Introduction to Database Systems

Group Project:Library Database

Group: 5A

Group member list:

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Introduction

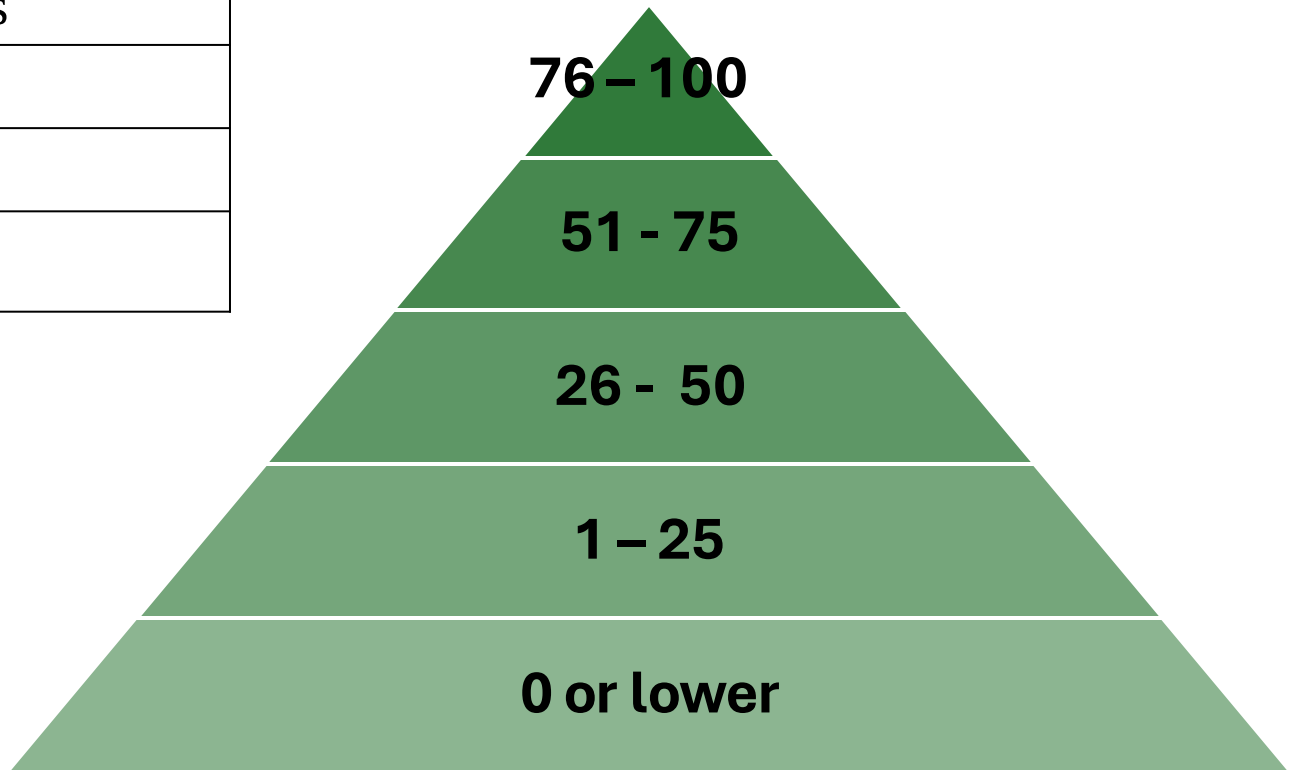
1. User requirement
2. Database model introduction
3. Table & ER Diagram
4. SQL Code & Requirement
5. Database Testing
6. Further Development
7. Conclusion

Background information

- Develop libarary system
- For student use and staff maintenance more effectively

Credits policy

Credits	Maximum borrowing numbers
76 - 100	15 book and 2 devices
51 - 75	10 book and 2 devices
26 - 50	5 book and 1 device
1 - 25	3 book and 1 device
0 or lower	0 book and device



Increase Credit

Donate $10 = 1 credit

Decrease Credit Reasons

Rules for the library (Do not break the rules, otherwise your credit will decrease)	
1. Do not damage Books and other library materials	(-5)
2. Patrons should be quiet while inside the library.	(-5)
3. Cell phones should be turned off or put in silent mode while in the library.	(-5)
4. Food and drinks are not allowed in the library.	(-5)
5. No alcoholic beverages are allowed in the library.	(-5)
6. The library's devices and internet connection should be used for educational and research purposes only.	(-5)
7. Patrons should not smoke or use tobacco products in the library.	(-5)
8. Patrons should not bring pets or animals into the library, except for service animals.	(-5)
9. Gambling is not allowed in the library.	(-5)
10. Illegal or unethical activities are not allowed in the library.	(-5)

Decrease the credit

Punishment of overdue (Do not return books late, otherwise your credit will decrease) The credits decrease will follow the equation
Credit reduced* = *Number of overdue book(s)* * Overdue *days

Punishment of device overdue (Do not owe return devices late, otherwise your credit will decrease) The credits decrease will follow the equation
Reduce credit* = *Number of devices* * Overdue *days

