EX1

Assumptions:

- 1. This is not even a table
- 2. Each customer is uniquely identified by customer Number
- 3. Each part is uniquely identified by partNumber
- 4. An order is uniquely identified by the combination of customerNumber, orderDate, and orderTime (assuming a
- customer can only place one order at a specific date and time)
- 5. Employees can help any customer (no special
- employee-customer relationship)
- 6. A part is stored in one specific cage location (cageCode)

| | Happy Supplies Parts Warehouse | | | | | | | | | | |
|----------------|--------------------------------|--------------|------------|--------------|-------------------|------------|----------|-----------------|-----------|-----------|-----------|
| customerNumber | customerName | customerType | partNumber | employeeName | partName | partType | cageCode | quantityOrdered | unitPrice | orderDate | orderTime |
| HG5487 | Jeff Peterson | Consumer | 10654 | D.Harrison | Float Control | Plumbing | G413 | 4 | 12 | 7/1/2024 | 10:30am |
| HG5487 | Jeff Peterson | Consumer | 10456 | D.Harrison | Modulator | Electrical | H433 | 3 | 7 | 7/1/2024 | 10:30am |
| HG5487 | Jeff Peterson | Consumer | 10776 | D.Harrison | Hose assembly | Plumbing | G413 | 7 | 9 | 7/1/2024 | 10:30am |
| HG5487 | Jeff Peterson | Consumer | 10657 | D.Harrison | Float assembly | Plumbing | G413 | 5 | 10 | 7/1/2024 | 10:30am |

Second step: Second Normal Form(2NF)

First step: Put everything on a table. It is already an 1NF.

| customer | | | | | |
|----------------|---------------|--------------|--|--|--|
| customerNumber | customerName | customerType | | | |
| HG5487 | Jeff Peterson | Consumer | | | |

Customer (customerNumber, customerName, customerType)

PK: customerNumber

• Resolves: customerName and customerType depend only on customerNumber

| order_line | | | | | | | | |
|------------|--|--|--|--|--|--|--|--|
| dered | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| part | | | | | | | | |
|--------------|---------------|------------|----------|-----------|--|--|--|--|
| partNumber | partName | partType | cageCode | unitPrice | | | | |
| <u>10654</u> | Float Control | Plumbing | G413 | 12 | | | | |
| 10456 | Modulator | Electrical | H433 | 7 | | | | |
| 10776 | Hose | Plumbing | G413 | 9 | | | | |
| 10657 | Float | Plumbing | G413 | 10 | | | | |

- Part (partNumber, partName, partType, cageCode, unitPrice)
- PK: partNumber
- Resolves: Part attributes depend only on partNumber

| order | | | | | | | |
|----------------|------------------|----------------|--------------|--|--|--|--|
| customerNumber | <u>orderDate</u> | orderTime | employeeName | | | | |
| <u>HG5487</u> | 7/1/2024 | <u>10:30am</u> | D.Harrison | | | | |

Order (customerNumber, orderDate, orderTime, employeeName)

- PK: customerNumber + orderDate + orderTime
- Resolves: employeeName depends on the order, not individual parts

transitive

employeeName

OrderLine (customerNumber, orderDate, orderTime, partNumber, quantityOrdered) • PK: customerNumber + orderDate + orderTime + partNumber

- Contains only attributes dependent on full composite key
- Final step: Third Normal Form(3NF)

customer

FK: customerNumber references Customer

| customerNumber | customerName | customerType | customerN | <u>lumber</u> | orderD | ate_ |
|----------------|------------------|------------------|---------------|---------------|----------|----------|
| <u>HG5487</u> | Jeff Peterson | Consumer | <u>HG5487</u> | | 7/1/2024 | |
| | | order_line | N | ot trar | sitive | |
| customerNumber | <u>orderDate</u> | <u>orderTime</u> | partNumber | quantit | yOrdered | <u>p</u> |
| <u>HG5487</u> | 7/1/2024 | <u>10:30am</u> | 10654 | | 4 | |
| HG5487 | 7/1/2024 | <u> 10:30am</u> | 10456 | | 3 | \vdash |

Not transitive

| | | order_line | IV | ot transitive |
|----------------|------------------|----------------|-------------------|-----------------|
| customerNumber | <u>orderDate</u> | orderTime | <u>partNumber</u> | quantityOrdered |
| <u>HG5487</u> | 7/1/2024 | <u>10:30am</u> | <u>10654</u> | 4 |
| HG5487 | 7/1/2024 | <u>10:30am</u> | <u>10456</u> | 3 |
| HG5487 | 7/1/2024 | <u>10:30am</u> | <u>10776</u> | 7 |
| <u>HG5487</u> | 7/1/2024 | <u>10:30am</u> | <u>10657</u> | 5 |

