

Database and SQL_Assignment_DB201SCDG06

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GTA Landscaping: User View 1

Below are shown 2 sample invoices for the services our business sells. (An invoice is the same as a receipt). We write a customer invoice once all services are completed for a customer visit. This invoice will itemize many details including the services provided, the time it took to complete those services, the charge for those services, the total of all service charges.

Sample1

Invoice Statement

INVOICE #: 1355

INVOICE DATE: 5-Jul-19

WORK TEAM: 2

EQUIP. USED: 20 hp John Deer tractor/ mower
10" tree pruning shears
2 hp Johnson grass trimmer

CUSTOMER: 56 - John Adams

ADDRESS: 234 Bloor W

Toronto
M2S 4S3

SERVICES:

| SERVICE CODE | DESCRIPTION | HOURLY CHARGE | WORK DURATION (hours) | TOTAL CHARGE |
|--------------|------------------|---------------|-----------------------|--------------|
| LC | Lawn Cutting | \$25.00 | 0.75 | \$18.75 |
| LW | Lawn Weeding | \$35.00 | 1.15 | \$40.25 |
| LF | Lawn Fertilizing | \$15.00 | 0.25 | \$3.75 |
| TG | Tree Pruning | \$45.00 | 0.50 | \$22.50 |
| | | | | |
| | | | | |

SUBTOTAL: \$85.25

GST (7%): \$5.97

PST (8%): \$6.82

TOTAL DUE: \$98.04

TotalCharge, Subtotal, GST, PST, and TotalDue are calculation parts. Therefore, these are not included in normalization.

EquipId with InvoiceNo must become a composite key because EquipId can have multiple data in one InvoiceNo.

ServiceCode with InvoiceNo must become a composite key because ServiceCode can have multiple data in one InvoiceNo.

1. InvoiceNo 2. InvoiceDate 3. TeamId 4.EquipId 5.EquipDesc 6.CustId 7.CustNameF 8. CustNameL 9. Address 10. City 11.Zip 12.ServiceCode 13. ServiceDesc 14. HourlyCharge 15.WorkDuration

UNF:

INVOICE [**InvoiceNo(PK)**, InvoiceDate, TeamId, CustId, CustNameF, CustNameL, Address, City, Zip, (EquipId, EquipDesc), (ServiceCode, ServiceDesc, HourlyCharge, WorkDuration)]

1NF:

INVOICE [**Invoice(PK)**, InvoiceDate, TeamId, CustId, CustNameF, CustNameL, Address, City, Zip]

EQUIP [**InvoiceNo(PFK)**, **EquipNo(PK)**, EquipDesc]

SERVICE [**InvoiceNo(PFK)**, **ServiceCode(PK)**, ServiceDesc, HourlyCharge, WorkDuration]

2NF:

INVOICE [**Invoice(PK)**, InvoiceDate, TeamId, CustId, CustNameF, CustNameL, Address, City, Zip]

EQUIPUSED [**InvoiceNo(PFK)**, **EquipNo(PFK)**]

EQUIP [**EquipNo(PK)**, EquipDesc]

SERVICE [**InvoiceNo(PFK)**, **ServiceCode(PFK)**, WorkDuration]

SERVICEUSED [**ServiceCode(PK)**, ServiceDesc, HourlyCharge]

3NF:

INVOICE [**Invoice(PK)**, InvoiceDate, TeamId, **CustId(FK)**]

CUSTOMER [**CustId(PK)**, CustNameF, CustNameL, Address, City, Zip]

EQUIPUSED [**InvoiceNo(PFK)**, **EquipNo(PFK)**]

EQUIP [**EquipNo(PK)**, EquipDesc]

SERVICEUSED [**InvoiceNo(PFK)**, **ServiceCode(PFK)**, WorkDuration]

SERVICE [**ServiceCode(PK)**, ServiceDesc, HourlyCharge]

GTA Landscaping: User View 2

Below is a listing of GTA Landscaping teams of lawn care specialists that do the services for our customers. The Operations Manager uses this report to schedule which teams will be sent to which customers on any given work day. Team members work together when visiting a customer site.

