Exercise 1

Step 1 : Raw Table Unormalized

This is the unnormalized relation directly from the form.
Attributes : CustomerNumber, CustomerName, CustomerType, OrderDate, OrderTime, Employee, PartNumber, PartName, PartType, CageCode, UnitPrice, and QuantityOrdered.

Happy Supplies
Parts Warehouse

Customer Name:	Jeff Peterson	**Date:**	7/1/2024
Customer Number:	H654587	**Time:**	10:30am
		Employee:	D. Harrison
Customer Type:	Consumer		

Part Number	Name	Type	Cage Code	Quantity Ordered	Unit Price
10654	Float Control	Plumbing	G413	4	12
10456	Modulator	Electrical	H433	3	7
10776	Hose Assembly	Plumbing	G413	7	9
10657	Float Assembly	Plumbing	G413	5	10

Assumptions :
1. A customer can place multiple orders.
2. An order can contain multiple parts.
3. Each part is uniquely identified by PartNumber.
4. Each part has only one PartName, PartType, CageCode, and UnitPrice.
5. A cage code identifies the storage location of one or more parts.
6. Employees can serve any customer (no special relationship between specific employees and customers).
7. An order is uniquely identified by the combination of CustomerNumber, Date, and Time.

Step 2: 1NF

All attributes are atomic, and rows are uniquely identified by the composite PK. (Raw data was also already in 1NF)

OrderForm_1NF

CustomerNumber	**Date**	**Time**	**PartNumber**	CustomerName	CustomerType	Employee	PartName	PartType	CageCode	QuantityOrdered	UnitPrice
H654587	7/1/2024	10:30am	10654	Jeff Peterson	Consumer	D. Harrison	Float Control	Plumbing	G413	4	12
H654587	7/1/2024	10:30am	10456	Jeff Peterson	Consumer	D. Harrison	Modulator	Electrical	H433	3	7
H654587	7/1/2024	10:30am	10776	Jeff Peterson	Consumer	D. Harrison	Hose Assembly	Plumbing	G413	7	9
H654587	7/1/2024	10:30am	10657	Jeff Peterson	Consumer	D. Harrison	Float Assembly	Plumbing	G413	5	10

Step 3: 2NF

Split the table to remove partial dependencies.

Customer

CustomerNumber	CustomerName	CustomerType
H654587	Jeff Peterson	Consumer

Employee

Employee
D. Harrison

Part

PartNumber	PartName	PartType	CageCode	UnitPrice
10654	Float Control	Plumbing	G413	12
10456	Modulator	Electrical	H433	7
10776	Hose Assembly	Plumbing	G413	9
10657	Float Assembly	Plumbing	G413	10

Order

CustomerNumber	**Date**	**Time**	Employee
H654587	7/1/2024	10:30am	D. Harrison

OrderLine

CustomerNumber	**Date**	**Time**	**PartNumber**	QuantityOrdered
H654587	7/1/2024	10:30am	10654	4
H654587	7/1/2024	10:30am	10456	3
H654587	7/1/2024	10:30am	10776	7
H654587	7/1/2024	10:30am	10657	5

Each non-key attribute depends fully on its table's PK. Partial dependencies have been eliminated.

Step 4: 3NF (marked FK)

2NF already satisfy the requirements of 3NF because there are no transitive dependencies

Customer

CustomerNumber	CustomerName	CustomerType
H654587	Jeff Peterson	Consumer

Employee

Employee
D. Harrison

Part

PartNumber	PartName	PartType	CageCode	UnitPrice
10654	Float Control	Plumbing	G413	12
10456	Modulator	Electrical	H433	7
10776	Hose Assembly	Plumbing	G413	9
10657	Float Assembly	Plumbing	G413	10

Order

CustomerNumber	**Date**	**Time**	*Employee*
H654587	7/1/2024	10:30am	D. Harrison

OrderLine

CustomerNumber	**Date**	**Time**	***PartNumber***	QuantityOrdered
H654587	7/1/2024	10:30am	10654	4
H654587	7/1/2024	10:30am	10456	3
H654587	7/1/2024	10:30am	10776	7
H654587	7/1/2024	10:30am	10657	5

