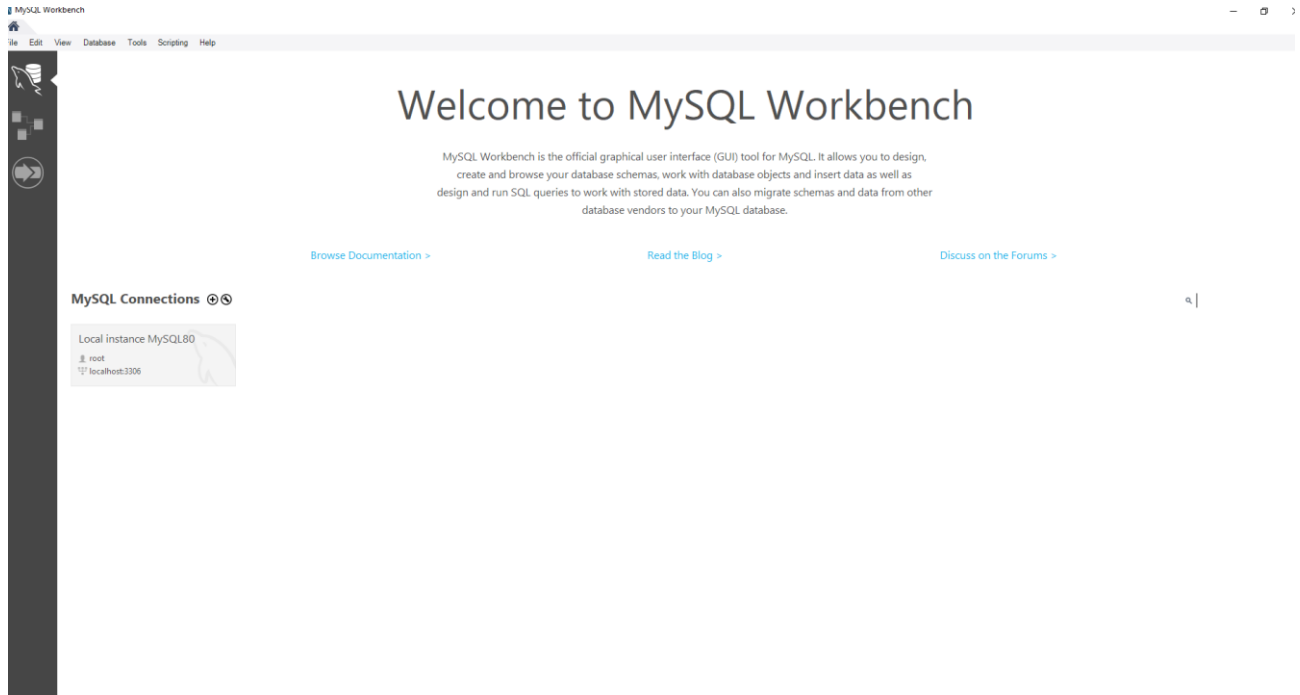


Databases Homework 2

Strus Dmytro

Domain: Technology transfer, 42

Step 1.1: Install MySQL on your computer

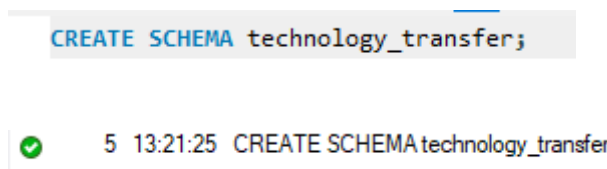


Step 1.2: Review the sources of useful information

Done

Step 1.3: Develop the logical data model for your domain variant and

Step 1.4: Develop and execute DDL queries





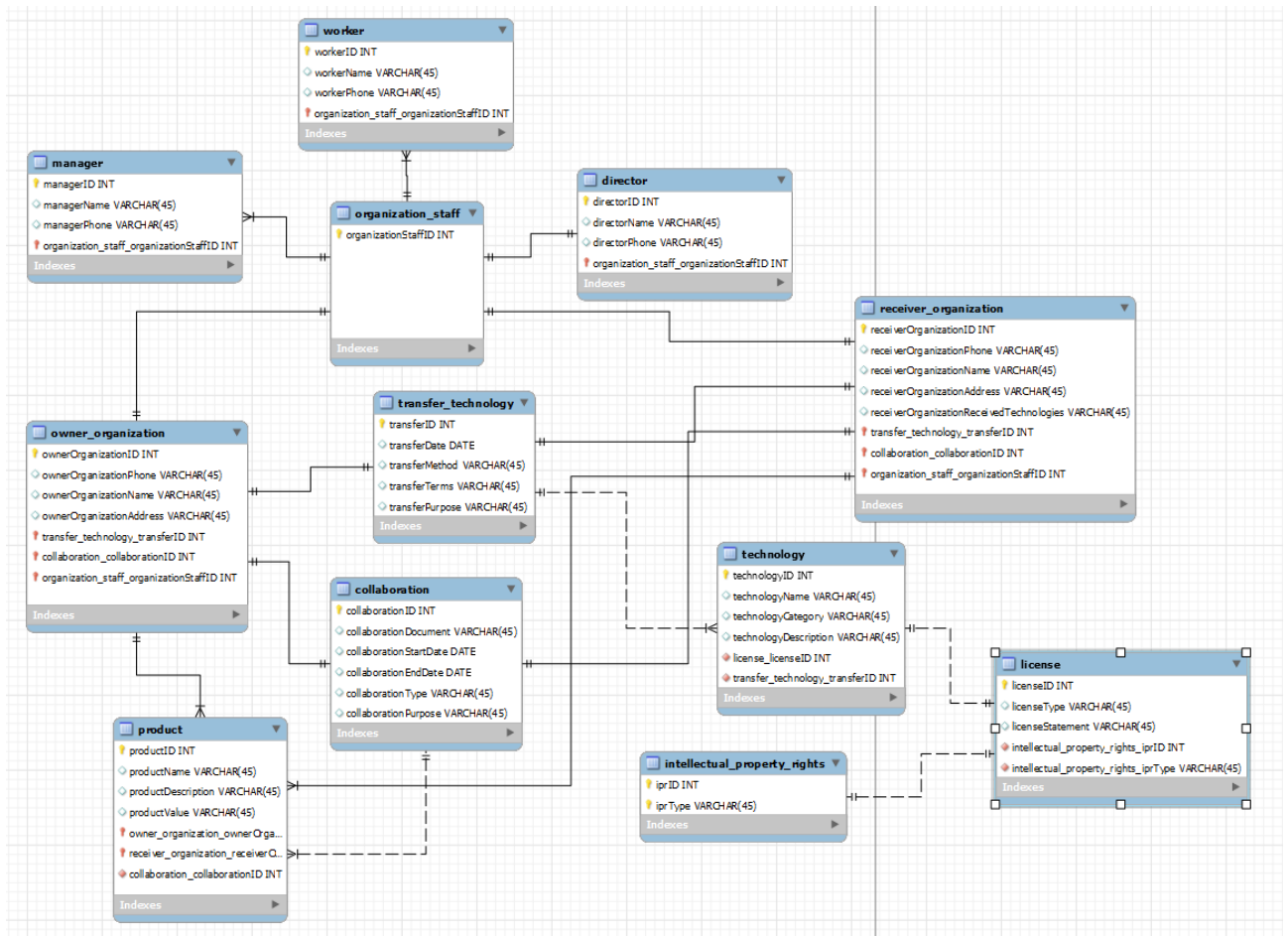
Created tables with SQL queries (example of one table)

```
CREATE TABLE IF NOT EXISTS `technology_transfer`.`transfer_technology` (
  `transferID` INT NOT NULL,
  `transferDate` DATE NULL,
  `transferMethod` VARCHAR(45) NULL,
  `transferTerms` VARCHAR(45) NULL,
  `transferPurpose` VARCHAR(45) NULL,
  PRIMARY KEY (`transferID`))
ENGINE = InnoDB
```

All created tables

✓	5	13:57:35	DROP DATABASE technology_transfer
✓	6	13:57:45	CREATE SCHEMA technology_transfer
✓	7	13:58:01	CREATE TABLE IF NOT EXISTS `technology_transfer`.`transfer_technology` (`transferID` INT NOT NULL, `transferDate` DATE NULL, `transferMetho...
✓	8	13:58:17	CREATE TABLE IF NOT EXISTS `technology_transfer`.`organization_staff` (`organizationStaffID` INT NOT NULL, PRIMARY KEY (`organizationStaffID`...
✓	9	13:58:42	CREATE TABLE IF NOT EXISTS `technology_transfer`.`manager` (`managerID` INT NOT NULL, `managerName` VARCHAR(45) NULL, `managerPho...
✓	10	13:58:53	CREATE TABLE IF NOT EXISTS `technology_transfer`.`director` (`directorID` INT NOT NULL, `directorName` VARCHAR(45) NULL, `directorPhone` V...
