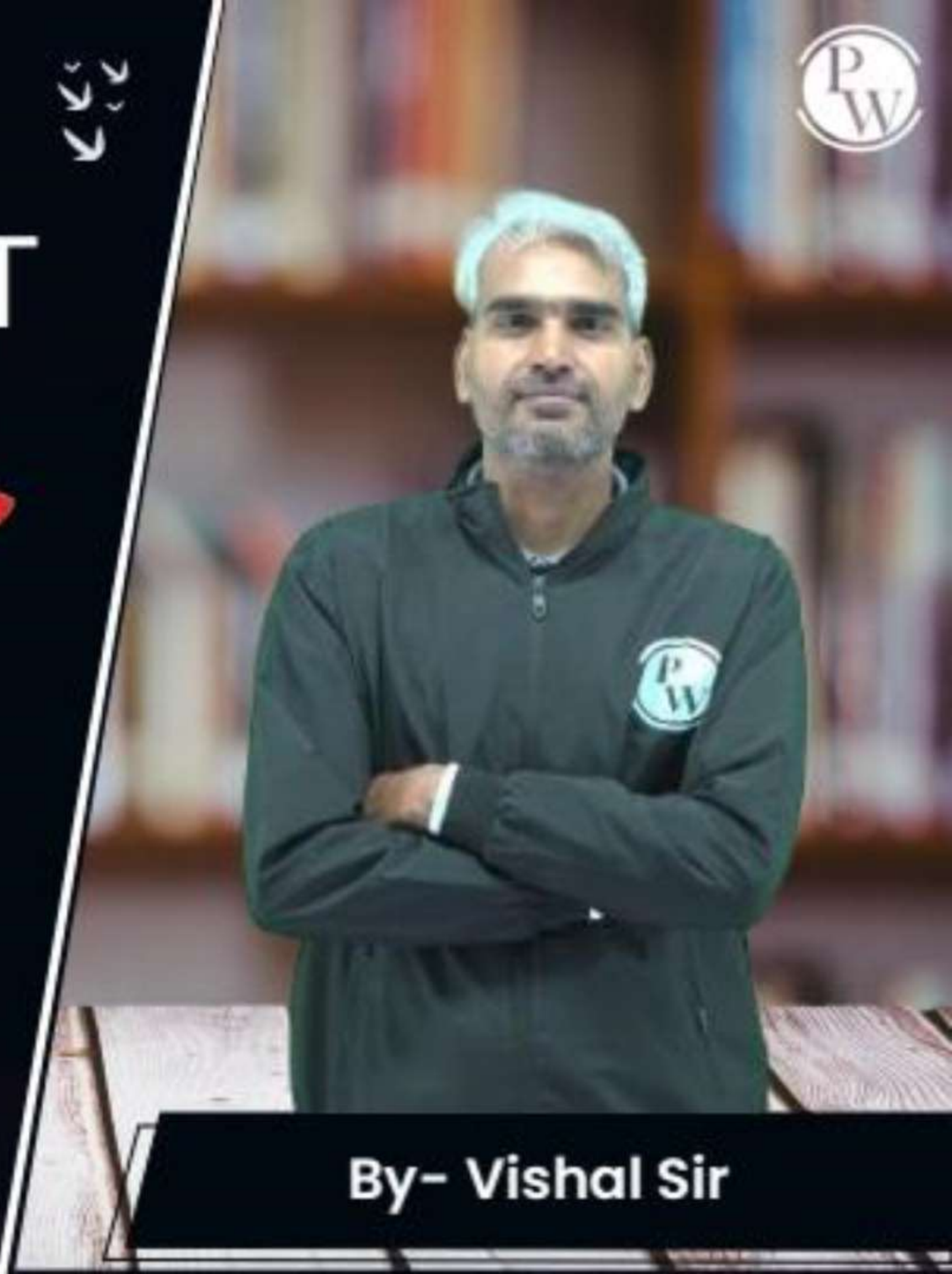
Computer Science & IT

Database Management System

Query Languages

Lecture No. 08



By- Vishal Sir

Recap of Previous Lecture

- **Topic** SQL clauses
- **Topic** Introduction to nested query
- **Topic** IN operator

Slide

Topics to be Covered

Topic ANY, ALL and EXISTS operators

Topic Practice questions

Slide

Q. Supplier (Sid, Sname, Rating)
Parts (Pid, Pname, Color)
Catalog (Sid, Pid, Cost)

} Retrieve Sid of the supplier who supplied at least one red color part.

Relational Algebra :- $\pi_{C.Sid}\left(\sigma_{\substack{C.Pid = P.Pid \\ P.Color = 'Red'}}(C \times P)\right)$

SQL {without Nested query} =

```
Select distinct Catalog.Sid
From Catalog, Parts
Where (Catalog.Pid = Parts.Pid AND Parts.Color = 'Red')
```

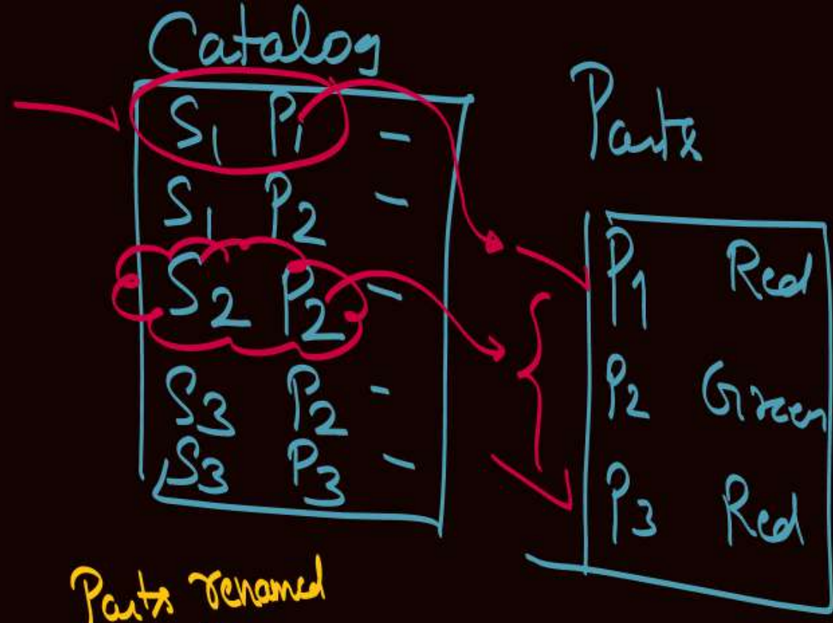
```
Select C.Sid
From Catalog As C, Parts As P
Where (C.Pid = P.Pid AND P.Color = 'Red')
```

≡

```
Select C.Sid
From Catalog C, Parts P
Where (C.Pid = P.Pid AND
       P.Color = 'Red')
```

Catalog renamed as C

Parts renamed as P



H.W Nested Write^SQL query using IN operator

```
Select distinct Sid
From Catalog
Where Pid IN (Select Pid
              From Parts
              Where Color = 'Red')
```

o/p = {P1, P3}

X IN { (1,2), (3,5), (2,4), (3,4) }

↓

if X = 1, then IN return false,

if X = (2,5), then IN return false.

if X = (3,4) then IN return true

Topic : ANY operator

'ANY' operator is used along with other Comparison operator.

