Dfo 1-2:

1. Important data that must be captured and stored in the student registration database would be Student ID number, name, date of birth, and address. Other information includes parent/guardian emergency contact information, health forms, and academic grades.

2. Important data for the library management system would be the book data (Author, Title, ISBN, publisher), inventory data for the book, customer ID information (contact information, email, card information, purchase information), and library information (contact information).

Dfo 1-3:

1. A. Hierarchal model
2. B. Network Model
3. C. Object-Oriented Model
4. D. Relational Model
5. E. Flat File Model

Dfo 1-4:

1. The Business rules identified are the type of membership that is being used. This includes student, corporate, and individuals. Another rule would be how long each membership can last.
2. Constraints would be that a person must be under one of the membership types and there must be justifications for membership to change.

3. The business rules attached to this are the doctors need a unique ID to be able to register with the hospital, patients must be registered to the hospital on their first visit with a unique ID number, and doctors need a minimum of 7 years' experience.

   Constraints would be that doctor's ID numbers have to start with the letters DC and that a unique patient's number must start with PT as well. Before a patient can seek help, they must first be registered on their first hospital visit.

Dfo 2-1:

1.

a. Books:

Book ID (Primary Key),
Title
ISBN (Unique Identifier)
Year
Price
PublisherID (Foreign Key)

b. Authors:
    - AuthorID (Primary Key)
    - Name
    - Address
    - Homepage URL
c. Publishers:
    - PublisherID (Primary Key)
    - Name
    - Address
    - Phone Number
    - URL
d. Book and Authors:
    - Book ID (Foreign key to Books Table)
    - AuthorID (Foreign Key to Authors Table)

e. Warehouse:
    - WarehouseID (Primary Key)
    - Code (Unique Identifier)
    - Address
    - Phone Number

f. Warehouse Stock:
    - Warehouse ID (Foreign key to Warehouses table)
    - Book ID (Foreign key to Books table)
    - Stock quantity
g. Customers:
    - Customer ID (Primary Key)
    - Name
    - Address
    - Email
    - Phone Number
h. Shopping Cart:
    - Shopping Cart ID (Primary Key)
    - Customer ID (Foreign key to Customer Table)

i. Cart Items:
    - Shopping Cart ID (Foreign key to Shopping Cart Table)
    - Book ID (Foreign key to Shopping Cart Table)
    - Quantity
j. Orders:
    - Order ID (Primary Key)
    - Customer ID (Foreign key to Customer Table)
    - Billing Address
    - Shipping Address
    - Shipping Option
    - Payment Information

Order Date
Order Status

k. Items:
   ItemID (Primary Key)
   OrderID (Foreign Key to Orders Table)
   BookID (Foreign key to Books Table)
   Quantity
   Price

2.

a. Customers:
   Customer ID (Primary Key)
   Name
   Address
   Phone number

b. Orders:
   Order ID (Primary Key)
   Customer ID (Foreign key to Customers Table)
   Order date

c. Items:
   Item ID (Primary Key)
   Order ID (Foreign Key to Orders table)
   Product ID (Foreign Key to Products table)
   Quantity
   Backorder Status

d. Products:
   Product ID (Primary Key)
   Product Name
   Product Description
   Supplier ID (Foreign Key to Suppliers Table)
   Quantity
   In Stock ReorderLevel

e. Suppliers:
   Supplier ID (Primary Key)
   Name
   Address
   Phone Number

f. Backorders:
   Backorder ID (Primary Key)
   Order Item ID (Foreign Key to Order Items Table)
   Supplier ID (Foreign Key to Suppliers Table)
   Reorder Date
   Status

g. Invoices:
   Invoice ID (Primary Key)
   Order ID (Foreign to Orders Table)

Invoice Date
Total Amount
Payment Status

h. Payments:
Payment ID (Primary Key)
Customer ID (Foreign Key to Customers Table)
Payment Date
Invoice ID (Foreign Key to Invoices Table)
Amount Paid
Payment Method

Dfo 2-2:

1.
1. Captures the functional and informational needs of business
2. Addresses the needs of a business but not address its implementation
3. Based on current needs, but may reflect future needs
4. Can become the blueprint for designing the physical model
5. Can identify important entities and relationships among entities

2. Two examples of conceptual models are an entity-relationship diagram and a flow chart.

Two examples of physical models: 3D Graphs, A diagram that includes table structures such as primary keys, columns, and foreign keys.

Dfo 2-3:

1.
1. School,
2. Student, Faculty, Parent Information
3. Department, Courses, Academic Session
4. Exam Grades, Attendance
5. Login Information

2. **COURSE**:
CourseID*
CourseName*

DEPARTMENT:
Department ID
Department Name
Department Head
STUDENT:
*STUDENT ID
*First Name
*Last Name
*Address

*Parent ID
*Department ID
o Email

FACULTY:

*Faculty ID
*Faculty First Name
*Faculty Last Name
*Faculty Login Time
*Faculty Logout Time
o contact info
o email

ACADEMIC SESSION:

*Session ID
*Session Name

PARENT INFORMATION:

*Parent ID
*Parent Name
* Contact information
o Email

EXAM:

EXAM ID
Name

Dfo 2-4:

1. Through the song name, artist, or album. The unique identifier would be SONG ID
2. Full name or Student ID.
3. Student ID, Movie Title and Date released, Locker Number
4. A. Unique Identifiers:
   Student ID
   Course ID
   Department ID
   Faculty ID
   Academic Session ID
   Parent Information ID
   Exam ID

   B. Candidate Unique Identifiers:
   Student Name
   Course Name
   Department Name
   Faculty Name
   Academic Session Name
   Parent Name
   Exam Nate

Dfo 2-5:

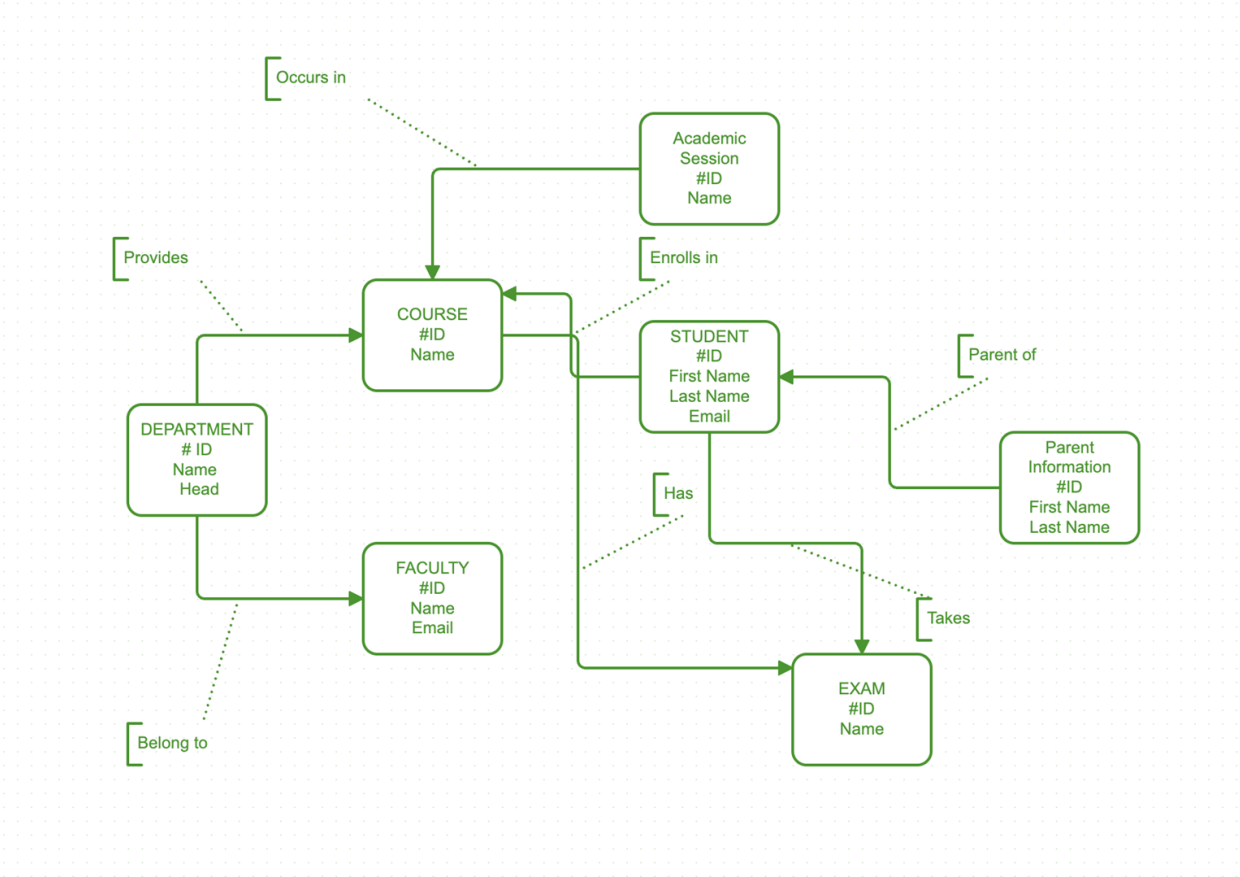
1. B. Each EMPLOYEE must be assigned to one and only one DEPARTMENT. Each DEPARTMENT must be responsible for one or more EMPlOYEEs.

2. A PERSON can be born in one or more TOWNs.
   A TOWN may be the birthplace of one and only one PERSON.

   Multiple PERSONs can be living in one and only one TOWN. A TOWN may be the hometown of multiple PERSONs.

   Multiple PERSONs may be the visitor of multiple TOWNs. Multiple TOWNs must be visited by multiple PERSONs.

   A PERSON may be the mayor of only one TOWN. A TOWN may be governed by only one PERSON.



3.

Each ACADEMIC SESSION must schedule one or more COURSE.
Each COURSE must be scheduled in one and only one ACADEMIC SESSION.
Each STUDENT may enroll in one or more COURSE.
Each COURSE must have enrolled one or more STUDENT.
Each COURSE must be offered by one and only one DEPARTMENT.
Each DEPARTMENT may offer one or more COURSES.