Team - Employee Reports

| <u>TEAM</u> | <u>DESCRIPTION</u> | | | | | |
|-----------------|---------------------|----------------|-------------|-------------------|-------------------|--|
| 1 | General Contracting | | | | | |
| <u>POSITION</u> | <u>NAME</u> | <u>EMP ID:</u> | <u>OHIP</u> | <u>HOME PHONE</u> | <u>START DATE</u> | <u>SKILLS</u> |
| Supervisor | Cindy Lee | 120 | 219032002 | 905-338-1234 | 1-Jan-98 | Electrical , Plumbing , General Contractor |
| Lawn Care | Amy Smith | 122 | 34111991 | 905-338-1234 | 30-Jun-99 | Irrigation , Lawn Maintenance |

| <u>TEAM</u> | <u>DESCRIPTION</u> | | | | | |
|-----------------|----------------------|----------------|-------------|-------------------|-------------------|---|
| 2 | Pruning and Planting | | | | | |
| <u>POSITION</u> | <u>NAME</u> | <u>EMP ID:</u> | <u>OHIP</u> | <u>HOME PHONE</u> | <u>START DATE</u> | <u>SKILLS</u> |
| Lawn Care | Paula Corelli | 121 | 325443001 | 416-458-4562 | 30-Jun-98 | Pruning , Irrigation , Fertilizing |
| Supervisor | Paul Huang | 123 | 54222991 | 416-932-4533 | 30-Jun-05 | "A" License , Electrical , General Contractor |

| <u>TEAM</u> | <u>DESCRIPTION</u> | | | | | |
|-----------------|---------------------|----------------|-------------|-------------------|-------------------|--|
| 3 | General Maintenance | | | | | |
| <u>POSITION</u> | <u>NAME</u> | <u>EMP ID:</u> | <u>OHIP</u> | <u>HOME PHONE</u> | <u>START DATE</u> | <u>SKILLS</u> |
| Lawn Care | Maria Wong | 124 | 43524532 | 905-345-5366 | 23-Aug-98 | Pruning , Lawn Maintenance |
| Supervisor | Phil Ramirez | 126 | 32543555 | 416-435-6599 | 3-Mar-17 | Irrigation , Plumbing , Electrical |

1. TeamId 2. TeamDesc 3. PositionId 4. PositionDesc 5. EmpNameF 6. EmpNameL 7. EmpId 8. Ohip
9. homeNo 10. PhoneNo 11. StartDate 12. SkillsId 13. SkillDesc

EmpId and SkillsId with TeamId must become a composite key because EmpId and SkillsId can have multiple data in one TeamId.

UNF:

TEAM [**TeamId(PK)**, TeamDesc, {(EmpId, PositionId, PositionDesc, EmpNameF, EmpNameL, Ohip, HomeNo, PhoneNo, StartDate), (SkillsId, SkillDesc)}]

1NF:

TEAM [**TeamId(PK)**, TeamDesc]

TEAMEMPSKILL [**TeamId(PFK)**, **EmpId(PK)**, **SkillsId(PK)**, PositionId, PositionDesc, EmpNameF, EmpNameL, Ohip, HomeNo, PhoneNo, StartDate, SkillDesc]

2NF:

TEAM [**TeamId(PK)**, TeamDesc]

TEAMEMPSKILL [**TeamId(PFK)**, **EmpId(PFK)**, **SkillsId(PFK)**, StartDate]

EMPLOYEE [**EmpId(PK)**, PositionId, PositionDesc, EmpNameF, EmpNameL, Ohip, HomeNo, PhoneNo]

SKILL [**SkillsId(PK)**, SkillDesc]

3NF:

TEAM [**TeamId(PK)**, TeamDesc]

TEAMEMPSKILL [**TeamId(PFK)**, **EmpId(PFK)**, **SkillsId(PFK)**, StartDate]

EMPLOYEE [**EmpId(PK)**, EmpNameF, EmpNameL, Ohip, HomeNo, PhoneNo, **PositionId(FK)**]

POSITION [**PositionId(PK)**, PositionDesc]

SKILL [**SkillsId(PK)**, SkillDesc]

GTA Landscaping: User View 3

GTA Landscaping also sells products to its customers. Below is shown a sample product sales report list. This type of report is required by the Purchasing Manager to evaluate which products are selling well and which ones are not selling well. When placing new purchases to replace items already sold, the Purchasing Manager will analyse this report first. The list shows a sample of products purchased over a 3-day period.

