012-01-27 00:00:00	319 N. Frances Street	Madison
...	161 rows returned in 8ms		

fig. 119

	InvoiceDate
1	2012-01-09 00:00:00
2	2012-01-22 00:00:00
3	2012-01-24 00:00:00
...	3 rows returned in 1ms

fig. 120

	InvoiceDate	BillingAddress	BillingCity
1	2012-01-09 00:00:00	Rua Dr. Falcão Filho, 155	São Paulo
2	2012-01-22 00:00:00	Av. Paulista, 2022	São Paulo
3	2012-01-22 00:00:00	Qe 7 Bloco G	Brasília
4	2012-01-24 00:00:00	1 Infinite Loop	Cupertino
...	4 rows returned in 2ms		

fig. 121

	InvoiceId	TrackId
1	108	1
2	1	2
3	214	2
4	319	3
5	1	4
6	108	5
7	2	6
8	2	8
9	214	8
10	108	9
...	2240 rows returned in 15ms	

fig. 122

	TrackId
1	1
2	2
3	3
4	4
5	5
6	6
7	8
8	9
9	10
10	12
...	1984 rows returned in 11ms

fig. 123

	TrackId	Composer	Name
1	7	Angus Young, Malcolm Young, Brian Johnson	Let's Get It Up
2	11	Angus Young, Malcolm Young, Brian Johnson	C.O.D.
3	17	AC/DC	Let There Be Rock
4	18	AC/DC	Bad Boy Boogie
5	22	AC/DC	Whole Lotta Rosie
6	23	Steven Tyler, Joe Perry, Jack Blades, Tommy Shaw	Walk On Water
7	27	Steven Tyler, Joe Perry, Desmond Child	Dude (Looks Like A Lady)
8	29	Steven Tyler, Joe Perry, Taylor Rhodes	Cryin'
9	33	Steven Tyler, Jim Vallance	The Other Side
10	34	Steven Tyler, Joe Perry, Desmond Child	Crazy
...	1519 rows returned in 20ms		