3N relations : (I Itaclized the FK hopefully its easy to see through pdf)
- Customer(CustomerNumber PK, CustomerName, CustomerType)
- Employee(Employee PK)
- Part(PartNumber PK, PartName, PartType, CageCode, UnitPrice)
- Order(CustomerNumber PK/FK, Date PK, Time PK, Employee FK)
- OrderLine(CustomerNumber PK/FK, Date PK/FK, Time PK/FK, PartNumber PK/FK, QuantityOrdered)

Exercise 2

Step 1 : Raw Table

Attributes: staffNo, therapistName, patNo, patName, appointmentDate, appointmentTime, branchNo

staffNo	therapistName	patNo	patName	appointment date	appointment time	branchNo
S1011	Fred Smith	P100	Lily White	9/12/2022	10:00	M15
S1011	Fred Smith	P105	Jill Baker	9/12/2022	12:00	M15
S1024	Heidi Pierce	P108	Andy McKee	9/12/2022	10:00	Q10
S1024	Heidi Pierce	P108	Andy McKee	9/14/2022	14:00	Q10
S1032	Richard Levin	P105	Jill Baker	9/14/2022	16:30	M15
S1032	Richard Levin	P110	Jimmy Winter	9/15/2022	18:00	B13

Assumptions :
1. Each therapist is uniquely identified by staffNo.
2. Each patient is uniquely identified by patNo.
3. Each branch is uniquely identified by branchNo.
4. A therapist may work at multiple branches across different days, but only at one branch per day.
5. An appointment is uniquely identified by the combination of staffNo, patNo, appointmentDate, appointmentTime.
6. A patient can have multiple appointments in one day and with different therapists.
7. Therapist names and patient names are dependent only on their respective IDs.

Step 2: 1NF All values are atomic and identified by the composite PK.

TherapistAppointment

staffNo	therapistName	**patNo**	patName	**appointmentDate**	**appointmentTime**	branchNo
S1011	Fred Smith	P100	Lily White	9/12/2022	10:00	M15
S1011	Fred Smith	P105	Jill Baker	9/12/2022	12:00	M15
S1024	Heidi Pierce	P108	Andy McKee	9/12/2022	10:00	Q10
S1024	Heidi Pierce	P108	Andy McKee	9/14/2022	14:00	Q10
S1032	Richard Levin	P105	Jill Baker	9/14/2022	16:30	M15
S1032	Richard Levin	P105	Jimmy Winter	9/15/2022	18:00	B13

Step 3: 2NF (remove partial dependencies)

Problem:
- therapistName is dependent on staffNo, where staffNo is only part of the composite PK.
- patName is dependent on patNo, patNo is only part of the composite PK.
- branchNo depends on the combination of staffNo + appointmentDate, not the full composite PK.

Fix:
- Move therapistName into a new Therapist relation with staffNo as PK.
- Move patName into a new Patient relation with patNo as PK.
- Keep branchNo in the Appointment relation (since it depends on staffNo + appointmentDate).
- The remaining Appointment relation now has only full dependencies on the composite PK.

Therapist

staffNo	therapistName
S1011	Fred Smith
S1024	Heidi Pierce
S1032	Richard Levin

Patient

patNo	patName
P100	Lily White
P105	Jill Baker
P108	Andy McKee
P108	Andy McKee
P105	Jill Baker
P105	Jimmy Winter

Branch

branchNo
M15
M15
Q10
Q10
M15
B13

Appointment

staffNo	**patNo**	**appointmentDate**	**appointmentTime**	branchNo
S1011	P100	9/12/2022	10:00	M15
S1011	P105	9/12/2022	12:00	M15
S1024	P108	9/12/2022	10:00	Q10
S1024	P108	9/14/2022	14:00	Q10
S1032	P105	9/14/2022	16:30	M15
S1032	P105	9/15/2022	18:00	B13

TherapistName depends only on staffNo, patName depends only on patNo, and branchNo depends on staffNo + appointmentDate. Partial dependencies are removed

Step 4: 3NF (The 2NF relations already satisfy 3NF because there are no transitive dependencies, itaclized FK)

Therapist

staffNo	therapistName
S1011	Fred Smith
S1024	Heidi Pierce
S1032	Richard Levin

Patient

patNo	patName
P100	Lily White
P105	Jill Baker
P108	Andy McKee
P108	Andy McKee
P105	Jill Baker
P105	Jimmy Winter