Each COURSE must be taught by one or more FACULTY.
Each FACULTY may teach one or more COURSE.
Each DEPARTMENT may contain one or more FACULTY.
Each FACULTY must belong to one and only one DEPARTMENT.

Each STUDENT may have one and only one PARENT INFORMATION. Each PARENT INFORMATION must be for one and only one STUDENT. Each STUDENT may take one or more EXAM.
Each EXAM must be taken by one or more STUDENT.

Each COURSE may have one or more EXAM.
Each EXAM must be for one and only one COURSE.

Dfo 2-6:

1. a. Entities: Can be Department, Employee, Project
   b. Attributes:
   Department:
   *Department Name
   *Supervisor ID
   *Supervisor Name
   Employee
   *Employee ID
   *Employee Name
   *Department ID
   *Project ID
   o Employee ID
   Project
   *Project ID
   o Project Name
2. HairStylist:
   HairStylistID
   *First Name
   *Last Name
   *Address
   *Phone number
   *Social-Security Number
   Client:
   *Client ID
   *First Name
   o Last Name
   o Phone Number
3. Teacher:
   *TeacherID
   *First Name

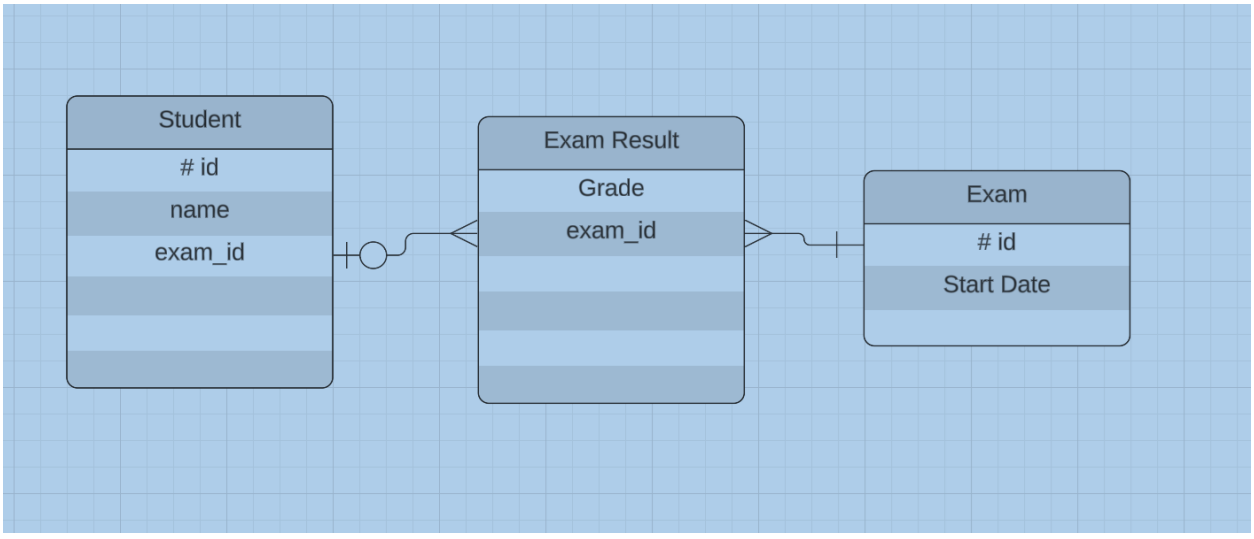
*Last Name
*Address
*Phone Number
*Email

Course:
*Course Code
*Course Name
Class:
*Class ID
*Day
*Time
*Classroom
A TEACHER can be assigned one or more CLASSES
A CLASS is taught by only one TEACHER
A COURSE may be offered through one or more CLASSES
A CLASS must be connected to only one COURSE

Dfo 3-1:

A) 1. The Student ID and course pair ID can be distinct or unique through the foreign keys of COURSE ID and Student ID
2. The Course ID and course pair ID can be distinct or unique through the foreign keys of COURSE ID and Student ID
3. Student_Course and Student_ Exam will have two more tables and there will be student ID and Exam ID foreign keys for Student_Course AND Exam ID and Student ID UNDER Student_Exam to be able to take multiple exams.

B)



C) 1. Faculty (Supertype)
ID

First Name
Last Name
Email
Login Date
Login Time
Details

FullTimeFaculty (Subtype)
Salary
Insurance Plan

PartTimeFaculty (Subtype)
Hourly Rate

D) 1. Course instance can be held ONLINE (subtype) or in a SEATED (subtype) Location.

Course (Supertype):
Course ID
Course Name

Seated (Subtype):
Building Name
Room Number
Date/Time

Online (Subtype):
Login ID
Password

E) 1. The hotel will have many floors
Many suites on each floor
Many rooms within each suite
The Unique Identifiers can be HOTEL ID, SUITE ID, FLOOR ID and Room ID.

