Team 3 Final Report

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INFO210: Database Management Systems

Library Database Management System

Project Category: Oracle Implementation

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I. Requirements Analysis

Our library DBMS system helps store all available media, tracks individuals who have borrowed items, and lists detailed information on items and the date borrowed as well as possible fines. These aspects help to create a cohesive and robust library management system. However there are some disadvantages to using our system. Some limitations of this design is that it only stores the most recent orders placed by any given student as well as the most recent fine received by any given student. This is because we implemented binary relationships for our design. Though, because it was not specified in the business rules that historical records pertaining to this information should be stored, we felt it was not necessary to include it. Further, the client specified that no two authors in their library have the same first and last name, so we designed our database around that known fact. However, if the library were to acquire more books and there comes a circumstance where two authors have the same first and last name, it will not be able to be entered into our system. This is due to our design utilizing the combination of the first and last name as the primary key distinguishing the authors apart from one another. Finally, a third limitation of our database worth mentioning is that our design has no means of accounting for physical space. In other words, it is possible that the database may be able to store more books than the physical library can. So, if the university were to try to expand their inventory, the staff would need to manually ensure that there is enough physical space in each section of the library to house the books that have been acquired.

Background and Opportunity Investigation

A library is a collection of organized information and resources which is made accessible to a well-defined community for borrowing or reference purposes. This collection is often maintained in physical format in a building or virtually – sometimes both. The resources at a Library can range from books and magazines to CD's and tapes. Moreover, a library is a complex institution that serves a great purpose to its community and houses vast amounts of knowledge that is made freely available to its patrons — for the most part. There is always the potential membership fees and fines. It often contains a large number of books that constantly need to be tracked and maintained, with items being borrowed and returned on a regular basis.

Client and Proposed Solution

Our client is a newly founded, small university. So far, the library department of this university has been keeping track of transactions manually. However, this manual process of keeping student records, book records, account details can be difficult to keep track of. There are various problems also faced by the students in the library such as finding any particular book, information whether a book is available or not, for what time this book will be available, searching for books using ISBN number etc. With a recent generous donation of books, the increased number of books in the library is making it difficult to go further with this current system, so the university has elected to switch to a digital system. For this reason, the university has hired us to create a library database management system that closely fits their current operations and policies.

We agree that this transition will be very beneficial for this institution since the main objective of library DBMS is to develop a new virtual system that will provide a solution to the manual base operations and provide the staff with a channel through which they can easily maintain records and users can access the information from wherever they are. Particularly, our library DBMS will provide a more efficient means of accounting for borrowers, dates, and fines. It will allow the user to be able to see which books are currently available in-store and which are currently checked out, as well as the expected date the book will be available again. Additionally, it will provide ease in calculating fines for overdue books depending on the book's original price. This will help in keeping the library's finances stable in its ability to replace lost/damaged books.

Intended Users

The target users for our library DBMS will be the university staff and students. so a portion of the books in the library will be college textbooks required by classes. However, our client would also like other various forms of books in the library, as well, to not limit the selection. For this reason, we decided to have our database management system not only host college textbooks but also fiction and other non-fiction genres including books pertaining but not limited to psychology, technology, and arts. Our DBMS will keep track of all the information about the books in the library, their cost, status and total number of books available at the library. The user will find this automated system marginally easier than using the manual writing

system. The implementation of this DBMS at the university will considerably reduce data entry time and provide readily calculated reports.

Data Requirements & Business Rules

A. Identified Schemas

Books (isbn, book_title, book_price, status)

Authors (auth_first, auth_last)

Locations (class_num, subclass_num)

Student_Borrowers (std_id, std_first, std_last, num_borrowed)

Orders (order_id, order_date, expiry_date)

Fines (fine_id, book_price, days_overdue, damage, amount_billed)

B. Relationships/Cardinality

a. ONE-TO-ONE

STUDENT_BORROWERS place ORDERS

b. ONE-TO-MANY

BOOKS found in LOCATIONS

BOOKS ordered by STUDENT_BORROWERS

FINES received by STUDENT_BORROWERS

c. MANY-TO-MANY

BOOKS written by AUTHORS

C. Identified Relationship Tables

Books(isbn, book_title, book_price, status, o_id, c_num, sub_num, s_id)

Written_By(a_first, a_last, isbn)