Product Sales Report - 3 day Sample

| PROD. CLASS: | PROD. ID: | PRODUCT: | CHARGE | QTY: | INVOICE ID: | INVOICE DATE: | SALES ASSISTANT: | CUST. NO.: |
|--------------|-----------|-------------------------------|---------|------|-------------|---------------|------------------|------------|
| GT | 10 | 6 foot garden rake | \$12.00 | 1 | 1356 | 5-Jul-18 | 144 - Paul Smith | 56 |
| GT | 40 | Flat-nosed Shovel | \$8.00 | 1 | 1356 | 5-Jul-18 | 144 - Paul Smith | 56 |
| FT | 140 | General grade lawn fertilizer | \$10.00 | 3 | 1356 | 5-Jul-18 | 144 - Paul Smith | 56 |
| SB | 100 | Golden cedar sapling | \$35.00 | 5 | 1367 | 6-Jul-18 | 145 - Maria Wong | 7 |
| SB | 110 | Mulberry sapling | \$15.00 | 2 | 1367 | 6-Jul-18 | 145 - Maria Wong | 7 |
| GT | 50 | Garden pitch-fork | \$7.00 | 1 | 1367 | 6-Jul-18 | 145 - Maria Wong | 7 |
| FT | 140 | General grade lawn fertilizer | \$10.00 | 2 | 1367 | 6-Jul-18 | 145 - Maria Wong | 7 |
| SP | 170 | 120 foot watering hose | \$25.00 | 3 | 1401 | 6-Jul-18 | 144 - Paul Smith | 34 |
| SP | 190 | Rotating sprinkler jet | \$19.00 | 3 | 1401 | 6-Jul-18 | 144 - Paul Smith | 34 |
| GT | 50 | Garden pitch-fork | \$7.00 | 1 | 1405 | 7-Jul-18 | 145 - Maria Wong | 56 |

1.ProClassCode 2.ProductId 3.ProductDesc 4.Charge 5.qty 6.InvoiceId 7.InvoiceDate 8.SalesAssId
9.AssNameF 10.AssNameL 11.CustNo

InvoiceId with ProductId must become a composite key in normalization. Because, Qty is considered by InvoiceId and ProductId.

UNF:

PROSALE [InvoiceId(PK), InvoiceDate, SalesAssId, AssNameF, AssNameL, CustNo, (ProductId, ProductDesc, Charge, qty, ProClassCode)]

1NF:

PROSALE [InvoiceId(PK), ProductId(PK), ProductDesc, ProClassCode, Charge, Qty, InvoiceDate, SalesAssId, AssNameF, AssNameL, CustNo]

2NF:

PROSALE [InvoiceId(PFK), ProductId(PFK), Qty]

PRODUCT [ProductId(PK), ProductDesc, Charge, ProClassCode]

INVOICE [InvoiceId(PK), InvoiceDate, SalesAssId, AssNameF, AssNameL, CustNo]

3NF:

PROSALE [InvoiceId(PFK), ProductId(PFK), Qty]

PRODUCT [ProductId(PK), ProductDesc, Charge, ProClassCode]

INVOICE [InvoiceId(PK), InvoiceDate, SalesAssId(FK), CustNo]

ASSISTANT [SalesAssId(PK), AssNameF, AssNameL]

GTA Landscaping: User View 4

Below is shown a sample product listing and pricing schedule. This report is used by the Sales Staff to determine pricing to be charged for the products that we sell. The "charge" of product sold is determined by adding the markup percentage to the cost.