CHAPTER 9

Views

fig. 124

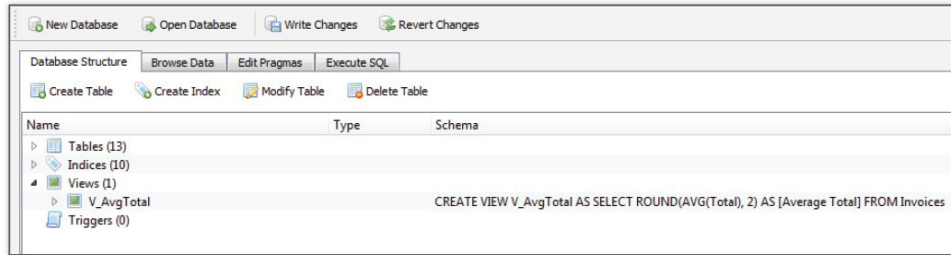


fig. 125

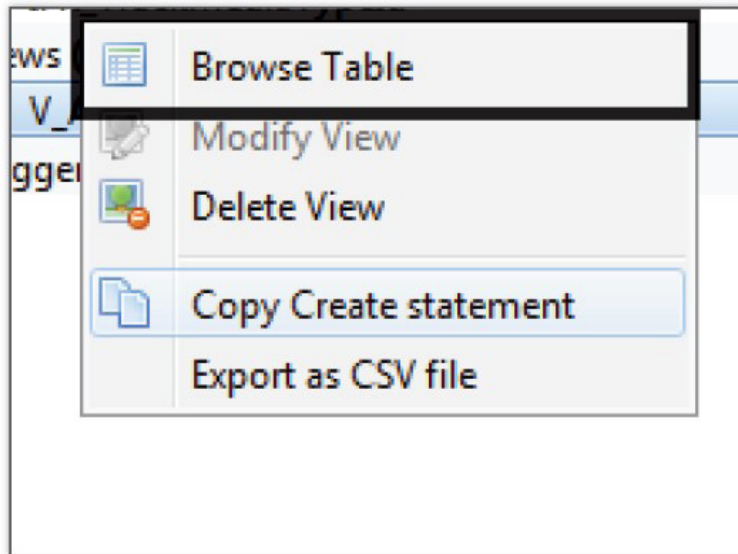
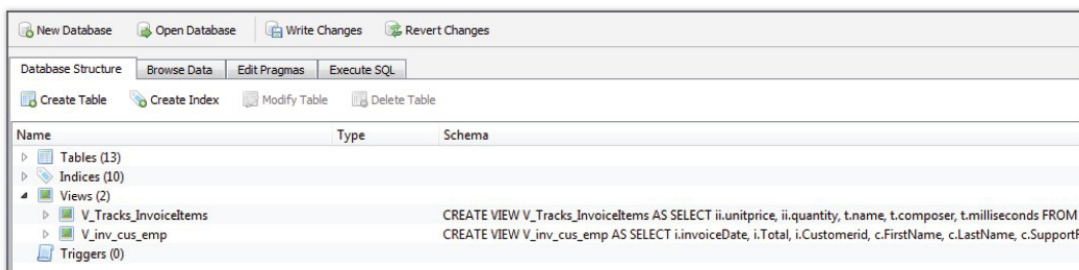


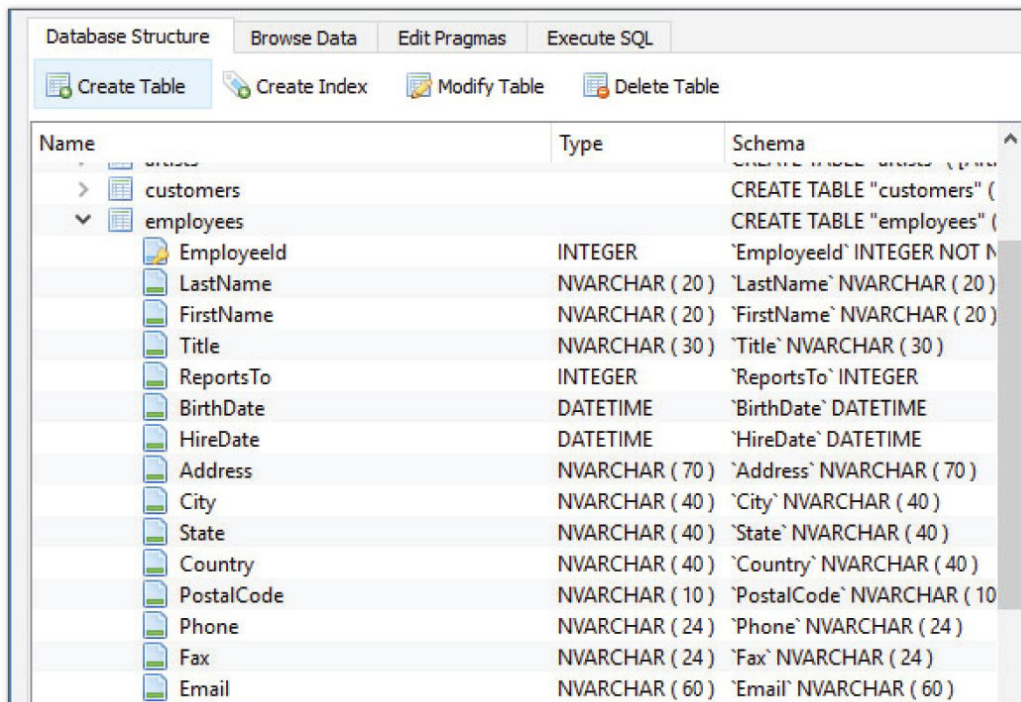
fig. 126



CHAPTER 10

Data Manipulation Language

fig. 127



The screenshot shows a database management interface with a 'Database Structure' tab selected. Below the tab are buttons for 'Create Table', 'Create Index', 'Modify Table', and 'Delete Table'. The main area displays a tree view of the database structure. The 'employees' table is expanded, showing its columns and their data types. The 'Schema' column shows the SQL code for each table.