Comparison operator: $<, \leq, >, \geq, =, <>$

$<ANY, \leq ANY, >ANY, \geq ANY, =ANY, <>ANY$

- ANY returns true if and only if at least one tuple in the given set of tuples satisfy the Comparison Condition with tuple under Consideration.

given set of tuples → o/p of inner query

Any tuple

eg. X < ANY { 2, 4, 7, 8, 12 }

Set of tuples {o/p of inner query}

× × ✓

if X = 4, then < ANY will return true

if X = 15, then < ANY will return false

Note:. If inner query result is Empty, then 'ANY' operator will always return false

Note:. 'IN' operator is Equivalent to '=ANY'.

Topic : ALL operator

- Just like 'ANY' operator, 'ALL' also works along with Comparison operators.
- 'ALL' returns false only if at least one tuple in the set of tuple fails the comparison condition

e.g. $X \geq ALL \{2, 4, 7, 9, 12\}$

$X = 9$, then $\geq ALL$ return false

∴ false

e.g. $X \geq ALL \{2, 4, 7, 9, 12\}$

$X = 15$ then $\geq ALL$ return true

Note: If inner query result is Empty, then 'ALL' operator will always return true

Note: 'NOT IN' is Equivalent to '<> ALL'

X NOT IN {2, 3, 5, 7}

X=4 NOT IN return True

X <> ALL {2, 3, 5, 7}

X=4, then <> ALL return true

Topic : EXISTS operator

'EXISTS' returns true if and only if inner query result is not Empty.

- i.e.,

① If inner query result is Empty then 'EXISTS' return false,

& ② If inner query result is not Empty. then 'EXISTS' return True

Complement of 'EXISTS' is 'NOT EXISTS'

#e.g.

```
SELECT C.sid
FROM Catalog C
WHERE EXISTS ( SELECT *
               FROM Parts P
               WHERE (P.Pid=C.Pid AND P.color='RED'))
```

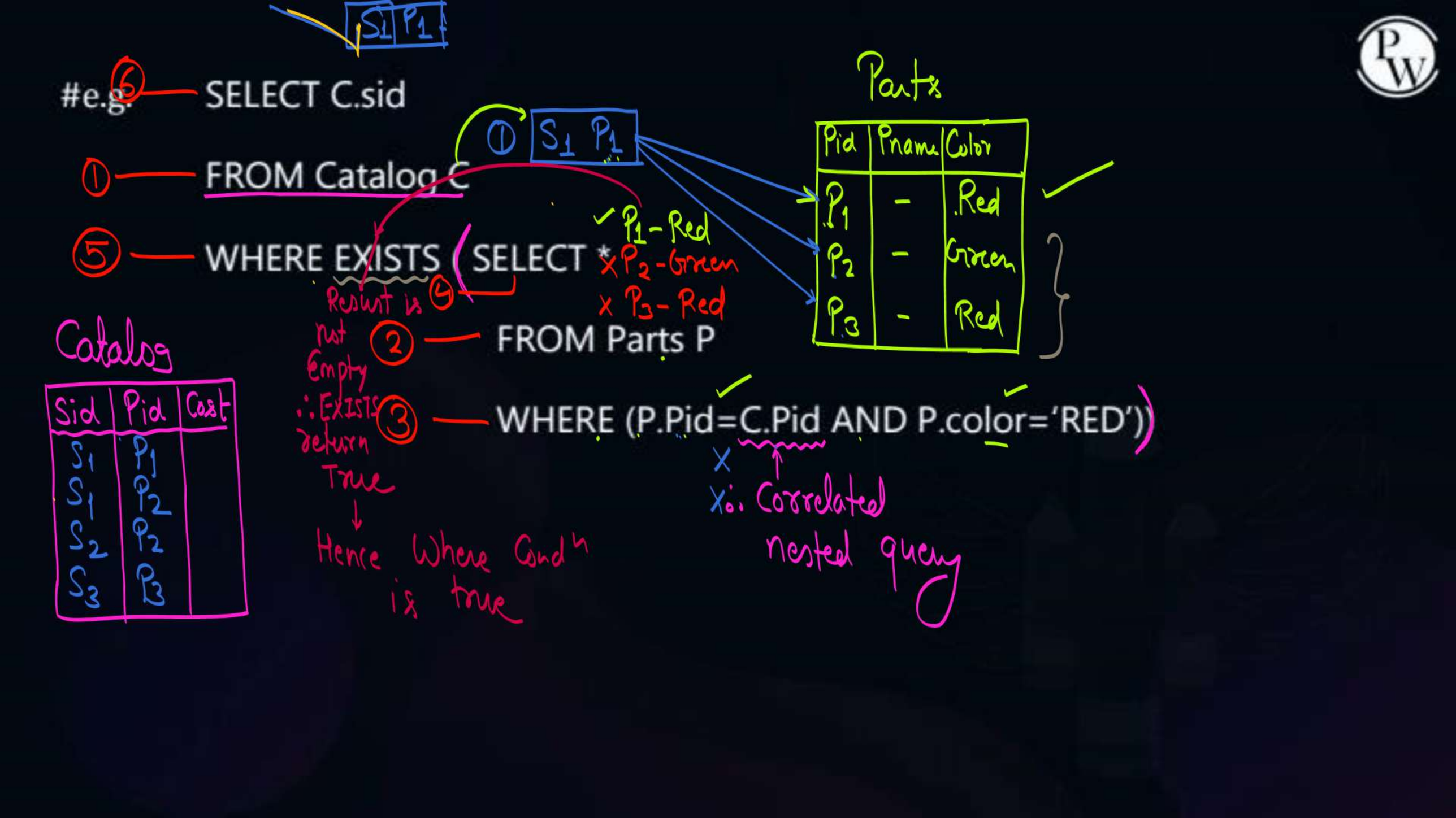
Parts

Pid	Pname	Color
P_1	-	Red
P_2	-	Green
P_3	-	Red

Catalog

Sid	Pid	Cost
S_1	P_1	
S_1	P_2	
S_2	P_2	
S_3	P_3	

What O/P will be produced if the query is Executed on given instances of Catalog & Parts relation?


