Assignment 3 - Normalization

Mingzhi Xu

Question 1

Assumptions

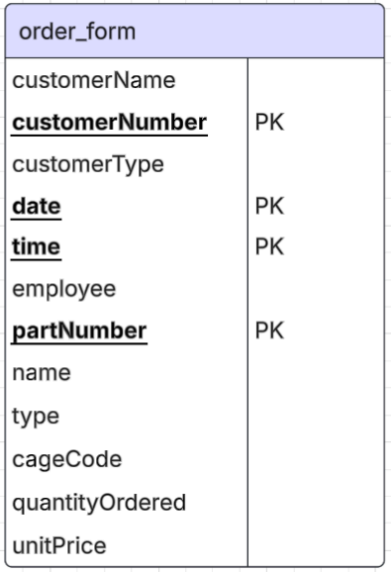
1. Each order must be handled by one and only one employee.
2. Each employee can handle multiple orders.
3. Customer numbers and part numbers are unique.

Process of normalizing

The original table is not in any normal form, since there are fields which contain multiple values like partNumber and others.

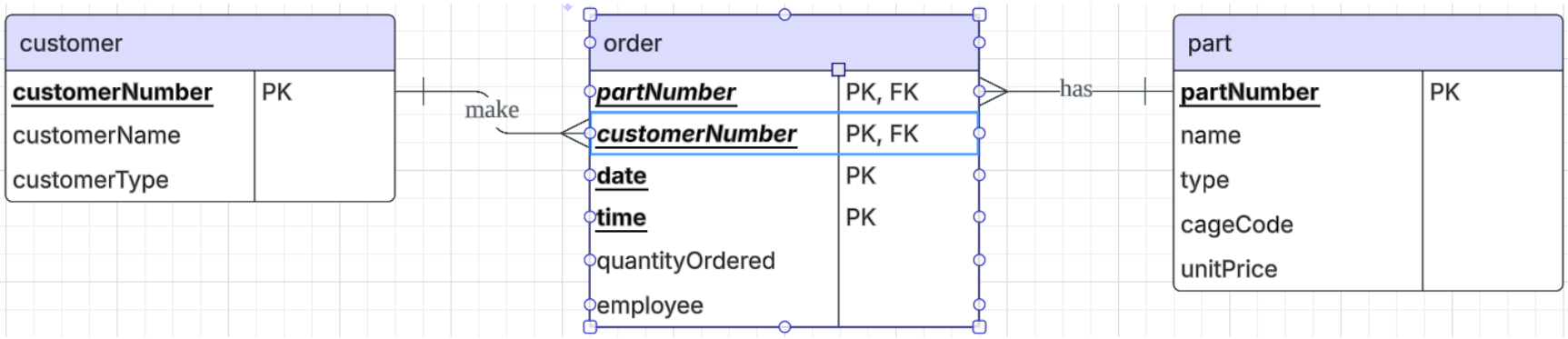
customerName	customer Number	customer Type	date	time	employee	partNumber	name	type	cageCode	quantity Ordered	unitPrice
Jeff Peterson	H G54587	Consumer	7/1/2024	10:30am	D. Harrison	10654, 10456, 10776, 10657	Float Control, Modulator, Hose Assembly, Float Assembly	Plumbing, Electrical, Plumbing, Plumbing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

To transform the table into 1NF, I split the repeating groups into separate rows, and ensure to set up a composite primary key, since there should be no single customer making two orders of the same parts at the moment. However this is not in 2NF yet, mainly due to the fact that there are more than one fields that make up the primary key and not all the non-PK fields are dependent on all the PK fields.



order_form											
customerName	**customer Number**	customer Type	**date**	**time**	employee	**partNumber**	partName	type	cageCode	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

To transform the table into 2NF, I remove the partial dependencies by splitting the table into three, in which the customer table contains details that depend only on CustomerNumber and part table contains details that depend only on partNumber. This is also in 3NF, since none of the fields are dependent on any of the non-PK fields.