Name	Type	Schema
customers		CREATE TABLE "customers" (
employees		CREATE TABLE "employees" (
EmployeeId	INTEGER	'EmployeeId' INTEGER NOT N
LastName	NVARCHAR (20)	'LastName' NVARCHAR (20)
FirstName	NVARCHAR (20)	'FirstName' NVARCHAR (20)
Title	NVARCHAR (30)	'Title' NVARCHAR (30)
ReportsTo	INTEGER	'ReportsTo' INTEGER
BirthDate	DATETIME	'BirthDate' DATETIME
HireDate	DATETIME	'HireDate' DATETIME
Address	NVARCHAR (70)	'Address' NVARCHAR (70)
City	NVARCHAR (40)	'City' NVARCHAR (40)
State	NVARCHAR (40)	'State' NVARCHAR (40)
Country	NVARCHAR (40)	'Country' NVARCHAR (40)
PostalCode	NVARCHAR (10)	'PostalCode' NVARCHAR (10
Phone	NVARCHAR (24)	'Phone' NVARCHAR (24)
Fax	NVARCHAR (24)	'Fax' NVARCHAR (24)
Email	NVARCHAR (60)	'Email' NVARCHAR (60)

CONCLUSION

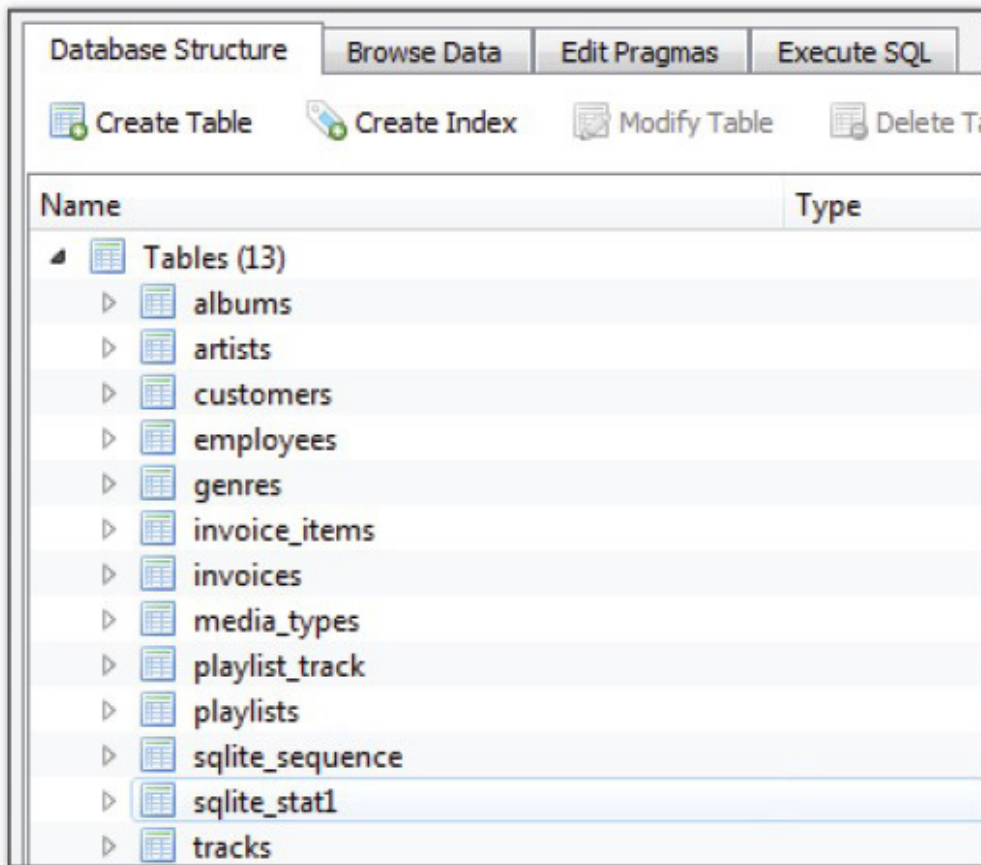
fig. 128



APPENDIX I

Data Analysis Checkpoint Questions and Solutions

fig. 129



The screenshot shows the 'Database Structure' pane in SQL Server Enterprise Manager. At the top, there are tabs for 'Database Structure', 'Browse Data', 'Edit Pragmas', and 'Execute SQL'. Below the tabs are icons for 'Create Table', 'Create Index', 'Modify Table', and 'Delete Table'. The main area displays a tree view of tables under the heading 'Tables (13)'. The tables listed are: albums, artists, customers, employees, genres, invoice_items, invoices, media_types, playlist_track, playlists, sqlite_sequence, sqlite_stat1, and tracks. The 'tracks' table is currently selected and highlighted.