Our library

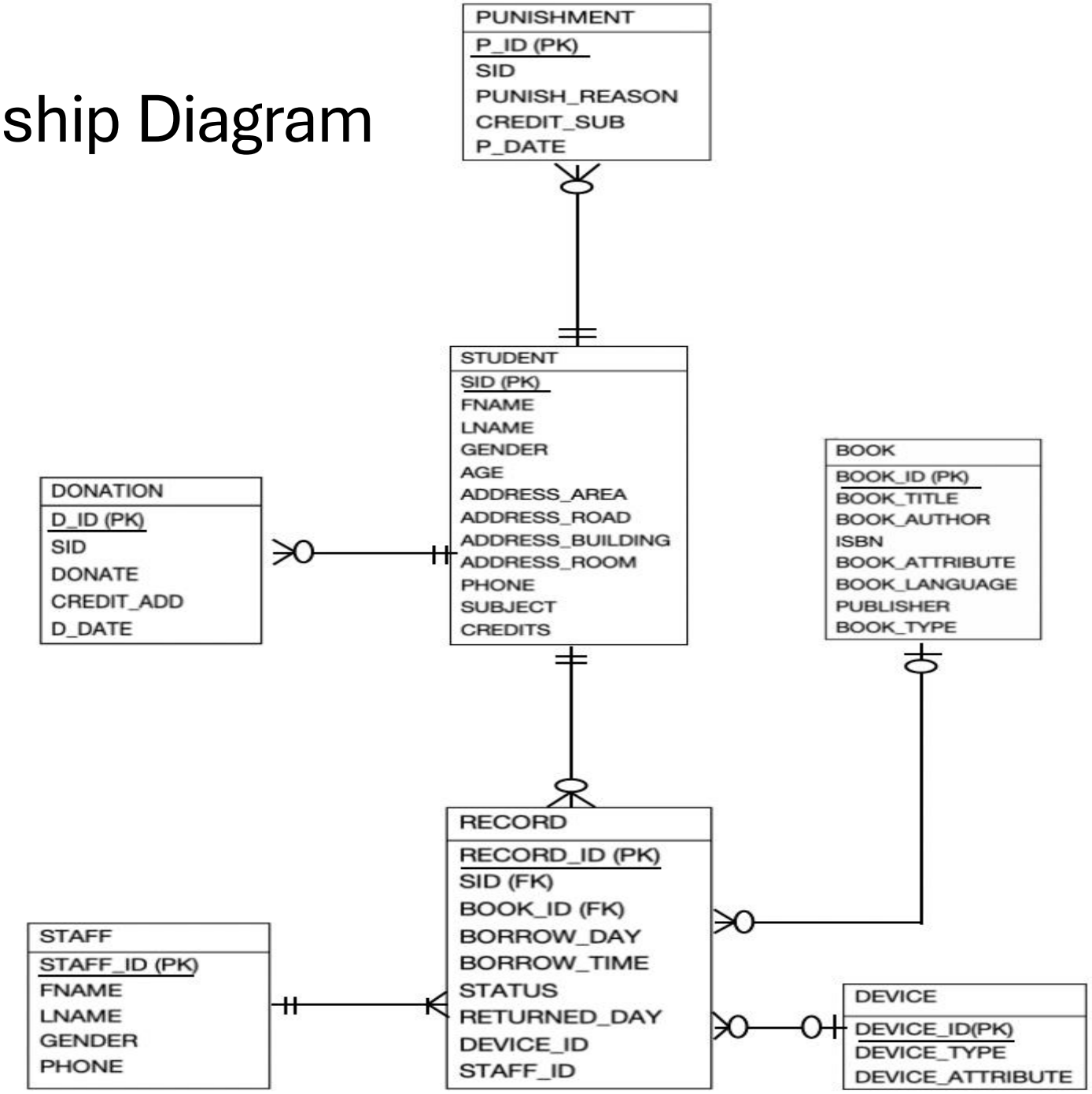
- We have 2319 Books
- We have 1000 registered students
- We have 111 records
- We have 15 devices

User Requirment

User: Student and library administer(staff)

- Book information management
- Student information management
- Device information management
- Staff information management
- Book borrowing/returning procedures
- Device borrowing/returning procedures
- Book borrowing/returning record
- Donation record (for credit increasing)
- Punishment record (for student’s credit decreasing)

Entity Relationship Diagram



Database Model

Seven tables

- RECORD
- STUDENT
- BOOK
- DEVICE
- STAFF
- DONATION
- PUNISHMENT

Data to be computed

Table: RECORD
Code and result

```
UPDATE RECORD
SET STATUS = 'RETURNED'
WHERE ((JulianDay(RETURNED_DAY)-JulianDay(BORROW_DAY)) <= 14);

UPDATE RECORD
SET STATUS = 'LATE'
WHERE ((JulianDay(RETURNED_DAY)-JulianDay(BORROW_DAY)) > 14);

UPDATE RECORD
SET STATUS = 'BORROW'
WHERE RETURNED_DAY IS NULL;
```

	RECORD_	SID	BOOK_ID	BORROW_	BORROW_	STATUS	RETURNE	DEVICE_I	STAFF_ID
1	1	10220004	10000	2024/1/1	12:00:00	RETURNED	2024/1/15	NULL	20207461
2	2	10220005	10001	2024/1/2	13:00:00	BORROW	NULL	NULL	20207461
3	3	10220006	10002	2024/1/3	14:00:00	RETURNED	2024/1/15	NULL	20207461
4	4	10220007	10003	2024/1/4	15:00:00	BORROW	NULL	NULL	20207461
5	5	10220008	10004	2024/1/5	16:00:00	RETURNED	2024/1/15	NULL	20207461
6	6	10220009	10005	2024/1/6	17:00:00	BORROW	NULL	NULL	20207461
7	7	10220010	10006	2024/1/7	18:00:00	LATE	2024/1/27	NULL	20207461
8	8	10220011	10007	2024/1/8	19:00:00	BORROW	NULL	NULL	20207461
9	9	10220012	10008	2024/1/9	20:00:00	RETURNED	2024/1/15	NULL	20207461
10	10	10220013	10009	2024/1/16	21:00:00	RETURNED	2024/1/17	NULL	20207461