S1 P1
#e.g. 6 SELECT C.sid
1 FROM Catalog C
5 WHERE EXISTS (SELECT *
Result is 4 not Empty ∴ EXISTS return True
2 FROM Parts P
3 WHERE (P.Pid=C.Pid AND P.color='RED'))
① S1 P1
P1 - Red
x P2 - Green
x P3 - Red
Parts
Pid | Pname | Color
P1 | - | Red
P2 | - | Green
P3 | - | Red
Catalog
Sid | Pid | Cost
S1 | P1
S1 | P2
S2 | P2
S3 | P3
Hence Where Cond^n is true
X ∴ Correlated nested query

#e.g. SELECT C.sid

FROM Catalog C

WHERE EXISTS (SELECT * FROM Parts P

WHERE (P.Pid=C.Pid AND P.color='RED'))

S_1 | P_2

S_1 P_2

P_1 - Red ✗
P_2 - Green ✗
P_3 - Red ✗

Empty
∴ False

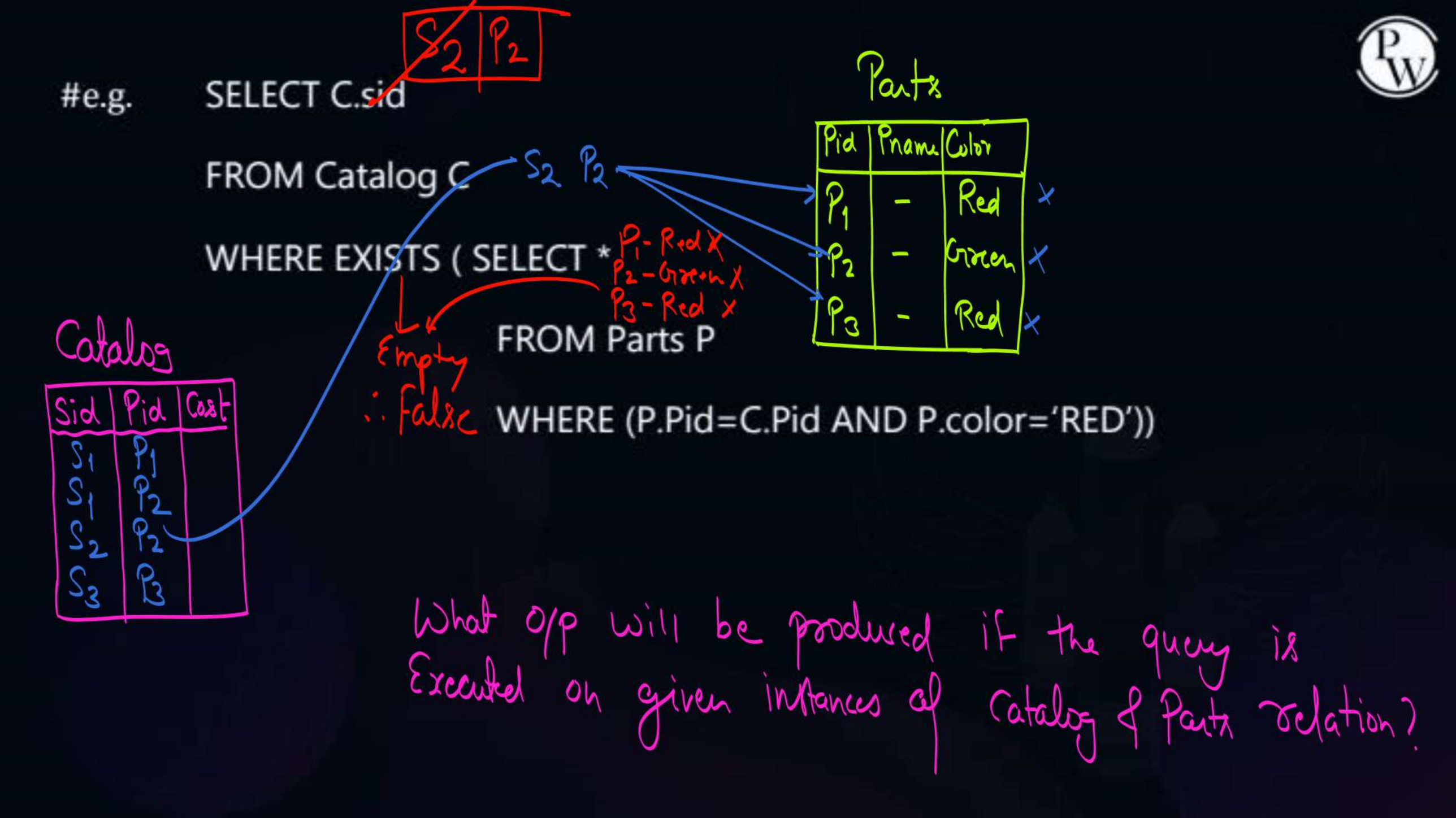
Parts

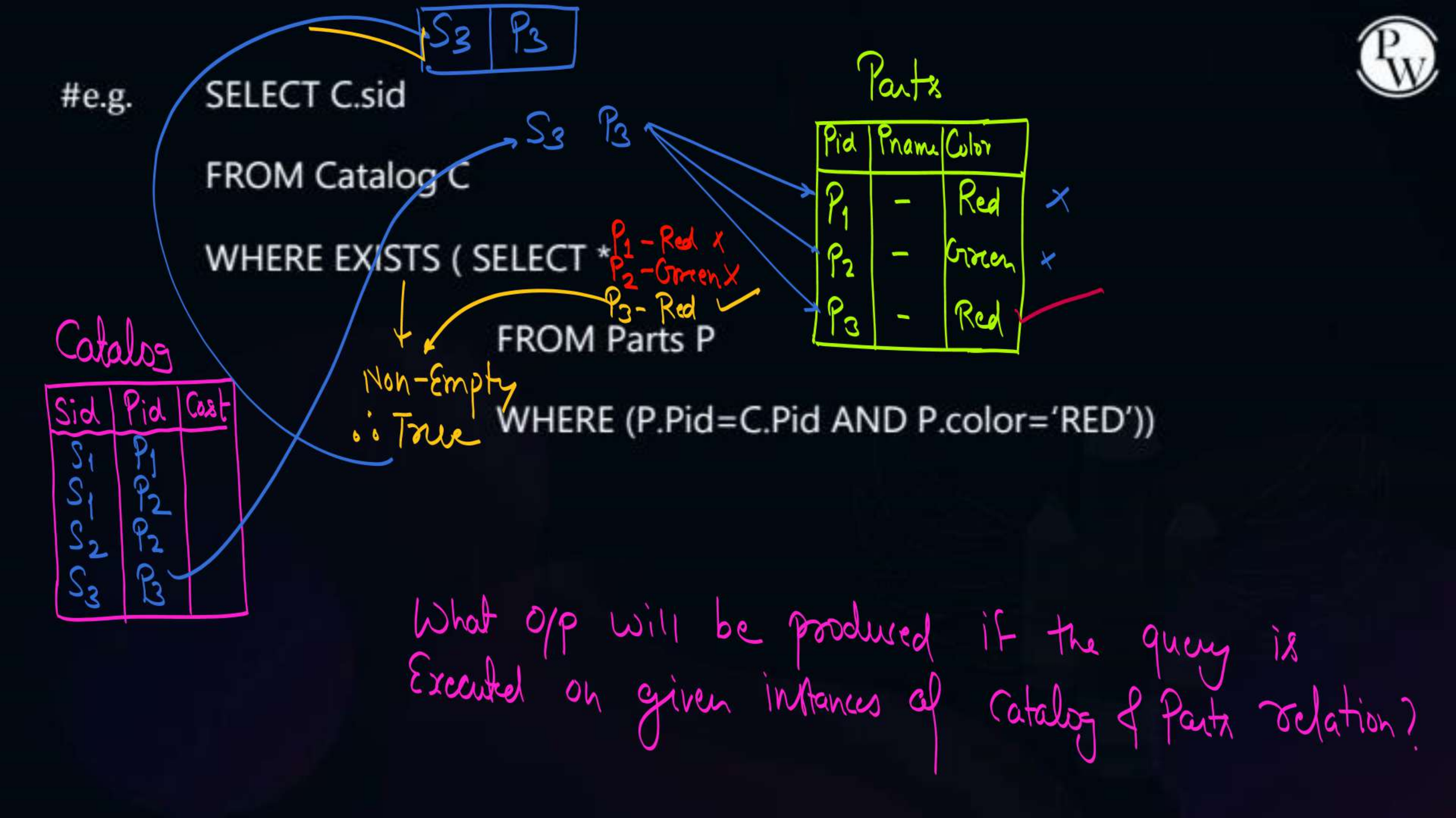
Pid	Pname	Color	
P_1	-	Red	✗
P_2	-	Green	✗
P_3	-	Red	✗

Catalog

Sid	Pid	Cost
S_1	P_1	
S_1	P_2	
S_2	P_2	
S_3	P_3	

What O/P will be produced if the query is Executed on given instances of Catalog & Parts relation?