Hotel:
Attributes:
Hotel ID (Unique Identifier)
Hotel Name
Address

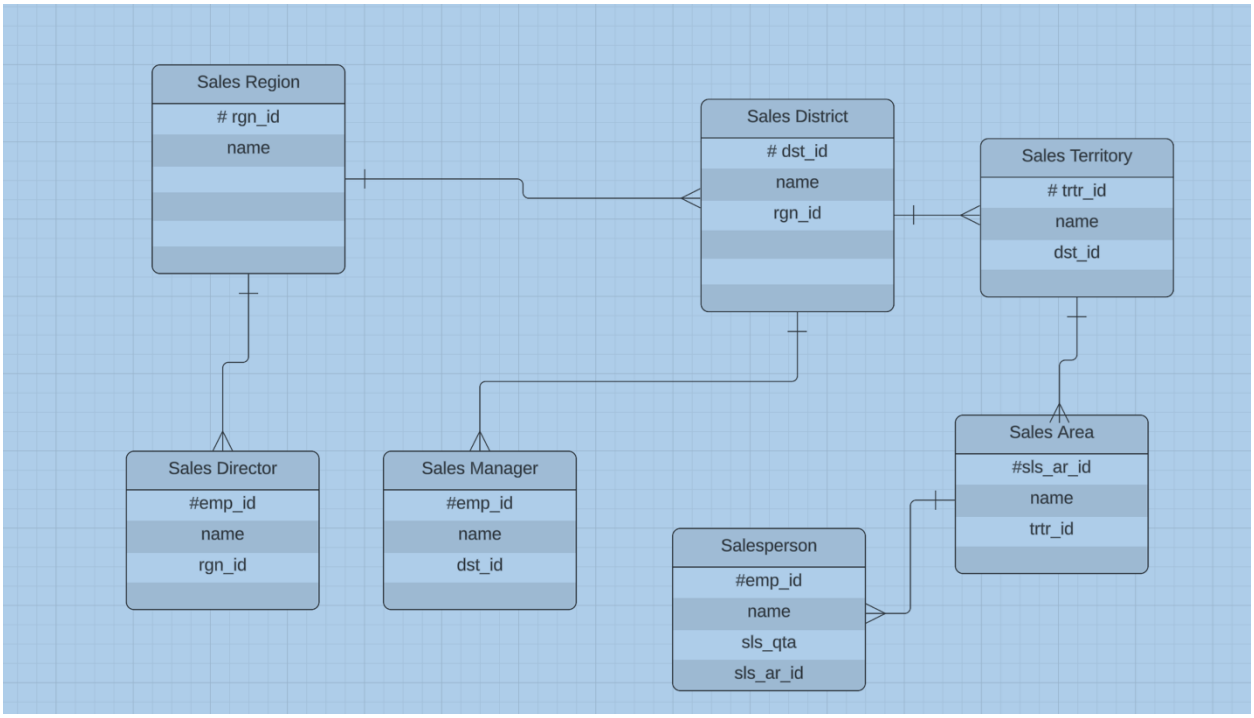
Floor:
Attributes:
Floor ID (Unique Identifier)
Floor Number
Hotel ID (Foreign Key, mentions Hotel)

Suite:
Attributes:
Suite ID (Unique Identifier)
Suite Number
Floor ID (Foreign Key, mentions Floor)

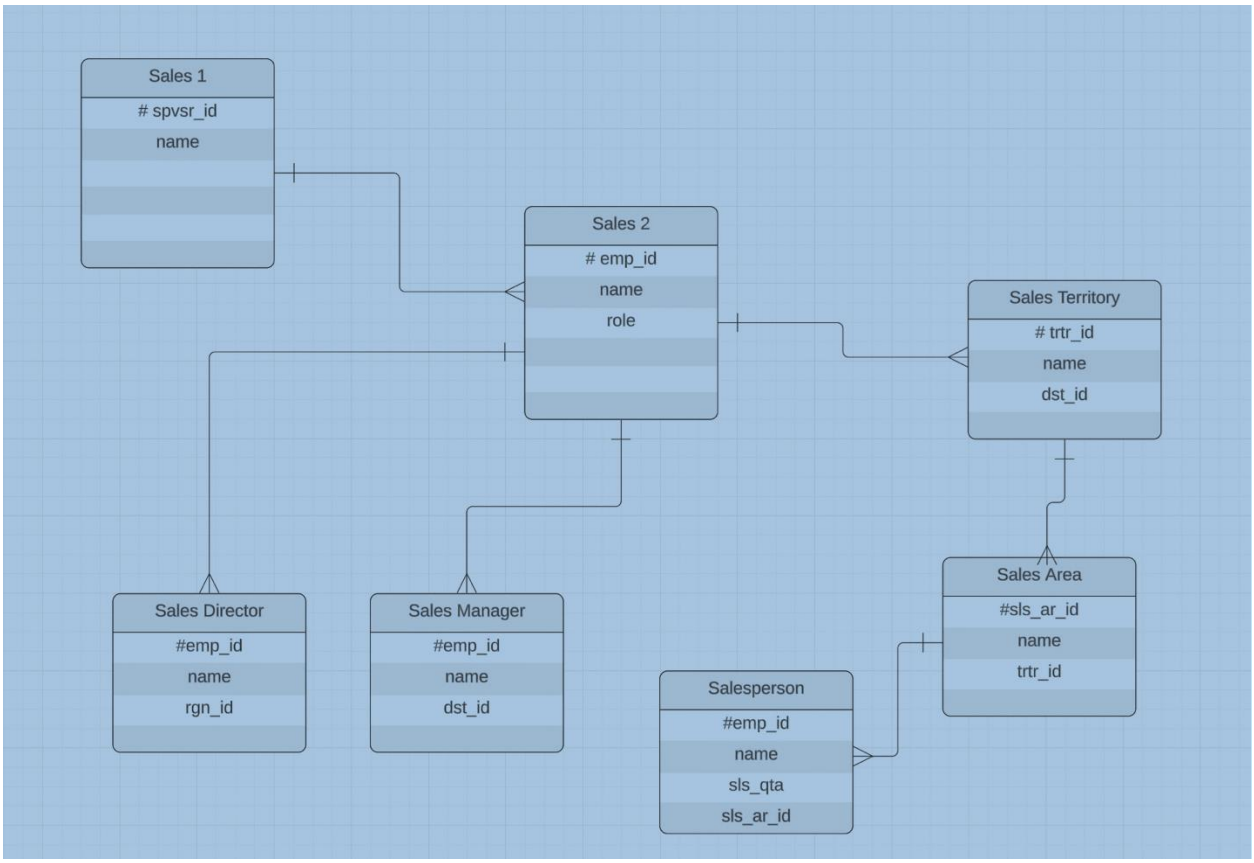
Room
Attributes
Room ID (Unique Identifier)
Room Number
Suite ID (Foreign Key, mentions Suite)