Data to be computed

Table: DONATION
Code and result

```
UPDATE DONATION
SET CREDIT_ADD = DONATE/10
```

	D_ID	SID	DONATE	CREDIT_ADD	D_DATE
1	1	10220001	800	80	2024/1/1
2	2	10220002	800	80	2024/1/2
3	3	10220003	800	80	2024/1/3
4	4	10220004	800	80	2024/1/4
5	5	10220005	800	80	2024/1/5

Table - RECORD

Library_Syste Table name: RECORD WITHOUT ROWID STRICT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	Default value
1	RECORD_ID	INTEGER								NULL
2	SID	INTEGER								NULL
3	BOOK_ID	INTEGER								NULL
4	BORROW_DAY	TEXT								NULL
5	BORROW_TIME	TEXT								NULL
6	STATUS	TEXT								NULL
7	RETURNED_DAY	TEXT								NULL
8	DEVICE_ID	INTEGER								NULL
9	STAFF_ID	INTEGER								NULL

Table - STUDENT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	
1	FNAME	TEXT								NULL
2	LNAME	TEXT								NULL
3	SID	INTEGER								NULL
4	GENDER	TEXT								NULL
5	AGE	INTEGER								NULL
6	ADDRESS_AREA	TEXT								NULL
7	ADDRESS_ROAD	TEXT								NULL
8	ADDRESS_BUILDING	TEXT								NULL
9	ADDRESS_ROOM	TEXT								NULL
10	PHONE	INTEGER								NULL
11	SUBJECT	TEXT								NULL
12	CREDITS	INTEGER								NULL

Table - BOOK

Library_Syste | Table name: BOOK | WITHOUT ROWID | STRICT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	
1	BOOK_ID	INTEGER	🔑							NULL
2	BOOK_TITLE	TEXT								NULL
3	BOOK_AUTHOR	TEXT								NULL
4	ISBN	INTEGER								NULL
5	BOOK_ATTRIBUTE	TEXT								NULL
6	BOOK_LANGUAGE	TEXT								NULL
7	PUBLISHER	TEXT								NULL
8	BOOK_TYPE	TEXT								NULL

Table - DEVICE

Library_Syste Table name: DEVICE WITHOUT ROWID STRICT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	Default value
1	DEVICE_ID	TEXT								NULL
2	DEVICE_TYPE	TEXT								NULL
3	DEVICE_ATTRIBUTE	TEXT								NULL

Table - STAFF

Library_Syste Table name: STAFF WITHOUT ROWID STRICT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	
1	STAFF_ID	INTEGER								NULL
2	FNAME	TEXT								NULL
3	LNAME	TEXT								NULL
4	GENDER	TEXT								NULL
5	PHONE	INTEGER								NULL

Table - DONATION

Library_Syste Table name: DONATION WITHOUT ROWID STRICT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	
1	D_ID	INTEGER								NULL
2	SID	INTEGER								NULL
3	DONATE	NUMERIC								NULL
4	CREDIT_ADD	INTEGER								NULL
5	D_DATE	DATE								NULL

Table - PUNISHMENT

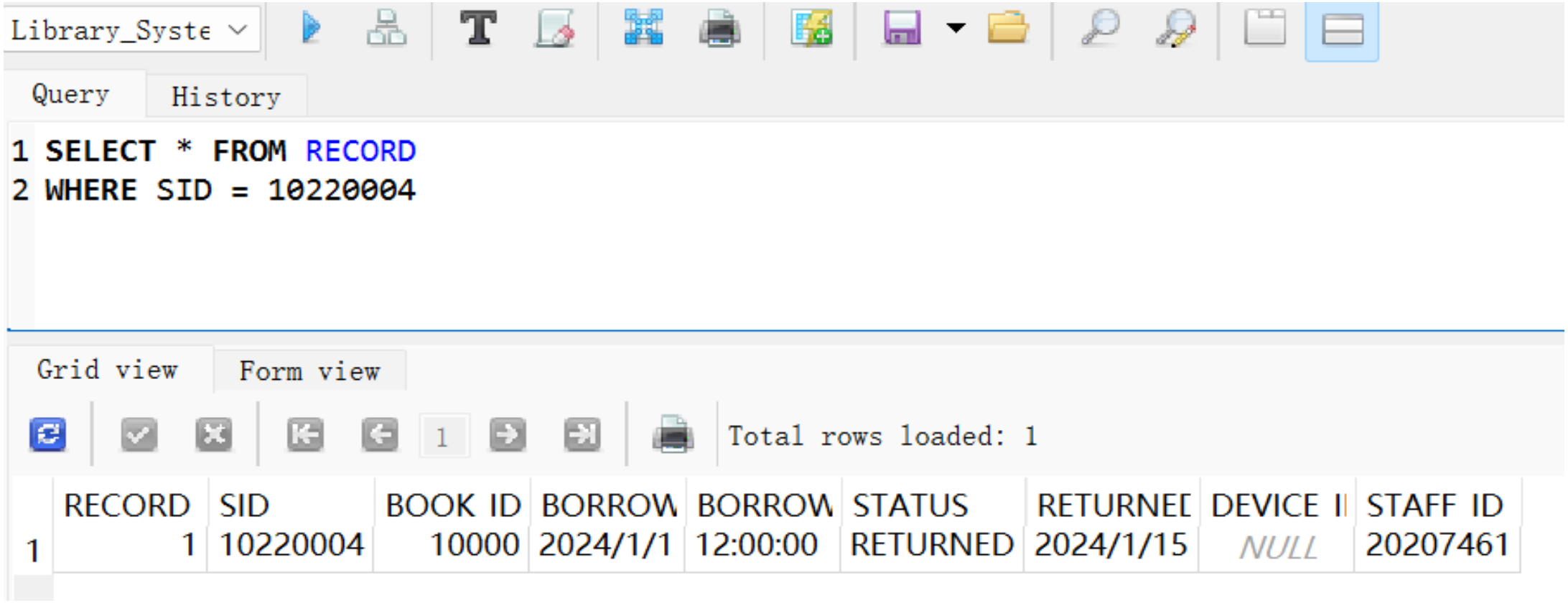
Library_Syste | Table name: PUNISHMENT | WITHOUT ROWID | STRICT

