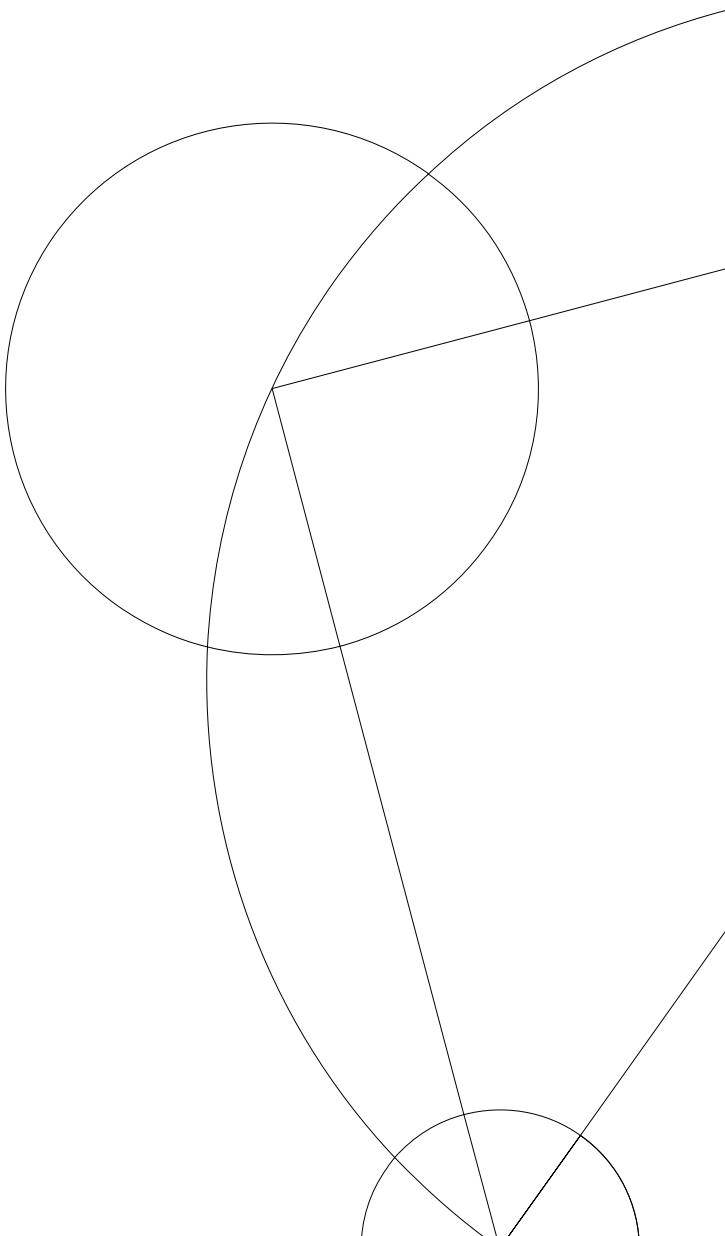
KØBENHAVNS UNIVERSITET

Mandatory assignment 2

Gruppe 16

DIS
2023



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Institut for Datalogi. 2. juni 2023

Gruppemedlemmer

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Exercise 1

1.1

- a) $\pi x, y(P) \bigcap Q$
- b) $Q \bowtie^o R_{\rho R(y)}(z)$
- c) $P \cup P$
- d) $P \bowtie_L^o \rho_{Q(z)}(y)\pi_z(Q)$
- e) $Q - R$
- f) $P \bowtie_L^o {}_{P.x \neq R.x \mathbf{AND} P.y \neq R.y} R$
- g) $Q - \pi_x(R)$
- h) $\pi_z(P \cap \rho_{Q(z)}(y)Q) \bowtie^o R$

1.2

- a) $Q \wedge R$
- b) $\exists y.\exists x.P \wedge x = y \vee x = z$
- c) $Q \wedge S \wedge S = (R \wedge x = y)$
- d) $P \wedge (Q \vee R)$

Exercise 2

a) A = ((ρ model2←model, speed2←speed, ram2←ram, hd2←hd, price2←price (ρ PC2 (PC)))
x
(π model,speed, ram, hd, price(PC)))
sigma price < price2 and ((speed > speed2 and ram > ram2) or (ram > ram2 and hd > hd2) or (speed > speed2 and hd > hd2)) (A)

b) $\sigma_{speed>2.16}(PC)$

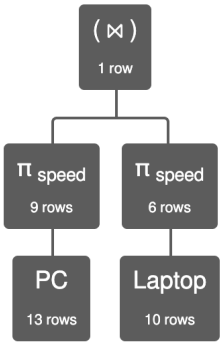
c) (π model,price(Laptop)
union
π model,price(PC)
union
π model,price(Printer))
join
π maker,model(Product)

d)
A = ((π model,price(Laptop)
union
π model,price(PC)
union
π model,price(Printer))
join
π maker,model(Product))