Orders_Place(order_id ,order_date, expiry_date, s_id)

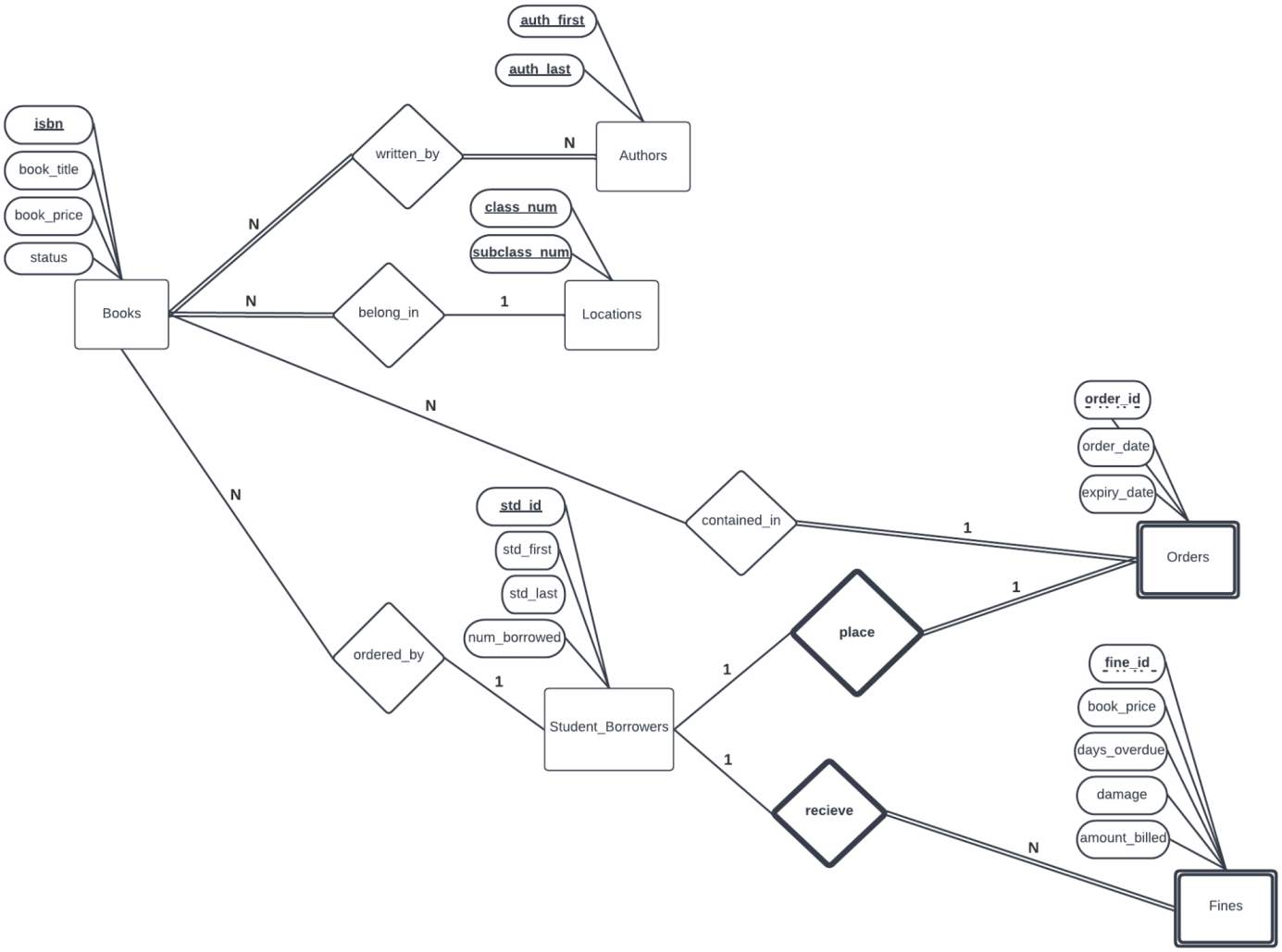
Fines_Recieve(fine_id, fstd_id, book_price, days_overdue, damage, amount_billed)