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate	Generated	Default value
1	P_ID	INTEGER								NULL
2	SID	INTEGER								NULL
3	PUNISH_REASON	TEXT								NULL
4	CREDIT_SUB	INTEGER								NULL
5	P_DATE									NULL

SQL Code List

For Students	For administers
1. Check student own record (For RECORD table)	8. Check student late returned record/ borrowing record/ returned record (For advanced checking of RECORD table)
2. Check book available or not (For BOOK table)	9. Check the quantity of book in the library (in different type) (For advanced checking of BOOK table)
3. Check self-information (For STUDENT table)	10. Find the favorite book type in the library (in gender/ age) (For advanced checking of BOOK table + Link with the STUDENT / RECORD table)
4. Check donate record (For DONATION table)	11. how many students always borrow the book/device (For advanced checking of STUDENT table)
5. Check punishment record (For PUNISHMENT table)	12. Who is the most hardworking staff (For STAFF table)
6. Check device available or not (For DEVICE table)	
7. Check the book information (For BOOK table)	

1. Check student own record (For RECORD table)



2. Check book available or not (For BOOK table)

Query History

```
1 SELECT BOOK_ID,BOOK_TITLE,BOOK_ATTRIBUTE
2 FROM BOOK
3 WHERE BOOK_ATTRIBUTE ='Available'
```

Grid view Form view

1 Total rows loaded: 2258

	BOOK ID	BOOK TITLE	BOOK ATTRIBU
1	10000	Android+移动开发一本就够.pdf	Available
2	10002	Android应用开发入门教程(经典版).pdf	Available
3	10004	Android应用开发详解.pdf	Available
4	10006	Android系统原理及开发要点详解.pdf.pdf	Available
5	10008	Android高级编程.pdf	Available
6	10009	Google Android开发入门与实战.pdf	Available
7	10016	深入理解android.pdf	Available
8	10018	apache-the-definitive-guide-3rd-edition.pdf	Available
9	10020	Hungry.Minds.Apache.Server.2.Bible.Mar.2002.ISBN.0764548212.pdf	Available
10	10022	Blender 3D Architecture,Buildings, and Scenery.2008.pdf	Available
11	10024	Blender Incredible Machines - Design, model, and texture complex mechanical objects in Blender ...	Available
12	10026	C#图解教程(第4版).pdf	Available
13	10028	Head First C#, 3rd Edition.pdf	Available
14	10029	[C#入门经典(第5版)].(美)沃森.(美)内格尔.扫描版.pdf	Available
15	10031	Adobe dreamweaver CS5中文版经典教程.pdf	Available
16	10033	[Adobe_Creative_Team]_Adobe_Muse_Classroom_in_a_Book.pdf	Available
17	10036	fllessons.zip	Available
18	10038	Packt.ActionScript.Graphing.Cookbook.Nov.2012.ISBN.184969320X.pdf	Available
19	10040	Pro Angular, 2nd Edition.pdf	Available
20	10042	The Majesty Of Vue.js.pdf	Available
21	10044	Vuejs-2-Cookbook-master.zip	Available
22	10046	Debian GNU Linux Bible(官网教材).pdf	Available
23	10048	Wireshark Network Analysis (The Official Certified Study Guide) 2Ed 2012.pdf	Available
24	10049	Wireshark 数据包分析实战（第二版）.pdf	Available
25	10051	[黑客之道：漏洞发掘的艺术].Jon.Erickson.扫描版.pdf	Available
26	10053	[黑武器：linux-BT4无线黑客].杨哲&许迅飞&陈伟.扫描版[www.ed2kers.com].pdf	Available
27	10056	新手易学-黑客攻防入门(第3版)].华诚科技.扫描.pdf	Available
28	10058	计算机网络第五版（谢希仁）.pdf	Available
29	10060	黑客攻防实战入门与提高.pdf	Available
30	10062	黑客社会工程学攻击档案袋.pdf	Available

3. Check self-information (For STUDENT table)

```
1 SELECT * FROM STUDENT WHERE SID = 10220001;
```

Grid view | Form view

Total rows loaded: 1

	LNAME	FNAME	SID	GENDER	AGE	ADDRESS AREA	ADDRESS ROAD	ADDRESS BUILDING	ADDRESS	PHONE	SUBJECT	CREDITS
1	Chan	Tai Tai	10220001	F	20	Southern District	1ST LANE KEI LUN WAI	Backingham Building金漢大廈	1000	17828755	Associate of Geography	100