$\gamma maker; max(price)$ß$price(A)$
join
A

e)$(\pi_{speed}(PC) \bowtie \pi_{speed}(Laptop))$

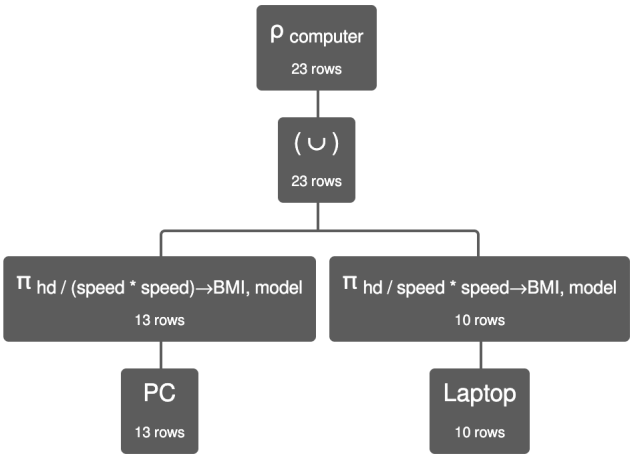
The expression tree



f)
π model,price (σ Laptop.price > avgprice (Laptop x(γ avg(price) $\rightarrow$avgprice(Laptop))))
g)
h)

```
type; max(price) → maxprice, min(price) → minprice(Printer)
```

i) $\rho_{computer}(\pi hd/(speed * speed) \rightarrow BMI, model(PC) \cup \pi hd/(speed * speed) \rightarrow BMI, model(Laptop)$
The expression tree



Exercise 3

a)

```
SELECT PC.model, PC.speed as GHz, PC.hd as GB
FROM PC
WHERE PC.price < 1000;
```

b)

```
SELECT DISTINCT product.maker
FROM product, printer
WHERE product.model = printer.model;
```

c)

```
SELECT product.maker, laptop.speed
FROM product, laptop
WHERE product.model = laptop.model AND hd > 30;
```

d)

```
SELECT product.model, pc.price
FROM product, pc
WHERE product.model = pc.model AND product.maker = 'B'
UNION
SELECT product.model, laptop.price
FROM product, laptop
WHERE product.model = laptop.model AND product.maker = 'B'
UNION
SELECT product.model, printer.price
FROM product, printer
WHERE product.model = printer.model AND product.maker = 'B'
```

e)

```
SELECT DISTINCT maker
FROM product
NATURAL JOIN laptop
WHERE maker NOT IN (SELECT DISTINCT maker
                    FROM product
                    NATURAL JOIN pc);
```

f)

```
SELECT *
FROM laptop
WHERE speed < (SELECT max(speed)
               FROM pc);
```

g)

```
SELECT product.maker
FROM product
JOIN printer ON product.model = printer.model
WHERE printer.color = 'true'
ORDER BY printer.price
LIMIT 1;
```

h)

```
SELECT model, price
FROM (SELECT model, speed, price
      FROM pc
      UNION
      SELECT model, speed, price
      FROM laptop) AS computers
WHERE speed >= (SELECT MAX(speed) FROM pc) AND speed >= (SELECT MAX(speed) FROM laptop);
```

i)

```
SELECT maker, avg(screen)
FROM product NATURAL JOIN laptop
GROUP BY maker;
```

j)

```
SELECT maker
FROM product
NATURAL JOIN pc
GROUP BY maker
HAVING COUNT(model) >= 3;
```

k)

```
SELECT maker, MAX(price) AS max_price
FROM product
NATURAL JOIN pc
GROUP BY maker
ORDER BY maker;
```

l)

```
SELECT AVG(pc.hd)
FROM product
JOIN pc ON product.model = pc.model
WHERE product.maker IN
(SELECT maker
    FROM product
    WHERE type = 'printer');
```

Exercise 4

a)

```
insert into Product values('C', 1100, 'PC');
insert into PC values(1100, 3.20, 1024, 180, 2499);
```

b)

```
DELETE FROM pc
WHERE hd < 100;
```

c)

```
DELETE FROM product
WHERE type = 'laptop' AND maker NOT IN (
    SELECT DISTINCT maker
    FROM product
    WHERE type = 'printer'
);
```

d)

```
INSERT INTO product(maker, model, type)
SELECT 'A', model, type
FROM product
Where maker ='B'
DELETE FROM product
where maker = 'B'
```

e)

```
UPDATE pc
SET ram = ram * 2.0
UPDATE pc
SET hd = hd + 60
```

f)

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

g)

```
DELETE FROM product
WHERE model NOTNUL
```