

Tutorial - 02 -

Exercise 01:

Owner(OwnerNum, firstname, lastname, address, phone number).

Property(PropertyNum, city, type, rental-price, OwnerNum*)

Customer(CustomerNum, firstnameC, lastnameC, addressC,
prefType, Budget Max).

Visit(PropertyNum*, CustomerNum*, VvisitDate).

a - Expressing the query in SQL :

Select propertyNum, city

From Visit v, Customer c, Property p

Where v. CustomerNum = c. CustomerNum

AND v. PropertyNum = p. PropertyNum

AND c. prefType = "apartment"

AND p. OwnerNum = 0PG93.

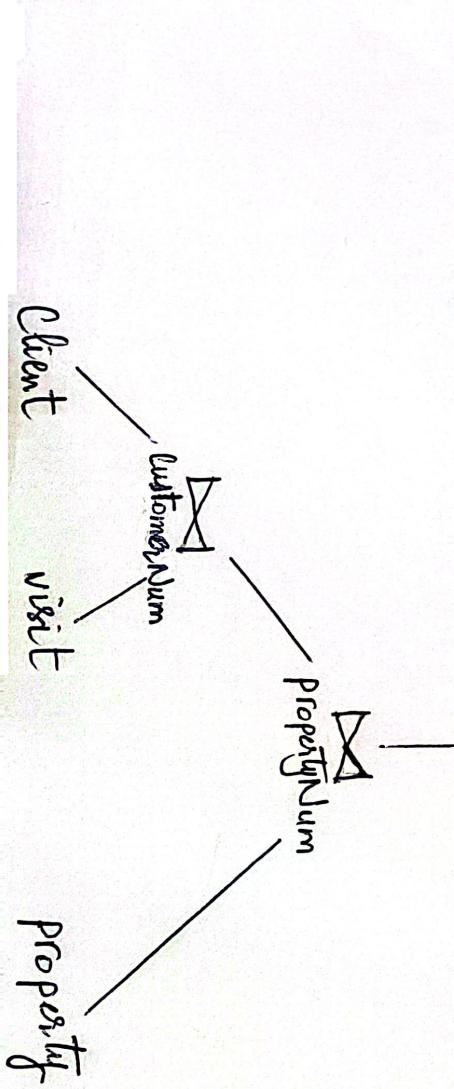
AND p. type = c. prefType.

b - The algebraic tree =

$\pi_{\text{propertyNum}, \text{city}}$.

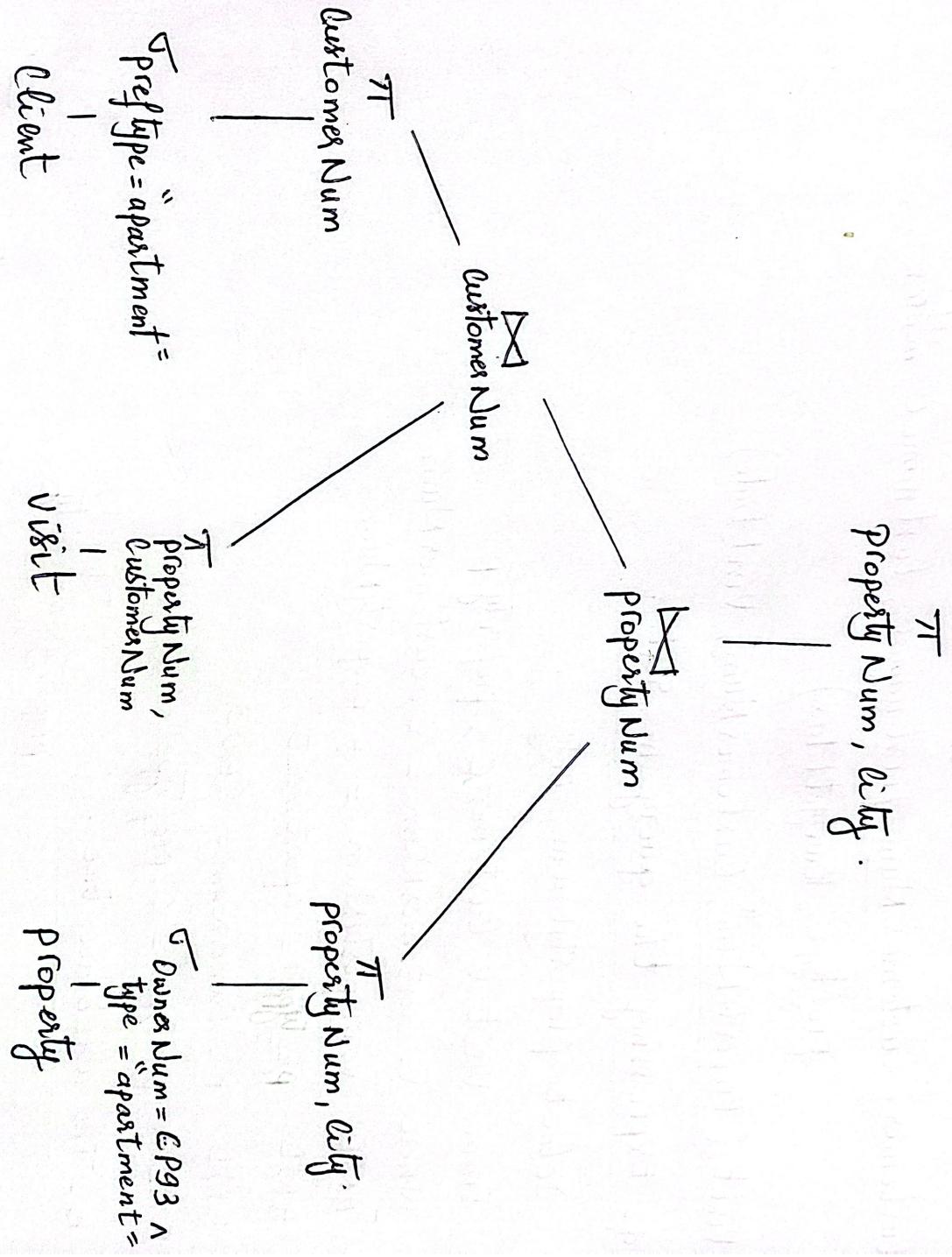
$S_{\text{Client}} \text{ prefType} = \text{"apartment"} \text{ AND } S_{\text{Property}} \text{ AND type} = \text{prefType}$