S2 P2
#e.g. SELECT C.sid
FROM Catalog C
WHERE EXISTS (SELECT *
FROM Parts P
WHERE (P.Pid=C.Pid AND P.color='RED'))
Parts
Pid Pname Color
P1 - Red
P2 - Green
P3 - Red
P1 - Red X
P2 - Green X
P3 - Red X
Empty
∴ false
Catalog
Sid Pid Cost
S1 P1
S1 P2
S2 P2
S3 P3
What O/P will be produced if the query is Executed on given instances of Catalog & Parts relation?



What O/P will be produced if the query is Executed on given instances of Catalog & Parts relation?

O/P:

Sid
S_1
S_3

#e.g. SELECT C.sid

FROM Catalog C

WHERE EXISTS (SELECT *

FROM Parts P

WHERE (P.Pid=C.Pid AND P.color='RED'))

Parts

Pid	Pname	Color	
P_1	-	Red	✓
P_2	-	Green	✗
P_3	-	Red	

Catalog

Sid	Pid	Cost
S_1	P_1	
S_1	P_2	
S_2	P_2	
S_3	P_3	

What O/P will be produced if the query is Executed on given instances of Catalog & Parts relation?

#e.g.

```
SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS ( SELECT P.Pid
                   FROM Parts P
                   WHERE NOT EXISTS (SELECT C2.Sid
                                     FROM Catalog C2
                                     WHERE(C2.Pid=P.Pid AND  C2.Sid=C1.Sid)))
```

Catalog

Sid	Pid
S_1	P_1
S_1	P_2
S_2	P_2

Parts

Pid	
P_1	
P_2	

What output is produced by above SQL query:

A. S_1, S_2 Sids of suppliers who supplied some parts (At least one)

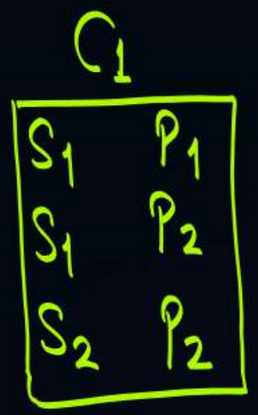
B. S_2 Sids of suppliers who supplied only proper subset of parts from all parts (But did not supply all parts)

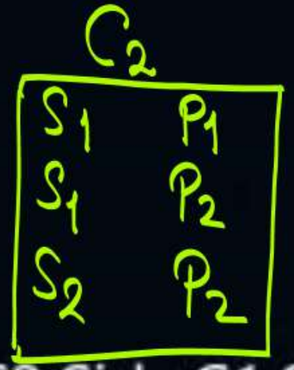
C. S_1 Sids of suppliers who supplied all parts

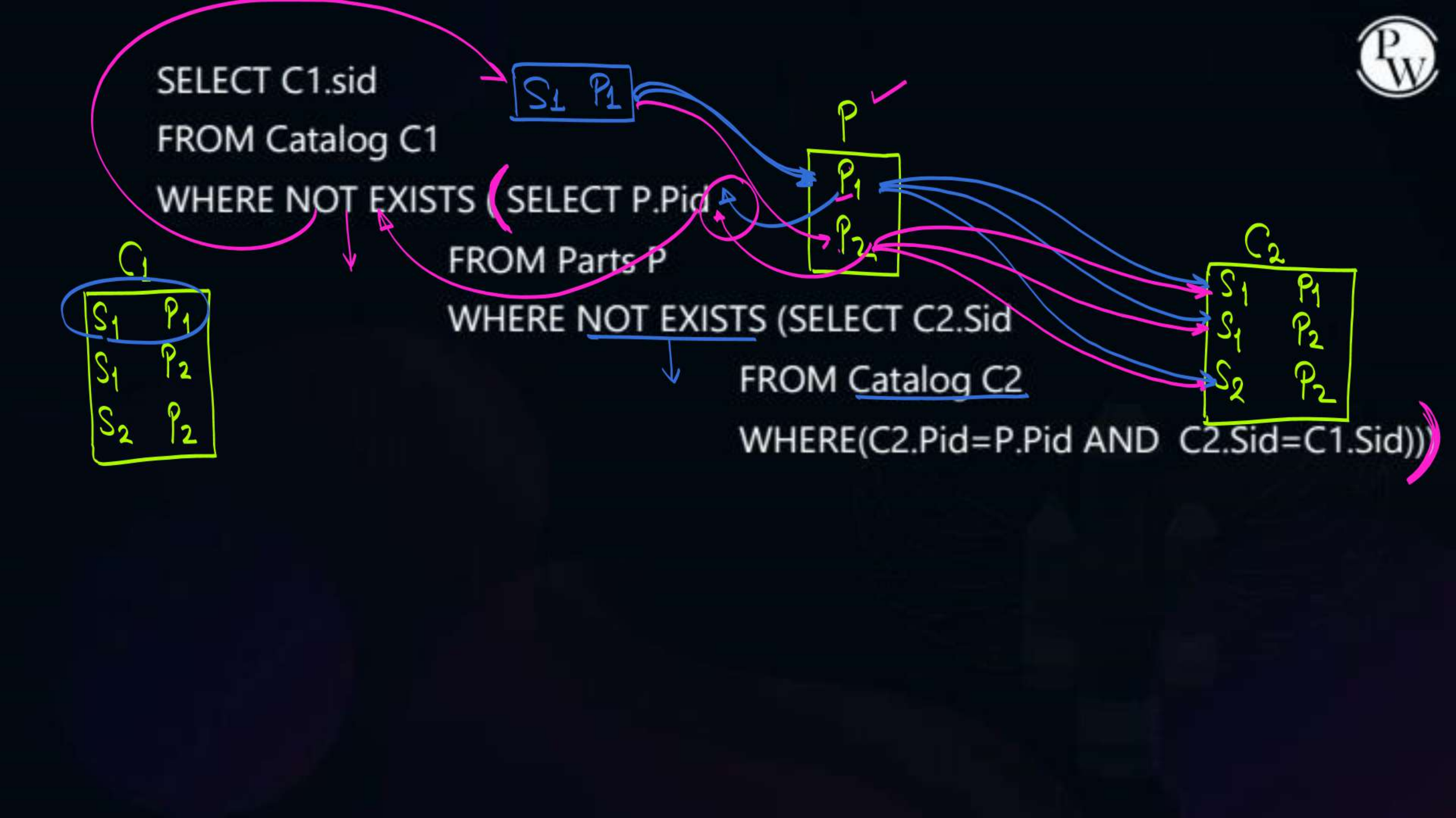
D. Sids of suppliers who did not supply any part

