Exercise 1

Step 1: Initial Data Table (Unnormalized Form)

Happy Supplies
Parts Warehouse

Customer Name:	Jeff Peterson	**Date:**	7/1/2024
Customer Number:	H G54587	**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

Which basically means (if we convert to standard naming and format convention)

customerName	customer Number	customerType	date	time	employee	partNumber	name	type	cage Code	quantity Ordered	unitPrice
Jeff Peterson	H G54587	Consumer	7/1/2024	10:30am	D. Harrison	10654	Float Control	Plumbing	G413	4	12
Jeff Peterson	H G54587	Consumer	7/1/2024	10:30am	D. Harrison	10456	Modulator	Electrical	H433	3	7
Jeff Peterson	H G54587	Consumer	7/1/2024	10:30am	D. Harrison	10776	Hose Assembly	Plumbing	G413	7	9
Jeff Peterson	H G54587	Consumer	7/1/2024	10:30am	D. Harrison	10657	Float Assembly	Plumbing	G413	5	10

Identified Issues:

- **Multiple Values in a Single Table**: The table contains attributes that belong to different entities (Customers, Employees, Orders, and Parts).
- **Functional Dependencies**: Some fields are dependent on non-key attributes, violating normal forms.

Step 2: Convert to First Normal Form (1NF)

1NF Rules:

- There should be a primary key.
- Each column should contain only a single value (no repeating groups).

Composite primary key: **customerNumber, date, time, partNumber, employee**

1NF Table:

customer Number	**customer Name**	**customer Type**	**date**	**time**	**part Number**	**partName**	**type**	**cage Code**	**quantity Ordered**	**unitPrice**	**employee**
H G54587	Jeff Peterson	Consumer	7/1/2024	10:30am	10654	Float Control	Plumbing	G413	4	12	D. Harrison
H G54587	Jeff Peterson	Consumer	7/1/2024	10:30am	10456	Modulator	Electrical	H433	3	7	D. Harrison
H G54587	Jeff Peterson	Consumer	7/1/2024	10:30am	10776	Hose Assembly	Plumbing	G413	7	9	D. Harrison
H G54587	Jeff Peterson	Consumer	7/1/2024	10:30am	10657	Float Assembly	Plumbing	G413	5	10	D. Harrison

Step 3: Convert to Second Normal Form (2NF)

2NF Rules:

- Must be in 1NF.
- No partial dependency.

Identified Issues:

- **customerName and customerType** depend only on **customerNumber**, not on partNumber.
- **employee** depends on date and time but not on partNumber.
- **partName, type, cageCode, and unitPrice** depend only on partNumber

Break into separate tables:

Customers Table

customerNumber	**customerName**	**customerType**
H G54587	Jeff Peterson	Consumer

Orders Table

- Assuming the same customer can make an order with two different employees on the same date and time.

customerNumber	**date**	**time**	**employee**
H G54587	7/1/2024	10:30am	D. Harrison

Parts Table

partNumber	**partName**	**type**	**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 Details Table

customerNumber	**date**	**time**	**partNumber**	**quantityOrdered**
H G54587	7/1/2024	10:30am	10654	4
H G54587	7/1/2024	10:30am	10456	3
H G54587	7/1/2024	10:30am	10776	7
H G54587	7/1/2024	10:30am	10657	5

- A customer may place multiple orders at the same time and each order can contain multiple parts.

Step 4: Convert to Third Normal Form (3NF)

3NF Rules:

- Must be in 2NF.
- No transitive dependencies.

Identified Issues:

- **employee** depends only on the Employee, not the Order.
- **cageCode** is not fully dependent on Part Number; it could be in its own table if needed for inventory tracking.

Final 3NF Tables:

Customers Table

customerNumber	**customerName**	**customerType**
H G54587	Jeff Peterson	Consumer

Orders Table

customerNumber	**date**	**time**	***employee***
H G54587	7/1/2024	10:30am	D. Harrison

Employees Table

employee
D. Harrison

- If I could, I'd add an employee ID to make the data a little less redundant.

Parts Table

partNumber	**partName**	**type**	**cageCode**	**unitPrice**
10654	Float Control	Plumbing	C413	12
10456	Modulator	Electrical	H433	7
10776	Hose Assembly	Plumbing	G413	9
10657	Float Assembly	Plumbing	G413	10

Order Details Table

customerNumber	**date**	**time**	***partNumber***	**quantityOrdered**
H G54587	7/1/2024	10:30am	10654	4
H G54587	7/1/2024	10:30am	10456	3
H G54587	7/1/2024	10:30am	10776	7
H G54587	7/1/2024	10:30am	10657	5

- I think an easy way to optimize this data would be to include an orderId variable.
    - It would allow us to not have to repeat a lot of information and we could potentially remove a lot of repetition.

Exercise 2

Step 1: Initial Data Table (Unnormalized Form - UNF)

staffNo	therapistName	patNo	patName	appointment		branchNo
				date	time	
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

Issues with this Table:

- Appointment date and time looks a little confusing so I'd reformat it to look like:

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	P110	Jimmy Winter	9/15/2022	18:00	B13

Issues with this Table:

- **Repeating Data**: Therapist and patient information is repeated multiple times.
- **Multiple Entities**: The table contains therapist details, patient details, appointment details, and branch details in one place.
- **Functional Dependencies**:
    - therapistName depends on staffNo.
    - patName depends on patNo.
    - branchNo is tied to an appointment, meaning it depends on staffNo, appointment date, and appointment time.

