

CPSC 304 Project Cover Page

Milestone #: 2

Date: February 28th, 2023

Group Number: 15

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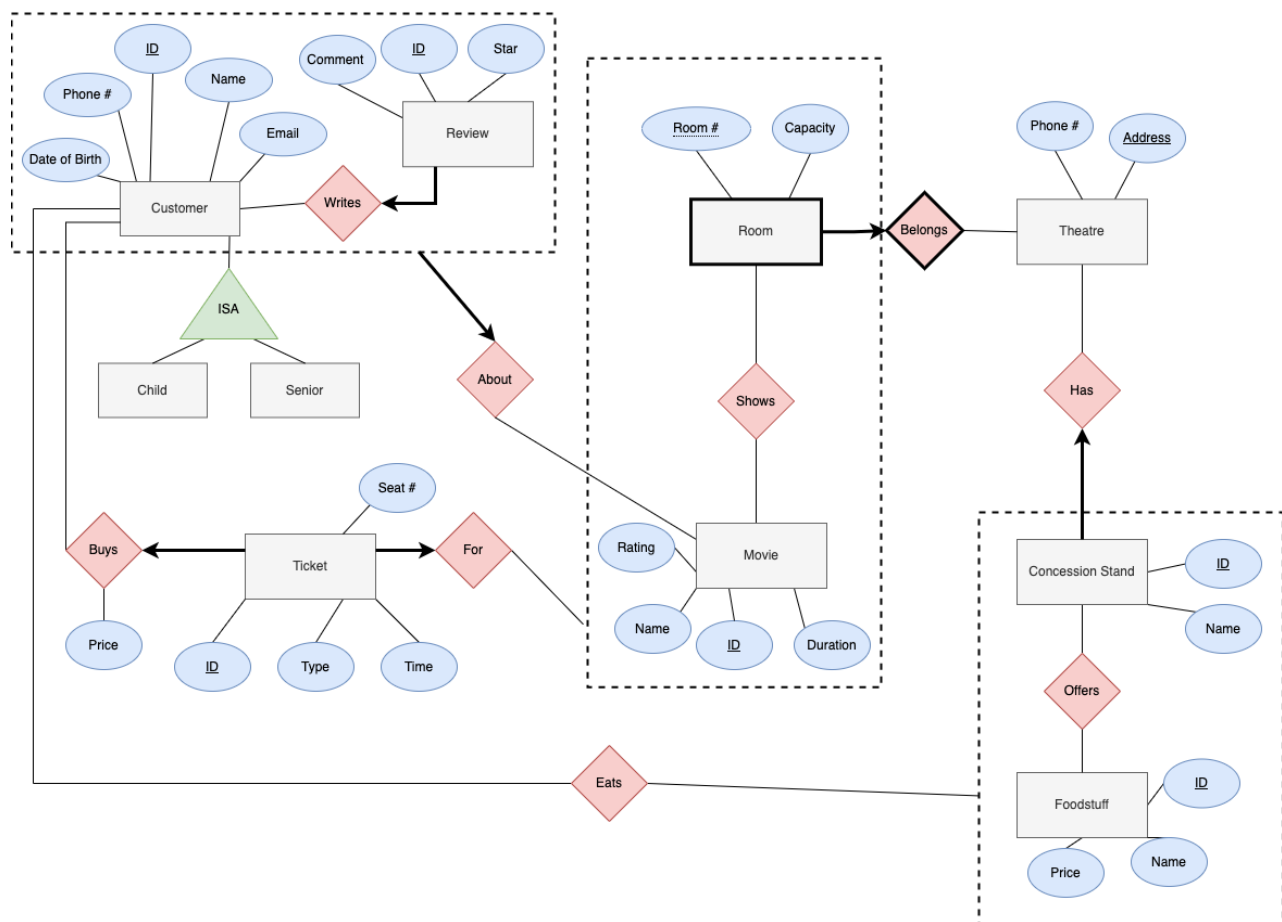
By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your email address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

1. Brief Summary

Our project is movie theater software. The customers will be able to buy tickets for movies at different theaters, and they will also be able to write reviews for movies and track what they buy at concession stands. The theater manager can manage which rooms show which movies at which times and see how well their business is running.