D. Business Rules to Hold

1. No two books' ISBNs are the same. Each book is written by at least one author. Each author writes at least one book, and no two authors have the same first name and last name combination.
2. Each location is uniquely identified by the main class number and subclass number combination, and one location in the library can contain many books. Logically, each book has exactly one correct location in the library. (look for at least and exactly and at most)
3. No two students have the same student ID. Each student can have up to one order placed at a time, and each order belongs to exactly one student. No two orders have the same order ID. An order can contain a minimum of one book and a maximum of ten books. Realistically, a book can be included in one order at most at any given time.
4. The library has a strict policy stating that all books in any one order must be checked out at the same time, in one transaction. Likewise, all the books in that same order must be returned in one transaction, at the same time. In other words, the individual is not allowed to return a portion of the order, but must return the whole order. If the book's status is “checked-out” for more than 14 days, the book is considered overdue and the borrower will receive one fine for every book contained in their overdue order. No two fines have the same fine ID, and each fine belongs to exactly one student.
5. The amount billed for each fine is 5% of the book’s price multiplied by each day the book is overdue. The maximum fine amount is 110% of the book’s price. If a book is returned damaged, the student will be charged a flat rate of 110% of the book’s price to cover any additional costs the library incurs for having to order a replacement. Books can be renewed, which changes the expiry date to 14 days after the book was renewed

II. Conceptual Design

A. Entity-Relation Diagram



B. Explanation of Relationships

The main entity sets in our ERD are:

- Books
- Authors
- Locations
- Student Borrowers
- Orders
- Fines

The most important entity set in our library is **Books**. Each book in the library has an international standard book number (ISBN), a title, a price, and a status discerning if it has been checked out. Books are written by **Authors**. They are described by a first name and a last name. Books can be written by multiple authors, and authors can write multiple books. This is represented by our many-to-many relationship. Authors must have written a book to be an author, and books need to have authors to exist. This is represented by the participation constraints on Books and Authors.

A book may be checked out by a **Student Borrower**. Borrowers within the library database are either borrowing books currently, or have borrowed books in the past. A student borrower is described by their student ID, first name, last name, and the number of books they have borrowed in their current active order, if any. Student Borrowers can borrow multiple books, but each book can only be borrowed by one Student Borrower. This is represented by our key constraint on Student Borrowers as a many-to-one relationship.

To borrow books, student borrowers will need to place **Orders**. There will be a separate entity set for orders that will keep track of these transactions. When a student borrower has an order associated with him/her, it will be described by an order ID, an order date, and an expiry date. Orders can contain multiple books, but a book cannot be in multiple orders. This is represented by the key constraint on Orders in the relationship between Orders and Books. Orders also need to contain books to exist, which is presented by the participation constraint on Orders. Orders can only be placed by one student borrower, and an order cannot have multiple student borrowers. This is represented by the key constraints on both Orders, and Student_Borrowers as a one-to-one relationship. Orders also need to have been placed by a student borrower to exist, which is represented by the participation constraint on Orders.

Naturally, a student borrower may receive a fine if the borrowed books are not returned within two weeks after the date they borrowed them. **Fines** are described by a fine ID, the full price of the book the fine is associated with, the number of days overdue, whether the book was damaged, and the amount billed to the student. If a student no longer exists in the database, then the information about both the student's fines and orders does not need to be stored. Hence, the Fines and Orders entity sets are **weak** ones. Student borrowers can have multiple fines, but fines cannot have multiple student borrowers. This is represented by the key constraint on Fines. Fines

cannot exist without student borrowers, which is represented by the participation constraint on Fines.

As for the **Locations** of the books, the library sections are organized by the universal Dewey Decimal Classification so that each book can be physically located in the library. There is a designated section in the library for each main genre, and within that section each genre is organized by its more specific subgenres. To model this, the location of books will be its own entity set with each location being described by a class number (representing the genre) and a subclass number (representing the sub-genre) (see appendix on page __). A location can have multiple books, but a book cannot have multiple locations. This is represented by the key constraint on Locations. Locations need to have books to exist, which is represented by the participation constraint on Books.

III. Logical Design

In our relational translation it was important to properly translate the Books entity set and its various relationships, because it connects to many other entity sets and relationships. We decided to create a combined table with the Books entity set, belong_in relationship, contained_in relationship, and ordered_by relationship. We named this table Books for simplicity and ease of understanding, but it contains those other relationships. This was done because there are many key constraints put onto the Books entity set with many of its relationships. There is a key constraint on Books with its relationship to Locations, Orders, and Student_Borrowers. By including these relationships in one table we are able to satisfy all of those key constraints.