✓	11	13:59:03	CREATE TABLE IF NOT EXISTS `technology_transfer`.`worker` (`workerID` INT NOT NULL, `workerName` VARCHAR(45) NULL, `workerPhone` VA...
✓	12	13:59:15	CREATE TABLE IF NOT EXISTS `technology_transfer`.`intellectual_property_rights` (`iprid` INT NOT NULL, `iprType` VARCHAR(45) NOT NULL, PRI...
✗	13	13:59:28	CREATE TABLE IF NOT EXISTS `technology_transfer`.`owner_organization` (`ownerOrganizationID` INT NOT NULL, `ownerOrganizationPhone` VARC...
✓	14	13:59:45	CREATE TABLE IF NOT EXISTS `technology_transfer`.`collaboration` (`collaborationID` INT NOT NULL, `collaborationDocument` VARCHAR(45) NUL...
✓	15	13:59:48	CREATE TABLE IF NOT EXISTS `technology_transfer`.`owner_organization` (`ownerOrganizationID` INT NOT NULL, `ownerOrganizationPhone` VARC...
✓	16	13:59:59	CREATE TABLE IF NOT EXISTS `technology_transfer`.`receiver_organization` (`receiverOrganizationID` INT NOT NULL, `receiverOrganizationPhone` ...
✓	17	14:00:10	CREATE TABLE IF NOT EXISTS `technology_transfer`.`product` (`productID` INT NOT NULL, `productName` VARCHAR(45) NULL, `productDescript...
✓	18	14:00:50	CREATE TABLE IF NOT EXISTS `technology_transfer`.`license` (`licenseID` INT NOT NULL, `licenseType` VARCHAR(45) NULL, `licenseStatement` ...
✓	19	14:01:00	CREATE TABLE IF NOT EXISTS `technology_transfer`.`technology` (`technologyID` INT NOT NULL, `technologyName` VARCHAR(45) NULL, `techn...