Product Report

| PRODUCT CLASS: | CLASSIFICATION | PRODUCT ID: | DESCRIPTION | COST | MARKUP | CHARGE |
|----------------|----------------|-------------|---------------------------------|---------|--------|---------|
| GT | Garden Tools | 10 | 6 foot garden rake | \$9.23 | 30% | \$12.00 |
| GT | Garden Tools | 20 | 7 foot leaf rake | \$7.69 | 30% | \$10.00 |
| GT | Garden Tools | 30 | Round mouth shovel | \$7.69 | 30% | \$10.00 |
| GT | Garden Tools | 40 | Flat-nosed Shovel | \$6.15 | 30% | \$8.00 |
| GT | Garden Tools | 50 | Garden pitch-fork | \$5.38 | 30% | \$7.00 |
| GT | Garden Tools | 60 | 8 inch hand shears | \$11.54 | 30% | \$15.00 |
| GT | Garden Tools | 70 | 12 inch trimming shears | \$14.62 | 30% | \$19.00 |
| GT | Garden Tools | 80 | 10 inch tamper | \$10.77 | 30% | \$14.00 |
| SB | Shrubs | 90 | Cedar sapling | \$20.00 | 50% | \$30.00 |
| SB | Shrubs | 100 | Golden cedar sapling | \$23.33 | 50% | \$35.00 |
| SB | Shrubs | 110 | Mulberry sapling | \$10.00 | 50% | \$15.00 |
| SB | Shrubs | 120 | Juniper sapling | \$16.67 | 50% | \$25.00 |
| FT | Fertilizers | 130 | Premium lawn fertilizer | \$12.00 | 25% | \$15.00 |
| FT | Fertilizers | 140 | General grade lawn fertilizer | \$8.00 | 25% | \$10.00 |
| FT | Fertilizers | 150 | Premium garden fertilizer | \$14.40 | 25% | \$18.00 |
| FT | Fertilizers | 160 | General grade garden fertilizer | \$9.60 | 25% | \$12.00 |
| SP | Sprinklers | 170 | 120 foot watering hose | \$17.86 | 40% | \$25.00 |
| SP | Sprinklers | 180 | 12 inch aluminum sprinkler | \$10.71 | 40% | \$15.00 |
| SP | Sprinklers | 190 | Rotating sprinkler jet | \$13.57 | 40% | \$19.00 |

1.ClassCode 2.ClassDesc 3.ProductId 4.ProductDesc 5.Cost 6.Markup

Charge is not in normalization because Charge is calculation part.

This view does not have any composite key. Therefore, this view has to try to find relationship between ProClass and ProductId in 3NF.

UNF:

PROCLASS [**ProClassCode(PK)**, ClassDesc, Markup, ProductId, ProductDesc, Cost)]

1NF:

PROCLASS [**ProClassCode(PK)**, ProductId, ProductDesc, Cost, ClassDesc, Markup]

2NF:

PROCLASS [**ProClassCode(PK)**, ProductId, ProductDesc, Cost, ClassDesc, Markup]

3NF:

CLASS [**ProClassCode(PK)**, ClassDesc, Markup]

PRODUCT [**ProductId(PK)**, ProductDesc, Cost, **ProClassCode(Fk)**]

GTA Landscaping: User View 5

GTA Landscaping maintains a list of supplier information and inventory information for the products being sold. All of our products are stored and displayed in one of the aisles of our main office showroom. (Inventory is the number of products GTA Landscaping has available for sale). Below is a sample Inventory Report

Inventory Report

| PRODUCT ID: | DESCRIPTION | INVENTORY | AISLE# | SUPPLIER |
|-------------|---------------------------------|-----------|--------|-----------------------|
| 10 | 6 foot garden rake | 5 | 1 | Sheffield-Gander inc. |
| 20 | 7 foot leaf rake | 5 | 1 | Sheffield-Gander inc. |
| 30 | Round mouth shovel | 4 | 1 | Husky Inc. |
| 40 | Flat-nosed Shovel | 2 | 1 | Husky Inc. |
| 50 | Garden pitch-fork | 6 | 1 | Husky Inc. |
| 60 | 8 inch hand shears | 9 | 2 | Sheffield-Gander inc. |
| 70 | 12 inch trimming shears | 10 | 2 | Sheffield-Gander inc. |
| 80 | 10 inch tamper | 3 | 2 | Husky Inc. |
| 90 | Cedar sapling | 34 | 5 | Northwood Farms inc. |
| 100 | Golden cedar sapling | 23 | 5 | Northwood Farms inc. |
| 110 | Mulberry sapling | 12 | 4 | Sherwood Nursery |
| 120 | Juniper sapling | 15 | 4 | Northwood Farms inc. |
| 130 | Premium lawn fertilizer | 4 | 6 | Sherwood Nursery |
| 140 | General grade lawn fertilizer | 12 | 6 | Sherwood Nursery |
| 150 | Premium garden fertilizer | 14 | 6 | Sherwood Nursery |
| 160 | General grade garden fertilizer | 12 | 6 | Sherwood Nursery |
| 170 | 120 foot watering hose | 9 | 3 | Diemar Garden Center |
| 180 | 12 inch aluminum sprinkler | 5 | 3 | Diemar Garden Center |
| 190 | Rotating sprinkler jet | 4 | 3 | Diemar Garden Center |