In our translation of the relationship between Authors and Books, we decided to create Authors as a separate table, and written_by as a separate table as well. The table written_by will have the primary key from Books isbn, and the composite primary key auth_first and auth_last as foreign keys. This will create a three attribute composite key of isbn, auth_first, and auth_last (PRIMARY KEY (a_first, a_last, isbn)). This will represent the many-to-many relationship between Authors and Books. We will not be able to model the participation constraints on both Books and Authors in that relationship due to creating separate tables for written_by and Authors. While ideally we would like to represent them both, representing the many-to-many

relationship was more important for our systems functionality compared to the participation constraints.

To represent the participation constraint on Books in its relationship with locations, we included belong_in with Books by taking the primary keys of Locations as foreign keys in Books.

```
FOREIGN KEY (c_num) REFERENCES Locations(class_num),
FOREIGN KEY (sub_num) REFERENCES Locations(subclass_num),
```

And we also set both of these attributes as NOT NULL to represent the participation constraint.

```
c_num number NOT NULL,
sub_num number NOT NULL,
```

For the relationship between Student_Borrowers and Orders, we decide to create Student_Borrowers as a separate table. For Orders we created a combined table with the Orders entity set and the place relationship as Orders_place. To represent the key constraint on Orders, we set the primary key to order_id (order_id number PRIMARY KEY,). To represent both the key constraint on Student_Borrowers, and the participation constraint on Orders we include std_id as a foreign key, and set it as UNIQUE and NOT NULL.

```
s_id number UNIQUE NOT NULL,
FOREIGN KEY (s_id) REFERENCES Student_Borrowers(std_id)
```

Due to this and the configuration of the Books table, we are unable to represent the participation constraint on Orders in its relationship with Books. While we would have liked to represent both, the key constraint on Books, as well as the ability to model the constraints with Student_Borrowers and Orders was more important to our overall functionality.

To model the relationship between Student_Borrowers and Fines, we decide to combine Fines and received into one table as Fines_Recieve. To model the key constraint on Fines we set fine_id as the primary key of Fines_Recieve. To model the participation constraint on Fines we include std_id as a foreign key and set it as NOT NULL.

```
std_id number NOT NULL,
FOREIGN KEY (fstd_id) REFERENCES Student_Borrowers(std_id)
```

With this relational translation, we were able to successfully model the business rules displayed on our ER diagram as tables and statements in SQL.

IV. Populating Data, Modifying Statements, and Queries

All data for the tables are loaded using INSERT statements in the .sql file. In the comments of the .sql file, we have provided further comprehensive explanations for the queries and modifications of data and schema following this initial population of the tables. In summary, the entire .sql file should be able to be executed with no issues, including the queries and most of the modifying statements. However, because we wanted the queries to be able to be run on the original data before it is modified for the sake of simplicity, we decided to comment out certain sql statements that would modify the table schema. These statements include those related to altering table names, renaming columns, and dropping tables and columns.

All of these sections that have been commented out have also been specified in the .sql file comments and are intended so that they can be uncommented and executed if need be. In addition, all our modifying statements already output the data/schema so that the user can easily see the changes that have been made.