f).

1. Hierarchical structure:

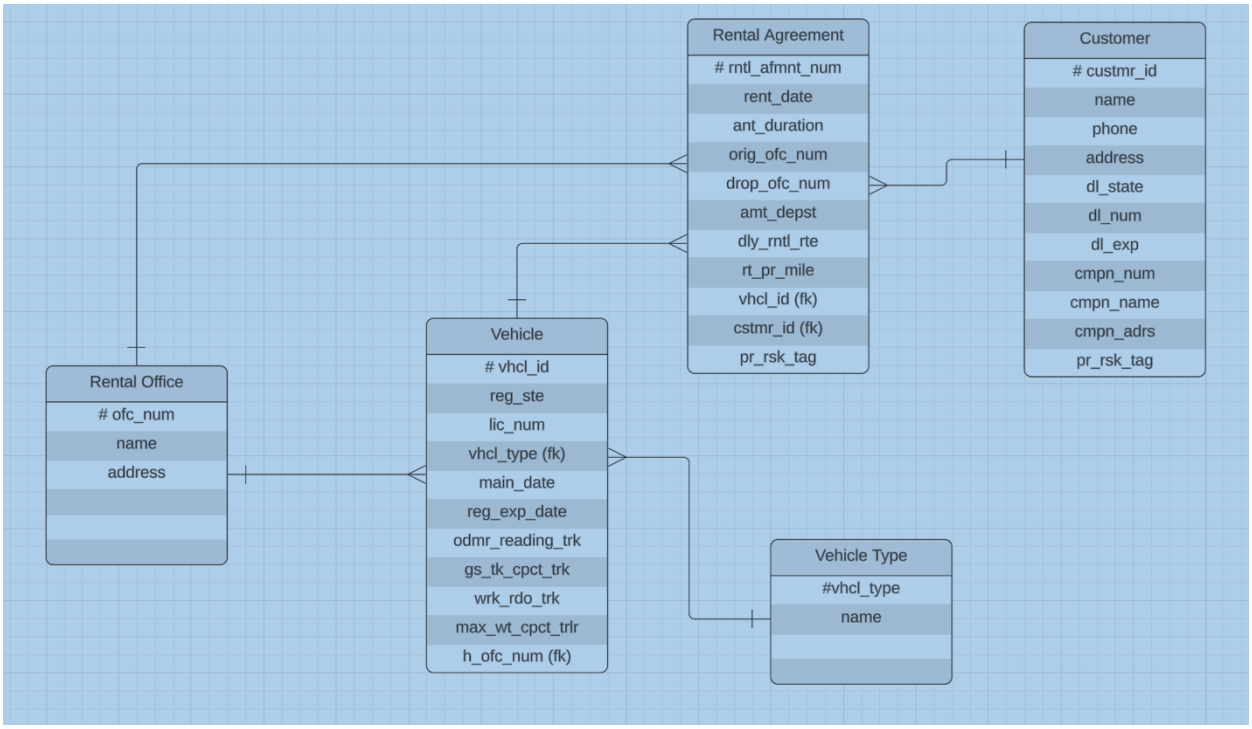


Recursive structure


Sales 1
spvsr_id
name
Sales 2
emp_id
name
role
Sales Territory
trtr_id
name
dst_id
Sales Director
#emp_id
name
rgn_id
Sales Manager
#emp_id
name
dst_id
Sales Area
#sls_ar_id
name
trtr_id
Salesperson
#emp_id
name
sls_qta
sls_ar_id