H433

• FK: customerNumber, orderDate, orderTime references Order (composite FK)

part_type

Electrical

• FK: partNumber references Part

| order | Not |
|-------|-------|
| | order |

| 1103487 | | 77172024 | | 771720 | | 10.5 | <u> </u> | D. | Harrison | |
|----------------|-----------------|-----------|-----|---------|-----------|------|------------|-----------|----------|--|
| Not transitive | | | | | | par | t | | | |
| mber | quantityOrdered | | par | tNumber | partNam | ne | partType | unitPrice | | |
| <u>IIIDEI</u> | quanti | tyordered | 1 | 10654 | Float Con | trol | Plumbing | 12 | | |
| <u>54</u> | | 4 | 1 | 10456 | Modulate | or | Electrical | 7 | | |
| | | | | 10776 | Hose | | Plumbing | 9 | | |
| <u>56</u> | | 3 | | 10657 | Float | | Plumbing | 10 | | |
| | | | | | | | | | | |

<u>orderTim</u>e

Part (partNumber, partName, partType, unitPrice)

- PK: partNumber
- FK: partType references PartType
- Resolves: Removed cageCode since it depends on partType, not

Part_Type (partType, cageCode)

- PK: partType
- New table created to store the relationship between part types
- partType cageCode and their cage locations Plumbing G413
 - Resolves: cageCode now depends directly on its primary key (partType)

First step: 1NF

pointmentDate and appointmentTime to make it 1NF

| Seperate appointmentDate and appointmentTime to make it 1NF | | | | | | | | |
|---|---------------|--------------|-----------------|-----------------|-----------------|----------|--|--|
| Panacea Mental Health Corporation | | | | | | | | |
| staffNo | therapistName | <u>patNo</u> | patName | appointmentDate | appointmentTime | branchNo | | |
| <u>\$1011</u> | Fred Smith | <u>P100</u> | Lily White | 9/12/2022 | 10:00 | M15 | | |
| <u>\$1011</u> | Fred Smith | <u>P105</u> | Jill Baker | 9/12/2022 | 12:00 | M15 | | |
| <u>\$1024</u> | Heidi Pierce | <u>P108</u> | Andy Mckee | 9/12/2022 | 10:00 | Q10 | | |
| <u>\$1024</u> | Heidi Pierce | <u>P108</u> | Andy Mckee | 9/14/2022 | <u>14:00</u> | Q10 | | |
| <u>\$1032</u> | Richard Levin | <u>P105</u> | Jill Baker | 9/14/2022 | <u>16:30</u> | M15 | | |
| S1032 | Richard Levin | <u>P110</u> | Jimmy Winter | 9/15/2022 | <u>18:00</u> | B13 | | |

Second step: 2NF

| therapist | | | | | |
|---------------------|---------------|--|--|--|--|
| staffNo | therapistName | | | | |
| <u>\$1011</u> | Fred Smith | | | | |
| S1024 | Heidi Pierce | | | | |
| S1032 Richard Levin | | | | | |

- Resolves: therapistName
- depends on the complete primary key

staffNo

S1011

S1011

S1024

S1024

patient <u>patNo</u> patName P100 Lily White P105 Jill Baker P108 Andy Mckee P110 Jimmy Winter

EX2

- PK: patNo
- Resolves: patName now depends on the complete primary key

9/12/2022

9/12/2022

9/12/2022

9/14/2022

appointmentDate appointmentTime

10:00

12:00

10:00

14:00

16:30

18:00

appointment

therapist_schedule appointmentDate staffNo branchNo S1011 9/12/2022 S1024 9/12/2022 Q10 S1024 9/14/2022 Q10 M15 S1032 9/14/2022

9/15/2022

• **PK**: staffNo, appointmentDate

S1032

• Resolves: branchNo now depends on the complete primary key (tracks which branch a therapist works at on each day)

Assumptions

- 1. Each employee is uniquely identified by eNo (Employee Number)
- 2. Each contract is uniquely identified by contractNo
- 3. Each event is uniquely identified by eventNo
- 4. An employee can work on multiple contracts
- 5. The hours attribute represents the number of hours an employee worked on a specific contract

First step: 1NF

EX3

| Maid Better temp agency | | | | | | | | |
|-------------------------|-------------------|-------|----------|---------|----------|--|--|--|
| <u>eNo</u> | <u>contractNo</u> | hours | eName | eventNo | eventLoc | | | |
| <u>1135</u> | <u>C1024</u> | 16 | Smith J | H25 | Queens | | | |
| <u>1057</u> | <u>C1024</u> | 24 | Hocine D | H25 | Queens | | | |
| <u>1068</u> | <u>C1025</u> | 28 | White T | H4 | Yonkers | | | |
| <u>1135</u> | <u>C1025</u> | 15 | Smith J | H4 | Yonkers | | | |
| <u>1135</u> | <u>C1026</u> | 10 | Smith J | H25 | Queens | | | |