Appendix

A. Screenshot of Tables

Books Table:

```
SQL> SELECT * FROM Books;

ISBN          BOOK_TITLE                                              BOOK_PRICE STATUS    O_ID C_NUM SUB_NUM    S_ID
------------- ------------------------------------------------------- ---------- ------ ------- ----- ------- -------
9781400032051 1491: New Revelations of the Americas Before Columbus        16.34 in                9       70
9780380001224 84, Charing Cross Road                                      13.49 in                8       16
9780241451939 A Short History of Nearly Everything                        20.49 in                5        0
9780812979329 Behind the Beautiful Forevers: Life, Death, and Hope in     10.44 out     555444     3        5   71732
               a Mumbai Undercity

9780385526265 Destiny of the Republic: A Tale of Madness, Medicine, a     18.99 out     555444     9       73   71732
              nd the Murder of a President

9780552554565 Eragon                                                      14.69 in                8       13
9780385611749 Eragon: Eldest                                              15.70 in                8       13
9780143117285 Farm City: The Education of an Urban Farmer                  4.97 in                6       30
9780060974060 Friday Night Lights: A Town, A Team, and A Dream            19.47 out     547635     7       96   32456
9780062873743 Just Kids                                                    8.88 in                7       82
9787559841315 Never Cry Wolf                                              10.49 in                5       99
9780307352156 Quiet: The Power of Introverts in a World that Cant Sto     18.47 out     764535     1       55   57485
              p Talking

9780393881721 Stiff: The Curious Lives of Human Cadavers                  13.89 in                6       11
9781955423397 The Power of Habit                                          13.12 out     132456     1       58   25136
9780060839789 The Professor and the Madman: A Tale of Murder, Insanit     11.49 in                4       23
              y, and the Making of the Oxford English Dictionary

9780446583787 The Reading Promise: My Father and the Books we Shared       7.82 in                0       28
9780307455772 The Righeous Mind: Why Good People are Divided by Polit     20.49 out     637345     2        1   21345
              ics and Religion

9798809159685 Thinking, Fast and Slow                                     11.29 in                1       53
9780965778404 Under the Banner of Heaven: A Story of Violent Faith         9.60 in                2       89
9780316143479 When you are Engulfed in Flames                             21.76 in                8       14
9780439023481 The Hunger Games                                             8.98 out     768452     8       13   87463
9780439023498 Catching Fire                                                4.86 in                8       13
9780545663267 Mocking Jay                                                  4.87 in                8       13
9781338635171 The Ballad of Songbirds and Snakes                           9.15 out     312515     8       13   68406
9780385742528 Unbroken                                                     5.62 out     546735     9       40   58397
9780739323595 The Devil in the White City: Murder, Magic, and Madness      9.50 in                3       64
               at the Fair That Changed America

9780375727207 The Fabric of the Cosmos: Space, Time, and the Texture       7.69 out     482641     5       23   92658
              of Reality

9780594871118 The Guns at Last Light: The War in Western Europe, 1944      8.00 in                9       40
              -1945

9781400096237 The Information: A History, A Theory, A Flood               12.39 in                0       20
9780143038580 The Omnivore???s Dilemma: A Natural History of Four Mea     13.88 in                3       94
              ls


30 rows selected.
```

Written_By Table:

```
SQL> SELECT * FROM Written_By;

A_FIRST         A_LAST          B_ISBN
--------------- --------------- -----------------
Alice           Ozma            9780446583787
Bill            Bryson          9780241451939
Brian           Greene          9780375727207
Buzz            Bissinger       9780060974060
Charles         Duhigg          9781955423397
Charles         Mann            9781400032051
Daniel          Kahneman        9798809159685
David           Sedaris         9780316143479
Erik            Larson          9780739323595
Farley          Mowat           9787559841315
Helene          Hanff           9780380001224
James           Gleick          9781400096237
Jon             Krakauer        9780965778404
Jonathan        Haidt           9780307455772
Katherine       Boo             9780143117285
Laura           Hillenbrand     9780385742528
Mary            Roach           9780393881721
Michael         Polla           9780143038580
Novella         Carpenter       9780812979329
Patti           Smith           9780062873743
Rick            Atkinson        9780594871118
Simon           Winchester      9780060839789
Susan           Cain            9780307352156
Suzanne         Collins         9780439023481
Suzanne         Collins         9780439023498
Suzanne         Collins         9780545663267
Suzanne         Collins         9781338635171

27 rows selected.
```

Authors Table:

```
SQL> SELECT * FROM Authors;

AUTH_FIRST      AUTH_LAST
--------------- ---------------
Alice           Ozma
Bill            Bryson
Brian           Greene
Buzz            Bissinger
Candice         Millard
Charles         Duhigg
Charles         Mann
Christopher     Paloni
Daniel          Kahneman
David           Sedaris
Erik            Larson
Farley          Mowat
Helene          Hanff
James           Gleick
Jon             Krakauer
Jonathan        Haidt
Katherine       Boo
Laura           Hillenbrand
Mary            Roach
Michael         Polla
Novella         Carpenter
Patti           Smith
Rick            Atkinson
Simon           Winchester
Susan           Cain
Suzanne         Collins

26 rows selected.
```