4. Check student late record/ borrowing record/ returned record/ late returned record

Query History

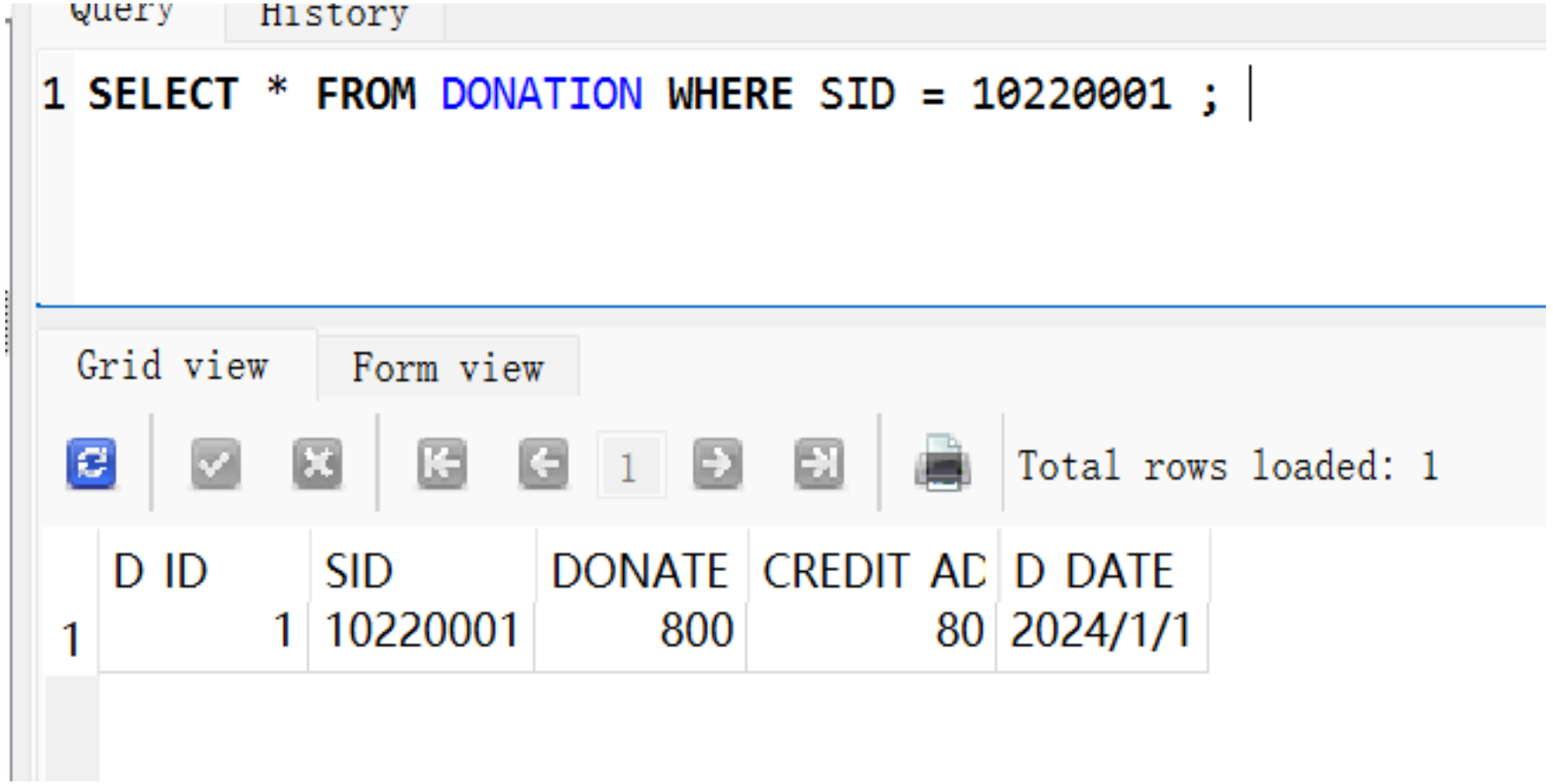
```
1 SELECT * FROM RECORD WHERE STATUS = "BORROW";
```

Grid view Form view

Total rows loaded: 54

	RECORD	SID	BOOK ID	BORROW	BORROW	STATUS	RETURNE	DEVICE I	STAFF ID
1	2	10220005	10001	2024/1/2	13:00:00	BORROW	NULL	NULL	20207461
2	4	10220007	10003	2024/1/4	15:00:00	BORROW	NULL	NULL	20207461
3	6	10220009	10005	2024/1/6	17:00:00	BORROW	NULL	NULL	20207461
4	8	10220011	10007	2024/1/8	19:00:00	BORROW	NULL	NULL	20207461
5	11	10220014	10010	2024/1/11	22:00:00	BORROW	NULL	NULL	20207461
6	13	10220016	10012	2024/1/13	0:00:00	BORROW	NULL	NULL	20207461
7	15	10220018	10014	2024/1/15	2:00:00	BORROW	NULL	NULL	20207461
8	16	10220019	10015	2024/1/16	3:00:00	BORROW	NULL	NULL	20207461
9	18	10220021	10017	2024/1/18	5:00:00	BORROW	NULL	NULL	20207461
10	20	10220023	10019	2024/1/20	7:00:00	BORROW	NULL	NULL	20207461
11	22	10220025	10021	2024/1/22	9:00:00	BORROW	NULL	NULL	20207461
12	24	10220027	10023	2024/1/24	11:00:00	BORROW	NULL	NULL	20207461
13	26	10220029	10025	2024/1/26	13:00:00	BORROW	NULL	NULL	20207461
14	28	10220031	10027	2024/1/28	15:00:00	BORROW	NULL	NULL	20207461
15	31	10220034	10030	2024/1/31	18:00:00	BORROW	NULL	NULL	20207461
16	33	10220036	10032	2024/2/2	20:00:00	BORROW	NULL	NULL	20207461

4. Check donate record



5. Check PUNISHMENT record

```
1 SELECT * FROM PUNISHMENT WHERE SID = 10220005
```

Grid view | Form view

Total rows loaded: 1

	P ID	SID	PUNISH REAS	CREDIT SU	P DATE
1	6	10220005	Owe book	61	2024/7/1

Initial setup	STUDENT: Student name, SID, Gender, Age, Address, Phone, Subject, Credits

