

## The Library Database

### 1. Overview

Most of the SQL assignments and quizzes are based on the library database, so you should study it carefully.

### 2. The Library Database

The California Tech Library (CTL) has approximately 16,000 members and 100,000 titles. In addition to verifying the availability of books to members who wish to borrow from the library database, librarians must know how many copies of each book are in the library or out on loan at any given time.

To become a member of the library, an applicant fills out a form including their SSN, mailing address, and phone number. Once this form is complete, librarians issue a numbered, machine-readable card to the new member.

The librarians must have a system to keep track of books, borrowers, and book loans. Some books may have the same title; therefore, the title cannot be used as a means of identification. Every book is identified by its International Standard Book Number (ISBN), which is a unique international code assigned to all books.

Consider the LIBRARY relational schema as it is used to keep track of members, books, catalogs, and borrowing activity.

- **BORROWER:** The BORROWER table stores the member's name and mailing address. The card number column serves as the primary key column for the BORROWER table.
- **BOOKS:** The BOOKS table stores the ISBN, title, publication date, and publisher ID of each book. The table also stores a categories name for each book (for example Science, Children, Cooking).
- **CATEGORIES:** The CATEGORIES table contains a list of book categories. Each book belongs to a category and a category ID identifies each category. For each category of book, we store a category ID (unique) and a category description.
- **AUTHOR and BOOK\_AUTHOR:** The AUTHOR table maintains a list of authors' names. The BOOK\_AUTHOR table was created as a bridging table between these two entities. The BOOK\_AUTHOR table stores both the ISBN and author ID of each book.
- **PUBLISHER:** The PUBLISHER table contains the ID code, name, contact person, and telephone number of the publisher. The PUBLISHER table can be joined to the BOOKS table through the publisher ID field, which is the common field. The linked data from the PUBLISHER and BOOKS tables is useful in determining which publisher to contact when you need to reorder books by identifying books you obtained from each publisher.
- **BOOK\_COPIES:** The BOOK\_COPIES table stores the ISBN, branch ID, and number of copies of each book.
- **BOOK\_LOANS:** The BOOK\_LOANS table stores each table stores the ISBN, branch ID, card number, date out, and due date of each loaned book.
- **BRANCH:** The BRANCH table stores each branch ID, branch name, city, and address.

The full set of normalized tables for the library database is as follows:

#### SCHEMA

BORROWER (card\_no, last\_name, first\_name, address, city, state, zip)

BOOKS (ISBN, title, pub\_date, pub\_id, list\_price, category\_id, pub\_id)

CATEGORIES (category\_id, category\_desc)

AUTHOR (author\_id, last\_name, first\_name)

BRANCH (branch\_id, branch\_name, city)

BOOK\_AUTHOR (ISBN, author\_id)

PUBLISHER (pub\_id, name, contact, phone)

BOOK\_LOANS (ISBN, branch\_id, card\_no, date\_out, due\_date)

BOOK\_COPIES (ISBN, branch\_id, no\_of\_copies)

### 3. The Data Dictionary for the Library Database

Table Name	BORROWER		
Key Type	Column Name	Data Type	Size
pk	card_no	INT	4
		VARCHAR	15
	last_name	VARCHAR	15
	first_name	VARCHAR	20
		VARCHAR	12
	address	VARCHAR	2
	city	VARCHAR	5
	state	INT	4
	zip	VARCHAR	15

Table Name	BOOKS		
Key Type	Column Name	Data Type	Size
pk	ISBN	VARCHAR	5
	title	VARCHAR	10
	pub_date	VARCHAR	30
fk (PUBLISHER)	publ_id	DATE	
fk (CATEGORIES)	category_id	INT	
	author_id	INT	10
	List_price	VARCHAR	4

Table Name	AUTHOR		
Key Type	Column Name	Data Type	Size
pk	author_id	VARCHAR	4
	first_name	VARCHAR	10
	last_name	VARCHAR	10

Table Name	BOOK_AUTHOR		
Key Type	Column Name	Data Type	Size
pk fk (AUTHOR)	author_id	VARCHAR	4
pk fk (BOOKS)	ISBN	VARCHAR	10