Table is already in 1NF

Second step: Second Normal Form(2NF)

| employee | | | | |
|------------------|----------|--|--|--|
| <u>eNo</u> eName | | | | |
| <u>1135</u> | Smith J | | | |
| <u>1057</u> | Hocine D | | | |
| 1068 | White T | | | |
| | | | | |

eNo

1135

1057

1068

1135

1135

• **PK:** eNo, contractNo

• No changes from 2NF

• FK: eNo references Employee

• **FK:** contractNo references Contract

• Resolves: eName now depends on the complete primary key

| employee_contract | | | | |
|-------------------|----------------------------------|--|--|--|
| <u>contractNo</u> | hours | | | |
| <u>C1024</u> | 16 | | | |
| <u>C1024</u> | 24 | | | |
| <u>C1025</u> | 28 | | | |
| <u>C1025</u> | 15 | | | |
| <u>C1026</u> | 10 | | | |
| | C1024 C1024 C1025 C1025 | | | |

employee_contract

contractNo

C1024

C1024

C1025

C1025

C1026

| | contract | | | | |
|-------------------|----------|----------|--|--|--|
| <u>contractNo</u> | eventNo | eventLoc | | | |
| <u>C1024</u> | H25 | Queens | | | |
| <u>C1025</u> | H4 | Yonkers | | | |
| <u>C1026</u> | H25 | Queens | | | |

- PK: contractNo
- Resolves: eventNo and eventLoc now depend on the complete primary key
- **PK**: eNo, contractNo
- Resolves: hours depends on the complete primary key (tracks hours worked by each employee on each contract)

Final step: Third Normal Form(3NF)

eventNo

H25

Н4

transitive dependency

• New table created to eliminate

directly on its primary key

• **Resolves:** eventLoc now depends

• **PK:** eventNo

(eventNo)

eventLoc

Queens

Yonkers

| empl | employee | | | | |
|------------------|----------|--|--|--|--|
| <u>eNo</u> | eName | | | | |
| <u>1135</u> | Smith J | | | | |
| <u>1057</u> | Hocine D | | | | |
| <u>1068</u> | White T | | | | |
| • PK: eNo | | | | | |

No changes from

| | 2111 | | | |
|----------|---------|--|--|--|
| contract | | | | |
| ntractNo | eventNo | | | |
| C1024 | H25 | | | |
| C1025 | H4 | | | |
| | | | | |

- cor C1026 H25
- **PK:** contractNo

B13

hours

16

24

28

15

10

- FK: eventNo references Event
- Resolves: Removed eventLoc; now only contains contractNo and its associated eventNo

| appointment | | | | | |
|----------------|--------------|-----------------|-----------------|--|--|
| <u>staffNo</u> | <u>patNo</u> | appointmentDate | appointmentTime | | |
| <u>\$1011</u> | <u>P100</u> | 9/12/2022 | <u>10:00</u> | | |
| <u>\$1011</u> | <u>P105</u> | 9/12/2022 | <u>12:00</u> | | |
| <u>\$1024</u> | <u>P108</u> | 9/12/2022 | <u>10:00</u> | | |
| <u>\$1024</u> | <u>P108</u> | 9/14/2022 | 14:00 | | |
| <u>\$1032</u> | <u>P105</u> | 9/14/2022 | <u>16:30</u> | | |
| <u>\$1032</u> | <u>P110</u> | 9/15/2022 | <u>18:00</u> | | |

- PK: staffNo, patNo, appointmentDate, appointmentTime
- Resolves: No non-key attributes remain; this table represents the many-to-many relationship between therapists and patients at specific times

Final step: 3NF

| · | | |
|-----------------------|---------------|--|
| therapist | | |
| staffNo therapistName | | |
| <u>\$1011</u> | Fred Smith | |
| <u>S1024</u> | Heidi Pierce | |
| <u>S1032</u> | Richard Levin | |

| therapist | | pa | atient |
|---------------|---------------|---------------|--------------|
| taffNo | therapistName | patNo patName | |
| <u>\$1011</u> | Fred Smith | <u>P100</u> | Lily White |
| S1024 | Heidi Pierce | P105 | Jill Baker |
| S1032 | Richard Levin | <u>P108</u> | Andy Mckee |
| | | <u>P110</u> | Jimmy Winter |
| | | | |

| pa | atient | therapist_schedule | | |
|-------|--------------|--------------------|-----------|-----|
| patNo | patName | <u>staffNo</u> | branchNo | |
| P100 | Lily White | <u>\$1011</u> | 9/12/2022 | M15 |
| P105 | Jill Baker | <u>\$1024</u> | 9/12/2022 | Q10 |
| P108 | Andy Mckee | <u>\$1024</u> | 9/14/2022 | Q10 |
| P110 | Jimmy Winter | <u>\$1032</u> | 9/14/2022 | M15 |
| | | <u>\$1032</u> | 9/15/2022 | B13 |
| | | | | |

- FK: staffNo references Therapist
- S1032 P105 9/14/2022 S1032 P110 9/15/2022 • FK: staffNo references Therapist

patNo

P100

P105

P108

P108

• FK: patNo references Patient • FK: (staffNo, appointmentDate) references TherapistSchedule

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. An appointment is uniquely identified by the combination of staffNo, patNo, appointmentDate, and appointmentTime