Name	Type
Tables (13)	
albums	
artists	
customers	
employees	
genres	
invoice_items	
invoices	
media_types	
playlist_track	
playlists	
sqlite_sequence	
sqlite_stat1	
tracks	

fig. 130



The screenshot shows the structure of the 'tracks' table. The table has the following columns and data types:

Column Name	Data Type
TrackId	INTEGER
Name	NVARCHAR (2...)
AlbumId	INTEGER
MediaTypeId	INTEGER
GenreId	INTEGER
Composer	NVARCHAR (2...)
Milliseconds	INTEGER
Bytes	INTEGER
UnitPrice	NUMERIC (10, ...)

fig. 131

Database Structure									
Browse Data									
Edit Pragmas									
Execute SQL									
Table: tracks									
	TrackId	Name	AlbumId	MediaTypeId	GenreId	Composer	Milliseconds	Bytes	UnitPrice
	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	1	For Those Ab...	1	1	1	Angus Young,...	343719	11170334	0.99
2	2	Balls to the Wall	2	2	1	NULL	342562	5510424	0.99
3	3	Fast As a Shark	3	2	1	F. Baltes, S. K...	230619	3990994	0.99
4	4	Restless and ...	3	2	1	F. Baltes, R.A...	252051	4331779	0.99
5	5	Princess of th...	3	2	1	Deaffy & R.A. ...	375418	6290521	0.99

fig. 132

	LastName
1	Almeida
2	Barnett
3	Bernard
4	Brooks
5	Brown
6	Chase
7	Cunningham
8	Dubois
9	Fernandes
10	Francis
...	

fig. 133

	Company
1	Woodstock Discos
2	Telus
3	Rogers Canada
4	Riotur
5	Microsoft Corporation
6	JetBrains s.r.o.
7	Google Inc.
8	Embraer - Empresa Brasileira de Aeronáutica S.A.
9	Banco do Brasil S.A.
10	Apple Inc.
...	

fig. 134

	FirstName	LastName	PostalCode
1	João	Fernandes	NULL
2	Madalena	Sampaio	NULL
3	Hugh	O'Reilly	NULL
4	Luís	Rojas	NULL
5	Stanisław	Wójcik	00-358
6	Lucas	Mancini	00192
7	Terhi	Hämäläinen	00530
8	Eduardo	Martins	01007-010
9	Alexandre	Rocha	01310-200
10	Bjørn	Hansen	0171
...			

fig. 135

	InvoiceDate	BillingAddress	BillingCity	BillingCountry	Total	PurchaseType
1	1/1/2009 0:00	Theodor-Heuss-Straße 34	Stuttgart	Germany	1.98	Foreign Sales
2	1/2/2009 0:00	Ullevålsveien 14	Oslo	Norway	3.96	Foreign Sales
3	1/3/2009 0:00	Grêtrystraat 63	Brussels	Belgium	5.94	Foreign Sales
4	1/6/2009 0:00	8210 111 ST NW	Edmonton	Canada	8.91	Foreign Sales
5	1/11/2009 0:00	69 Salem Street	Boston	USA	13.86	Domestic Sales
6	1/19/2009 0:00	Berger Straße 10	Frankfurt	Germany	0.99	Foreign Sales
7	2/1/2009 0:00	Barbarossastraße 19	Berlin	Germany	1.98	Foreign Sales
8	2/1/2009 0:00	8, Rue Hanovre	Paris	France	1.98	Foreign Sales
9	2/2/2009 0:00	9, Place Louis Barthou	Bordeaux	France	3.96	Foreign Sales
10	2/3/2009 0:00	3 Chatham Street	Dublin	Ireland	5.94	Foreign Sales
...						

