CREATE table Product (

maker varchar(40),

model varchar(40),

type varchar(20),

Primary Key(maker, model)

);

CREATE table PC (

model varchar(40),

speed float,

ram int,

hdisk int,

price float,

Primary Key(model)

);

CREATE table Laptop (

model varchar(40),

speed float,

ram int,

hdisk int,

screen int,

price float,

Primary Key(model)

);

CREATE table Printer (

model varchar(40),

color BIT,

type varchar(40),

price float,

Primary Key(model)

);

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CREATE table Classes (

class varchar(40),

type char(2),

country varchar(100),

guns int,

bore int,

displacement int,

Primary Key(class)

);

CREATE table Ships (

name varchar(40),

class varchar(40),

launched int,

Primary Key(name)

);

CREATE table Battles (

name varchar(100),

bdate int,

Primary Key(name)

);

CREATE table Outcomes (

ship varchar(40),

battle varchar(100),

result int,

Primary Key(ship, battle)

);

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CREATE table Employees (

Eno varchar(100),

Ename varchar(100),

Hire\_Date int,

Primary Key(Eno)

);

CREATE table Books (

Isbn decimal(15, 0),

Bname varchar (100),

Quantity int,

Price decimal(15, 2),

Primary Key(Isbn)

);

Create table Customers (

Cno int,

Cname varchar (100),

Street varchar (100),

Zip varchar(9),

Phone varchar(15),

Primary Key (Cno)

);

Create table Orders (

Ono int,

Cno int,

Eno int,

Received date,

Shipped date,

Primary Key(Ono)

);

Create table Orderline (

Ono int,

Isbn decimal (15, 0),

Qty int,

Primary Key (Ono, Isbn)

);

Create table Zipcodes (

Zip decimal (9, 0),

City varchar(50),

State varchar(50),

Primary Key(Zip)

);

1. π model (σ speed >= 3.00 from PC)

2. π maker ((σ hdisk >= 100 Laptop) ⋈ Product)

3. π model, price ( ρ(R1, (σ maker=’B’ Product)) ⋈ PC) U π model, price (R1 ⋈ Laptop) U π model, price (R1 ⋈ Printer)

4. π model ( σ type=’laser’ and color=’yes’ Printer)

5. π maker ((π maker (Laptop ⟗ Product)) - (π maker (σ type = ‘PC’ Product)) )

6. π R1.hdisk (σ R1.hdisk=PC.hdisk and PC.model <> R1.model ( PC X ρ (R1, PC ))

7. π PC.model and R1.model (PC ⟗ PC.speed = R1.speed and PC.ram = R1.ram and PC.model < R1.model ρ(R1, PC));

8. π P1.maker

(σ Product.Maker = P1.Maker

(((σ Left.model <> R1.model ((ρ Left, (σ speed >= 2.8 PC)) X ρ (R1, ( σ speed >= 2.8 Laptop)))) U

(σ Left.model <> R1.model ((ρ Left, (σ speed >= 2.8 PC)) X ρ (R1, ( σ speed >= 2.8 PC)))) U

(σ Left.model <> R1.model ((ρ Left, (σ speed >= 2.8 Laptop)) X ρ (R1, ( σ speed >= 2.8 Laptop)))))

⟗ Left.Model = Product.Model and R1.Model = P1.Model (Product X ρ(P1, Product))))

9. ρ(newTable, (Product ⟗ PC))

π maker ((newTable ⟗ newTable.speed <> R1.speed and newTable.model <> R1.model and newTable.maker = R1.maker ρ(R1, newTable))

⟗ newTable.speed <> R2.speed and R1.speed <> R2.speed and newTable.model <> R2.model and R1.model <> R2.model and newTable.maker = R2.maker ρ(R2, newTable))

10. ρ(newTable, σ type = ‘PC’ Product)

π newTable.maker

(newTable ⟗ newTable.model <> newTable1.model and newTable.maker = newTable 1.maker ρ(newTable1,newTable)

⟗ newTable.model <> newTable2.model and newTable1.model <> newTable2.model and newTable.maker = newTable2.maker ρ(newTable2, newTable))

11. π class, country (σ bore >= 16 Classes)

12. π name (Ships ⟗ (σ country = ‘USA’ Classes))

13. π name (σ launched < 1921 Ships)

14. π ship (σ battle = ‘Denmark Strait’ and result = ‘sunk’ Outcomes)

15. π name (Ships ⟗ (σ class = ‘capital’ and displacement > 35000 Classes))

16. π name, displacement, guns (Classes ⟗ (Ships ⟗ Ships.name = Outcomes.ship (σ battle = Guadalcanal Outcomes))

17. (π name->ships Ships) U (π ships Outcomes)

18. π Classes.class - π Ships.class (Ships ⟗ Ships.class = R1.class and Ships.name <> R1.name ρ(R1, Ships))

19. π Classes.country (σ Classes.class ==’battleship’ and R1.class == ‘battlecruiser’ (Classes X ρ(R1, Classes)))

20. ρ (R1, (Outcomes ⟗ Outcomes.battle = Battles.name Battles);

π R1.ship (σ R1.result = ‘damaged’ and R1.bdate < R2.bdate (R1 x ρ (R2, R1)))

21. π cno, cname (σ zip = 49008 Customers)

22. π cno, cname (σ state = ‘Michigan’ (Customers ⟗ Zipcodes))

23. π Employee.Eno (σ Zipcodes.State = ‘Michigan’ (((Employees ⟗ Orders) ⟗ Customers) ⟗ Zipcodes))

24. π Employee.Eno (σ Orders.Zip = 49008 and R1.Zip = 49009 ((Employees ⟗ Orders) ⟗ Employee.Eno = R1.Eno and Orders.Ono <> R1. Ono ρ(R1, Orders)))

25. π Customers.cname (σ Employee.Ename = ‘Jones’ ((Employees ⟗ Orders) ⟗ Customers))

26. π Customers. Cname

(σ Books.Bname <> ‘Database’ (((Customers ⟗ Orders) ⟗ Orderline) ⟗ Books))

27. ρ (newTable, (Books ⟗ Books.Bname > R1.Bname ρ (R1, Books));

π newTable.Bname, R1.Bname

28. ρ (newTable, (σ Price = 24.99 Books));

ρ (newTable1, (σ Price = 19.99 Books));

π newTable.Bname, newTable1.Bname (newTable X newTable1);

29. ρ(newTable, π Orderline.Isbn (σ Cno = ‘1111’ Orders) ⟗ Orderline));

ρ (newTable2, (newTable ⟗ Orderline));

ρ (newTable3, (newTable2 ⟗ Orders));

ρ (newTable4, (newTable3 ⟗ Customers));

π Cname;

30. ρ(newTable, π Orderline.Isbn (σ Cno = ‘11111’ Orders) ⟗ Orderline));

ρ (newTable3, (Customers ⟗ Orders));

ρ (newTable4, newTable3 ⟗ Orderline));

π Cname (newTable4 / newTable);