Table Name	PUBLISHER		
Key Type	Column Name	Data Type	Size
pk	pub_id	INT	
	name	VARCHAR	23
	contact	VARCHAR	15
	phone	VARCHAR	12

Table Name	BOOK_LOANS		
Key Type	Column Name	Data Type	Size
pk fk (BRANCH)	branch_id	INT	10
pk fk (BORROWER)	card_no	INT	4
pk fk (BOOKS)	ISBN	VARCHAR	10
	date_out	DATE	
	due_date	DATE	

Table Name	BOOK_COPIES		
Key Type	Column Name	Data Type	Size
pk fk (BOOKS)	ISBN	VARCHAR	10
pk fk (BRANCH)	branch_id	INT	8
	no_of_copies	INT	
Table Name	BRANCH		
Key Type	Column Name	Data Type	Size

pk	branch_id	INT(8)	8
	branch_name	VARCHAR(80)	80
	city	VARCHAR(80)	80
	address	VARCHAR(80)	80

Table Name	CATEGORIES		
Key Type	Column Name	Data Type	Size
pk	category_id	INT(10)	10
	category_desc	VARCHAR(80)	80

#### 4. Tables for the Library Database

Field	Type	Null	Key	Default	Extra
category_id	int(10)	NO	PRI	NULL	
category_desc	varchar(80)	NO			

Structure of the CATEGORIES table

Field	Type	Null	Key	Default	Extra
card_no	int(4)	NO	PRI	NULL	
last_name	varchar(15)	NO		NULL	
first_name	varchar(15)	NO		NULL	
address	varchar(20)	YES		NULL	
city	varchar(12)	YES		NULL	
state	varchar(2)	YES		NULL	
zip	varchar(5)	YES		NULL	

Structure of the BORROWER table

Field	Type	Null	Key	Default	Extra
isbn	varchar(10)	NO	PRI	NULL	
pub_date	date	YES		NULL	
title	varchar(130)	YES		NULL	
Pub_id	int(11)	YES	MUL	NULL	
list_price	decimal(5,2)	YES		NULL	
category_id	int(10)	YES	MUL	NULL	

Structure of the BOOKS table

Field	Type	Null	Key	Default	Extra
isbn	varchar(10)	NO	PRI	NULL	
author_id	varchar(4)	NO	PRI	NULL	

Structure of the BOOK\_AUTHOR table

Field	Type	Null	Key	Default	Extra
author_id	varchar(4)	NO	PRI	NULL	
last_name	varchar(10)	YES		NULL	
first_name	varchar(10)	YES		NULL	

**Structure of the AUTHOR table**

Field	Type	Null	Key	Default	Extra
pub_id	int(11)	NO	PRI	NULL	
name	varchar(23)	YES		NULL	
contact	varchar(15)	YES		NULL	
phone	varchar(12)	YES		NULL	

**Structure of the PUBLISHER table**

Field	Type	Null	Key	Default	Extra
isbn	varchar(10)	NO	PRI	NULL	
branch_id	int(8)	NO	PRI	NULL	
card_no	int(11)	NO	PRI	NULL	
date_out	date	YES		NULL	
due_date	date	YES		NULL	

**Structure of the BOOK\_LOANS table**

Field	Type	Null	Key	Default	Extra
isbn	varchar(10)	NO	PRI	NULL	
branch_id	int(8)	NO	PRI	NULL	
no_of_copies	int(11)	YES		NULL	

**Structure of the BOOK\_COPIES table**

Field	Type	Null	Key	Default	Extra
branch_id	int(8)	NO	PRI	NULL	
branch_name	varchar(80)	NO			
city	varchar(80)	YES		NULL	
address	varchar(80)	YES		NULL	