1.ProductId 2.ProductDesc 3.InventoryId 4.AisleNo 5.SupplierId 6.SupplierName

This View does not have any composite key. Therefore, it must find relationship between ProductId, InventoryId, and SupplierId in 3NF.

UNF:

PRODUCT [ProductId, Description, (Inventory, AisleNo, Supplier)]

1NF:

PRODUCT [ProductId, Inventory, Description, AisleNo, Supplier]

2NF:

PRODUCT [ProductId, Description]

INVENTORY [ProductId, Inventory, AisleNo, Supplier]

3NF:

PRODUCT [ProductId(PK), Description]

INVENTORY [ProductId(PFK), Inventory(PK), AisleNo, SupplierId(FK)]

SUPPLIER [SupplierId(PK), supplier]

ALL 3NF BEFORE MERGE

- 1-1: INVOICE [**Invoice(PK)**, InvoiceDate, TeamId, **CustId(FK)**]
 1-2: CUSTOMER [**CustId(PK)**, CustNameF, CustNameL, Address, City, Zip]
 1-3: EQUIPUSED [**InvoiceNo(PFK)**, **EquipNo(PFK)**]
 1-4: EQUIP [**EquipNo(PK)**, EquipDesc]
 1-5: SERVICEUSED [**InvoiceNo(PFK)**, **ServiceCode(PFK)**, WorkDuration]
 1-6: SERVICE [**ServiceCode(PK)**, ServiceDesc, HourlyCharge]
- 2-1: TEAM[**TeamId(PK)**, TeamDesc]
 2-2: TEAMEMPSKILL [**TeamId(PFK)**, **EmpId(PFK)**, **SkillsId(PFK)**, StartDate]
 2-3: EMPLOYEE [**EmpId(PK)**, EmpNameF, EmpNameL, Ohip, HomeNo, PhoneNo, **PositionId(FK)**]
 2-4: POSITION [**PositionId(PK)**, PositionDesc]
 2-5: SKILL [**SkillsId(PK)**, SkillDesc]
- 3-1: PROSALE [**InvoiceId(PFK)**, **ProductId(PFK)**, Qty]
 3-2: PRODUCT [**ProductId(PK)**, ProductDesc, Charge, ProClassCode]
 3-3: INVOICE [**InvoiceId(PK)**, InvoiceDate, **SalseAssId(FK)**, CustNo]
 3-4: ASSISTANT [**SalseAssId(PK)**, AssNameF, AssNameL]
- 4-1: CLASS [**ProClassCode(PK)**, ClassDesc, Markup]
 4-2: PRODUCT [**ProductId(PK)**, ProductDesc, Cost, **ProClassCode(FK)**]
- 5-1: PRODUCT [**ProductId(PK)**, ProductDesc]
 5-2: INVENTORY [**ProductId(PFK)**, **Inventory(PK)**, AisleNo, **SupplierId(FK)**]
 5-3: SUPPLIER [**SupplierId(PK)**, SupplierName]

Explanation of Merging

- A. 1-1(INVOICE) and 3-3(INVOICE) will be merged in one table. Therefore, CustId and TeamId become foreign keys.
 INVOICE [**InvoiceId(PK)**, InvoiceDate, **TeamId(FK)**, **CustId(FK)**, **SalseAssId(FK)**]
 B. 3-2(PRODUCT), 4-2(PRODUCT), and 5-1(PRODUCT) tables will be merged in one table. Therefore, ProClassCode can become a foreign key.
 PRODUCT [**ProductId(PK)**, ProductDesc, Cost, **ProClassCode(FK)**]

After merging tables (Final Tables)