fig. 136

	InvoiceDate	BillingAddress	BillingCity	BillingCountry	Total	SalesType
1	1/11/2009 0:00	69 Salem Street	Boston	USA	13.86	Domestic Sales
2	2/19/2009 0:00	1600 Amphitheatre Parkway	Mountain View	USA	0.99	Domestic Sales
3	3/4/2009 0:00	1 Microsoft Way	Redmond	USA	1.98	Domestic Sales
4	3/4/2009 0:00	1 Infinite Loop	Cupertino	USA	1.98	Domestic Sales
5	3/5/2009 0:00	801 W 4th Street	Reno	USA	3.96	Domestic Sales
6	3/6/2009 0:00	319 N. Frances Street	Madison	USA	5.94	Domestic Sales
7	4/14/2009 0:00	1 Infinite Loop	Cupertino	USA	13.86	Domestic Sales
8	6/6/2009 0:00	1 Microsoft Way	Redmond	USA	3.96	Domestic Sales
9	6/7/2009 0:00	801 W 4th Street	Reno	USA	5.94	Domestic Sales
10	6/10/2009 0:00	1033 N Park Ave	Tucson	USA	8.91	Domestic Sales
...						

fig. 137

	InvoiceDate	BillingAddress	BillingCity	BillingCountry	Total	SalesType
1	3/21/2010 0:00	162 E Superior Street	Chicago	USA	15.86	Domestic Sales
2	5/29/2011 0:00	319 N. Frances Street	Madison	USA	18.86	Domestic Sales
3	8/5/2012 0:00	2211 W Berry Street	Fort Worth	USA	23.86	Domestic Sales

fig. 138

	TrackId	Name	AlbumId	MediaTypeId	GenreId	Composer	Milliseconds	Bytes	UnitPrice
	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	1	For Those Ab...	1	1	1	Angus Young,...	343719	11170334	0.99
2	2	Balls to the Wall	2	2	1	NULL	342562	5510424	0.99
3	3	Fast As a Shark	3	2	1	F. Baltes, S. K...	230619	3990994	0.99
4	4	Restless and ...	3	2	1	F. Baltes, R.A....	252051	4331779	0.99
5	5	Princess of th...	3	2	1	Deaffy & R.A. ...	375418	6290521	0.99
6	6	Put The Finge...	1	1	1	Angus Young,...	205662	6713451	0.99
7	7	Let's Get It Up	1	1	1	Angus Young,...	233926	7636561	0.99
8	8	Inject The Ve...	1	1	1	Angus Young,...	210834	6852860	0.99
9	9	Snowballed	1	1	1	Angus Young,...	203102	6599424	0.99
10	10	Evil Walks	1	1	1	Angus Young,...	263497	8611245	0.99

fig. 139

	MailingAddress
1	FRANK HARRIS 1600 Amphitheatre Parkway, Mountain View, CA 94043
2	JACK SMITH 1 Microsoft Way, Redmond, WA 98052
3	MICHELLE BROOKS 627 Broadway, New York, NY 10012
4	TIM GOYER 1 Infinite Loop, Cupertino, CA 95014
5	DAN MILLER 541 Del Medio Avenue, Mountain View, CA 94040
1	KATHY CHASE 801 W 4th Street, Reno, NV 89503
2	HEATHER LEACOCK 120 S Orange Ave, Orlando, FL 32801
3	JOHN GORDON 69 Salem Street, Boston, MA 2113
4	FRANK RALSTON 162 E Superior Street, Chicago, IL 60611
5	VICTOR STEVENS 319 N. Frances Street, Madison, WI 53703
...	

fig. 140

	BillingCountry	AVG(Total)
1	USA	5.7479121

fig. 141

	SUM(Total)
1	2328.6

fig. 142

	InvoiceDate	Total
1	11/13/2013 0:00	25.86
2	8/5/2012 0:00	23.86
3	2/18/2010 0:00	21.86
4	4/28/2011 0:00	21.86
5	1/18/2010 0:00	18.86
6	5/29/2011 0:00	18.86
7	1/13/2010 0:00	17.91
8	9/5/2012 0:00	16.86
9	10/6/2012 0:00	16.86
10	3/21/2010 0:00	15.86
...		