customer		
customerName	***customer Number***	customer Type
Jeff Peterson	H G54587	Consumer

order					
customer Number	**date**	**time**	employee	***partNumber***	quantity Ordered

H G54587	7/1/2024	10:30am	D. Harrison	10654	4
H G54587	7/1/2024	10:30am	D. Harrison	10456	3
H G54587	7/1/2024	10:30am	D. Harrison	10776	7
H G54587	7/1/2024	10:30am	D. Harrison	10657	5

part				
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

Question 2

Assumptions

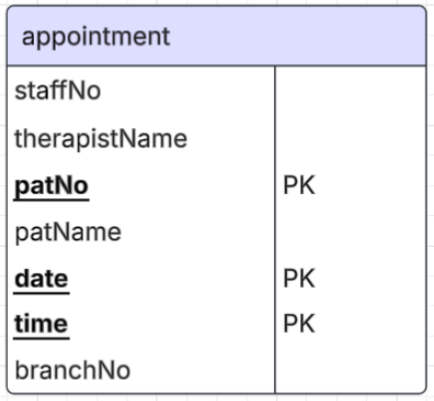
1. Each appointment is assigned to one therapist and one patient.
2. A therapist can work at multiple branches but only at one branch per day.
3. A patient can have multiple appointments on the same day. But only one appointment at the same time.
4. staffNo, patNo, branchNo are unique.

Process of normalizing

The original table is not in any normal form, since the field appointment date time contains multiple values like.

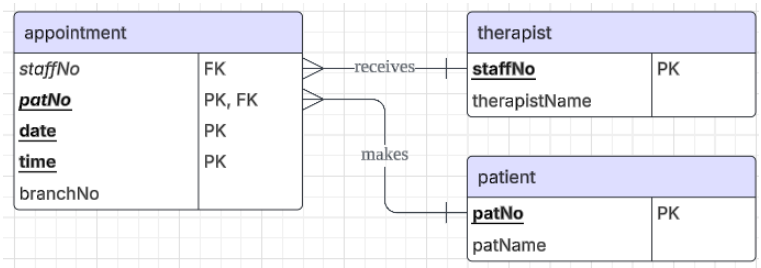
staffNo	therapistName	patNo	patName	appointment date time	branchNo
S1011	Fred Smith	P100	Lily White	9/12/2022 10:00	M15
S1011	Fred Smith	P105	Jill Baker	9/12/2022 12:00	M15
S1024	Heidi Pierce	P108	Andy McKee	9/12/2022 10:00	Q10
S1024	Heidi Pierce	P108	Andy McKee	9/14/2022 14:00	Q10
S1032	Richard Levin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

To transform the table into 1NF, I split the appointment date time field into separate fields of time and date to ensure atomicity, then set up a composite primary key. However this is not in 2NF yet, mainly due to the fact that there are more than one fields that make up the primary key and not all the non-PK fields are dependent on all the PK fields.



appointment						
staffNo	therapistName	**patNo**	patName	**date**	**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

To transform the table into 2NF, I remove the partial dependencies by splitting the table into three, since therapistName depends on staffNo and patName depends on patNo.



