

Practice for  
SQL and Constraints  
(Product-PC-Laptop-Printer)

# Exercise – PC/Laptop/Printer

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

- a) Find those manufacturers that sell Laptops, but not PC's
- b) Find those hard-disk sizes that occur in two or more PC's.
- c) Find those manufacturers of at least two different computers (PC or Laptops) with speed of at least 700.
- d) Find the manufacturers who sell exactly three different models of PC.
- e) Using two INSERT statements, store in the database the fact that PC model 1100 is made by manufacturer C, has speed 1800, RAM 256, hard disk 80, a 20x DVD, and sells for \$2499.
- f) Insert the facts that for every PC there is a laptop with the same manufacturer, speed, RAM and hard disk, a 15-inch screen, a model number 1000 greater, and a price \$500 more.
- g) Delete all PC's with less than 20 GB of hard disk.
- h) Delete all laptops made a manufacturer that doesn't make printers.
- i) Manufacturer A buys manufacturer B. Change all products made by B so they are now made by A.
- j) For each PC, double the amount of RAM and add 20 GB to the amount of hard disk.
- k) For each laptop made by manufacturer B, add one inch to the screen size and subtract \$100 from the price.

# Creation of Tables

```
CREATE TABLE Product (  
    maker CHAR(10),  
    model INT,  
    type CHAR(5)  
);
```

```
CREATE TABLE PC (  
    model INT,  
    speed INT,  
    ram INT,  
    hd INT,  
    rd INT,  
    price INT  
);
```

```
CREATE TABLE Laptop (  
    model INT,  
    speed INT,  
    ram INT,  
    hd INT,  
    screen INT,  
    price INT  
);
```

```
CREATE TABLE Printer (  
    model INT,  
    color CHAR(1),  
    type CHAR(5),  
    price INT  
);
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

a) Find those manufacturers  
that sell Laptops, but not  
PC's.

```
(SELECT maker  
FROM Laptop NATURAL JOIN Product)  
MINUS  
(SELECT maker  
FROM PC NATURAL JOIN Product);
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

b) Find those hard-disk sizes  
that occur in two or more  
PC's.

```
SELECT hd  
FROM PC  
GROUP BY hd  
HAVING COUNT(model) >= 2;
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

c) Find those manufacturers of at least two different computers (PC or Laptops) with speed of at least 700.

```
SELECT maker
FROM (
    (SELECT model, speed
     FROM PC) UNION
    (SELECT model, speed
     FROM Laptop) )
NATURAL JOIN
Product
WHERE speed >= 700
GROUP BY maker
HAVING COUNT(model) >= 2;
```

Or:

```
SELECT maker
FROM (
    (SELECT model, speed
     FROM PC) UNION
    (SELECT model, speed
     FROM Laptop)
) C
JOIN
Product
    ON C.model = Product.model
WHERE C.speed >= 700
GROUP BY Product.maker
HAVING COUNT(C.model) >= 2;
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

d) Find the manufacturers  
who sell exactly three  
different models of PC.

```
SELECT Product.maker
FROM PC, Product
WHERE PC.model=Product.model
GROUP BY Product.maker
HAVING COUNT(PC.model)=3;
```

Or:

```
SELECT maker
FROM PC NATURAL JOIN Product
GROUP BY maker
HAVING COUNT(model)=3;
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

```
INSERT INTO Product(maker,model,type)
VALUES('C',1100,'PC');
```

```
INSERT INTO PC(model,speed,ram,hd,rd,price)
VALUES(1100,1800,256,80,20,2499);
```

e) Using two INSERT statements, store in the database the fact that PC model 1100 is made by manufacturer C, has speed 1800, RAM 256, hard disk 80, a 20x DVD, and sells for \$2499.



**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

```
INSERT INTO Product(maker,model,type)
(SELECT maker,model+1000,'Laptop'
FROM Product
WHERE type='PC'
);
```

```
INSERT INTO Laptop(model,speed,ram,hd,screen,price)
(SELECT model+1000, speed, ram, hd, 15, price+500
FROM PC
);
```

f) Insert the facts that for every PC there is a laptop with the same manufacturer, speed, RAM and hard disk, a 15-inch screen, a model number 1000 greater, and a price \$500 more.

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

g) Delete all PC's with less than 20 GB of hard disk.

