

## Question 1

a. Assumption:

1. The Part Number can only be sold once and it is unique
2. Each employee is only helping one customer at a time
3. Employees can handle multiple orders
4. Each customer belongs to one customer type
5. Each customer may order more than one types of supply
6. The unit price of each supplies is constant within a order

b&c&d. Normalization:

The original table is not in normalized form since it have redundant data with repeating groups. For example, partNumber, caused part details to be repeated. To make it 1NF, one and only one composite primary key is identified: customerNumber+ Date + Time + partNumber.

customerName	customerNumber	customerType	date	time	employee	partNumber	name	type	cageCode	quantityOrdered	unitPrice
Jeff Peterson	HG54587	Customer	7/1/2024	10:30 AM	D.Harrison	10654	Float Control	Plumbing	G413	4	12
Jeff Peterson	HG54587	Customer	7/1/2024	10:30 AM	D.Harrison	10456	Modulator	Electrical	H433	3	7
Jeff Peterson	HG54587	Customer	7/1/2024	10:30 AM	D.Harrison	10776	House Assembly	Plumbing	G413	7	9
Jeff Peterson	HG54587	Customer	7/1/2024	10:30 AM	D.Harrison	10657	Float Assembly	Plumbing	G413	5	10

However, this table is not in 2NF, the reason is because that not all non-primary key is dependent on all the PK. Moreover, the PK is not only made up by one field. To make the table 2NF&3NF, all attributes should be dependent on one field of PK. Based on dependency, the table is separated into multiple tables.

Dependency:

customerName and customerType depends on customerNumber(PK) and forms a customer\_info table.

customer_info		
customerName	customerNumber PK	customerType
Jeff Peterson	HG54587	Customer

name, type, cageCode, unitPrice depends on partNumber(PK) and forms a part\_info table

part_info				
partNumber PK	name	type	cageCode	unitPrice
10654	Float Control	Plumbing	G413	12
10456	Modulator	Electrical	H433	7
10776	House Assembly	Plumbing	G413	9
10657	Float Assembly	Plumbing	G413	10

customer_employee			
customerNumber	date	time	employee
HG54587	7/1/2024	10:30 AM	D.Harrison
HG54587	7/1/2024	10:30 AM	D.Harrison
HG54587	7/1/2024	10:30 AM	D.Harrison
HG54587	7/1/2024	10:30 AM	D.Harrison

quantityOrdered depends on each specific order and forms a order table

PK: customerNumber+ Date + Time + partNumber

FK: partNumber linked to the part\_info table

FK: customerNumber linked to the customer\_info table

FK: customerNumber + date + time + employee linked to the customer\_employee table

order				
customerNumber PK	date PK	time PK	partNumber PK	quantityOrdered
HG54587	7/1/2024	10:30 AM	10654	4
HG54587	7/1/2024	10:30 AM	10456	3
HG54587	7/1/2024	10:30 AM	10776	7
HG54587	7/1/2024	10:30 AM	10657	5

## Question 2

a. Assumption:

1. One therapist has one and only one staffNo
2. One patient has one and only one patNo
3. Each appointment is conducted by one therapist to one patient
4. A therapist can conduct one and only one appointment at the same time but may conduct multiple appointments in one day

b&c&d. Normalization

The original table is not in normalized form since it have redundant data with repeating groups. The table contains multiple information like date and time

1NF (Appointment date and time is splitter into two separate attributes)

PK: staffNo + patNo + appointmentDate + time

staffNo PK	therapistName	patNo PK	patName	appointmentDate PK	time PK	branchNo
S1011	Fred Smith	P100	Lily White	9/12/2022	10:00	M15
S1011	Fred Smith	P105	Jil 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	Jil Baker	9/14/2022	16:30	M15
S1032	Richard Levin	P110	Jimmy Winter	9/15/2022	18:00	B13

The table is now in 1NF, to make it into 2NF, the table should not have partial redundancy. Multiple fields of PK should be operated into different tables. Moreover, attributes should not depend on the same key.

therapistName is only dependent on therapistNo

PK: staffNo

therapist	
staffNo PK	therapistName
S1011	Fred Smith
S1011	Fred Smith
S1024	Heidi Pierce
S1024	Heidi Pierce
S1032	Richard Levin
S1032	Richard Levin

patName is only dependent on patNo

PK: patNo

patient	
patNo PK	patName
P100	Lily White
P105	Jil Baker
P108	Andy McKee
P108	Andy McKee
P105	Jil Baker
P110	Jimmy Winter

branchNo is dependent on staffNo and appointmentDate

PK: staffNo + appointmentDate

location		
staffNo PK	appointmentDate PK	branchNo
S1011	9/12/2022	M15
S1011	9/12/2022	M15
S1024	9/12/2022	Q10
S1024	9/14/2022	Q10
S1032	9/14/2022	M15
S1032	9/15/2022	B13

The appointment table is formed in 3NF

PK: staffNo + appointmentDate + time

appointment			
staffNo PK	patNo PK	appointmentDate PK	time PK
S1011	P100	9/12/2022	10:00
S1011	P105	9/12/2022	12:00
S1024	P108	9/12/2022	10:00
S1024	P108	9/14/2022	14:00
S1032	P105	9/14/2022	16:30
S1032	P110	9/15/2022	18:00

FK:

patNo is linked to the patient table

staffNo is linked to the therapists table

staffNo + appointmentDate is linked to the location table

These tables are now in 3NF without transitive dependency

### Question 3

a. Assumption:

1. eNo is unique for each employee
2. Each event is handled by one and only one contract
3. One contract may differ from different needs

b&c&d. Normalization

The original table is in 1NF form since it does not have repeating groups and have PK.

employee_work					
eNo PK	contractNo PK	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

PK: eNo + contractNo

However, the table is not in 2NF since it have composite PK.

There are attributes that only depends on one PK, for example eName only depend on eNo

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

PK: eNo

eventNo only depends on contractNo; eventLoc only depends on contractNo

contract		
contractNo PK	eventNo	eventLoc
C1024	H25	Queens
C1024	H25	Queens
C1025	H4	Yonkers
C1025	H4	Yonkers
C1026	H25	Queens

PK: contractNo

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

These tables are now in 2NF, but not 3NF, since there is transitive redundancies in the contract table  
Split the contract table;

eventLoc only depends on eventNo

event	
eventNo PK	eventLoc
H25	Queens
H25	Queens
H4	Yonkers
H4	Yonkers
H25	Queens

PK: eventNo

These tables are now in 3NF without transitive dependency