Locations Table:

```
SQL> SELECT * FROM Locations;

 CLASS_NUM SUBCLASS_NUM
---------- ------------
         0           20
         0           28
         1           53
         1           55
         1           58
         2            1
         2           89
         3            5
         3           64
         3           94
         4           23
         5            0
         5           23
         5           99
         6           11
         6           30
         7           82
         7           96
         8           13
         8           14
         8           16
         9           40
         9           70
         9           73

24 rows selected.
```

Student_Borrowers Table

```
SQL> SELECT * FROM Student_Borrowers;

  STD_ID STD_FIRST  STD_LAST   NUM_BORROWED
-------- ---------- ---------- ------------
   12345 Greg       Heffley               1
   32456 John       Smith                 3
   45634 Lauren     Cohen                 2
   64956 Daniel     Klein                 1
   57485 Pete       Jenning               2
   25136 Hayley     Williams              1
   19034 Wendy      Scott                 3
   74535 Emil       Sigh                  1
   90324 Ash        Foster                2
   21345 Aron       Tong                  1
   58397 Ross       Mcalister             1
   25634 Brian      Larson                2
   68406 Jake       Green                 1
   87463 Tim        Chapel                1
   92658 Jimothy    James                 1
   71732 Greg       Oden                  2

16 rows selected.
```

Orders_Place Table:

```
SQL> SELECT * FROM Orders_Place;

 ORDER_ID ORDER_DATE EXPIRY_DATE    S_ID
--------- ---------- ----------- -------
   432532 02-FEB-22  23-FEB-22     12345
   547635 08-MAR-22  29-MAR-22     32456
   557843 21-JUN-22  12-JUL-22     45634
   673842 01-JAN-22  09-FEB-22     64956
   764535 04-MAR-22  25-MAR-22     57485
   132456 12-MAR-22  02-APR-22     25136
   673435 17-JAN-22  07-FEB-22     19034
   896744 02-MAY-22  23-MAY-22     74535
   568363 01-FEB-22  22-FEB-22     90324
   637345 23-APR-22  14-MAY-22     21345
   546735 13-JUN-22  04-JUL-22     58397
   357134 10-MAY-22  31-MAY-22     25634
   312515 25-MAR-22  14-APR-22     68406
   768452 01-JAN-22  22-JAN-22     87463
   482641 09-MAR-22  30-MAR-22     92658
   555444 03-MAR-22  24-MAR-22     71732

16 rows selected.
```

Fines_Recieve Table:

```
SQL> SELECT * FROM Fines_Recieve;

   FINE_ID   FSTD_ID BOOK_PRICE DAYS_OVERDUE DAMAGE AMOUNT_BILLED
---------- ---------- ---------- ------------ ------ -------------
   4738579      12345      13.49            3 N                2.02
   5869305      32456      14.69            0 Y               16.16
   6758495      45634      10.49            4 N                 .00
   5624123      57485      12.39            0 N                 .00
   3617230      74535      13.12            3 Y               14.43
   9172323      57485      20.49            2 N                2.05

6 rows selected.
```

B. Queries

--Q1: List full names of all Student Borrowers.

```
SELECT std_first, std_last
  2  FROM  Student_Borrowers;

STD_FIRST  STD_LAST
---------- ----------
Greg       Heffley
John       Smith
Lauren     Cohen
Daniel     Klein
Pete       Jenning
Hayley     Williams
Wendy      Scott
Emil       Sigh
Ash        Foster
Aron       Tong
Ross       Mcalister
Brian      Larson
Jake       Green
Tim        Chapel
Jimothy    James
Greg       Oden

16 rows selected.
```

--Q2: List full names of Students and the books they borrowed.

```
FROM Student_Borrowers, Books
  2    3  WHERE Books.s_id=Student_borrowers.std_id;

STD_FIRST  STD_LAST   BOOK_TITLE
---------- ---------- ------------------------------------------------------
Greg       Oden       Behind the Beautiful Forevers: Life, Death, and Hope in
                       a Mumbai Undercity

Greg       Oden       Destiny of the Republic: A Tale of Madness, Medicine, a
                      nd the Murder of a President

Emil       Sigh       Farm City: The Education of an Urban Farmer
John       Smith      Friday Night Lights: A Town, A Team, and A Dream
Pete       Jenning    Quiet: The Power of Introverts in a World that Cant Sto
                      p Talking

Hayley     Williams   The Power of Habit
Aron       Tong       The Righeous Mind: Why Good People are Divided by Polit
                      ics and Religion

Tim        Chapel     The Hunger Games
Jake       Green      The Ballad of Songbirds and Snakes
Ross       Mcalister  Unbroken
Jimothy    James      The Fabric of the Cosmos: Space, Time, and the Texture
                      of Reality


11 rows selected.
```