Step 2: Convert to First Normal Form (1NF)

1NF Rules:

- There should be a primary key.
- Each column should contain only a single value (no repeating groups).

Composite primary key: **staffNo, patNo, appointment date, appointment time, branchNo**

1NF Table:

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	**P110**	Jimmy Winter	**9/15/2022**	**18:00**	**B13**

Step 3: Convert to Second Normal Form (2NF)

2NF Rules:

- Must be in 1NF.
- No **partial dependencies**

Identified Issues:

- therapistName depends only on staffNo, not on the full primary key.
- patName depends only on patNo.
- branchNo depends on staffNo for a specific appointment, not the full key

Solution: Break into separate tables:

Therapists Table

staffNo	therapistName
S1011	Fred Smith
S1024	Heidi Pierce
S1032	Richard Levin

Patients Table

patNo	patName
P100	Lily White
P105	Jill Baker
P108	Andy McKee
P110	Jimmy Winter

Appointments Table

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	**P110**	**9/15/2022**	**18:00**	*B13*

Branches Table

branchNo
M15
Q10
B13

Step 4: Convert to Third Normal Form (3NF)

3NF Rules:

- Must be in 2NF.
- No **transitive dependencies** (a non-key attribute cannot depend on another non-key attribute).

Identified Issues:

- branchNo depends on staffNo on a given day.
- The branchNo should be related to a therapist's location.

Final 3NF Tables:

Therapists Table

staffNo	therapistName
S1011	Fred Smith
S1024	Heidi Pierce
S1032	Richard Levin

Patients Table

patNo	patName
P100	Lily White
P105	Jill Baker
P108	Andy McKee
P110	Jimmy Winter

Appointments Table

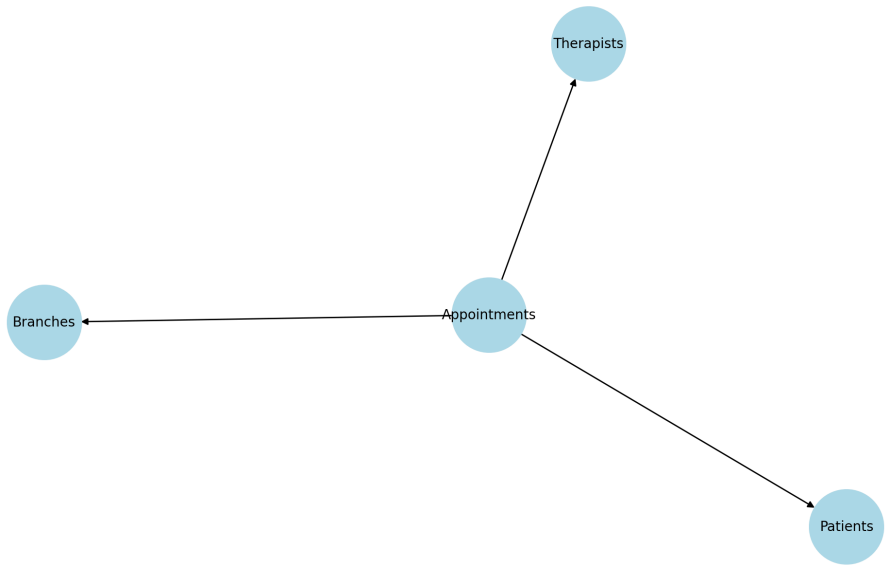
staffNo	*patNo*	appointmentDate	appointmentTime	*branchNo*
S1011	**P100**	**9/12/2022**	**10:00**	*M15*
S1011	**P105**	**9/12/2022**	**12:00**	*M15*
S1024	**P108**	**9/12/2022**	**10:00**	*Q10*
S1024	**P108**	**9/14/2022**	**14:00**	*Q10*
S1032	**P105**	**9/14/2022**	**16:30**	*M15*
S1032	**P110**	**9/15/2022**	**18:00**	*B13*

Branches Table

branchNo
M15
Q10
B13

Final Summary

- **1NF**: Eliminated repeating groups.
- **2NF**: Eliminated partial dependencies by separating Therapists, Patients, Appointments, and Branches.
- **3NF**: Eliminated transitive dependencies by ensuring branchNo is independently linked to therapists.



Exercise 3

Step 1: Initial Data Table (Unnormalized Form - UNF)

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:

- **eNo** is unique for each employee.
- **contractNo** represents a contract assigned to a specific event.
- Each **contractNo** applies to one **eventNo**.

Step 2: Convert to First Normal Form (1NF)

Composite primary key: **eNo, contractNo**

1NF Table:

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 3: Convert to Second Normal Form (2NF)

2NF Rules:

- Must be in 1NF.
- No **partial dependencies**

Identified Issues:

- eName depends only on eNo, not on contractNo.
- eventLoc depends only on eventNo, not on contractNo.

Solution: Break into separate tables:

Employees Table

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

Events Table

eventNo	**eventLoc**
H25	Queens
H4	Yonkers

Contracts Table

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

Employee Contracts Table

eNo	***contractNo***	**hours**

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

Step 4: Convert to Third Normal Form (3NF)

3NF Rules:

- Must be in 2NF.
- No **transitive dependencies** (a non-key attribute cannot depend on another non-key attribute).

Final 3NF Tables:

Employees Table

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

Events Table

eventNo	**eventLoc**
H25	Queens
H4	Yonkers

Contracts Table

contractNo	***eventNo***

C1024	**H25**
C1025	**H4**
C1026	**H25**

Employee Contracts Table

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