**Structure of the BRANCH table**

card_no	last_name	first_name	address	city	state	zip
1001	Morales	Bonita	P.O. BOX 6677	Hayward	CA	94304
1002	Thompson	Ryan	P.O. BOX 6677	Hayward	CA	94704
1003	Smith	Leila	P.O. BOX 66	Berekely	CA	94701
1004	Pierson	Thomas	69821 South Avenue	Union City	CA	94512
1005	Girard	Cindy	P.O. BOX 851	Hayward	CA	94645
1006	Cruz	Meshia	82 Dirt Road	Albany	CA	94234
1007	Giana	Tammy	9153 Main Street	Berekely	CA	94703
1008	Jones	Kenneth	P.O. BOX 137	Fremont	CA	94708
1009	Perez	Jorge	P.O. BOX 8564	Oakland	CA	94601
1010	Lucas	Jake	114 East Savannah	Alameda	CA	94501
1011	McGovern	Reese	P.O. BOX 18	Oakland	CA	94619
1012	Mckenzie	William	P.O. BOX 971	Union City	CA	94536
1013	Nguyen	Nicholas	357 White Eagle AVE.	Fremont	CA	94545
1014	Lee	Jasmine	P.O. BOX 2947	San Leandro	CA	94414
1015	Schell	Steve	P.O. BOX 677	Hayward	CA	94311
1016	Daum	Michell	9851231 Long Road	Alameda	CA	91508
1017	Nelson	Becca	P.O. BOX 563	San Leandro	CA	94006
1018	Montiasa	Greg	1008 Grand Avenue	Berekely	CA	91206
1019	Smith	Jennifer	P.O. BOX 1151	Berekely	CA	97962
1020	Falah	Kenneth	P.O. BOX 335	San Leandro	CA	94577
1021	Anders	Matt	123 Summit Court	Hayward	CA	94540

Data in the BORROWER Table

category_id	category_desc
91111	Family Life
92222	Cooking
93333	Science
94444	Literature
95555	Fiction
96666	Fitness
97777	Children
98888	Computer Science
99999	General

Data in the CATEGORIES Table

isbn	pub_date	title	Pub_id	list_price	category_id
0060959290	NULL	Among the Russians	9000	11.20	99999
0132149871	2001-02-03	North Carolina Hiking Trails	9561	14.95	99999
0201385902	2010-03-25	Intro to DB Systems-7th Ed	9325	80.00	98888
0201615711	2009-08-07	Network Programming with Perl	9776	39.95	98888
0265615357	2009-03-25	ADO and Oracle Workbook	9000	59.99	98888
0299282519	2005-09-02	The tale of the body thief	9325	6.99	95555
0312135033	2011-05-12	Great Catherine	9561	13.56	99999
0345298063	2004-06-09	Peter the Great : His Life and World	9000	11.20	99999
0345438310	2008-03-10	Nicholas and Alexandra	9561	14.40	99999
0399501487	2000-03-28	Lord of the Flies: A Novel	9561	6.95	95555
0401140733	2015-07-07	The Third Option	9024	24.95	95555
0446310783	2015-07-20	To Kill a Mockingbird	9000	6.99	95555
046507135X	2008-03-25	Why Birds Sing	9725	20.25	97777
0505523078	2004-02-18	Virtual Heaven	9456	5.99	95555
0534368018	2009-05-08	A First Book of C++: From Here to There	9024	60.95	98888
0553577476	2005-03-25	Lady Reckless	9776	5.50	95555
0596000278	2006-05-04	Programming Perl	9745	39.96	98888
0657895157	2011-03-22	Rainbows and Rainbows	9725	19.99	99999
0671032658	2010-02-18	Green Mile, The	9456	7.99	95555
0674003306	2003-02-01	Lenin: A Biography	9000	28.00	99999
0679451234	2010-03-20	Sibley Guide to Bird Life and Behavior	9000	20.00	99999
0743215052	2011-03-08	The Constant Gardener	9024	28.00	91111
0764547161	2010-11-18	PHP4 Bible	9902	27.99	98888
0811826848	2000-05-29	Beatles Anthology, The	9456	59.95	99999
0821762559	2015-03-23	Daughter of Camelot	9000	5.99	95555
0852515358	2005-04-15	ADO: the ebook	9000	49.99	98888
0935112510	2015-04-28	Golf Rules Illustrated	9102	19.95	92222
1059831198	2005-03-08	Harry Potter and the goblet of fire	9000	25.95	97777
1557044287	2013-03-09	Gladiator	9902	26.36	95555
1565922840	2003-02-11	Learning Perl	9456	23.96	98888
1565926099	2004-05-16	Perl for System Administration	9456	27.96	98888
1584500492	2009-01-09	Game Programming Gems	9325	69.95	98888
1915762492	2005-03-30	Interview with a vampire	9745	6.99	95555
1930110006	NULL	Data Munging with Perl	9745	29.56	98888
2147428890	2007-08-19	The Mbuti Pygmies	9000	15.00	99999
2491748320	NULL	The vampire lestat	9776	6.99	95555
3437212490	2010-03-08	The mists of avalon	9325	12.95	95555
3957136468	2002-02-01	George and Martha the complete stories of two best friends	9000	25.00	97777
4981341710	2006-04-08	Harry Potter and the chambers of secrets	9456	17.95	97777
8117949391	2007-09-01	Oracle8 Programming a primer	9745	29.99	98888
8843172113	2007-09-09	Harry Potter and the chamber of secrets	9102	19.95	97777
9247381001	2004-05-06	Skiing Everyone	9456	10.00	99999
9780071599	2011-03-25	Oracle SQL Fundamentals I Exam Guide	9725	90.00	98888
9959789321	2003-03-08	Lasher	9456	14.00	95555