ER diagram in MySQL workbench



I have made some changes from my HW1 in relations in order to get working databases with logic primary and foreign keys. Also I merged transfer and technology_transfer into one entity transfer_technology because dividing it into 2 entities don't make a lot of sense and add more troubles in this case

In this step I created tables, databases, made logical schema with corresponding primary and foreign keys and proper datatypes. In next step I will populate my databases and execute some DDL queries.

Step 1.5: Develop and execute DDL queries and

Step: 1.5.1 Populate Your Database

To populate my database I run next SQL query with already created csv file via excel

```

1 LOAD DATA INFILE 'D:/Programing/kurs 2/semester 2/databases/hw_2/collaboration_table.csv' INTO TABLE collaboration
2 FIELDS TERMINATED BY ';'
3 LINES TERMINATED BY '\n'
4 IGNORE 1 LINES;

```

and got

```
1 • SELECT * FROM technology_transfer.collaboration;
```

collaborationID	collaborationDocument	collaborationStartDate	collaborationEndDate	collaborationType	collaborationPurpose
10	Document № 10	2024-02-15	2024-05-28	Research	To conduct research on the impact of climate ch...
11	Document № 11	2024-02-27	2024-08-14	Project	To develop a new software application
12	Document № 12	2024-03-09	2024-07-19	Training	To provide training sessions on cybersecurity a...
NULL	NULL	NULL	NULL	NULL	NULL

✓ 5 16:32:45 LOAD DATA INFILE 'D:/Programing/kurs 2/semester 2/databases/hw_2/collaboration_table.csv' INTO TABLE collaboration FIELDS TERMINAT...

I repeated this procedure to fill al tables with CSVs

All tables filled with data

directorID	directorName	directorPhone	organization_staff_organizationStaffID
380	Darion	00011	200
381	Kenpachi	00022	201
382	Eren	00033	202
383	Tirion	00044	203
384	Saya	00055	204
385	Akaza	00066	205
NULL	NULL	NULL	NULL

	iprID	iprType
▶	3000	Patent
	3001	Utility
	3002	Trade secret
✱	NULL	NULL

	licenseID	licenseType	licenseStatement	intellectual_property_rights_iprID	intellectual_property_rights_iprType
▶	2000	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2001	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2002	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2003	Copyright	Exclusive rights to its use and distribution	3001	Utility
	2004	Copyright	Exclusive rights to its use and distribution	3001	Utility
	2005	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
	2006	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
*	NULL	NULL	NULL	NULL	NULL

	managerID	managerName	managerPhone	organization_staff_organizationStaffID
▶	350	Amir	00112	200
	351	Carlos	00222	200
	352	Diego	00434	201
	353	Fernando	00545	202
	354	Gideon	00656	202
	355	Hiroshi	00767	203
	356	Jamal	00876	204
	357	Khaled	00166	204
	358	Alexandro	00752	205
	359	Elijah	00429	205
✱	NULL	NULL	NULL	NULL

	organizationStaffID
▶	200
	201
	202
	203
	204
	205
★	NULL

	ownerOrganizationID	ownerOrganizationPhone	ownerOrganizationName	ownerOrganizationAddress	transfer_technology_transferID	collaboration_collaborationID	organization_staff_organizationStaffID
50	12312322		Samsung	199 Everland-ro Pogok-eup Cheoin-gu Yongin-si	1	10	200
51	22556346		Blizzard	16215 Alton Pkwy Irvine	2	11	201
52	58486884		Pfizer	66 Hudson Boulevard East New York	3	12	202

productID	productName	productDescription	productValue	owner_organization_ownerOrganizationID	receiver_organization_receiverOrganizationID	collaboration_collaborationID
400	Processor exynos	Processor for smartphones	Better experience of smartphones usage	50	53	10
401	Gorilla glass	For protection smartphones displays	Better protection of phones	50	53	10
402	Oculus rift	Headset for immersive gaming	Improves game experience	51	54	11
403	Unity	Game engine for 2-D, 3-D, VR	Based on it developed tons of games	51	54	11
404	Unreal engine	Game engine for AAA-quality games	For very realistic graphics	51	54	11
405	Pfizer vaccine	Protection against viruses	Saved a lot of health and even lifes	52	55	12
406	Hamilton microlab STAR	Robotic liquid handling system	Useful in automatization pharmacy	52	55	12
407	Autoinjectors	Automatically devices	Used in pre-measured dose of vaccine injections	52	55	12
408	Biomek i-Series	Automated workstation for liquid handling	Drug discovery, sample processing	52	55	12

receiverOrganizationID	receiverOrganizationPhone	receiverOrganizationName	receiverOrganizationAddress	receiverOrganizationReceivedTechnologies	transfer_technology_transferID	collaboration_collaborationID	organization_staff_organizationS
53	64564577	Apple	One Apple Park Way Cupertino	Operating systems, proccesors, glasses	1	10	203
54	53255463	Steam	10400 NE 4th St. Bellevue WA 98004	Virtual reality, game engines	2	11	204
55	88566685	BioNTech	An der Goldgrube 12, D-55131 Mainz	Vaccines researches, pharmacy robotics	3	12	205
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

(last column is organizationStaffID)