$\text{OwnerNum} = 0PG93$



Optimized tree:

Push down each selection as low as possible in the algebraic tree.



Exercise 02:

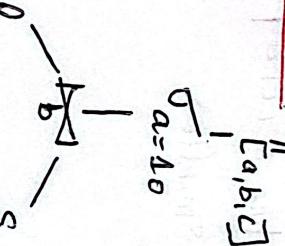
Execution cost: number of tuples (logical cost)

$$\text{Cost}(\pi) = \frac{\text{Card}(R_1) \times \text{Card}(R_2) \times \dots \times \text{Card}(R_n)}{\max(\text{Val}(R_1, \text{common att}), \dots, \text{Val}(R_n, \text{common att}))}$$

$\text{Cost}(\sigma) = \text{Card}(R) / \text{val}(R, \text{attribute used in the selection operation})$

$$\text{Cost}(\pi) = \text{Resulting tuples} \times [\text{size}(\text{att}_1) + \text{size}(\text{att}_2) + \dots + \text{size}(\text{att}_n)]$$

The first possible execution:



- Calculating the cost:

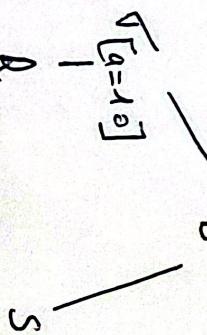
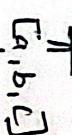
$$\text{Cost}(\sigma \text{ or } s) = \frac{\text{Card}(R) \times \text{Card}(S)}{\max(\text{Val}(R, b), \text{Val}(S, b))} = \frac{50000 \times 2000}{100 \times 200} = 50000$$

$$\text{Cost}(\delta_{[a=10]}) = \text{Card}(\text{Result}) / \text{val}(R, a) = \frac{50000}{50} = 1000$$

$$\begin{aligned}\text{Cost}(\pi_{[a,b,c]}) &= \text{Card}(\text{Result}) (\text{size}(a) + \text{size}(b) + \text{size}(c)) \\ &= 1000 (\text{size}(a) + \text{size}(b) + \text{size}(c)).\end{aligned}$$

$$\boxed{\text{Logical cost} = 50000 + 1000 = 51000}$$

The second possible execution:



True cost:

$$\text{Cost}(R_s) = \text{Card}(R) / \text{Val}(R, a) = 5000 / 50 = 100$$

$$\text{Cost}(R_s \bowtie S) = \frac{\text{Card}(R_s) \times \text{Card}(S)}{\max(\text{Val}(R_s, b), \text{Val}(S, b))} = \frac{100 \times 2000}{200} = 1000$$

$$\text{Cost}(\pi_{[a,b,c]}) = \text{Card}(R_s \bowtie S) (\text{size}(a) + \text{size}(b) + \text{size}(c)) \\ = 1000 (\text{size}(a) + \text{size}(b) + \text{size}(c))$$

$$\boxed{\text{Logical Cost} = 100 + 1000 = 1100}$$

The best execution plan is the second plan,
because its cost is smaller.