Branch

branchNo
M15
M15
Q10
Q10
M15
B13

Appointment

staffNo	***patNo***	**appointmentDate**	**appointmentTime**	*branchNo*
S1011	P100	9/12/2022	10:00	M15
S1011	P105	9/12/2022	12:00	M15
S1024	P108	9/12/2022	10:00	Q10
S1024	P108	9/14/2022	14:00	Q10
S1032	P105	9/14/2022	16:30	M15
S1032	P105	9/15/2022	18:00	B13

Final 3NF Relations
- Therapist(staffNo PK, therapistName)
- Patient(patNo PK, patName)
- Branch(branchNo PK)
- Appointment(staffNo PK/FK, patNo PK/FK, appointmentDate PK, appointmentTime PK, branchNo FK)

Exercise 3

Step 1 : Raw Table

Attributes: eNo, eName, contractNo, hours, eventNo, eventLoc

eNo	contractNo	hours	eName	eventNo	eventLoc
1135	C1024	16	Smith J	H25	Queens
1057	C1024	24	Hocine D	H25	Queens
1068	C1025	28	White T	H4	Yonkers
1135	C1025	15	Smith J	H4	Yonkers
1135	C1026	10	Smith J	H25	Queens

Assumptions
1. Each employee is uniquely identified by eNo.
2. Each employee has one name (eName), which depends only on eNo.
3. Each contract is uniquely identified by contractNo.
4. Each contract belongs to one specific event, identified by eventNo.
5. Each event is uniquely identified by eventNo and has a location (eventLoc).
6. Hours worked are tied to a specific employee on a specific contract.

Step 2 : 1NF

All values are atomic and partial dependencies exist (eName depends only on eNo, eventLoc depends only on eventNo).

EmployeeContract

eNo	**contractNo**	hours	eName	eventNo	eventLoc
1135	C1024	16	Smith J	H25	Queens
1057	C1024	24	Hocine D	H25	Queens
1068	C1025	28	White T	H4	Yonkers
1135	C1025	15	Smith J	H4	Yonkers
1135	C1026	10	Smith J	H25	Queens

Step 2 : 3NF

Problem:
- eName depends only on eNo, which is part of the composite PK (eNo, contractNo). This is a partial dependency.
- eventLoc depends only on eventNo, not on the full composite PK.
- Each contractNo applies to exactly one eventNo. This means contractNo → eventNo.

Fix:
- Create an Employee table so that eName depends only on eNo.
- Create an Event table so that eventLoc depends only on eventNo.
- Create a Contract table to link contractNo with its event.
- Create a WorkHours table that records the relationship between employees and contracts, along with hours worked.

Employee

eNo	eName
1135	Smith J
1057	Hocine D
1068	White T
1135	Smith J
1135	Smith J

Event

eventNo	eventLoc
H25	Queens
H25	Queens
H4	Yonkers
H4	Yonkers
H25	Queens

Contract

contractNo	eventNo
C1024	H25
C1024	H25
C1025	H4
C1025	H4
C1026	H25

WorkHour

eNo	**contractNo**	hours
1135	C1024	16
1057	C1024	24
1068	C1025	28
1135	C1025	15
1135	C1026	10

Each non-key attribute now fully depends on the whole PK of its table.

Step 4: 3NF (The 2NF relations already satisfy 3NF because there are no transitive dependencies, itaclized FK)

Employee

eNo	eName
1135	Smith J
1057	Hocine D
1068	White T
1135	Smith J
1135	Smith J

Final 3NF Relations
- Employee(eNo PK, eName)
- Event(eventNo PK, eventLoc)
- Contract(contractNo PK, eventNo FK)
- WorkHours(eNo PK/FK, contractNo PK/FK, hours)

Event

eventNo	eventLoc
H25	Queens
H25	Queens
H4	Yonkers
H4	Yonkers
H25	Queens

Contract

contractNo	*eventNo*
C1024	H25
C1024	H25
C1025	H4
C1025	H4
C1026	H25

WorkHour

eNo	***contractNo***	hours
1135	C1024	16
1057	C1024	24
1068	C1025	28
1135	C1025	15
1135	C1026	10