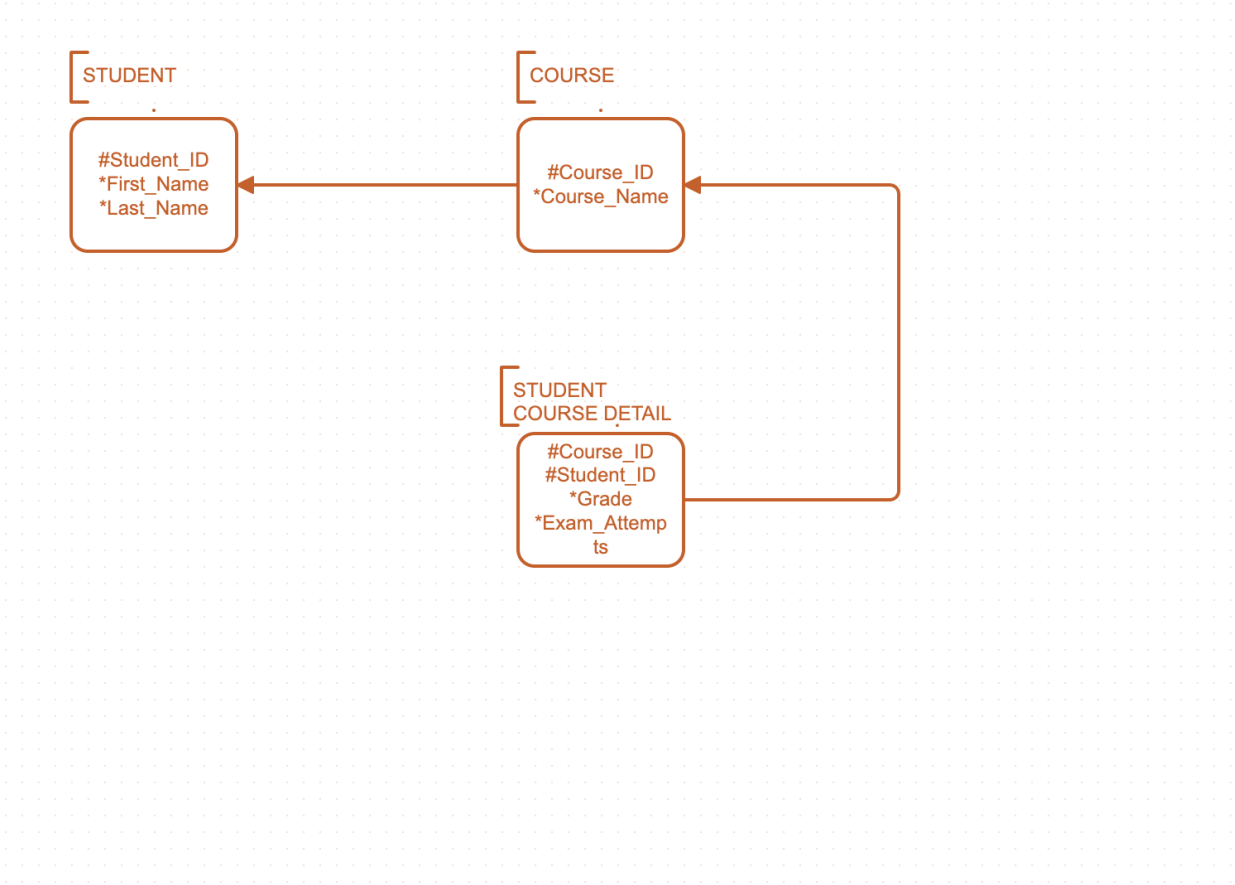
G)

1.


Rental Agreement
rntl_afmnt_num
rent_date
ant_duration
orig_ofc_num
drop_ofc_num
amt_depst
dly_rntl_rte
rt_pr_mile
vhcl_id (fk)
cstmr_id (fk)
pr_rsk_tag
Customer
custmr_id
name
phone
address
dl_state
dl_num
dl_exp
cmpn_num
cmpn_name
cmpn_adrs
pr_rsk_tag
Rental Office
ofc_num
name
address
Vehicle
vhcl_id
reg_ste
lic_num
vhcl_type (fk)
main_date
reg_exp_date
odmr_reading_trk
gs_tk_cpct_trk
wrk_rdo_trk
max_wt_cpct_trlr
h_ofc_num (fk)
Vehicle Type
#vhcl_type
name

DFO 3-2:

1, The ERD will be modified to include historical grades by having exam attempts under the STUDENT COURSE DETAIL entity to keep a record of HISTORICAL GRADES



A) Because the exams can be scheduled on the same day in the same classroom.

B) i. Making sure that the start time of the exam does not overlap with another exam.

ii. Due to conditional non-transferability, you cannot move an assignment of exam from one classroom to another unless the start time and date are in the future

iii. If dates and times are still in the future, the start date and time may be updated earlier or later.

Dfo 3-3:

1.

Item ID	Color
IT001	Red
IT001	Blue
IT002	Yellow
IT003	Green
IT004	Blue
IT004	Yellow

Item ID	Price
IT001	$16.56
IT002	$17.48
IT003	$19.76
IT004	$20.00

2.

Supplier ID	Store ID
SP001	S1
SP001	S3
SP002	S1
SP003	S2
SP004	S3

Store ID	Location
S1	New Hampshire
S2	Rhode Island
S3	Vermont
S4	New York
S5	Illinois

3.