```
DELETE FROM PC  
WHERE hd<20;
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

h) Delete all laptops made by a manufacturer that doesn't make printers.

```
DELETE FROM Laptop
WHERE model IN
(SELECT model
FROM Product
WHERE maker IN (
(SELECT maker
FROM Product NATURAL JOIN Laptop)
MINUS
(SELECT maker
FROM Product NATURAL JOIN Printer)
)
);
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

UPDATE Product

SET maker='B'

WHERE maker='C';

i) Manufacturer A buys manufacturer B. Change all products made by B so they are now made by A.

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

UPDATE PC

SET ram=ram\*2, hd=hd+20;

j) For each PC, double the amount of RAM and add 20 GB to the amount of hard disk.

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

k) For each laptop made by manufacturer B, add one inch to the screen size and subtract \$100 from the price.

```
UPDATE Laptop
SET screen=screen+1, price=price-100
WHERE model IN
(SELECT model
FROM Product
WHERE maker='B'
);
```

# Constraints – PCs, Laptops, Printers

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

First create keys and foreign key references.

Then create the following constraints.

- a) The speed of a laptop must be at least 800.
- b) The only types of printers are laser, ink-jet, and bubble.
- c) A model of a product must also be the model of a PC, a laptop, or a printer.

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

First create keys and  
foreign key references.

```
CREATE TABLE Product (  
  maker VARCHAR(10),  
  model INT PRIMARY KEY,  
  type VARCHAR(10)  
);
```

```
CREATE TABLE PC (  
  model INT PRIMARY KEY,  
  speed INT,  
  ram INT,  
  hd INT,  
  rd INT,  
  price FLOAT,  
  CONSTRAINT fk_pc FOREIGN KEY(model)  
    REFERENCES Product(model)  
    ON DELETE CASCADE  
);
```

```
CREATE TABLE Laptop (  
  model INT PRIMARY KEY,  
  speed INT,  
  ram INT,  
  hd INT,  
  screen INT,  
  price FLOAT,  
  CONSTRAINT fk_lap FOREIGN  
    KEY(model) REFERENCES  
    Product(model)  
    ON DELETE CASCADE  
);
```



**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

a) The speed of a laptop must be at least 800.

```
CREATE TABLE Laptop (  
    model INT PRIMARY KEY,  
    speed INT CHECK(speed >= 800),  
    ram INT,  
    hd INT,  
    screen INT,  
    price FLOAT,  
    CONSTRAINT fk_lap FOREIGN  
        KEY(model) REFERENCES  
        Product(model)  
    ON DELETE CASCADE  
);
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

b) The only types of printers are laser, ink-jet, and bubble.

```
CREATE TABLE Printer (  
    model INT PRIMARY KEY,  
    color VARCHAR(10),  
    type VARCHAR(10)  
    CHECK(type IN ('laser', 'ink-jet', 'bubble')),  
    price FLOAT,  
    CONSTRAINT fk_printer FOREIGN KEY(model) REFERENCES Product(model)  
    ON DELETE CASCADE  
);
```

**Product**(maker, model, type)

**PC**(model, speed, ram, hd, rd, price)

**Laptop**(model, speed, ram, hd, screen, price)

**Printer**(model, color, type, price)

c) A model of a product must also be the model of a PC, a laptop, or a printer.

```
CREATE VIEW ProductSafe(maker,model,type) AS
SELECT maker, model, type
FROM Product
WHERE model IN (
    (SELECT model FROM PC) UNION
    (SELECT model FROM Laptop) UNION
    (SELECT model FROM Printer)
)
WITH CHECK OPTION;
```

Then, we insert into this view as opposed to directly into Product.

Also, make the FOREIGN KEY constraints in PC, Laptop, and Printer *deferrable initially deferred*.