- #1. INVOICE [**InvoiceId(PK)**, InvoiceDate, **TeamId(FK)**, **CustId(FK)**, **SalseAssId(FK)**]
 #2. CUSTOMER [**CustId(PK)**, CustNameF, CustNameL, Address, City, Zip]
 #3. EQUIPUSED [**InvoiceNo(PFK)**, **EquipNo(PFK)**]
 #4. EQUIP [**EquipNo(PK)**, EquipDesc]
 #5. SERVICEUSED [**InvoiceNo(PFK)**, **ServiceCode(PFK)**, WorkDuration]
 #6. SERVICE [**ServiceCode(PK)**, ServiceDesc, HourlyCharge]
 #7. TEAM[**TeamId(PK)**, TeamDesc]
 #8. TEAMEMPSKILL [**TeamId(PFK)**, **EmpId(PFK)**, **SkillsId(PFK)**, StartDate]
 #9. EMPLOYEE [**EmpId(PK)**, EmpNameF, EmpNameL, Ohip, HomeNo, PhoneNo, **PositionId(FK)**]
 #10. POSITION [**PositionId(PK)**, PositionDesc]
 #11. SKILL [**SkillsId(PK)**, SkillDesc]
 #12. PROSALE [**InvoiceId(PFK)**, **ProductId(PFK)**, Qty]
 #13. PRODUCT [**ProductId(PK)**, ProductDesc, Cost, **ProClassCode(FK)**]
 #14. ASSISTANT [**SalseAssId(PK)**, AssNameF, AssNameL]
 #15. CLASS [**ProClassCode(PK)**, ClassDesc, Markup]
 #16. INVENTORY [**ProductId(PFK)**, **Inventory(PK)**, AisleNo, **SupplierId(FK)**]

#17. SUPPLIER [**SupplierId(PK)**, SupplierName]

Explanation of Relationship and Merging

- A. #1(INVOICE) and #4(EQUIP) tables are many-to-many relationship. However, many-to-many relationship makes ERD. Therefore, #3(EQUIPUSED) table will be used as a composite key to connect two tables. (composite key / zero-to-many)
- B. #1(INVOICE) and #2(CUSTOMER) tables are one-to-many relationship. #1 table can have many customers and #2 customer can one invoice (not zero).
- C. #1(INVOICE) and #5(SERVICE) tables are many-to-many relationship. To make clear relationship, #6(SERVICEUSED) is become a composite key. (composite key / zero-to-many)
- D. #7(Team) and #1(INVOICE) are zero-to-many relationship. #1 table can have at least one team (not many). #7 can have zero or many invoices.
- E. #7(Team) and #8(TEAMEMPSKILL) are one-many relationship. #7 can have one or many teamempskill and #8 can have one team.
- F. #8(TEAMEMPSKILL) and #9(EMPLOYEE) are one-to-many relationship. #8 can have one employee (not zero and many). #9 can have one or many teamempskill.
- G. #8(TEAMEMPSKILL) and #11(SKILL) are one-to-many relationship. #8 can have one skill(not one and many) and #11 can have one or many teamempskill.
- H. #9(EMPLOYEE) and #10(POSITION) are one-many relationship. #9 can have one position (not zero and many). #10 can have one or many employees.
- I. #12(PROSALE) and #1(INVOICE) are zero-to-many relationship. #12 can have zero or many invoices and #1 can have one prosale (not zero and many).
- J. #12(PROSALE) and #13(PRODUCT) are zero-to-many relationship. #12 can have one product (not zero and many) and #13 can have zero or many prosale.
- K. #13(PRODUCT) and #15(CLASS) are one-to-many relationship. #13 can have one class (not zero and many) and #15 can have one or many products.
- L. #14(ASSISTANT) and #1(INVOICE) are one-to-many relationship. #14 can have one or many invoices and #1 can have one assistant (not zero and many).
- M. #13(PRODUCT) and #16(INVENTORY) are one-to-many relationship. #13 can have one inventory (not zero and many) and #16 can have one or many products.
- N. #16(INVENTORY) and #17(SUPPLIER) are one-to-many relationship. #16 can have one supply (not zero and many) and #17 can have one or many inventories.

Entity Relationship Diagram