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1004	Virtual reality	Electronics	New style of gaming	2003	2
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
NULL	NULL	NULL	NULL	NULL	NULL

transferID	transferDate	transferMethod	transferTerms	transferPurpose
1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and proccesors for smartph...
2	2024-02-27	PayPal	Net 30	For game development project
3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
NULL	NULL	NULL	NULL	NULL

workerID	workerName	workerPhone	organization_staff_organizationStaffID
300	Bob	01111	200
301	Robert	02222	200
302	Ruslan	03333	201
303	Gaus	04444	201
304	Tom	05555	202
305	Joseph	01234	202
306	William	02444	203
307	James	06555	203
308	Christopher	07457	204
309	John	08877	204
310	Arman	06766	205
312	Sarah	07867	205
NULL	NULL	NULL	NULL

So once I created all tables, I will test and execute some DML queries

Some of them I already mentioned, which is creating database and tables and also I used another query with changing datatype from varchar(45) to varchar (256) because column was to short to write some text there

```
ALTER TABLE product
MODIFY COLUMN productValue VARCHAR(256);
```

I can also select all data from table

```
SELECT * FROM technology_transfer.technology;
```

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1004	Virtual reality	Electronics	New style of gaming	2003	2
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
NULL	NULL	NULL	NULL	NULL	NULL

And using alter add also new column e.g. add year of finding this technology

```
1 • ALTER TABLE technology
2 ADD COLUMN technologyYear DATE;
```

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID	technologyYear
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1	NULL
1001	Proccesors	Electronics	Developing multi proccesors	2001	1	NULL
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1	NULL
1004	Virtual reality	Electronics	New style of gaming	2003	2	NULL
1005	Game engines	Computer program	Unreal engine 5	2004	2	NULL
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3	NULL
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL

Then drop it

- 1 • **ALTER TABLE** technology
- 2 **DROP COLUMN** technologyYear;

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1004	Virtual reality	Electronics	New style of gaming	2003	2
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	as researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
NULL	NULL	NULL	NULL	NULL	NULL

I can drop also full database

```
DROP DATABASE transfer_technology;
```

But it would a be bad idea...

Step: 1.5.2 Select Data

Develop the queries that implement the following RA operations, one query per operation

- **Union** – query which is used to combine the results of two or more SELECT statements into a single result set (combine the results of two queries, removing duplicates). E.g. we can select some column - names from table worker and table manager which both have different names and results will be all these names in a set.

managerID	managerName	managerPhone	organization_staff_organizationStaffID
350	Amir	00112	200
351	Carlos	00222	200
352	Diego	00434	201
353	Fernando	00545	202
354	Gideon	00656	202
355	Hiroshi	00767	203
356	Jamal	00876	204
357	Khaled	00166	204
358	Alexandro	00752	205
359	Elijah	00429	205
NULL	NULL	NULL	NULL

	workerID	workerName	workerPhone	organization_staff_organizationStaffID
▶	300	Bob	01111	200
	301	Robert	02222	200
	302	Ruslan	03333	201
	303	Gaus	04444	201
	304	Tom	05555	202
	305	Joseph	01234	202
	306	William	02444	203
	307	James	06555	203
	308	Christopher	07457	204
	309	John	08877	204
	310	Arman	06766	205
	312	Sarah	07867	205
*	NULL	NULL	NULL	NULL

```

1  SELECT managerName AS name FROM manager
2  UNION
3  SELECT workerName AS name FROM worker;

```

	name
▶	Amir
	Carlos
	Diego
	Fernando
	Gideon
	Hiroshi
	Jamal
	Khaled
	Alexandro
	Elijah
	Bob
	Robert
	Ruslan
	Gaus
	Tom
	Joseph
	William
	James
	Christopher
	John
	Arman
	Sarah

I've got list of all managers and all workers names

- **Intersection** – query which is used to return the common rows of two or more queries (retrieve rows that appear in both R1 and R2).

E.g. If I select owner organization and receiver organization common between them will be their transferID and collaborationID

receiverOrganizationID	receiverOrganizationPhone	receiverOrganizationName	receiverOrganizationAddress	receiverOrganizationReceivedTechnologies	transfer_technology_transferID	collaboration_collaborationID	organization_staff_organizationS
53	64564577	Apple	One Apple Park Way Cupertino	Operating systems, processors, glasses	1	10	203
54	53255463	Steam	10400 NE 4th St, Bellevue WA 98004	Virtual reality, game engines	2	11	204
55	88566685	BioNTech	An der Goldgrube 12, D-55131 Mainz	Vaccines researches, pharmacy robotics	3	12	205
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

ownerOrganizationID	ownerOrganizationPhone	ownerOrganizationName	ownerOrganizationAddress	transfer_technology_transferID	collaboration_collaborationID	organization_staff_organizationStaffID
50	12312322	Samsung	199 Everland-ro Pogok-eup Cheoin-gu Yongin-si...	1	10	200
51	22556346	Blizzard	16215 Alton Pkwy Irvine	2	11	201
52	58486884	Pfizer	66 Hudson Boulevard East New York	3	12	202
NULL	NULL	NULL	NULL	NULL	NULL	NULL

```

1 SELECT owner_organization.transfer_technology_transferID, owner_organization.collaboration_collaborationID FROM owner_organization
2 INNER JOIN receiver_organization ON owner_organization.transfer_technology_transferID = receiver_organization.transfer_technology_transferID
3 AND owner_organization.collaboration_collaborationID = receiver_organization.collaboration_collaborationID;