2. The ER Diagram



Changes from Milestone 1 ER Diagram:

- Changed aggregation of Room, Movie, Theatre to include only Room and Movie based on the TA's comment "Cannot use aggregation to treat multiple relationship sets as a single entity" on Milestone 1 ER Diagram
- Added aggregation to Offers relation between Concession Stand and Foodstuff, so that Customer buys foodstuff from concession stand. This was a suggestion given by TA on Milestone 1 ER Diagram.
- Removed the attribute "Guardian Name" for the child in the ISA because it is unnecessary and there is no use
- Moved the Time attribute from Shows to Ticket to simplify the diagram and because the double aggregation was unnecessary.

3. Schema

Note:

- Primary keys are underlined. Foreign keys are bolded
- For attribute naming, If there is an identical attribute for multiple entities, add the name of the entity before the attribute. Eg: customer has attribute ID becomes customerID.
- # is replaced with Num or omitted. Eg. room# is roomNum, phone# is phone

Customer(ID: varchar[20], name: varchar[30], email: varchar[40], phone: varchar[15], dateOfBirth: date)

- ck: ID, email, (name + phone + dateOfBirth)
- not null: email
- unique: email, (name + phone + dateOfBirth)

Child(ID: varchar[20])

- ck: ID

Senior(ID: varchar[20])

- ck: ID

Review(ID: varchar[20], star: float, comment: varchar[1000], **customerID**: varchar[20], **movieID**: varchar[20])

- ck: ID
- not null: movieID, customerID

Theatre(address: varchar[50], phone: varchar[20])

- ck: address, phone
- unique: phone

Room(roomNum: integer, **address**: varchar[50], capacity: integer)

- ck: (roomNum + address)

Movie(ID: varchar[20], duration: integer, rating: varchar[10], name: varchar[50])

- ck: ID
- not null: duration, name

Shows(**address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

*Movie's ID is changed to movieID to make clear what ID it is referring to

- ck: address + roomNum + movieID

Ticket(ID: varchar[20], type: varchar[20], seatNum: varchar[4], time: timestamp, **customerID**: varchar[20], price: float, **address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

- ck: ID, (time + roomNum + address + seatNum)
- unique: time + roomNum + address + seatNum
- not null: customerID, address, roomNum, movieID, time, price

ConcessionStand(ID: varchar[20], name: varchar[20], **address**: varchar[50])

- ck: ID
- not null: **address**

Foodstuff (ID: varchar[20], name: varchar[20], price: float)

- ck: ID
- not null: name, price

Offers (**foodStuffID**: varchar[20], **concesssionStandID**: varchar[20])

- ck: (foodStuffID + cooncessionStandID)

Eats (**customerID**: varchar[20], **concessionStandID**: varchar[20] , **foodStuffID**: varchar[20])

- ck: customerID + concessionStandID + foodStuffID

4. Functional Dependencies

Customer(ID: varchar[20], name: varchar[30], email: varchar[40], phone: varchar[15], dateOfBirth: date)

- ID -> name, email, phone, dateOfBirth
- email -> ID, name, phone, dateOfBirth
- (name + phone + dateOfBirth) -> ID, email

Child(ID: varchar[20])

- Only the trivial one

Senior(ID: varchar[20])

- Only the trivial one

Review(ID: varchar[20], star: float, comment: varchar[1000], **customerID**: varchar[20], **movieID**: varchar[20])

- ID -> star, comment, customerID, movieID

Theatre(address: varchar[50], phone: varchar[20])

- address -> phone
- phone -> address

Room(roomNum: integer, **address**: varchar[50], capacity: integer)

- roomNum, address -> capacity

Movie(ID: varchar[20], duration: integer, rating: varchar[10], name: varchar[50])