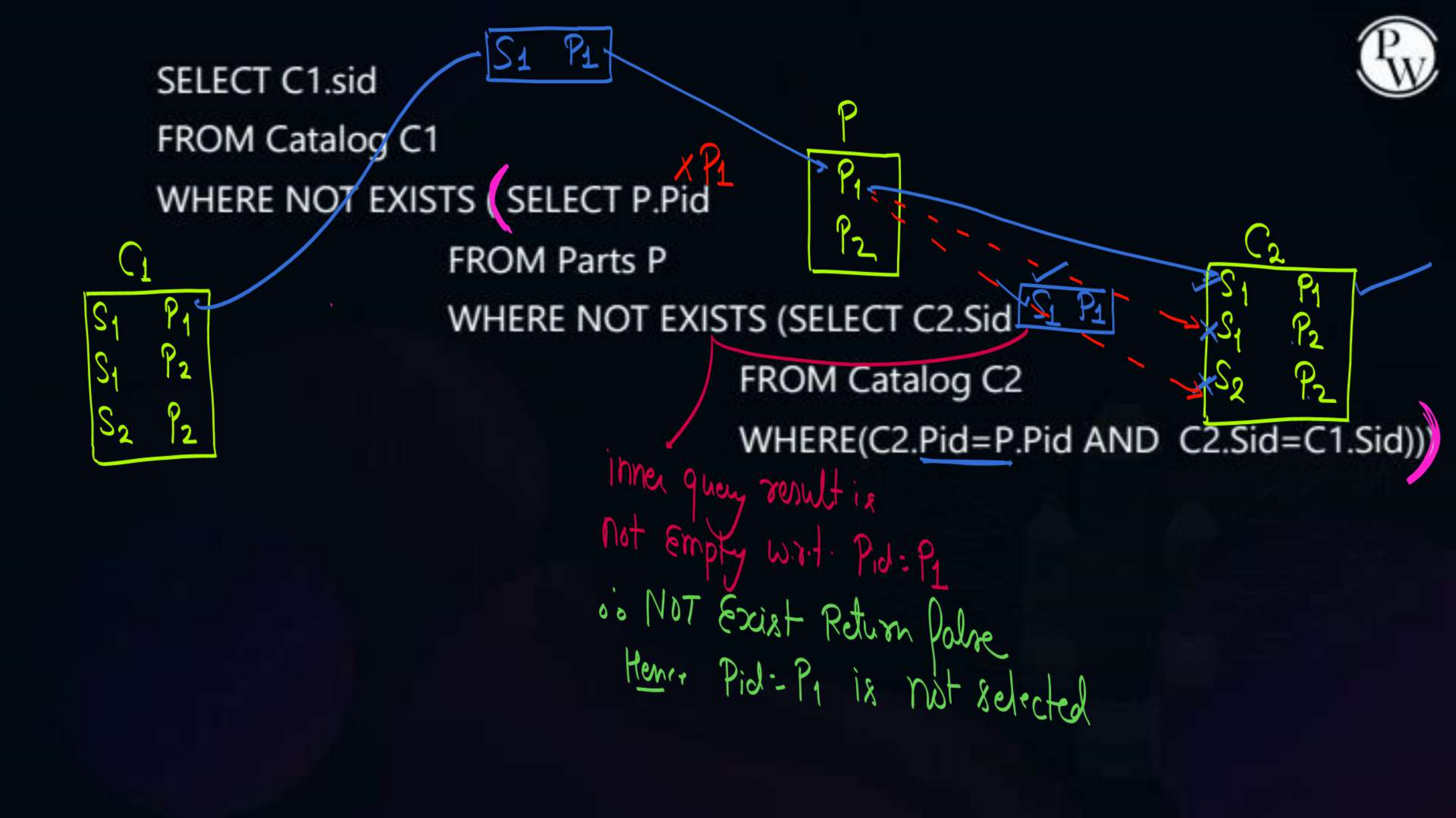
'D' can not be the correct option

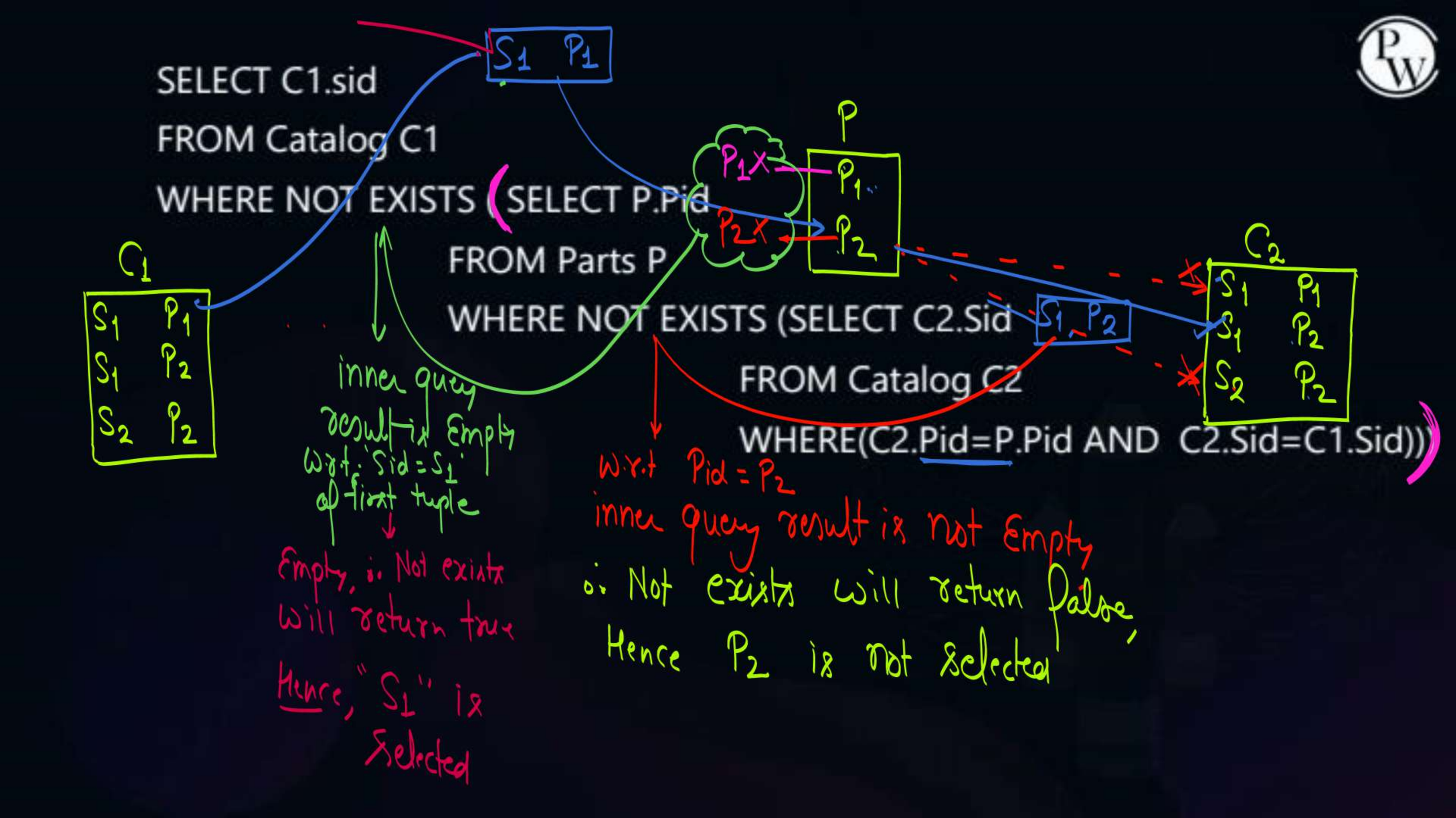
```
SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
                  FROM Parts P
                  WHERE NOT EXISTS (SELECT C2.Sid
                                    FROM Catalog C2
                                    WHERE(C2.Pid=P.Pid AND  C2.Sid=C1.Sid)))
```