```

So I want to select all same ID's of transfers and collaborations in both companies and I've got

transfer_technology_transferID	collaboration_collaborationID
1	10
2	11
3	12

- **Difference** – query which is used to return table without some rows which are in this table (retrieve rows from R1 that do not appear in R2)
E.g. For example I want to select all data that are in technology table but not in technology table_2 I can use difference

Technology table

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Providing new operating systems	2000	1
1001	Processors	Electronics	Developing multi processors	2001	1
1002	Glasses	Materials	Improvement of protection of smartphone glas...	2002	1
1004	Virtual reality	Electronics	New style of gaming	2003	2
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
NULL	NULL	NULL	NULL	NULL	NULL

Technology table 2

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Providing new operating systems	2000	1
1004	Virtual reality	Electronics	New style of gaming	2003	2
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3

Created with code

```

1 CREATE TEMPORARY TABLE technology_2
2 SELECT * FROM technology
3 WHERE technologyID IN (1000, 1004, 1007);

```

And difference

```

1 • SELECT * FROM technology
2 WHERE technologyID NOT IN (SELECT technologyID FROM technology_2)

```

Results in

	technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
▶	1001	Processors	Electronics	Developing multi processors	2001	1
	1002	Glasses	Materials	Improvement of protection of smartphone glas...	2002	1
	1005	Game engines	Computer program	Unreal engine 5	2004	2
	1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
•	NULL	NULL	NULL	NULL	NULL	NULL

What is expected to see, all rows from table technology 2 are removed and I have got table technology without rows in table technology 2

- **Cartesian product** – query which is used to combine columns from each row from one table with another columns of each row from another table (combine every row of R1 with every row of R2 or in other words joins every record in the first table with every record in the second table). Result will be table with all possible columns for each row from both tables

E.g. we can see combinations of collaboration table and transfer technology table

	transferID	transferDate	transferMethod	transferTerms	transferPurpose
▶	1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and procesors for smartph...
	2	2024-02-27	PayPal	Net 30	For game development project
	3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
•	NULL	NULL	NULL	NULL	NULL

	collaborationID	collaborationDocument	collaborationStartDate	collaborationEndDate	collaborationType	collaborationPurpose
▶	10	Document № 10	2024-02-15	2024-05-28	Research	To conduct research on the impact of climate ch...
	11	Document № 11	2024-02-27	2024-08-14	Project	To develop a new software application
	12	Document № 12	2024-03-09	2024-07-19	Training	To provide training sessions on cybersecurity a...
•	NULL	NULL	NULL	NULL	NULL	NULL

```

• SELECT * from collaboration
! CROSS JOIN transfer_technology

```

Results in

	collaborationID	collaborationDocument	collaborationStartDate	collaborationEndDate	collaborationType	collaborationPurpose	transferID	transferDate	transferMethod	transferTerms	transferPurpose
▶	12	Document № 12	2024-03-09	2024-07-19	Training	To provide training sessions on cybersecurity a...	1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and processors for smartph...
	11	Document № 11	2024-02-27	2024-08-14	Project	To develop a new software application	1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and processors for smartph...
	10	Document № 10	2024-02-15	2024-05-28	Research	To conduct research on the impact of climate ch...	1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and processors for smartph...
	12	Document № 12	2024-03-09	2024-07-19	Training	To provide training sessions on cybersecurity a...	2	2024-02-27	PayPal	Net 30	For game development project
	11	Document № 11	2024-02-27	2024-08-14	Project	To develop a new software application	2	2024-02-27	PayPal	Net 30	For game development project
	10	Document № 10	2024-02-15	2024-05-28	Research	To conduct research on the impact of climate ch...	2	2024-02-27	PayPal	Net 30	For game development project
	12	Document № 12	2024-03-09	2024-07-19	Training	To provide training sessions on cybersecurity a...	3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
	11	Document № 11	2024-02-27	2024-08-14	Project	To develop a new software application	3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
	10	Document № 10	2024-02-15	2024-05-28	Research	To conduct research on the impact of climate ch...	3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...

- **Selection** – query used to return all tuples for which holds some true condition (retrieve rows from R where a condition is met).
E.g. I want to select all technologies which were transferred in transfer with ID = 1

	technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
▶	1000	Operating systems	Electronics	Providing new operating systems	2000	1
	1001	Processors	Electronics	Developing multi processors	2001	1
	1002	Glasses	Materials	Improvement of protection of smartphone glas...	2002	1
	1004	Virtual reality	Electronics	New style of gaming	2003	2
	1005	Game engines	Computer program	Unreal engine 5	2004	2
	1006	Vaccines researches	Biology	New vaccines against diseases	2005	3
	1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
*	NULL	NULL	NULL	NULL	NULL	NULL

```
1 • SELECT * from technology
2 WHERE transfer_technology_transferID = 1
```

And I have got three technologies which were transferred with transferID = 1

	technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
▶	1000	Operating systems	Electronics	Providing new operating systems	2000	1
	1001	Processors	Electronics	Developing multi processors	2001	1
	1002	Glasses	Materials	Improvement of protection of smartphone glas...	2002	1
*	NULL	NULL	NULL	NULL	NULL	NULL

- **Projection** – query used to get exactly columns from table (retrieve specified columns from R).
E.g. I want to get only period of collaborations (start and end dates)

	collaborationID	collaborationDocument	collaborationStartDate	collaborationEndDate	collaborationType	collaborationPurpose
	10	Document № 10	2024-02-15	2024-05-28	Research	To conduct research on the impact of climate ch...
	11	Document № 11	2024-02-27	2024-08-14	Project	To develop a new software application
	12	Document № 12	2024-03-09	2024-07-19	Training	To provide training sessions on cybersecurity a...
	NULL	NULL	NULL	NULL	NULL	NULL

```
1 • SELECT collaborationStartDate, collaborationEndDate FROM collaboration
```