Exercise 03:

Student (idS, name, age, address)

Book (idB, title, author)

Borrow (idS, idB, date)

Query: Select s.name

from Student s, Book b, Borrow br

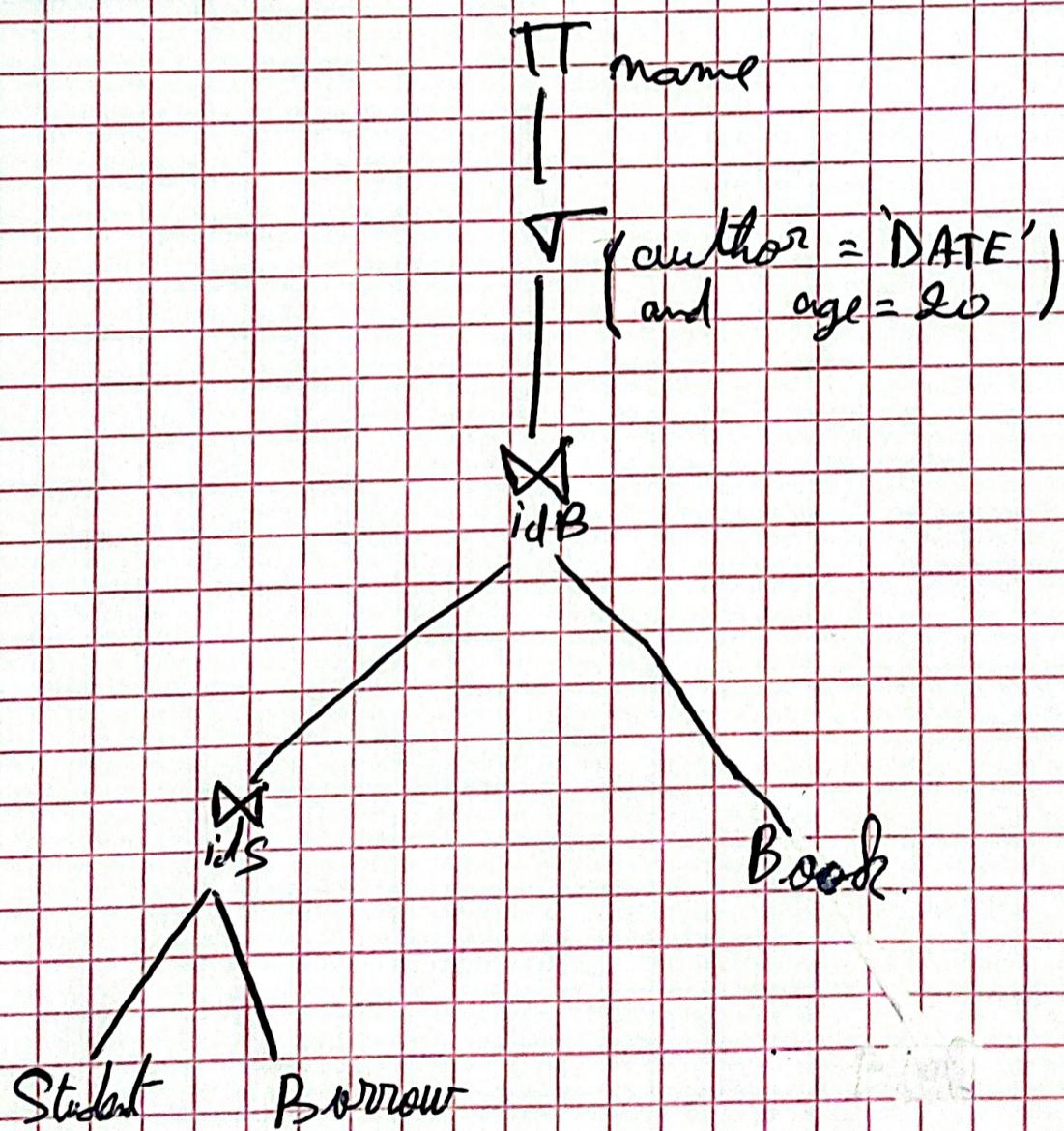
where s.idS = br.idS

AND b.idB = br.idB

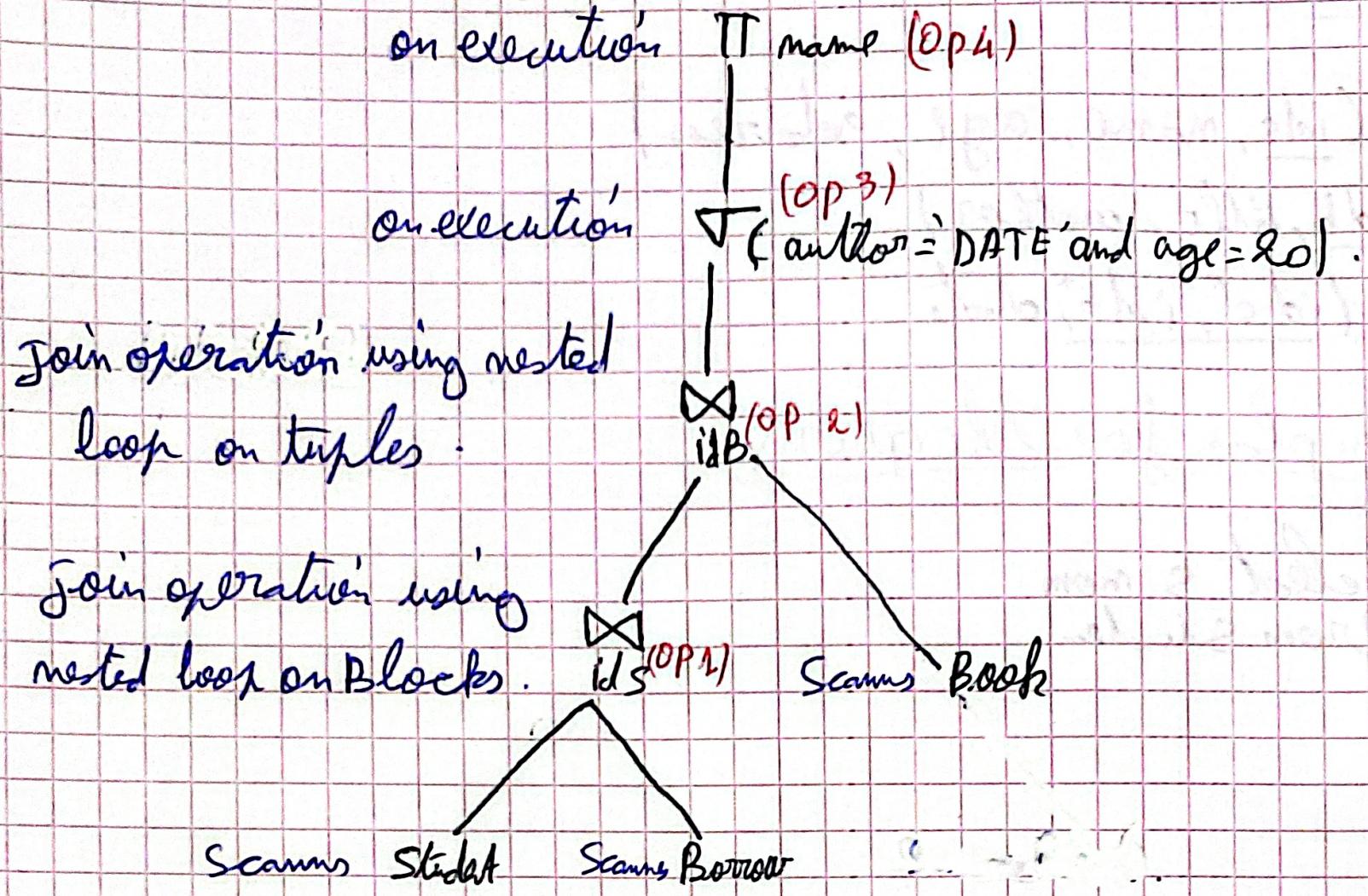
AND b.author = 'DATE'

AND s.age = 20.

a - 1st Execution plan:



b - calculation of the cost:



Operation	logical cost	physical cost
OP 1	$\frac{1\ 000\ 000 \times 3\ 000\ 000}{1\ 000\ 0}$ $= 300\ 000 \text{ rows}$	$ T_1 + T_1 T_3 \leftarrow \text{number of pages.}$ $= 1000 + 1000 \times 15\ 000$ $= 1500\ 100 \text{ pagl.}$
OP 2	$\frac{300\ 000 \times 5\ 000}{5\ 000}$ $= 3\ 000\ 000 \text{ rows}$	$\text{num of tuples (previous operation)} \times T_2 $ $= 300\ 000 \times 5\ 000$ $= 15\ 000\ 00\ 000$
OP 3	$\frac{3\ 000\ 000}{500 \times (24 - 10 + 1)}$ $= 40 \text{ rows}$	on execution.
OP 4	$40 \times \text{size(name)}$	on execution.
Total	$600\ 000 + 40 \cdot \text{size(name)}$	$15\ 15\ 00\ 100\ 0$