	NAME	LNAME	SID	GENDER	AGE	ADDRESS_AREA	ADDRESS_ROAD	ADDRESS_BUILDING	ADDRESS_	PHONE	SUBJECT	CREI
1	han	Tai Tai	10220001	F	20	Southern District	1ST LANE KEI LUN WAI	Backingham Building金漢大廈	1000	17828755	Associate of Geography	
2	han	Tai Zung	10220002	F	20	Wan Chai District	2ND LANE KEI LUN WAI	Baguio Villa碧瑤灣	1001	13103385	Associate of Social Sciences	
3	han	Tai Sin	10220003	F	19	Eastern District	3RD LANE KEI LUN WAI	Banyan Garden泓景臺	1002	19760548	Higher Diploma in Dental Hygiene	
4	han	Tai Jat	10220004	F	18	Southern District	4TH LANE KEI LUN WAI	Banyan Mall泓景滙	1003	12260505	Associate of Business Administration	
5	han	Tai Ji	10220005	F	22	Yau Tsim Mong District	5TH LANE KEI LUN WAI	Banyan Villas柏蔭圍	1004	10246957	Associate of Social Sciences	
6	han	Tai Saam	10220006	F	20	Sham Shui Po District	A KUNG KOK SHAN ROAD	Bao Hua Building保華大廈	1005	17687067	Associate of Geography	
7	han	Tai Sam	10220007	F	19	Kowloon City District	A KUNG KOK STREET	Bailey Garden碧麗花園	1006	18194438	Higher Diploma in Engineering	
8	han	Tai Man	10220008	F	22	Wong Tai Sin District	A KUNG NGAM ROAD	Baily Court百利軒	1007	17463164	Higher Diploma in Architectural Studies	
9	han	Tai Tin	10220009	F	19	Kwun Tong District	A KUNG NGAM VILLAGE LANE	Baker Residences貝殼	1008	13433417	Higher Diploma in Information Security	
10	han	Tai Kowng	10220010	F	17	Tsuen Wan District	A KUNG NGAM VILLAGE ROAD	Baker View東海雅園	1009	17787542	Higher Diploma in Public Relations and Corporate Communications	
11	han	Zung Tai	10220011	M	18	Tuen Mun District	ABERDEEN MAIN ROAD	Beach Pointe海灣閣	1010	17496484	Higher Diploma in eSports	
12	han	Zung Zung	10220012	F	22	Yuen Long District	ABERDEEN PRAYA ROAD	Beacon Heights畢架山花園	1011	11573625	Higher Diploma in Data Science	
13	han	Zung Sin	10220013	F	20	North District	ABERDEEN RESERVOIR ROAD	Bel Mount Garden貝麗花園	1012	11791418	Higher Diploma in Translation and Interpretation	
14	han	Zung Jat	10220014	F	18	Tai Po District	ABERDEEN STREET	Bel Shine Centre貝晉中心	1013	19434402	Higher Diploma in Engineering	
15	han	Zung Ji	10220015	M	22	Sai Kung District	ABERDEEN TUNNEL	Bel Trade Commercial Building百貿商業大廈	1014	11766194	Higher Diploma in eSports	

BOOK: Basic information of each book

	BOOK_ID	BOOK_TITLE	BOOK_AUTH	ISBN	BOOK_AT	BOOK_LA	PUBLISHER	BOOK_TYPE
1	10000	Android+移动开发一本就够.pdf	FAANHOI	9144665…	Available	Chinese	Advance Forward Education Limited	CS
2	10001	Android4编程入门经典.pdf	FAANGEI	9004053…	Not available	English	Aristo Educational Press Ltd	CS
3	10002	Android应用开发入门教程(经典版).pdf	FAANSEUK	9743202…	Available	Chinese	Cengage Learning Hong Kong Limited	CS
4	10003	Android应用开发揭秘高清版.pdf	FAANGA	9887674…	Not available	English	Chinese Technical Press Ltd	CS
5	10004	Android应用开发详解.pdf	FAANYAT	9157027…	Available	Chinese	Chung Tai Educational Press	CS
6	10005	Android开发入门教程.pdf	FAANBAN	9018079…	Not available	English	Classroom Publications Ltd	CS
7	10006	Android系统原理及开发要点详解.pdf.pdf	FAANGEI	9694188…	Available	Chinese	Crystal Education Publications	CS
8	10007	Android编程入门很简单_王勇编著.pdf	FAANYIN	9772370…	Not available	English	Department of Electrical and Electronic Engineering, The University of Hong Kong…	CS
9	10008	Android高级编程.pdf	FAANNG…	9057076…	Available	Chinese	Educational Publishing House Ltd	CS
10	10009	Google Android开发入门与实战.pdf	FAANYU	9386978…	Available	English	Erudite Publishing House	CS
11	10010	Google.Android.SDK开发范例大全.pdf	FAANLUNG	9286810…	Not available	Chinese	Excellence Publication Company Limited	CS
12	10011	[Android.游戏开发入门]（美）Mario.Zechner.插图版.pdf	FAANFUK	9225003…	NA	English	Advance Forward Education Limited	CS
13	10012	[Android软件安全与逆向分析].丰生强.扫描版[ED2000.COM].pdf	FAANDAK	9301488…	Not available	Chinese	Aristo Educational Press Ltd	CS
14	10013	[Publish]Android程序员指南.pdf	FAANYAU	9154662…	NA	English	Cengage Learning Hong Kong Limited	CS
15	10014	《Android移动应用开发从入门到精通》.(张魏,李兵).PDF	FAANTIN	9486362…	Not available	Chinese	Chinese Technical Press Ltd	CS
16	10015	【送你书】自制编程语言.pdf	FAANGAAI	9593367…	Not available	English	Chung Tai Educational Press	CS
17	10016	深入理解android.pdf	FAANHOI	9304922…	Available	Chinese	Classroom Publications Ltd	CS
18	10017	精通Android游戏开发.pdf	FAANYIU	9253421…	Not available	English	Crystal Education Publications	CS
19	10018	apache-the-definitive-guide-3rd-edition.pdf	FAANSEUN	9758810…	Available	Chinese	Department of Electrical and Electronic Engineering, The University of Hong Kong…	CS
20	10019	httpd-docs-2.4.12.en.pdf	FAANGA	9674735…	Not available	English	Educational Publishing House Ltd	CS