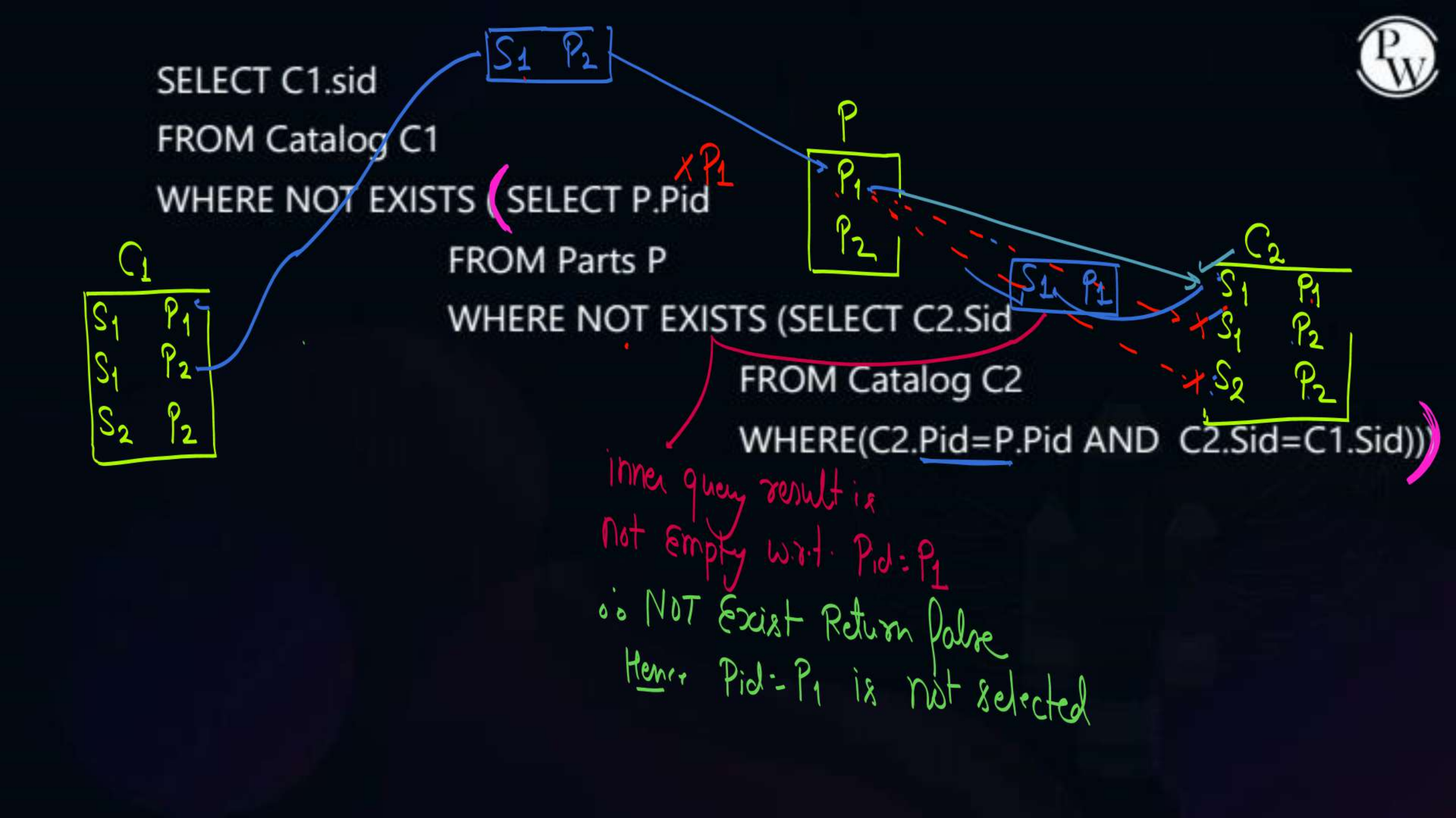


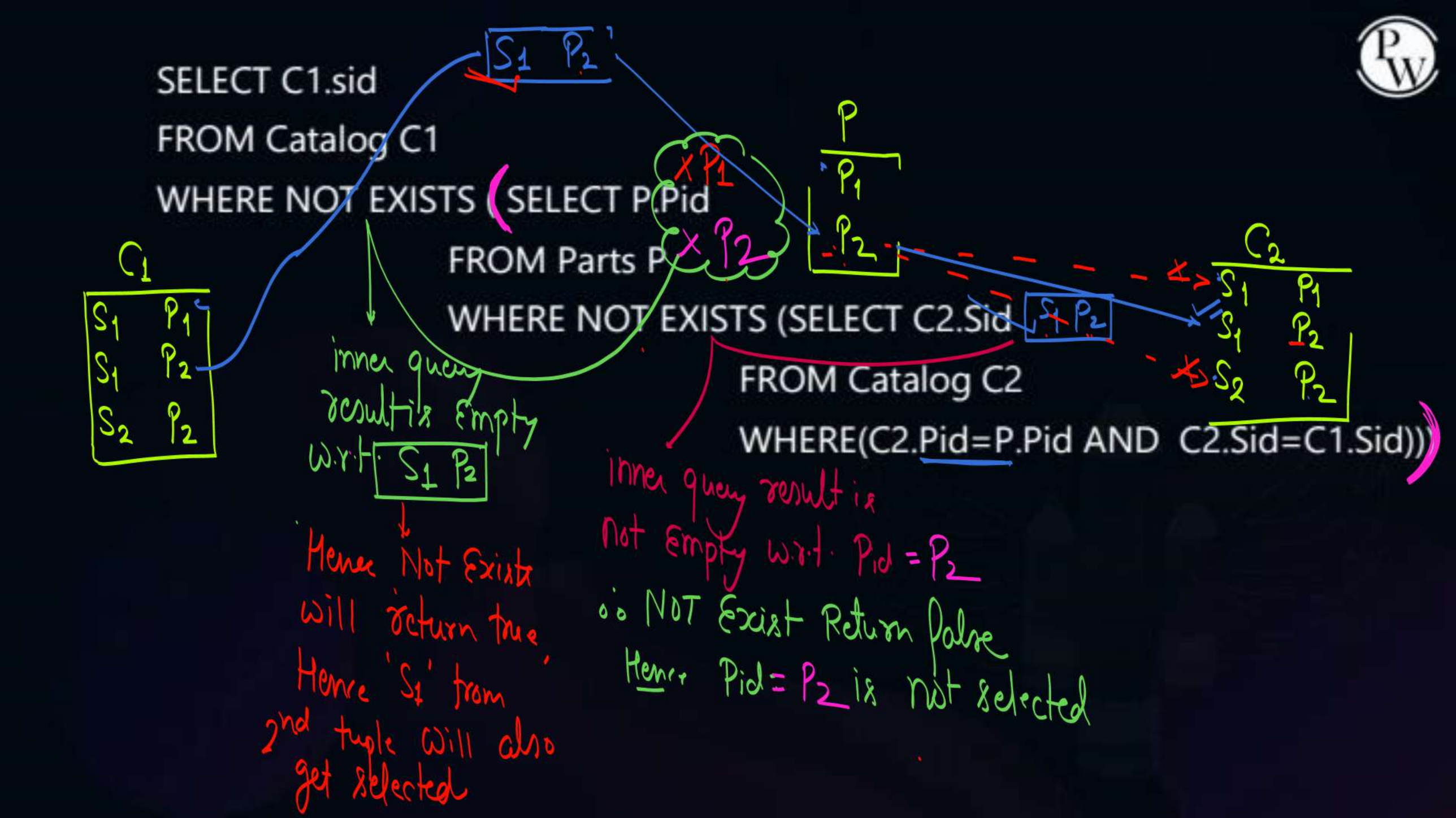


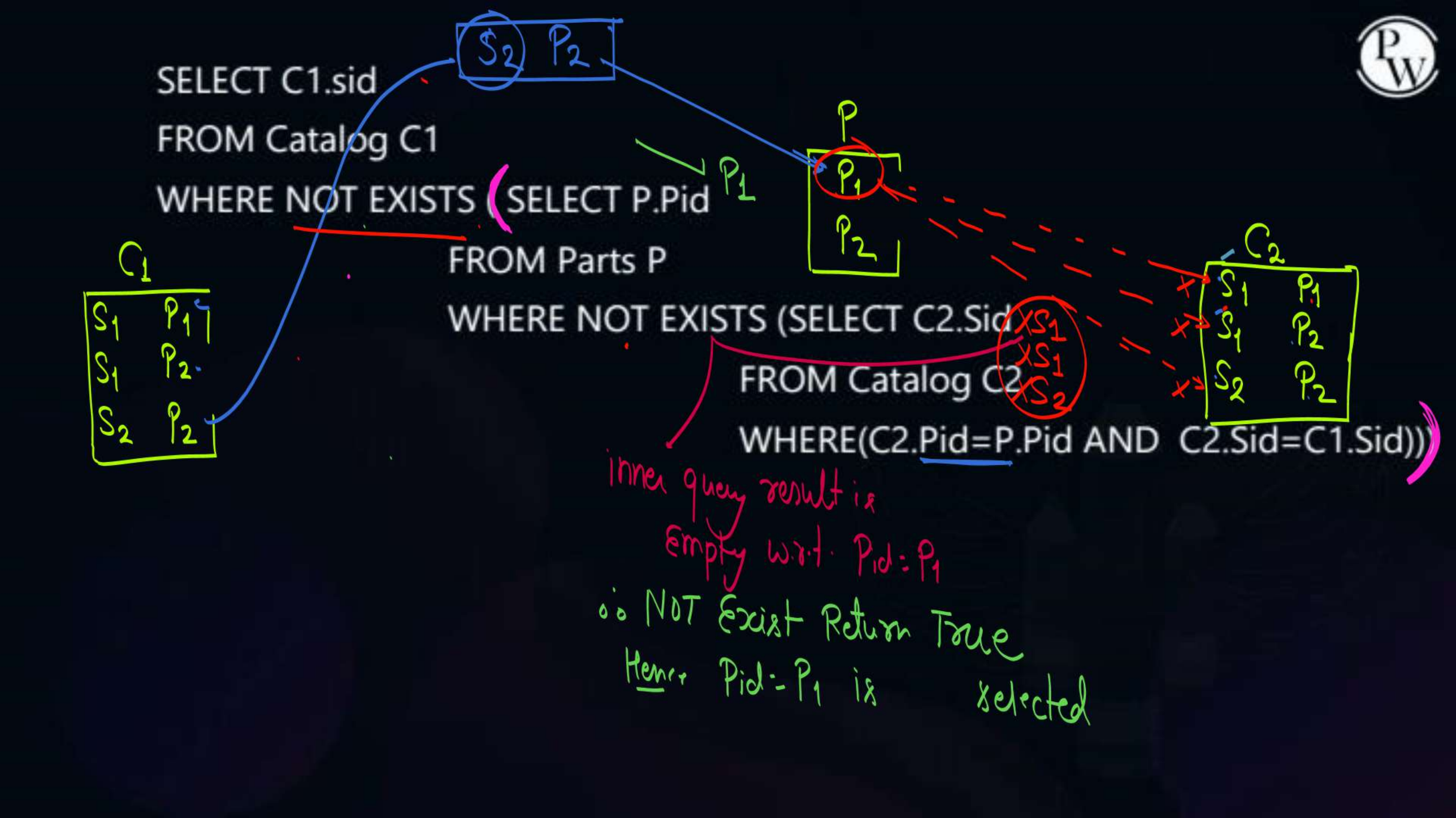

SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
S1 P1
P
P1
P2
C2
S1 P1
S1 P2
S2 P2