- ID -> duration, rating, name

Shows(**address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

- only the trivial one

Ticket(ID: varchar[20], type: varchar[20], seatNum: varchar[4], time: timestamp, **customerID**: varchar[20], price: float, **address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

- ID -> type, seatNum, time, customerID, price, address, roomNum, movieID
- time, roomNum, address, seatNum -> ID, type, customerID, price, movieID
- time, roomNum, address -> movieID (non-PK or CK)

ConcessionStand(ID: varchar[20], name: varchar[20], **address**: varchar[50])

- ID -> name, address

Foodstuff (ID: varchar[20], name: varchar[20], price: float)

- ID -> name, price

Offers (**foodStuffID**: varchar[20], **concessionStandID**: varchar[20])

- only the trivial one

Eats (**customerID**: varchar[20], **concessionStandID**: varchar[20] , **foodStuffID**: varchar[20])

- Only the trivial one

5. Normalization

Not in BCNF or 3NF:

Ticket(ID: varchar[20], type: varchar[20], seatNum: varchar[4], time: timestamp, **customerID**: varchar[20], price: float, **address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

- ID → type, seatNum, time, customerID, price, address, roomNum, movieID
 - ID is PK, thus super key; does not violate BCNF
- time, roomNum, address, seatNum → ID, type, customerID, price, movieID
 - time + roomNum + address + seatNum is CK, thus super key; does not violate BCNF
- time, roomNum, address → movieID (non-PK or CK)
 - violates BCNF or 3NF
 - time + roomNum + address is not super key & movieID is not part of minimal key

R1(time, roomNum, address, movieID)

R2(ID, type, seatNum, time, **customerID**, price, **address**, **roomNum**)

- ID+ = {type, seatNum, time, customerID, price, address, roomNum}; thus, ID is PK

Let R1 be renamed to MovieSchedule and R2 be renamed to Ticket.

Post Normalization to BCNF:

MovieSchedule(time: timestamp, roomNum: integer, address: varchar[50], **movieID**: varchar[20])

- ck: time + roomNum + address
- not null: movieID

Ticket(ID: varchar[20], type: varchar[20], seatNum: varchar[4], **time**: timestamp, **customerID**: varchar[20], price: float, **address**: varchar[50], **roomNum**: integer)

- ck: ID, (time + roomNum + address + seatNum)
- unique: (time + roomNum + address + seatNum)
- not null: time, customerID, address, roomNum, price

No decomposition (Tables already in 3NF or BCNF):

Customer(ID: varchar[20], name: varchar[30], email: varchar[40], phone: varchar[15], dateOfBirth: date)

- ck: ID, email, (name + phone + dateOfBirth)
- not null: email
- unique: email, (name + phone + dateOfBirth)

Child(ID: varchar[20])

- ck: ID

Senior(ID: varchar[20])

- ck: ID

Review(ID: varchar[20], star: float, comment: varchar[1000], **customerID**: varchar[20], **movieID**: varchar[20])

- ck: ID
- not null: movieID, customerID

Theatre(address: varchar[50], phone: varchar[20])

- ck: address, phone
- unique: phone

Room(roomNum: integer, address: varchar[50], capacity: integer)

- ck: (roomNum + address)

Movie(ID: varchar[20], duration: integer, rating: varchar[10], name: varchar[50])

- ck: ID
- not null: duration, name

Shows(**address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

*Movie's ID is changed to movieID to make clear what ID it is referring to

- ck: address + roomNum + movieID

ConcessionStand(**ID**: varchar[20], name: varchar[20], **address**: varchar[50])

- ck: ID
- not null: **address**

Foodstuff (**ID**: varchar[20], name: varchar[20], price: float)

- ck: ID
- not null: name, price

Offers (**foodStuffID**: varchar[20], **concesssionStandID**: varchar[20])

- ck: (foodStuffID + cooncessionStandID)

Eats (**customerID**: varchar[20], **concessionStandID**: varchar[20] , **foodStuffID**: varchar[20])