Results in

	collaborationStartDate	collaborationEndDate
►	2024-02-15	2024-05-28
	2024-02-27	2024-08-14
	2024-03-09	2024-07-19

- **Theta join** – query used to get set of all combinations of tuples in R1 and R2 for which some conditions holds true on their shared attributes (combine rows from R1 and R2 based on a condition).
E.g. I want to select all combinations of workers whose last digit in phone number equals 7 and all combinations of managers whose last digit in phone number equals 2

	managerID	managerName	managerPhone	organization_staff_organizationStaffID
►	350	Amir	00112	200
	351	Carlos	00222	200
	352	Diego	00434	201
	353	Fernando	00545	202
	354	Gideon	00656	202
	355	Hiroshi	00767	203
	356	Jamal	00876	204
	357	Khaled	00166	204
	358	Alexandro	00752	205
	359	Elijah	00429	205
*	NULL	NULL	NULL	NULL

	workerID	workerName	workerPhone	organization_staff_organizationStaffID
►	300	Bob	01111	200
	301	Robert	02222	200
	302	Ruslan	03333	201
	303	Gaus	04444	201
	304	Tom	05555	202
	305	Joseph	01234	202
	306	William	02444	203
	307	James	06555	203
	308	Christopher	07457	204
	309	John	08877	204
	310	Arman	06766	205
	312	Sarah	07867	205
*	NULL	NULL	NULL	NULL

```
3 AND SUBSTRING(workerPhone, -1) = '7';
```

Results in

managerID	managerName	managerPhone	organization_staff_organizationStaffID	workerID	workerName	workerPhone	organization_staff_organizationStaffID
358	Alexandro	00752	205	308	Christopher	07457	204
351	Carlos	00222	200	308	Christopher	07457	204
350	Amir	00112	200	308	Christopher	07457	204
358	Alexandro	00752	205	309	John	08877	204
351	Carlos	00222	200	309	John	08877	204
350	Amir	00112	200	309	John	08877	204
358	Alexandro	00752	205	312	Sarah	07867	205
351	Carlos	00222	200	312	Sarah	07867	205
350	Amir	00112	200	312	Sarah	07867	205

Step 1.5.3: Update Data

In this step I will some queries to update my data with UPDATE

UPDATE – is a query replaces the values in columns

As specified in the SET clause

In one or several tables (JOIN clause)

In the rows that match the condition in WHERE clause

E.g. director has been changed in Samsung organization (directorID = 380, organization staff of Samsung = 200)

Initially I have

```
1 SELECT * FROM owner_organization
2 WHERE organization_staff_organizationStaffID = 200
```

result 5/10							
	ownerOrganizationID	ownerOrganizationPhone	ownerOrganizationName	ownerOrganizationAddress	transfer_technology_transferID	collaboration_collaborationID	organization_staff_organizationStaffID
▶	50	12312322	Samsung	199 Everland-ro Pogok-eup Cheoin-gu Yongin-si...	1	10	200
	NULL	NULL	NULL	NULL	NULL	NULL	NULL

	directorID	directorName	directorPhone	organization_staff_organizationStaffID
▶	380	Darion	00011	200
	381	Kenpachi	00022	201
	382	Eren	00033	202
	383	Tirion	00044	203
	384	Saya	00055	204
	385	Akaza	00066	205
*	NULL	NULL	NULL	NULL

Using UPDATE

```

1  UPDATE director
2  SET directorName = 'Rennala', directorPhone = '00054'
3  WHERE directorID = 380

```

	directorID	directorName	directorPhone	organization_staff_organizationStaffID
▶	380	Rennala	00054	200
	381	Kenpachi	00022	201
	382	Eren	00033	202
	383	Tirion	00044	203
	384	Saya	00055	204
	385	Akaza	00066	205
*	NULL	NULL	NULL	NULL

I've got new director (Rennala) with new phone number for Samsung organization because director still belongs to 200 organization_staff_ID

Now I will update a primary key of technology virtual reality with technologyID = 1004

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1004	Virtual reality	Electronics	New style of gaming	2003	2
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
NULL	NULL	NULL	NULL	NULL	NULL

```

1  UPDATE technology
2  SET technologyID = 1009
3  WHERE technologyID = 1004

```

Successfully updated (now it has technologyID = 1009 primary key)

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
1009	Virtual reality	Electronics	New style of gaming	2003	2
NULL	NULL	NULL	NULL	NULL	NULL

Also I can update foreign key for some technology (transferID from 2 to 3)

```

1 • UPDATE technology
2   SET transfer_technology_transferID = 3
3   WHERE technologyID = 1009

```

And get

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
1009	Virtual reality	Electronics	New style of gaming	2003	3
NULL	NULL	NULL	NULL	NULL	NULL

Now virtual reality technology with ID 1009 will be transferred in transfer with ID 3

Step: 1.5.4 Add New Data

I can insert new record (row) using INSERT query which inserts new rows into an existing table

Into one table

Single or multiple rows

Selected columns (default values in the skipped columns)