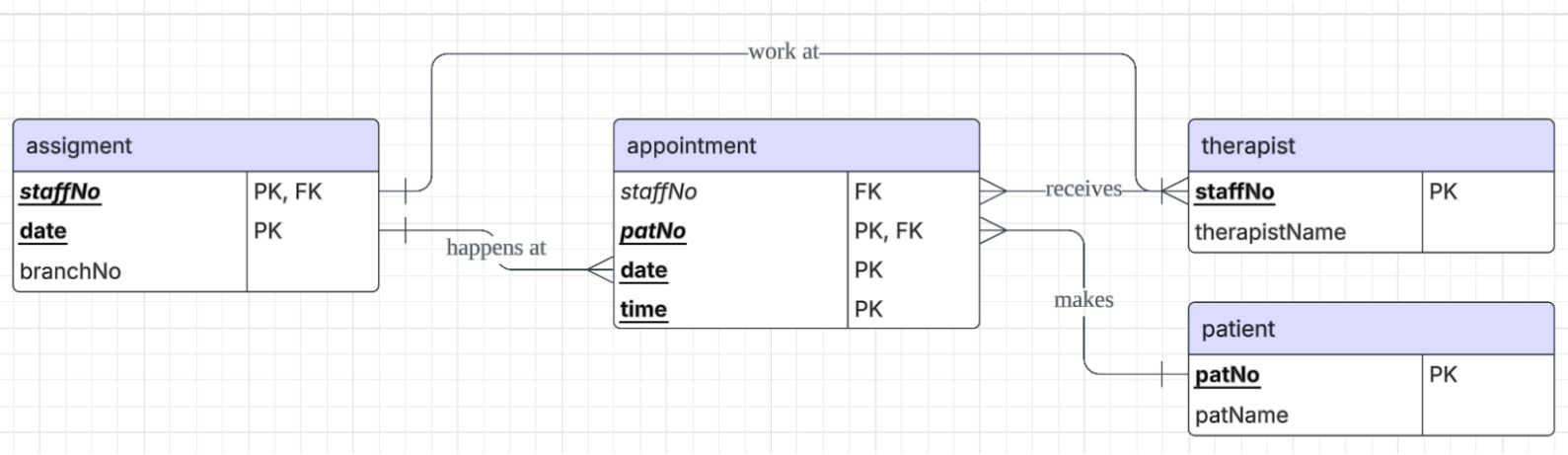
appointment				
staffNo	***patNo***	**date**	**time**	branchNo
S1011	P100	9/12/2022	10:00	M15
S1011	P105	9/12/2022	12:00	M15
S1024	P108	9/12/2022	10:00	Q10
S1024	P108	9/14/2022	14:00	Q10
S1032	P105	9/14/2022	16:30	M15
S1032	P110	9/15/2022	18:00	B13

therapist

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

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

This is not 3NF yet because there is a transitive dependency because therapists can be assigned to different branches on different days. Therefore I split the branch assignment information into a separate table.



assignment		
staffNo	**date**	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

appointment			
staffNo	***patNo***	**date**	**time**
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

therapist	
staffNo	therapistName
S1011	Fred Smith
S1011	Fred Smith
S1024	Heidi Pierce

S1024	Heidi Pierce
S1032	Richard Levin
S1032	Richard Levin

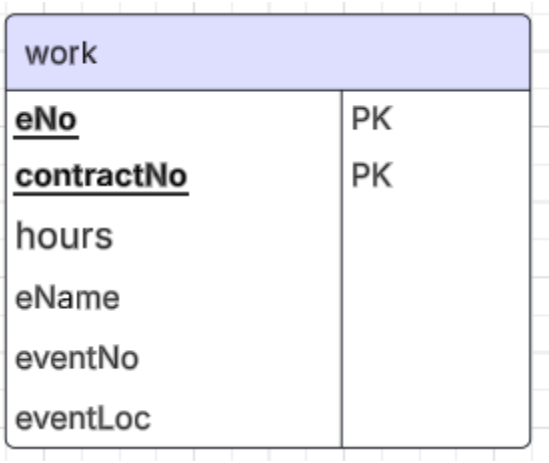
patient	
patNo	patName
P100	Lily White
P105	Jill Baker
P108	Andy McKee
P108	Andy McKee
P105	Jill Baker
P110	Jimmy Winter