DEVICE: Device ID, Type, Status

	DEVICE_ID	DEVICE_TYPE	DEVICE_ATTRIBUTE
1	1	Computer-1	Available
2	2	Computer-2	Available
3	3	Computer-3	Available
4		Computer-4	Available

Data entry by end-user

RECORD: Record ID, SID, Book ID or Device ID, 2 data 1 time, status, staff ID

	RECORD_ID	SID	BOOK_ID	BORROW_D	BORROW_T	STATUS	RETURNED	DEVICE_ID	STAFF_ID
1	1	10220004	10000	2024/1/1	12:00:00	RETURNED	2024/1/15	NULL	20207461
2	2	10220005	10001	2024/1/2	13:00:00	BORROW	NULL	NULL	20207461
3	3	10220006	10002	2024/1/3	14:00:00	RETURNED	2024/1/15	NULL	20207461
4	4	10220007	10003	2024/1/4	15:00:00	BORROW	NULL	NULL	20207461
5	5	10220008	10004	2024/1/5	16:00:00	RETURNED	2024/1/15	NULL	20207461
6	6	10220009	10005	2024/1/6	17:00:00	BORROW	NULL	NULL	20207461
7	7	10220010	10006	2024/1/7	18:00:00	LATE	2024/1/27	NULL	20207461
8	8	10220011	10007	2024/1/8	19:00:00	BORROW	NULL	NULL	20207461
9	9	10220012	10008	2024/1/9	20:00:00	RETURNED	2024/1/15	NULL	20207461
10	10	10220013	10009	2024/1/16	21:00:00	RETURNED	2024/1/17	NULL	20207461

DONATION: Donate ID, SID, Donate, Credit add, Donate data

	D_ID	SID	DONATE	CREDIT_ADD	D_DATE
1	1	10220001	$800	80	2024/1/1
2	2	10220002	$800	80	2024/1/2
3	3	10220003	$800	80	2024/1/3
4	4	10220004	$800	80	2024/1/4
5	5	10220005	$800	80	2024/1/5

PUNISHMENT: Punishment ID, SID, Reason, Credit subtract, Punishment data

	P_ID	SID	PUNISH_REASON	CREDIT_SUB	P_DATE
1	1	10220006	Break rule1	5	2024/1/1
2	2	10220007	Break rule2	5	2024/1/2
3	3	10220008	Break rule3	5	2024/1/3
4	4	10220009	Break rule4	5	2024/1/4
5	5	10220010	Owe book	20	2024/1/26
6	6	10220005	Owe book	61	2024/7/1
7	7	10220007	Owe book	123	2024/9/1

Data to be computed	RECODE: STATUS The following SQL updates the STATUS: UPDATE RECORD SET STATUS = 'RETURNED' WHERE ((JulianDay(RETURNED_DAY)-JulianDay(BORROW_DAY)) < 14); UPDATE RECORD SET STATUS = 'LATE' WHERE ((JulianDay(RETURNED_DAY)-JulianDay(BORROW_DAY)) > 14); UPDATE RECORD SET STATUS = 'BORROW' WHERE RETURNED_DAY IS NULL; Sample results:

	RECORD_ID	SID	BOOK_ID	BORROW_D	BORROW_T	STATUS	RETURNED	DEVICE_ID	STAFF_ID
1	1	10220004	10000	2024/1/1	12:00:00	RETURNED	2024/1/15	NULL	20207461
2	2	10220005	10001	2024/1/2	13:00:00	BORROW	NULL	NULL	20207461
3	3	10220006	10002	2024/1/3	14:00:00	RETURNED	2024/1/15	NULL	20207461
4	4	10220007	10003	2024/1/4	15:00:00	BORROW	NULL	NULL	20207461
5	5	10220008	10004	2024/1/5	16:00:00	RETURNED	2024/1/15	NULL	20207461
6	6	10220009	10005	2024/1/6	17:00:00	BORROW	NULL	NULL	20207461
7	7	10220010	10006	2024/1/7	18:00:00	LATE	2024/1/27	NULL	20207461
8	8	10220011	10007	2024/1/8	19:00:00	BORROW	NULL	NULL	20207461
9	9	10220012	10008	2024/1/9	20:00:00	RETURNED	2024/1/15	NULL	20207461

Database Testing

- Database testing
  - Tested retreival of different types of data
  - Data included in database refelcts normal user data input and usage
- Tested muitiple entries and data retrive request
- Data and sql code works in situations defined
- Results are consistant with the expected outcome

Further Development

- As for our further development plan, we considered adding some new things which are……
- **Library Activity**

  - Student can join the library activity to increase their library's credit

  - Let the library staff have more work to do, utilizing the library human resource appropriately
- **Advanced User service supporting (VIP)**

  - Provided a better reading environment (e.g. VIP Reading Room/ Afternoon tea provided)

  - Book Recommending (each week)

  - Borrowing more book without the credit limit

  - Book reservation

  - Provided the electric book resource
- **Journal service supported**

  - Provided journal article (e.g. Science & Nature)

  - Provided article repeated content checking service

Conclusion

After the quality testing, no errors appeared in the database. Also, the database design fulfilled the basic demands of students and library administrators. We evaluated that this database can be used in real-life situations.