--Q3: List the names of books and who borrowed them that have been borrowed by students in which the books are worth more than $10.

```
SELECT Books.book_title, Student_Borrowers.std_first, Student_Borrowers.std_last, Books.book_pr
FROM Books, Student_Borrowers
  3  WHERE Books.s_id=Student_Borrowers.std_id
  4  AND Books.book_price>10;

BOOK_TITLE                                          STD_FIRST  STD_LAST   BOOK_PRICE
--------------------------------------------------- ---------- ---------- ----------
Behind the Beautiful Forevers: Life, Death, and Hope in Greg       Oden           10.44
 a Mumbai Undercity

Destiny of the Republic: A Tale of Madness, Medicine, a Greg       Oden           18.99
nd the Murder of a President

Friday Night Lights: A Town, A Team, and A Dream       John       Smith          19.47
Quiet: The Power of Introverts in a World that Cant Sto Pete       Jenning        18.47
p Talking

The Power of Habit                                     Hayley     Williams       13.12
The Righeous Mind: Why Good People are Divided by Polit Aron       Tong           20.49
ics and Religion


6 rows selected.
```

--Q4: List the average price of books borrowed by students with first name Greg.

```
SELECT AVG(Books.book_price)
FROM Books, Student_Borrowers
WHERE Books.s_id=Student_Borrowers.std_id
  4  AND Student_borrowers.std_first='Greg';

AVG(BOOKS.BOOK_PRICE)
---------------------
               14.715

SQL>
```

--Q5: List all book names and prices by price ascending with a tiebreaker of ISBN.

```
SELECT book_title, book_price
FROM Books
  3  ORDER BY book_price desc, ISBN;

BOOK_TITLE                                                BOOK_PRICE
--------------------------------------------------------- ----------
When you are Engulfed in Flames                                21.76
A Short History of Nearly Everything                           20.49
The Righeous Mind: Why Good People are Divided by Polit        20.49
ics and Religion

Friday Night Lights: A Town, A Team, and A Dream               19.47
Destiny of the Republic: A Tale of Madness, Medicine, a        18.99
nd the Murder of a President

Quiet: The Power of Introverts in a World that Cant Sto        18.47
p Talking
```

(Results shortened due to the table being larger than a single window. Run the included sql query if the full results are needed.)

--Q6: List all book names and prices by price ascending with a tiebreaker of ISBN of books that have been borrowed by students who have borrowed more than 1 book

```
SELECT Books.book_title, Books.book_price
FROM Books, Student_Borrowers
WHERE Books.s_id=Student_Borrowers.std_id
AND Student_Borrowers.num_borrowed>1
  5  ORDER BY book_price desc, ISBN;

BOOK_TITLE                                                BOOK_PRICE
---------------------------------------------------------- ----------
Friday Night Lights: A Town, A Team, and A Dream                19.47
Destiny of the Republic: A Tale of Madness, Medicine, a         18.99
nd the Murder of a President

Quiet: The Power of Introverts in a World that Cant Sto         18.47
p Talking

Behind the Beautiful Forevers: Life, Death, and Hope in         10.44
 a Mumbai Undercity


SQL>
```

--Q7: List book titles of books that have been borrowed by students who have a damage fine, sorted descending by that books' ISBN.

```
SQL> SELECT Books.book_title
FROM Books, Fines_Recieve, Student_Borrowers
WHERE Books.s_id=Student_Borrowers.std_id
AND Fines_Recieve.fstd_id = Student_Borrowers.std_id
AND Fines_Recieve.damage='Y'
  6  ORDER BY ISBN desc;

BOOK_TITLE
----------------------------------------------------------
Farm City: The Education of an Urban Farmer
Friday Night Lights: A Town, A Team, and A Dream

SQL>
```