Question 3

Assumptions

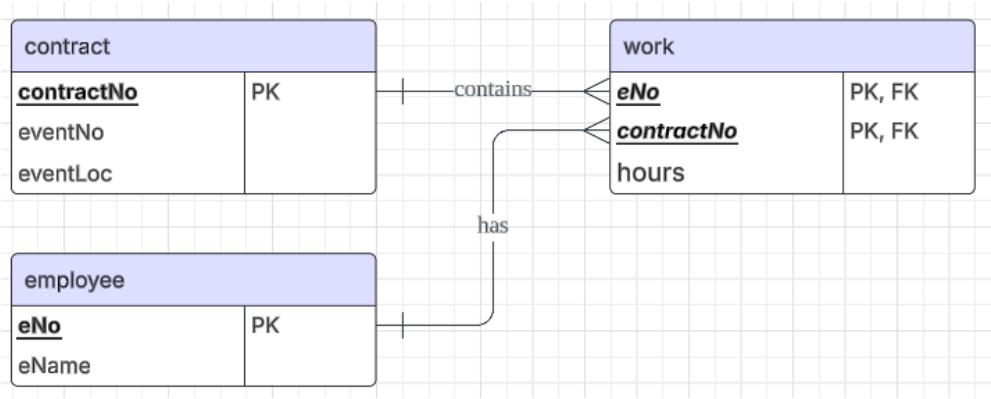
Process of normalizing

The original table is already in 1NF, since there is no repeating groups and there is a composite primary key consist of eNo and contractNo.



work					
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

However it is not in 2NF yet, since not all the non-PK fields are dependent on all the PK fields. To convert it into 2NF, I split the table into three, in which the employee table contains information only about the employee and the contract table contains information only about the contract.

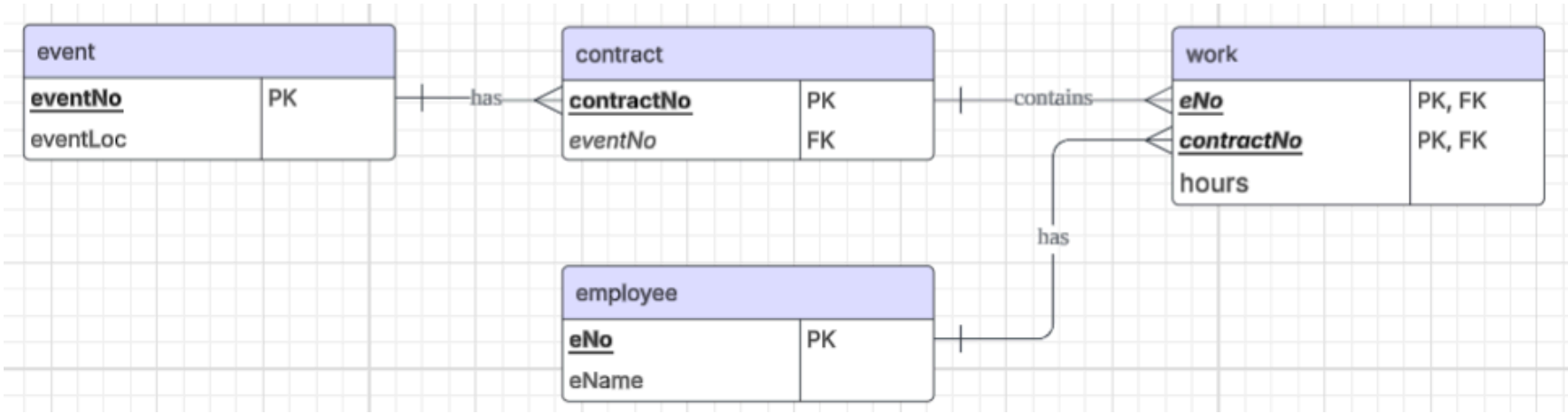


work		
eNo	***contractNo***	hours
1135	C1024	16
1057	C1024	24
1068	C1025	28
1135	C1025	15
1135	C1026	10

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

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

However this is not in 3NF yet, since there is a transitive dependency in the contract table that eventLoc is dependent on eventNo, not contractNo. To remove this transitive dependency, I create one more table for event information only.



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

contract	
<u>contractNo</u>	*eventNo*
C1024	H25
C1024	H25
C1025	H4
C1025	H4
C1026	H25

event	
<u>eventNo</u>	eventLoc
H25	Queens
H25	Queens
H4	Yonkers
H4	Yonkers
H25	Queens

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