- ck: customerID + concessionStandID + foodStuffID

6. SQL DDL Statements

```
CREATE TABLE Customer (  
    ID          VARCHAR(20) PRIMARY KEY,  
    name        VARCHAR(30),  
    email       VARCHAR(40) UNIQUE NOT NULL,  
    phone       VARCHAR(15),  
    dateOfBirth DATE,  
    UNIQUE (name, phone, dateOfBirth)  
)
```

```
CREATE TABLE Child (  
    ID          VARCHAR(20) PRIMARY KEY,  
    FOREIGN KEY (ID) REFERENCES Customer(ID)  
        ON DELETE CASCADE  
)
```

```
CREATE TABLE Senior (  
    ID          VARCHAR(20) PRIMARY KEY,  
    FOREIGN KEY (ID) REFERENCES Customer(ID)  
        ON DELETE CASCADE  
)
```

```
CREATE TABLE Review (  
    ID          VARCHAR(20) PRIMARY KEY,  
    star        FLOAT,  
    comment     VARCHAR(500),  
    customerID  VARCHAR(20) NOT NULL,  
    movieID     VARCHAR(20) NOT NULL,  
    FOREIGN KEY (customerID) REFERENCES Customer(ID),  
    FOREIGN KEY (movieID) REFERENCES Movie(ID)  
)
```

```
CREATE TABLE Theatre (  
    address     VARCHAR(50) PRIMARY KEY,  
    phone       VARCHAR(20) UNIQUE  
)
```

```
CREATE TABLE Room (  
    roomNum    INTEGER,  
    address    VARCHAR(50),  
    capacity   INTEGER,  
    PRIMARY KEY (roomNum, address),  
    FOREIGN KEY (address) REFERENCES Theatre(address)  
        ON DELETE CASCADE  
)
```

```
CREATE TABLE Movie (  
    ID          VARCHAR(20) PRIMARY KEY,  
    duration    INTEGER NOT NULL,  
    rating      VARCHAR(10),  
    name        VARCHAR(50) NOT NULL  
)
```

```
CREATE TABLE Shows (  
    address    VARCHAR(50),  
    roomNum    INTEGER,  
    movieID    VARCHAR(20),  
    PRIMARY KEY (address, roomNum, movieID),  
    FOREIGN KEY (roomNum, address) REFERENCES Room(roomNum, address),  
    FOREIGN KEY (movieID) REFERENCES Movie(ID)  
)
```

```
CREATE TABLE MovieSchedule (  
    time        TIMESTAMP,  
    roomNum     INTEGER,  
    address     VARCHAR(50),  
    movieID     VARCHAR(20) NOT NULL,  
    PRIMARY KEY (time, roomNum, address),  
    FOREIGN KEY (address, roomNum, movieID) REFERENCES Shows(address, roomNum,  
movieID)  
)
```

```

CREATE TABLE Ticket (
    ID          VARCHAR(20) PRIMARY KEY,
    type        VARCHAR(20),
    seatNum     VARCHAR(4),
    time        TIMESTAMP NOT NULL,
    customerID  VARCHAR(20) NOT NULL,
    price       FLOAT NOT NULL,
    address     VARCHAR(50) NOT NULL,
    roomNum     INTEGER NOT NULL,
    UNIQUE (time, roomNum, address, seatNum),
    FOREIGN KEY (customerID) REFERENCES Customer(ID),
    FOREIGN KEY (time, roomNum, address) REFERENCES MovieSchedule(time, roomNum,
address)
)

```

```

CREATE TABLE ConcessionStand (
    ID          VARCHAR(20) PRIMARY KEY,
    name        VARCHAR(20),
    address     VARCHAR(50) NOT NULL,
    FOREIGN KEY (address) REFERENCES Theatre(address)
)

```

```

CREATE TABLE Foodstuff (
    ID          VARCHAR(20) PRIMARY KEY,
    name        VARCHAR(20) NOT NULL,
    price       FLOAT NOT NULL
)