Values could be taken from a SELECT query

I want to add new two managers for organization Steam with ID 54 and organization staff ID of steam 204

receiverOrganizationID	receiverOrganizationPhone	receiverOrganizationName	receiverOrganizationAddress	receiverOrganizationReceivedTechnologies	transfer_technology_transferID	collaboration_collaborationID	organization_staff_organizationStaffID
53	64564577	Apple	One Apple Park Way Cupertino	Operating systems, processors, glasses	1	10	203
54	53255463	Steam	10400 NE 4th St. Bellevue WA 98004	Virtual reality, game engines	2	11	204
55	88566685	BioNTech	An der Goldgrube 12, D-55131 Mainz	Vaccines researches, pharmacy robotics	3	12	205
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

workerID	workerName	workerPhone	organization_staff_organizationStaffID
300	Bob	01111	200
301	Robert	02222	200
302	Ruslan	03333	201
303	Gaus	04444	201
304	Tom	05555	202
305	Joseph	01234	202
306	William	02444	203
307	James	06555	203
308	Christopher	07457	204
309	John	08877	204
310	Arman	06766	205
312	Sarah	07867	205
NULL	NULL	NULL	NULL

organizationStaffID
200
201
202
203
204
205
NULL

```

INSERT INTO manager(managerID, managerName, managerPhone, organization_staff_organizationStaffID)
VALUES (360, 'Carol', '00657', 204),
(361, 'Licardius', '00439', 204)

```

I’ve got two new managers for Steam organization with IDs 360 and 361

managerID	managerName	managerPhone	organization_staff_organizationStaffID
350	Amir	00112	200
351	Carlos	00222	200
352	Diego	00434	201
353	Fernando	00545	202
354	Gideon	00656	202
355	Hiroshi	00767	203
356	Jamal	00876	204
357	Khaled	00166	204
358	Alexandro	00752	205
359	Elijah	00429	205
360	Carol	00657	204
361	Licardius	00439	204
NULL	NULL	NULL	NULL

For complex INREST I run this code

```

1 • INSERT INTO transfer_technology (transferID,transferDate,transferMethod,transferTerms,transferPurpose)
2   VALUES (4, '2024-01-27', 'Universal Bank', 'Cash', 'Improving connections');
3
4 • INSERT INTO intellectual_property_rights(iprID, iprType)
5   VALUES (3002, 'Trade secret');
6
7 • INSERT INTO license(licenseID, licenseType, licenseStatement, intellectual_property_rights_iprID, intellectual_property_rights_iprType)
8   VALUES (2007, 'Proprietary', 'Permitting the software to be used in proprietary projects', 3002, 'Trade secret');
9
10 • INSERT INTO technology(technologyID, technologyName, technologyCategory, technologyDescription, license_licenseID, transfer_technology_transferID)
11   VALUES (1010, 'Comp plates', 'Electronics', 'For computer details', 2007, 4);
12
13
14
15

```

and got 4 tables with added data and foreign keys

transferID	transferDate	transferMethod	transferTerms	transferPurpose
1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and procesors for smartph...
2	2024-02-27	PayPal	Net 30	For game development project
3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
4	2024-01-27	Universal Bank	Cash	Improving connections
NULL	NULL	NULL	NULL	NULL

	technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
▶	1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
	1001	Proccesors	Electronics	Developing multi proccesors	2001	1
	1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
	1005	Game engines	Computer program	Unreal engine 5	2004	2
	1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
	1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
	1009	Virtual reality	Electronics	New style of gaming	2003	3
	1010	Comp plates	Electronics	For computer details	2007	4
*	NULL	NULL	NULL	NULL	NULL	NULL

	licenseID	licenseType	licenseStatement	intellectual_property_rights_iprID	intellectual_property_rights_iprType
▶	2000	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2001	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2002	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2003	Copyright	Exclusive rights to its use and distribution	3001	Utility
	2004	Copyright	Exclusive rights to its use and distribution	3001	Utility
	2005	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
	2006	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
*	NULL	NULL	NULL	NULL	NULL

	iprID	iprType
▶	3000	Patent
	3001	Utility
	3002	Trade secret
	3002	Trade secret
*	NULL	NULL

(here is some trouble with foreign key constraint was, so I added new same record but previously it works like one to many as I can see from tables)

REPLACE

```
REPLACE INTO manager(managerID, managerName, managerPhone, organization_staff_organizationStaffID)
VALUES (350, 'Aragorn', '00996', 200)
```

```
1 • REPLACE INTO manager(managerID, managerName, managerPhone, organization_staff_organizationStaffID)
2 VALUES (350, 'Aragorn', '00996', 201)
```

managerID	managerName	managerPhone	organization_staff_organizationStaffID
350	Aragorn	00996	200
350	Aragorn	00996	201
351	Carlos	00222	200
352	Diego	00434	201
353	Fernando	00545	202
354	Gideon	00656	202
355	Hiroshi	00767	203
356	Jamal	00876	204
357	Khaled	00166	204
358	Alexandro	00752	205
359	Elijah	00429	205
360	Carol	00657	204
361	Licardius	00439	204
NULL	NULL	NULL	NULL

With REPLACE query I can add and replace records, the main difference between is that insert add new rows but replace deletes exists rows with same primary key, insert fails with primary key if same primary key already exists and replace replaces existing row with same primary key and replaces it.