Data in the BOOKS Table

branch_id	branch_name	city	address
91234	Bayfair	San Leandro	27300 Patrick Ave
92345	Cal State	Hayward	835 C St
93456	Downtown	Hayward	200 Civic Plaza
94567	Sharpstown	Berekely	16335 E 14th St
95678	Berekely Public Library	Berekely	395 Paseo Grande
96789	Fremont Public Library	Fremont	2400 Stevenson Blvd
97891	Union City Library	Union City	34007 Alvarado-Niles Rd

Data in the BRANCH Table

isbn	author_id
3957136468	A100
8843172113	A100
0743215052	A105
8843172113	A105
0764547161	A210
046507135X	B100
0811826848	B100
2491748320	B100
3437212490	B100
0345298063	B610
0399501487	C510
0674003306	C510
0821762559	C510
0671032658	D311
1565926099	D610
2491748320	F100
0679451234	G474
0852515358	H314
0401140733	J100
9959789321	J100
0534368018	J211
1584500492	J211
1557044287	K100
4981341710	K100
0201615711	K310
1930110006	K910
0060959290	M410
0935112510	M410
8843172113	P105
0201385902	P747
0553577476	R100
2491748320	R100
8117949391	R100
0534368018	R310
0596000278	R310
1565926099	R310
0312135033	R410
1565922840	R910
0132149871	S100
0265615357	S100
0299282519	S100
0446310783	S100
0505523078	S100
1059831198	S100
9780071599	S100
9780071599	S190
1565926099	T610
1915762492	W100
9247381001	W100
1915762492	W105
2147428890	W105
0657895157	W314
0399501487	W343

Data in the BOOK\_AUTHOR Table

author_id	last_name	first_name
A100	Austin	James
A105	Adams	Juan
A210	Steven	Rice
B100	Jackoby	Jack
B610	Tim	Carlos
C510	Carolly	Nikos
D311	David	Cwalina
D610	DeLoura	Miller
F100	Fields	Jesse
G474	Graeme	Gibson
H314	Bert	Holldobler
J100	Jones	Gibson
J211	James	Watson
J310	Clark	Cottrell
K100	Kzochsky	Tamara
K310	Kay	Brodo
K910	King	Stephen
M100	Martinez	Weisfeld
M410	Mass	Michael
P100	Porter	Lisa
P105	Peterson	Tina
P747	Ken	Pugh
R100	Robinson	Robert
R310	Rajshekhar	Sunderram
R410	Robert	Massie
R710	Rasmus	Birkhead
R910	Ridley	Scott
S100	Smith	Wilson
S190	Baron	Schwartz
T610	Jim	Melton
W100	Allen	William
W105	White	Lisa
W110	Wilkinson	Anthony
W314	E.O.	Wilson
W343	Matt	Weisfeld