```

```

CREATE TABLE Offers (
    foodStuffID    VARCHAR(20),
    concessionStandID  VARCHAR(20),
    PRIMARY KEY (foodStuffID, concessionStandID),
    FOREIGN KEY (foodStuffID) REFERENCES Foodstuff(ID),
    FOREIGN KEY (concessionStandID) REFERENCES ConcessionStand(ID)
)

```

```

CREATE TABLE Eats (
    customerID      VARCHAR(20),
    concessionStandID  VARCHAR(20),
    foodStuffID      VARCHAR(20),
    PRIMARY KEY (customerID, concessionStandID, foodStuffID),
    FOREIGN KEY (customerID) REFERENCES Customer(ID),
    FOREIGN KEY (foodStuffID, concessionStandID) REFERENCES Offers(foodStuffID,
concessionStandID)
)

```


7. INSERT Statements

Customer(ID: varchar[20], name: varchar[30], email: varchar[40], phone: varchar[15], dateOfBirth: date)

1. INSERT INTO Customer(ID, name, email, phone, dateOfBirth)
VALUES ('1', 'Yuhei Arimoto', 'yuhei61627@icloud.com', '6043652065', 20021220)
2. INSERT INTO Customer(ID, name, email, phone, dateOfBirth)
VALUES ('2', 'Sean Quan', 'seanpquan@gmail.com', '6044961125', 20021231)
3. INSERT INTO Customer(ID, name, email, phone, dateOfBirth)
VALUES ('3', 'Tanmay Goyal', 'sancriuse75@gmail.com', '2083891111', 20030120)
4. INSERT INTO Customer(ID, name, email, phone, dateOfBirth)
VALUES ('4', 'Jack Aaaa', 'jack1234@icloud.com', '6041655235', 20001005)
5. INSERT INTO Customer(ID, name, email, phone, dateOfBirth)
VALUES ('5', 'Sam Bcde', 'samsam@gmail.com', '1234561234', 19900610)

Child(ID: varchar[20])

1. INSERT INTO Child(ID) VALUES ('1')
2. INSERT INTO Child(ID) VALUES ('2')
3. INSERT INTO Child(ID) VALUES ('10') *assume Customer with ID 10 exists
4. INSERT INTO Child(ID) VALUES ('15') *assume Customer with ID 15 exists
5. INSERT INTO Child(ID) VALUES ('105') *assume Customer with ID 105 exists

Senior(ID: varchar[20])

1. INSERT INTO Child(ID) VALUES ('3')
2. INSERT INTO Child(ID) VALUES ('5')
3. INSERT INTO Child(ID) VALUES ('9') *assume Customer with ID 9 exists
4. INSERT INTO Child(ID) VALUES ('82') *assume Customer with ID 82 exists
5. INSERT INTO Child(ID) VALUES ('100') *assume Customer with ID 100 exists

Review(ID: varchar[20], star: float, comment: varchar[1000], **customerID**: varchar[20], **movieID**: varchar[20])

1. INSERT INTO Review(ID, star, comment, customerID, movieID)
VALUES ('1', 4.0, 'Great movie', '1', '10')
2. INSERT INTO Review(ID, star, comment, customerID, movieID)
VALUES ('2', 4.5, 'Awesome plot', '2', '10')
3. INSERT INTO Review(ID, star, comment, customerID, movieID)
VALUES ('3', 1.0, 'Just boring', '5', '2345')
4. INSERT INTO Review(ID, star, comment, customerID, movieID)
VALUES ('4', 3.2, 'Super Mid movie, not bad', '3', '157982')
5. INSERT INTO Review(ID, star, comment, customerID, movieID)
VALUES ('10', 4.1, 'Pretty good. Great actors', '4', '113')

Theatre(address: varchar[50], phone: varchar[20])

1. INSERT INTO Theatre(address, phone)
VALUES ('1234 West Mall, Vancouver, BC', '3251112682')
2. INSERT INTO Theatre(address, phone)
VALUES ('5959 Student Union Boulevard, Vancouver, BC', '6041112222')
3. INSERT INTO Theatre(address, phone)
VALUES ('2929 Main Mall, Victoria, BC', '6049871234')
4. INSERT INTO Theatre(address, phone)
VALUES ('104 58 Ave SE, Calgary, AB', '4032555501')
5. INSERT INTO Theatre(address, phone)
VALUES ('452 SW Marine Dr, Vancouver, BC', '6046300414')