--Q8: List IDs of fines and student names of students who have fines

```
SELECT Fines_Recieve.fine_id, Student_Borrowers.std_first, Student_Borrowers.std_last
FROM Fines_Recieve, Student_Borrowers
  3  WHERE Fines_Recieve.fstd_id = Student_Borrowers.std_id;

 FINE_ID STD_FIRST  STD_LAST
-------- ---------- ----------
 4738579 Greg       Heffley
 5869305 John       Smith
 6758495 Lauren     Cohen
 5624123 Pete       Jenning
 9172323 Pete       Jenning
 3617230 Emil       Sigh

6 rows selected.
```

--Q9: List average price and the Author name of books written by Authors whose first name starts with an S grouped by that books' main class number.

```
SELECT AVG(Books.book_price), Written_by.a_first, Written_by.a_last, c_num
FROM Books, Written_by
WHERE Books.ISBN=Written_by.b_isbn
AND Written_by.a_first LIKE 'S%'
  5  GROUP BY c_num, Written_by.a_first, Written_by.a_last;

AVG(BOOKS.BOOK_PRICE) A_FIRST         A_LAST          C_NUM
--------------------- --------------- --------------- -----
                18.47 Susan           Cain                1
                11.49 Simon           Winchester          4
                6.965 Suzanne         Collins             8
```

--Q10: List the maximum price of books written by Suzanne Collins

```
SELECT MAX(book_price)
FROM Books, Written_by
WHERE Books.ISBN = Written_by.b_isbn
  4  AND Written_by.a_first='Suzanne';

MAX(BOOK_PRICE)
---------------
           9.15
```

--Q11: List all books and their main and sub class that are written by Suzanne Collins OR books that are in main class 3, ordered by price descending

```
SQL> SELECT book_title, c_num, sub_num, book_price
FROM Books, Written_by
WHERE Books.isbn=Written_by.b_isbn
AND Written_by.a_first='Suzanne'
UNION
SELECT book_title, c_num, sub_num, book_price
FROM Books
WHERE Books.c_num=3
  9  ORDER BY book_price desc;

BOOK_TITLE                                                C_NUM SUB_NUM BOOK_PRICE
--------------------------------------------------------- ----- ------- ----------
The Omnivore???s Dilemma: A Natural History of Four Mea     3      94      13.88
ls

Behind the Beautiful Forevers: Life, Death, and Hope in     3       5      10.44
 a Mumbai Undercity

The Devil in the White City: Murder, Magic, and Madness     3      64       9.50
 at the Fair That Changed America

The Ballad of Songbirds and Snakes                          8      13       9.15
The Hunger Games                                            8      13       8.98
Mocking Jay                                                 8      13       4.87
Catching Fire                                               8      13       4.86
```

--Q12: List the Order ID, Student ID, and name of Book borrowed

```
SELECT order_id, Orders_Place.s_id, book_title
FROM Books, Orders_Place, Student_borrowers
WHERE Books.s_id=Student_borrowers.std_id
  4  AND Books.o_id=Orders_Place.order_id;

ORDER_ID    S_ID BOOK_TITLE
-------- ------- ------------------------------------------------------------
  547635   32456 Friday Night Lights: A Town, A Team, and A Dream
  764535   57485 Quiet: The Power of Introverts in a World that Cant Sto
                 p Talking

  132456   25136 The Power of Habit
  896744   74535 Farm City: The Education of an Urban Farmer
  637345   21345 The Righeous Mind: Why Good People are Divided by Polit
                 ics and Religion

  546735   58397 Unbroken
```

(Results shortened due to the table being larger than a single window. Run the included sql query if the full results are needed.)

--Q13: List the order dates and fines of students

```
SELECT std_first, std_last, order_date, expiry_date, amount_billed
FROM Orders_Place, Fines_Recieve, Student_Borrowers
WHERE Student_Borrowers.std_id = Orders_Place.s_id
  4  AND Student_Borrowers.std_id = Fines_Recieve.fstd_id;

STD_FIRST  STD_LAST   ORDER_DATE EXPIRY_DATE AMOUNT_BILLED
---------- ---------- ---------- ----------- -------------
Greg       Heffley    02-FEB-22  23-FEB-22           2.02
John       Smith      08-MAR-22  29-MAR-22          16.16
Lauren     Cohen      21-JUN-22  12-JUL-22            .00
Pete       Jenning    04-MAR-22  25-MAR-22            .00
Pete       Jenning    04-MAR-22  25-MAR-22           2.05
Emil       Sigh       02-MAY-22  23-MAY-22          14.43

6 rows selected.
```

Works Cited

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