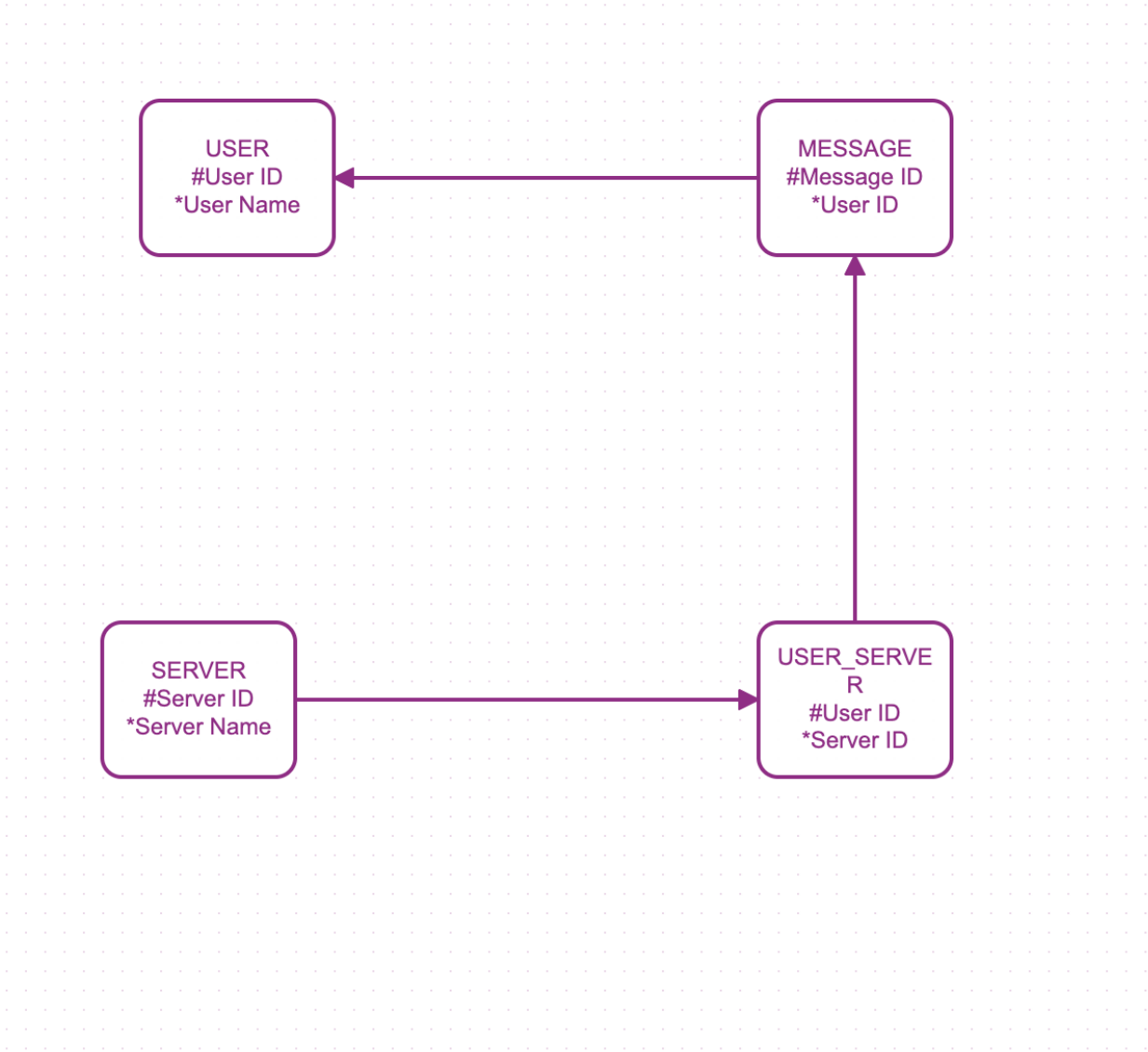
Book ID	Category ID	Price
1	1	$27.99
2	2	$17.99
3	1	$20.99
4	3	$40.99
5	2	$19.99