Step: 1.5.5 Delete Data

I can delete manager from manager table manager with ID 350 and organization staff 200

	managerID	managerName	managerPhone	organization_staff_organizationStaffID
▶	350	Aragorn	00996	200
	350	Aragorn	00996	201
	351	Carlos	00222	200
	352	Diego	00434	201
	353	Fernando	00545	202
	354	Gideon	00656	202
	355	Hiroshi	00767	203
	356	Jamal	00876	204
	357	Khaled	00166	204
	358	Alexandro	00752	205
	359	Elijah	00429	205
	360	Carol	00657	204
	361	Licardius	00439	204
✱	NULL	NULL	NULL	NULL

```

1 • DELETE FROM manager
2 WHERE managerID = 350 AND organization_staff_organizationStaffID = 200

```

	managerID	managerName	managerPhone	organization_staff_organizationStaffID
▶	350	Aragorn	00996	201
	351	Carlos	00222	200
	352	Diego	00434	201
	353	Fernando	00545	202
	354	Gideon	00656	202
	355	Hiroshi	00767	203
	356	Jamal	00876	204
	357	Khaled	00166	204
	358	Alexandro	00752	205
	359	Elijah	00429	205
	360	Carol	00657	204
	361	Licardius	00439	204
✱	NULL	NULL	NULL	NULL

Where Aragorn with organization ID 200 was deleted

More complex delete with related tables is

technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
1000	Operating systems	Electronics	Prodoving new operating systems	2000	1
1001	Proccesors	Electronics	Developing multi proccesors	2001	1
1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
1005	Game engines	Computer program	Unreal engine 5	2004	2
1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
1009	Virtual reality	Electronics	New style of gaming	2003	3
1010	Comp plates	Electronics	For computer details	2007	4
NULL	NULL	NULL	NULL	NULL	NULL

licenseID	licenseType	licenseStatement	intellectual_property_rights_iprID	intellectual_property_rights_iprType
2000	Permissive	Modify and distribute software under minimal re...	3000	Patent
2001	Permissive	Modify and distribute software under minimal re...	3000	Patent
2002	Permissive	Modify and distribute software under minimal re...	3000	Patent
2003	Copyright	Exdusive rights to its use and distribution	3001	Utility
2004	Copyright	Exdusive rights to its use and distribution	3001	Utility
2005	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
2006	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
2007	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
NULL	NULL	NULL	NULL	NULL

transferID	transferDate	transferMethod	transferTerms	transferPurpose
1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and proccesors for smartph...
2	2024-02-27	PayPal	Net 30	For game development project
3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
4	2024-01-27	Universal Bank	Cash	Improving connections
NULL	NULL	NULL	NULL	NULL

- `DELETE FROM technology`
`WHERE technologyID = 1010;`
- `DELETE FROM transfer_technology`
`WHERE transferID = 4;`
- `DELETE FROM license`
`WHERE licenseID = 2007;`

Deleted license technology and transfer with all foreign keys and primary keys and I get

	technologyID	technologyName	technologyCategory	technologyDescription	license_licenseID	transfer_technology_transferID
▶	1000	Operating systems	Electronics	Prodiving new operating systems	2000	1
	1001	Proccesors	Electronics	Developing multi procesors	2001	1
	1002	Glasses	Materials	Improvement of protection of smarthphone glas...	2002	1
	1005	Game engines	Computer program	Unreal engine 5	2004	2
	1006	Vaccines researches	Biology	New vaccines againts diseases	2005	3
	1007	Pharmacy robotics	Biology	Automatization of pharmacy development	2006	3
	1009	Virtual reality	Electronics	New style of gaming	2003	3
*	NULL	NULL	NULL	NULL	NULL	NULL

	licenseID	licenseType	licenseStatement	intellectual_property_rights_iprID	intellectual_property_rights_iprType
▶	2000	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2001	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2002	Permissive	Modify and distribute software under minimal re...	3000	Patent
	2003	Copyright	Exclusive rights to its use and distribution	3001	Utility
	2004	Copyright	Exdusive rights to its use and distribution	3001	Utility
	2005	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
	2006	Proprietary	Permitting the software to be used in proprietar...	3002	Trade secret
*	NULL	NULL	NULL	NULL	NULL

	transferID	transferDate	transferMethod	transferTerms	transferPurpose
▶	1	2024-02-15	Bank transfer	Telegraphic	Developing glasses and procesors for smartph...
	2	2024-02-27	PayPal	Net 30	For game development project
	3	2024-03-09	Cash transfer	Net 15	Advertisement campaign for new pharmacy rele...
*	NULL	NULL	NULL	NULL	NULL

✓	99	23:45:28	DELETE FROM technology WHERE technologyID = 1010
✓	100	23:45:32	DELETE FROM technology WHERE technologyID = 1010
✓	101	23:45:32	DELETE FROM transfer_technology WHERE transferID = 4
✓	102	23:45:32	DELETE FROM license WHERE licenseID = 2007

Step: 1.6 Conclusive Remarks

I almost went crazy while doing my assignment here but it is useful experience. Overall, MySQL workbench is a powerful tool for database managing, creating tables, running tons of different queries, making diagrams and a lot of another things. It offers a diverse range of data types, numeric, textual, temporal, and geographical data. This versatility simplifies the management of different data types within a single database, facilitating tasks such as text searches and mathematical calculations. Additionally, MySQL provides an array of query functions and operators, empowering users to extract specific subsets of data and arrange it based on various criteria (what I have done in this assignment). All in all, my interaction with MySQL has been enriching, as I've uncovered numerous valuable features that are likely to benefit me in future work.