fig. 143

	InvoiceDate	Total	BillingCountry
1	11/13/2013 0:00	25.86	USA
2	8/5/2012 0:00	23.86	USA
3	2/18/2010 0:00	21.86	USA
4	4/28/2011 0:00	21.86	USA
5	1/18/2010 0:00	18.86	USA
6	5/29/2011 0:00	18.86	USA
7	1/13/2010 0:00	17.91	USA
8	9/5/2012 0:00	16.86	USA
9	10/6/2012 0:00	16.86	USA
10	3/21/2010 0:00	15.86	USA
...			

fig. 144

	CustomerId	FirstName	LastName	Company	Address	City	State	Country	PostalCode	Phone	Fax	Email	SupportId
1	60	New	Customer		123 Day Street	New York	NY	USA	11201	(347)525-8688		nc@gmail.com	1

APPENDIX II

List of SQL Keywords by Chapter

fig. 145

TYPES OF OPERATORS

COMPARISON	LOGICAL	ARITHMETIC
= Equal To > Greater Than < Less Than >= Greater Than or Equal To <= Less Than or Equal To <> Not Equal To	BETWEEN IN LIKE AND OR	+ Add - Subtract / Divide * Multiply % Modulo

fig. 146

	InvoiceDate	BillingAddress	BillingCity	Total	PurchaseType
1	2009-05-10 00:00:00	Lijnbaansgracht 120bg	Amsterdam	8.91	Target Purchase
2	2010-12-15 00:00:00	Lijnbaansgracht 120bg	Amsterdam	1.98	Baseline Purchase
3	2011-03-19 00:00:00	Lijnbaansgracht 120bg	Amsterdam	3.96	Low Purchase
...
71	2010-03-21 00:00:00	162 E Superior Street	Chicago	15.86	Top Performers

fig. 147

	InvoiceDate	Results of DATE Function
1	2009-01-01 00:00:00	2009-01-01
2	2009-01-02 00:00:00	2009-01-02
3	2009-01-03 00:00:00	2009-01-03
4	2009-01-06 00:00:00	2009-01-06
5	2009-01-11 00:00:00	2009-01-11
...		

fig. 148

TYPES OF FUNCTIONS

STRING	DATE	AGGREGATE
INSTR ()	DATE ()	AVG ()
LENGTH ()	DATETIME ()	COUNT ()
LOWER ()	JULIANDAY ()	MAX ()
LTRIM ()	STRFTIME ()	MIN ()
REPLACE ()	TIME ()	SUM ()
RTRIM ()	'NOW'	
SUBSTR ()		
TRIM ()		
UPPER ()		

← || (double pipes concatenation)

Miscellaneous Functions: Round ()

fig. 149

```

1  SELECT
2      InvoiceDate,
3      BillingAddress,
4      BillingCity,
5      Total
6  FROM
7      invoices
8  WHERE Total <
9      (select
10         avg(Total)
11        from
12         invoices)
13  ORDER BY
14      Total DESC
15

```

OUTER QUERY (lines 1-5)

inner query (lines 9-12)

OUTER QUERY (lines 13-14)

fig. 150

	TrackId
1	1
2	2
3	3
4	4
5	5
6	6
7	8
8	9
9	10
10	12
...	1984 rows returned in 11ms

GLOSSARY

Aggregate Function

A function designed to produce a single result based on the contents of an entire field. Aggregate functions can return a sum, a minimum, a maximum, a count, or other mathematical functions.

Alias

A substitute name for a database column defined by the user in an AS statement. An alias is used for clarity or presentation when displaying a query.

Argument

A parameter of a function, usually encased in parentheses () and separated by a comma.

Arithmetic Operator

An SQL keyword used to perform basic arithmetic operations (add, subtract, multiply, divide, modulo) usually within a WHERE clause.

Attribute

Another representation of a field.

Boolean

A data type expressed as either true or false.