Data in the AUTHOR Table



pub_id	name	contact	phone
9000	Addison Wesley	Tommie Seymour	000-714-8321
9024	Pearson	Carlsen Benny	800-987-0000
9102	O'Reilly	David Davidson	800-555-1211
9325	McGraw Hill	Renee Smith	800-555-9743
9456	Morgan Kaufmann	Jane Tomlin	010-410-0010
9561	Houghton Mifflin	Edwards Donna	800-444-9723
9725	Springer	Adams Samuel	800-333-8344
9745	American Publishing	NULL	800-555-8284
9776	Simon and Schuster	NULL	888-666-8284
9902	W.W. Norton	Brahms Johnni	888-410-0010

**Data in the PUBLISHER Table**

isbn	branch_id	card_no	date_out	due_date
0060959290	96789	1006	2017-06-03	2017-07-05
0132149871	93456	1013	2017-03-08	2017-03-10
0299282519	94567	1007	2017-03-07	2017-04-07
0299282519	94567	1012	2017-02-15	2017-03-15
0299282519	96789	1005	2017-10-07	2017-11-07
0401140733	93456	1003	2017-01-10	2017-02-15
0401140733	93456	1008	2017-01-15	2017-02-15
0446310783	91234	1021	2017-07-15	2017-08-15
0534368018	93456	1003	2016-06-03	2017-01-03
0553577476	91234	1005	2017-06-15	2017-07-15
0671032658	95678	1011	2017-10-15	2017-11-05
0674003306	97891	1009	2017-01-09	2017-02-09
0764547161	93456	1013	2017-03-08	2017-03-10
0935112510	94567	1005	2017-04-02	2017-05-02
0935112510	94567	1008	2017-08-13	2017-09-13
1059831198	93456	1004	2017-06-03	2017-07-03
1565926099	91234	1007	2017-06-11	2017-07-11
1915762492	91234	1005	2017-06-15	2017-07-15
1930110006	94567	1012	2017-02-15	2017-03-15
1930110006	96789	1003	2017-10-07	2017-11-07
1930110006	97891	1011	2017-04-14	2017-05-10
2491748320	97891	1009	2017-01-09	2017-02-09
3437212490	95678	1010	2017-10-15	2017-11-15
3957136468	96789	1006	2017-06-03	2017-07-05
3957136468	97891	1011	2017-06-15	2017-07-15
4981341710	94567	1005	2017-08-13	2017-09-13
4981341710	94567	1008	2017-04-02	2017-05-02
9247381001	93456	1009	2017-01-15	2017-01-15
9247381001	97891	1011	2017-04-14	2017-05-10
9959789321	91234	1007	2017-08-15	2017-09-15