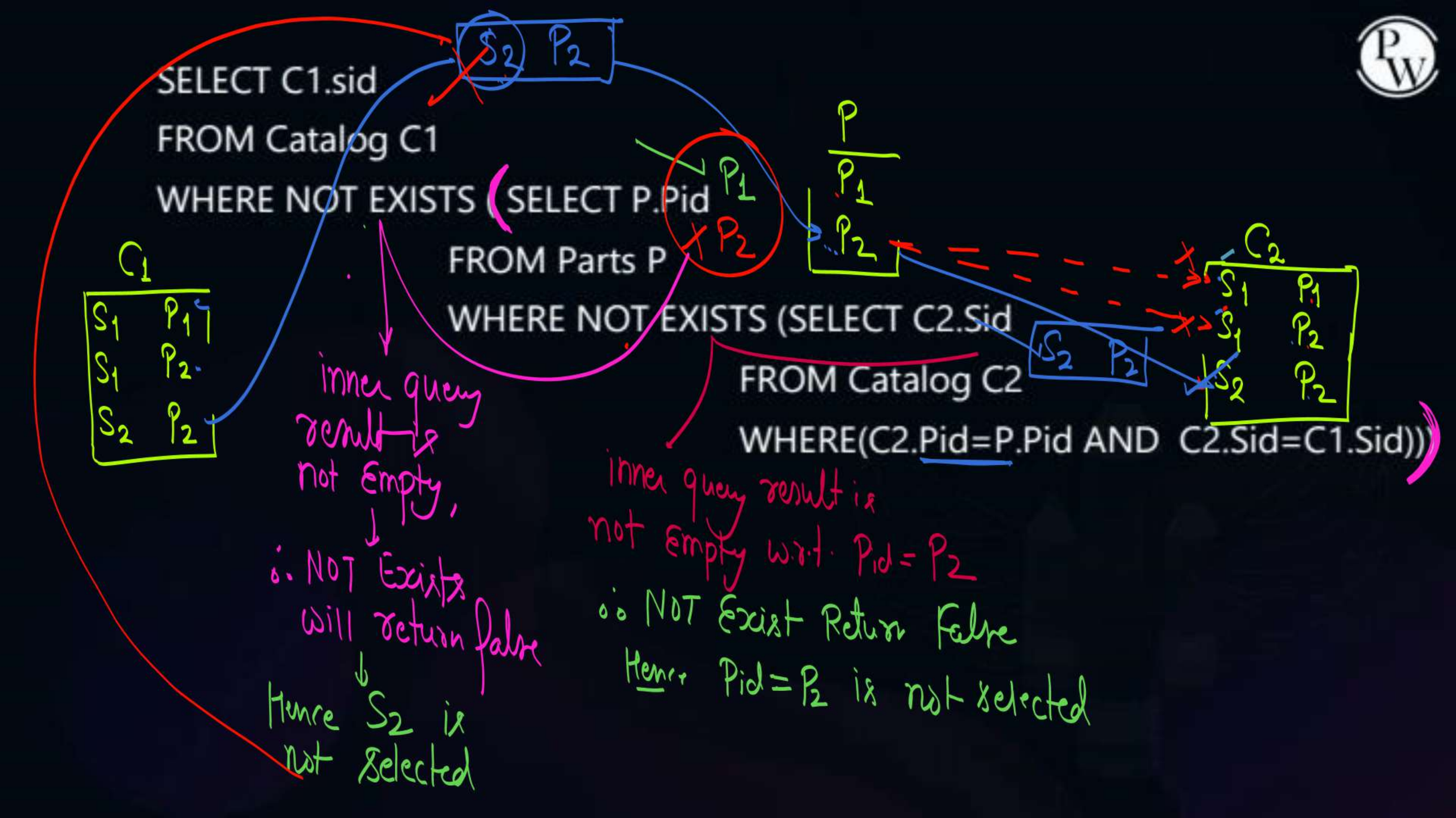

SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
P
P1
P2
C2
S1 P1
S1 P2
S2 P2
inner query result is
Not empty w.r.t. Pid: P1
∴ NOT Exist Return False
Hence Pid:- P1 is not selected


SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
P
P1
P2
C2
S1 P1
S1 P2
S2 P2
S1 P2
inner query result is Empty w.r.t Sid = S1 of first tuple
Empty, i.e. Not exists will return true
Hence, "S1" is Selected
w.r.t Pid = P2
inner query result is not Empty
i.e. Not exists will return false,
Hence P2 is not selected


SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
P
P1
P2
C2
S1 P1
S1 P2
S2 P2
inner query result is
Not empty w.r.t. Pid: P1
∴ NOT Exist Return False
Hence Pid:- P1 is not selected


SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
P
P1
P2
C2
S1 P1
S1 P2
S2 P2
S1 P2
inner query result is Empty w.r.t S1 P2
Hence Not Exists will return true. Hence 'S1' from 2nd tuple will also get selected
inner query result is not empty w.r.t. Pid = P2
∴ NOT Exist Return false
Hence Pid = P2 is not selected


SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
C2
S1 P1
S1 P2
S2 P2
P
P1
P2
inner query result is
Empty w.r.t. Pid: P1
∴ NOT Exist Return True
Hence Pid:- P1 is selected


SELECT C1.sid
FROM Catalog C1
WHERE NOT EXISTS (SELECT P.Pid
FROM Parts P
WHERE NOT EXISTS (SELECT C2.Sid
FROM Catalog C2
WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid))
C1
S1 P1
S1 P2
S2 P2
C2
S1 P1
S1 P2
S2 P2
P
P1
P2
inner query result is not Empty.
∴ NOT Exists will return false
Hence S2 is not selected
inner query result is not empty w.r.t. Pid = P2
∴ NOT Exist Return False
Hence Pid = P2 is not selected

o/p S_1 distinct

#e.g. SELECT C1.sid

FROM Catalog C1

WHERE NOT EXISTS (SELECT P.Pid

FROM Parts P

WHERE NOT EXISTS (SELECT C2.Sid

FROM Catalog C2

WHERE(C2.Pid=P.Pid AND C2.Sid=C1.Sid)))

o/p :- S_1, S_1 => option 'C' is Correct

Catalog

Sid	Pid
S_1	P_1
S_1	P_2
S_2	P_2

Parts

Pid	
P_1	
P_2	

What output is produced by above SQL query:

A. S_1, S_2 Sids of suppliers who supplied some parts (At least one)

B. S_2 Sids of suppliers who supplied only proper subset of parts from all parts (But did not supply all parts)

C. S_1 Sids of suppliers who supplied all parts

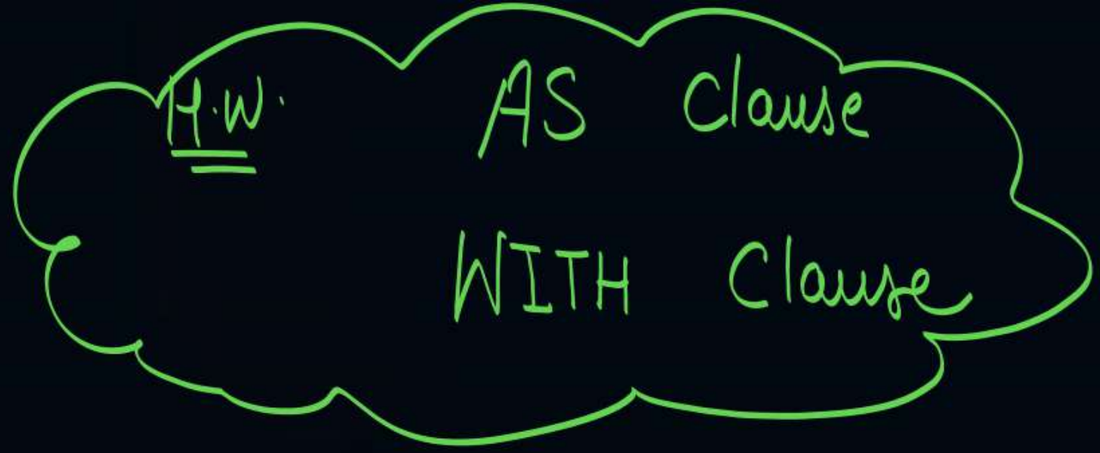
D. Sids of suppliers who did not supply any part

'D' can not be the correct option

2 mins Summary

Topic ANY, ALL and EXISTS operators

Topic Practice questions



THANK - YOU

Slide