In the future, we also hope to add more functions and different content according to the above plan, to enhance our service and database efficiency. We believe that our library database can acquire a good performance in daily life.

Question1

The STUDENT table has CREDITS attribute while the DONATION table and PUNISHMENT table have CREDIT_ADD and CREDIT_SUB attributes. Explain how to ensure the accuracy of the CREDITS for each STUDENT.

For this question, we have two methods,

1. Prevention Method
2. Checking Method

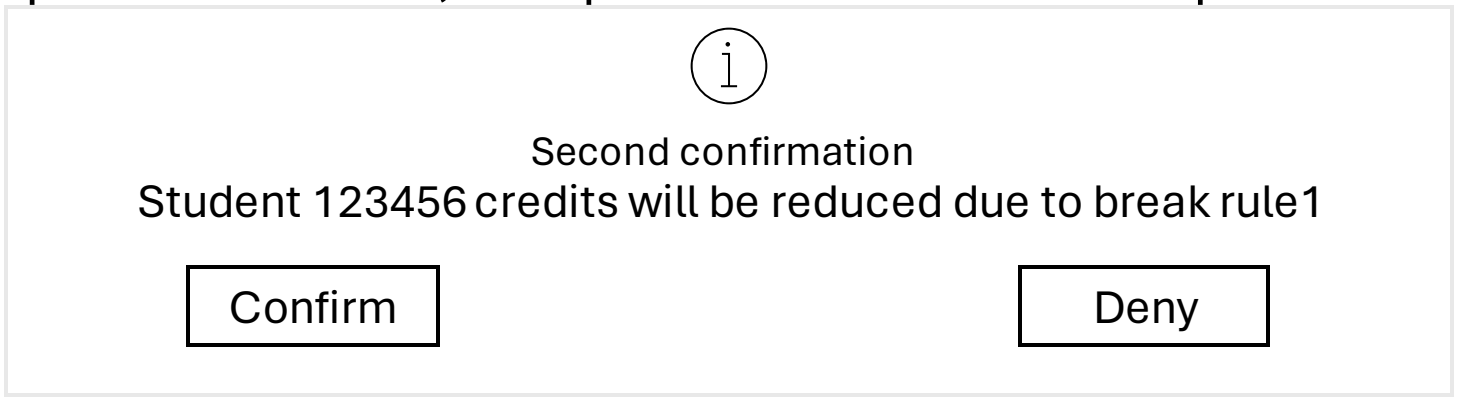
Prevention Method- Second confirmation

- Situation: Owe book / device > Full automation > Less error rate/ No Human error

- Situation: Break rule: Human enter the reason

Prevention Method- Second confirmation

- Solution : Reduce the human input process
  - 10 button, each button refer to one rule
  - Staff just press the button; computer finish the remains part



- Second confirmation window to staff
- After the credit was reduce, system will send the reduce message to student

Checking Method

Assume the system exists some error in credit system.
We conclude the error in two types, human error and system problem.

1.Human error

It means the problem resulted in by library staff, e.g.
In PUNISHMENT,

-PUNISH_REASON is not same with the CREDIT_SUB

e.g. CREDIT_SUB become a negative value => error

=>because of Staff input a wrong number

2. System error

It means the problem resulted in by the system

e.g. The correct record was deleted accidentially or disappeared.

	P_ID	SID	PUNISH_REAS	CREDIT_SU	P_DATE
1	1	10220006	Break rule1	5	2024/1/1
2	2	10220007	Break rule2	5	2024/1/2
3	3	10220008	Break rule3	5	2024/1/3
4	4	10220009	Break rule4	5	2024/1/4
5	5	10220010	Owe book	20	2024/1/27
6	6	10220005	Owe book	61	2024/7/1
7	7	10220007	Owe book	123	2024/9/1
8	10	10220008	Owe book	30	2024/12/31
9	8	10220109	Owe device	16	2024/12/31
10	9	10220110	Owe device	30	2024/5/17

Method:

- Design a program to run after the library service ends.
- Check for human and system errors:
  First, check the CREDIT_SUB recorded in the PUNISHMENT table, where P_DATE is within 7 days.
- According to the setting rule, check the logical range of CREDIT_SUB. For example, certain rules will not result in a decrease of 1000 credits or “-10” credits.
- Check the description of the PUNISMENT_REASON, it should follow the rules.

Method(cont.):

- Secondly, check the CREDIT_ADD in the DONATION table, where D_DATE is within 7 days.
- Finally, the program will check STUDENT table's attribute CREDIT, calculate all the history record again if the amended CREDIT amended at the same day.
- If the program detects an error, record the relevant SID, D_ID, P_ID, and error type [human error or system error]. The error message will be reviewed by the library staff.
- Also, the database will be backed up each month. If the record was disappeared or deleted accidently, the record will return to normal.

Q2

- The STUDENT table has AGE attribute. Explain why or why not store Date of Birth instead of AGE.

- I think we made a mistake when setting the AGE attribute of the STUDENT Table. We forgot that due to the user's age changing every year or even every day, we mistakenly set the AGE attribute of the STUDENT Table to a number instead of the year of birth. If we fill an integer in the AGE attribute, it will cause the database unable to update the age information of users in the STUDENT table in real-time. If the AGE attribute is set to date of birth, there is no need to change the user's AGE attribute.