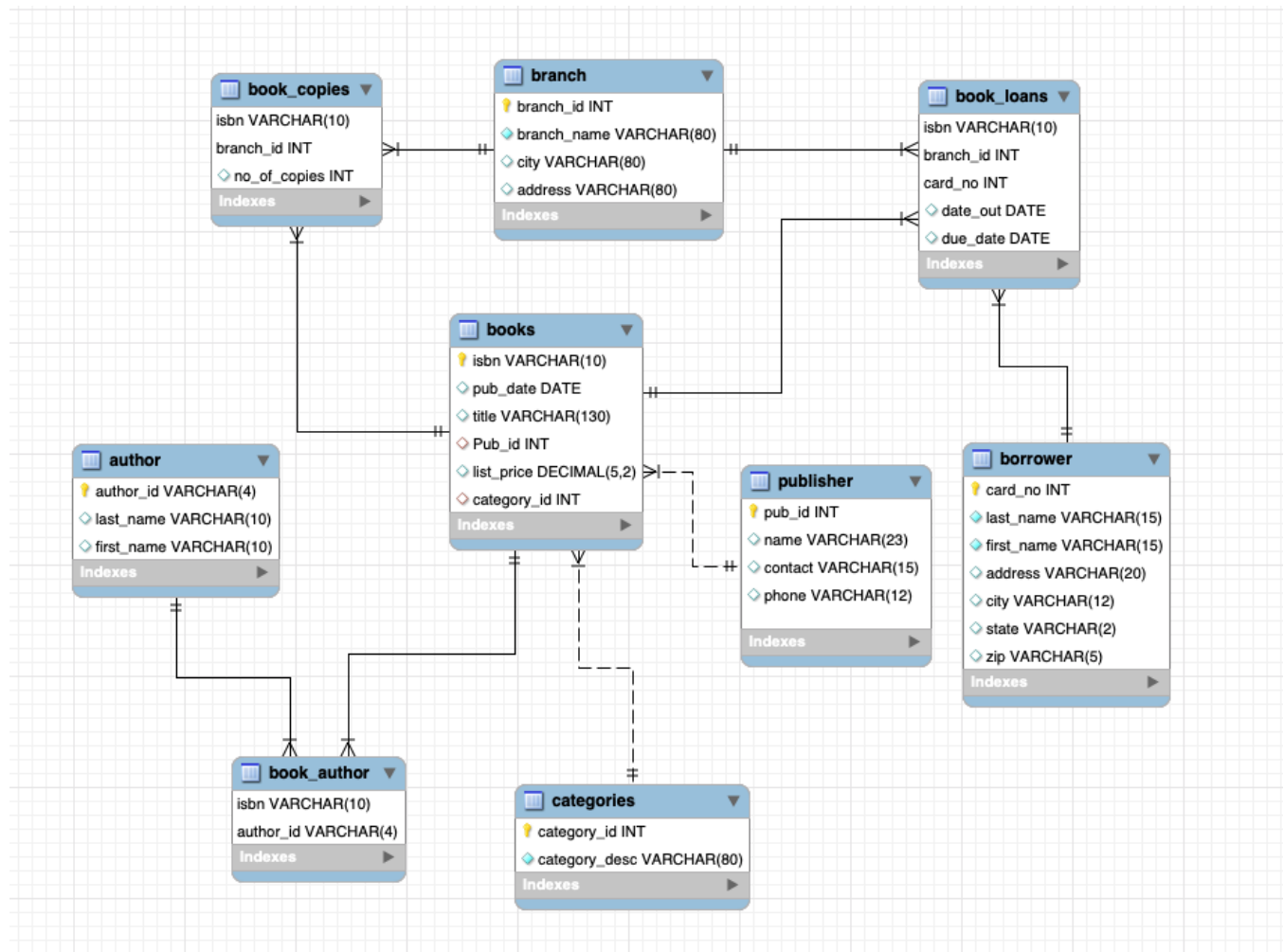
Data in the BOOK\_LOANS Table

isbn	branch_id	no_of_copies
0060959290	94567	8
0060959290	96789	3
0132149871	93456	10
0201615711	93456	11
0201615711	97891	5
0299282519	94567	8
0299282519	96789	3
0312135033	94567	5
0345298063	91234	10
0399501487	91234	10
0399501487	92345	3
0399501487	97891	4
0401140733	93456	15
0401140733	97891	5
0446310783	91234	2
0505523078	94567	5
0534368018	93456	14
0534368018	97891	15
0553577476	91234	5
0553577476	94567	3
0596000278	92345	8
0596000278	94567	9
0671032658	95678	20
0671032658	97891	10
0674003306	92345	9
0674003306	97891	5
0743215052	96789	2
0764547161	93456	12
0811826848	97891	2
0821762559	94567	5
0935112510	94567	5
0935112510	96789	4
1059831198	92345	10
1059831198	93456	5
1557044287	94567	7
1565922840	95678	20
1565922840	97891	12
1565926099	91234	2
1584500492	92345	5
1584500492	94567	3
1915762492	91234	2
1930110006	94567	9
1930110006	96789	3
1930110006	97891	2
2147428890	91234	5
2147428890	94567	3
2491748320	92345	9
2491748320	97891	4
3437212490	95678	20
3437212490	97891	10
3957136468	94567	9
3957136468	96789	3
3957136468	97891	2
4981341710	92345	8
4981341710	94567	9
8117949391	94567	5
8843172113	92345	10
8843172113	93456	5
9247381001	93456	14
9247381001	97891	15
9959789321	91234	12

Data in the BOOK\_COPIES Table

## 5. The E-R diagram

The next E-R diagram shows the relations between all the tables.



ER schema diagram for the Library Database