Category ID	Category Desc
1	Cooking
3	Computers
2	Travel

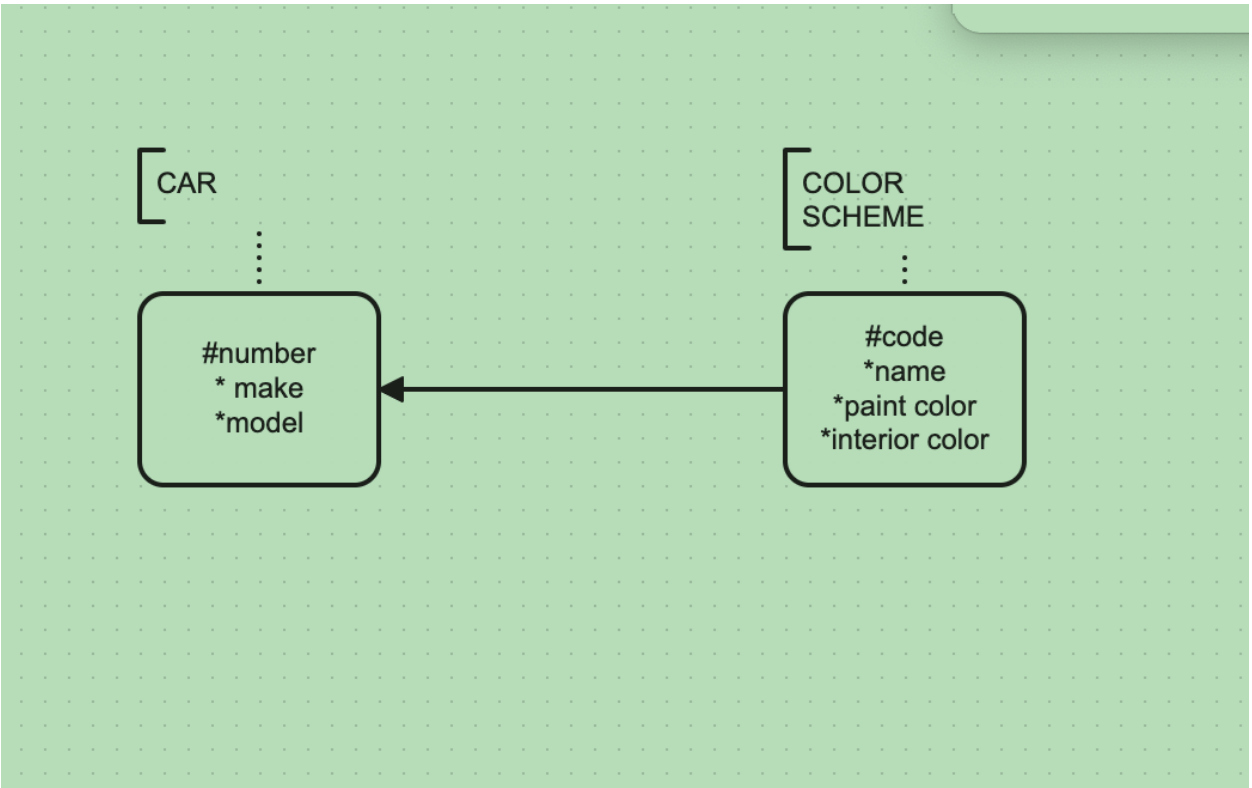
b).
1. Course belongs in academic session
Exam type would be in a different table
Date and Login Time are in a different table
Table for who should take exam

C)

1.



2. The color and interior color and paint color are attributes of color scheme



d)

1. Identify the business rules:
   - Each book has specific time, ISBN, Year, and Price
   - Authors linked to one or more books
   - Publishers are recorded with address, name, and URL
   - Warehouses are identified by specific information such as codes, phone numbers, and address
   - Books can be stocked at different warehouses
   - The database can track the number of copies of books at each warehouse
   - Customer has specific information such as phone, email, and name
   - Each customer has many shopping carts that has different books by a specific ID
   - Shopping carts have the number of books copied
   - Customer provide specific information for the transaction and an email is sent.
2.

Business Rule	Structural Business Rule	Procedural Business Rule	Programmatic Business Rule
All teachers in our school must possess a valid teaching certificate	X		

Each Department must offer a Course	X		
Approval of travel requests to an event must be signed by the project manager of the event		X	
A customer may make numerous payments on account	X		
A machine operator may not work more than 10 hours in a day			X
The Rental amount in RENTAL is calculated from the Rental rate multiplied by the number of days			X

A Customer can have zero, one or many ORDERS	X		
The Total cost of the RENTAL is calculated from the sum of Insurance amount, Rental amount, and Late charge			X
A customer's debt must not exceed the customer's credit limit.			X

Dfo 3-4)
1.

Analysis	Design
Attribute	Column
Entity	Table
ER Model	Physical design
Instance	Row
Primary UID	Primary key
Relationship	Foreign key
Secondary UID	Unique key

2.

a. pk	Primary key
b. fk	Foreign key
c. uk	Unique key

d. *	Mandatory
e. o	Optional

2b. A. Authors: ATR
b. Publishers: PLR
c. Customers: CTR

3.

SONG	EVENT	CUSTOMER	
X			Title
X	**X**		Description
	X		Venue
		X	First Name
		X	Phone Number
X			Release Date
		X	Last Name
X	**X**		Type
		X	Email address

b)

PARENT INFORMATION

Key Type	**Optionality**	**Parent Information**
pk	*	id
	*	parent_firstname
	*	parent_lastname
	o	parent2_first_name
	o	parent2_lastname

EXAM TYPES

Key Type	**Optionality**	**Exam Type**

pk	*	id
	*	name
	o	description

STUDENTS

Key Type	Optionality	Student
pk	*	id
	*	first_name
	*	last_name
	*	reg_year
uk	*	email
fk1	*	Parent_id

DEPARTMENTS

Key Type	Optionality	Department
pk	*	id
uk	*	name
	*	head

FACULTY

Key Type	Optionality	Faculty Information
pk		id
	*	first_name
	*	Last_name
uk	*	email
	o	salary
	o	insurance
	o	Hourly_rate

fk1	o	Dept_id

Courses

Key Type	**Optionality**		**Course**
pk	*		id
uk	*		name
fk1	*		Session_id
fk2	*		Dept_id
	o		Date_time

Academic Session

Key Type	**Optionality**	**Academic Session**
pk	*	id
uk	*	name