Room(roomNum: integer, **address**: varchar[50], capacity: integer)

1. INSERT INTO Room(roomNum, address, capacity)
VALUES (1, '1234 West Mall, Vancouver, BC', 100)
2. INSERT INTO Room(roomNum, address, capacity)
VALUES (2, '1234 West Mall, Vancouver, BC', 150)
3. INSERT INTO Room(roomNum, address, capacity)
VALUES (1, '452 SW Marine Dr, Vancouver, BC', 85)
4. INSERT INTO Room(roomNum, address, capacity)
VALUES (4, '452 SW Marine Dr, Vancouver, BC', 50)
5. INSERT INTO Room(roomNum, address, capacity)
VALUES (5, '452 SW Marine Dr, Vancouver, BC', 200)

Movie(ID: varchar[20], duration: integer, rating: varchar[10], name: varchar[50])

1. INSERT INTO Movie(ID, duration, rating, name)
VALUES ('10', 148, 'PG-13', 'Spider-Man: No Way Home')
2. INSERT INTO Movie(ID, duration, rating, name)
VALUES ('53', 121, 'PG-13', 'Spider-Man')
3. INSERT INTO Movie(ID, duration, rating, name)
VALUES ('2345', 95, '18A', 'Cocaine Bear')
4. INSERT INTO Movie(ID, duration, rating, name)
VALUES ('157982', 126, 'G', 'The Karate Kid')
5. INSERT INTO Movie(ID, duration, rating, name)
VALUES ('113', 125, 'PG-13', 'Ant-Man and the Wasp: Quantumania')

Shows(**address**: varchar[50], **roomNum**: integer, **movieID**: varchar[20])

1. INSERT INTO Shows(address, roomNum, movieID)
VALUES ('1234 West Mall, Vancouver, BC', 1, '10')
2. INSERT INTO Shows(address, roomNum, movieID)
VALUES ('1234 West Mall, Vancouver, BC', 1, '2345')

3. INSERT INTO Shows(address, roomNum, movieID)
VALUES ('452 SW Marine Dr, Vancouver, BC', 4, '10')
4. INSERT INTO Shows(address, roomNum, movieID)
VALUES ('452 SW Marine Dr, Vancouver, BC', 4, '157982')
5. INSERT INTO Shows(address, roomNum, movieID)
VALUES ('452 SW Marine Dr, Vancouver, BC', 4, '113')

MovieSchedule(time: timestamp, **roomNum**: integer, **address**: varchar[50], **movieID**:
varchar[20])

1. INSERT INTO MovieSchedule(time, roomNum, address, movieID)
VALUES ('2023-4-1 09:00', 4, '452 SW Marine Dr, Vancouver, BC', '10')
2. INSERT INTO MovieSchedule(time, roomNum, address, movieID)
VALUES ('2023-4-1 15:00', 4, '452 SW Marine Dr, Vancouver, BC', '10')
3. INSERT INTO MovieSchedule(time, roomNum, address, movieID)
VALUES ('2023-4-10 13:00', 4, '452 SW Marine Dr, Vancouver, BC', '10')
4. INSERT INTO MovieSchedule(time, roomNum, address, movieID)
VALUES ('2023-4-1 10:00', 4, '452 SW Marine Dr, Vancouver, BC', '157982')
5. INSERT INTO MovieSchedule(time, roomNum, address, movieID)
VALUES ('2023-4-1 09:00', 1, '1234 West Mall, Vancouver, BC', '10')

Ticket(ID: varchar[20], type: varchar[20], seatNum: varchar[4], **time**: timestamp, **customerID**:
varchar[20], price: float, **address**: varchar[50], **roomNum**: integer)