Clause

A subsection of an SQL statement that starts with a reserved keyword and may include additional parameters and operators.

Coding Convention

A set of guidelines, standards, and best practices used in most programming languages to ensure that code is readable by other company stakeholders.

Column

Another representation of a field.

Comparison Operator

An SQL keyword used to compare values, usually used within a WHERE clause. Examples include “=” (equal to), “>” (greater than), “<” (less than), “>=” (greater than or equal to), “<=” (less than or equal to), “<>” (not equal to).

Composite Key

A primary key consisting of two or more fields combined in such a way as to make a unique identifier.

Data Manipulation Language (DML)

A subset of SQL keywords that are used to add, remove, and modify data in a database. Examples include INSERT, UPDATE, and DELETE.

Data

Information that can be recorded and stored in a database.

Data Type

An attribute of a field that specifies what type of data that field can hold. Examples include numerical and text.

Database

A collection of data arranged for ease and speed of search and retrieval by a computer.

Database Administrator

A database professional responsible for the maintenance, security, and integrity of a database. Duties may include deciding who has access to what parts of the database and determining who can edit the database.

DB Browser

An SQL browser that uses the SQLite RDBMS.

Entity Relationship Diagram (ERD)

The graphical “blueprint” of a database that explains relationships between tables, such as a relationship between a primary key in one table and its corresponding foreign key(s) in other tables. An ERD can also be called a schema.

Field

A space allocated for a particular type of data. Field could refer to one specific item in a record or the entire column. Sometimes referred to as a column or attribute.

Foreign Key

A column in a table that is a primary key in another table.

Function

A special SQL keyword that accepts certain parameters called arguments, performs an operation (such as a calculation or modification of the data in the field), and returns the result of that operation as a value.

Integer

A data type that represents a whole (non-decimal) number.

Keyword

A special reserved word in SQL that performs a specific function in a statement or query. SELECT is the most common SQL keyword.

Logical Operator

An SQL keyword used to perform conditional selection of data meeting certain criteria, usually within a WHERE clause. Examples include BETWEEN, IN, LIKE, AND, and OR.

Messages Pane

A part of the SQL browser that gives the user feedback on the results of executed queries.

Metadata

Data about the structure of the data in a database.

Normalization

A technique used in the creation of databases to reduce redundant columns and thus decrease both the size of the database and the time required to run queries.

Operator

A special SQL keyword, usually used in conjunction with an existing SQL clause such as the WHERE clause. Common operators include comparison operators, logical operators, and arithmetic operators.

Primary Key

The column that acts as a unique identifier for a particular record in a table.

Query

A request made in Structured Query Language, entered into an SQL browser, requesting a specific set of information.

Query Pane

A part of the SQL browser that allows the user to enter SQL queries.

RDBMS

An abbreviation for relational database management system.

Record

One complete set of information, usually consisting of one row and at least one column.

Relational Database

A database design that employs multiple tables linked to each other by the use of primary and foreign key fields.

Relational Database Management System

A software package that allows the user to create, edit, and run SQL queries on relational databases.

Results Pane

The part of the SQL browser that shows the result set, or data returned from a query.

Result Set

The output or resulting data of a successfully executed query, usually in the form of records from the database.

Row

Another representation of a record.

Sandbox

A database environment that is isolated from any live servers or sensitive data so that code can be tested or practiced.

Schema

A description of the relationship between database tables and their primary and foreign keys that can be shown visually by an entity relationship diagram (ERD).

SQL

Structured Query Language. A standardized set of keywords specifically designed to create, manipulate, and control relational databases.

SQLite

A particular implementation of SQL, also called a relational database management system.

SQL Browser

The software interface of a relational database management system that allows an end user to browse databases and execute queries using Structured Query Language.

Statement

Any valid piece of code that can be executed by the RDBMS.

String

Text data stored in a text-based data type such as NVARCHAR.

Syntax

The correct keyword usage, order, and structure of SQL statements so that the SQL browser correctly interprets the resulting query.

Syntax Error

An error message created by the SQL browser due to an improperly structured query.

Table

A unique set of records, consisting of both rows and columns.