1. INSERT INTO Ticket(ID, type, seatNum, time, customerID, price, address, roomNum)
VALUES ('1452', '3D', 'D15', '2023-4-1 09:00', '1', 19.0, '452 SW Marine Dr, Vancouver,
BC', 4)
2. INSERT INTO Ticket(ID, type, seatNum, time, customerID, price, address, roomNum)
VALUES ('1453', '3D Luxury', 'A05', '2023-4-1 09:00', '2', 20.0, '1234 West Mall,
Vancouver, BC', 1)
3. INSERT INTO Ticket(ID, type, seatNum, time, customerID, price, address, roomNum)

VALUES ('1500', '4DX', 'C05', '2023-4-1 10:00', '4', 25.0, '452 SW Marine Dr, Vancouver, BC', 4)

4. INSERT INTO Ticket(ID, type, seatNum, time, customerID, price, address, roomNum)

VALUES ('173', 'Normal', 'C05', '2023-4-10 13:00', '1', 17.0, '452 SW Marine Dr, Vancouver, BC', 4)

5. INSERT INTO Ticket(ID, type, seatNum, time, customerID, price, address, roomNum)

VALUES ('782', 'Normal', 'D21', '2023-4-1 15:00', '5', 17.0, '452 SW Marine Dr, Vancouver, BC', 4)

ConcessionStand(ID: varchar[20], name: varchar[20], **address**: varchar[50])

1. INSERT INTO ConcessionStand(ID, name, address)

VALUES ('12', 'McDonald', '452 SW Marine Dr, Vancouver, BC')

2. INSERT INTO ConcessionStand(ID, name, address)

VALUES ('115', 'StarBucks', '452 SW Marine Dr, Vancouver, BC')

3. INSERT INTO ConcessionStand(ID, name, address)

VALUES ('1', 'A&W', '1234 West Mall, Vancouver, BC')

4. INSERT INTO ConcessionStand(ID, name, address)

VALUES ('1234', 'StarBucks', '1234 West Mall, Vancouver, BC')

5. INSERT INTO ConcessionStand(ID, name, address)

VALUES ('602', 'Tim Hortons', '104 58 Ave SE, Calgary, AB')

Foodstuff (ID: varchar[20], name: varchar[20], price: float)

1. INSERT INTO Foodstuff(ID, name, price)

VALUES ('100', 'BigMac Meal', 12.0)

2. INSERT INTO Foodstuff(ID, name, price)

VALUES ('101', 'Fries', 3.5)

3. INSERT INTO Foodstuff(ID, name, price)

VALUES ('2001', 'Iced Latte', 5.5)

4. INSERT INTO Foodstuff(ID, name, price)

VALUES ('57', 'Wedges', 4.5)

5. INSERT INTO Foodstuff(ID, name, price)

VALUES ('3', 'Root Beer', 2.5)

Offers (foodStuffID: varchar[20], concessionStandID: varchar[20])

1. INSERT INTO Offers(foodStuffID, concessionStandID)

VALUES ('100', '12')

2. INSERT INTO Offers(foodStuffID, concessionStandID)

VALUES ('2001', '1234')

3. INSERT INTO Offers(foodStuffID, concessionStandID)

VALUES ('2001', '115')

4. INSERT INTO Offers(foodStuffID, concessionStandID)

VALUES ('3', '1')

5. INSERT INTO Offers(foodStuffID, concessionStandID)

VALUES ('57', '602')

Eats (customerID: varchar[20], concessionStandID: varchar[20] , foodStuffID: varchar[20])

1. INSERT INTO Eats(customerID, concessionStandID, foodStuffID)

VALUES ('1', '12', '100')

2. INSERT INTO Eats(customerID, concessionStandID, foodStuffID)

VALUES ('2', '115', '2001')

3. INSERT INTO Eats(customerID, concessionStandID, foodStuffID)

VALUES ('2', '12', '100')

4. INSERT INTO Eats(customerID, concessionStandID, foodStuffID)

VALUES ('3', '602', '57')

5. INSERT INTO Eats(customerID, concessionStandID, foodStuffID)

VALUES ('4', '1234', '2001')