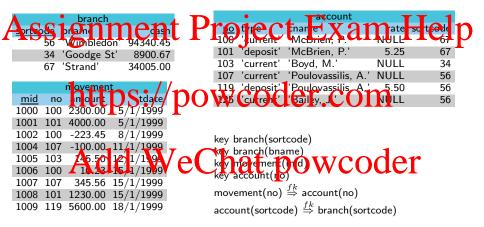
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Bank Branch Database



SQL WHERE expressions in more detail

Testing Strings against a Pattern

Assignment Project Exam Help Will return TRUE where pattern matches column. The escape_char may be used

before any of the special characters below to allow them to be treated as normal text.

- _ to match a single character
- % to rath an Sunt/e/ In with record the fers COM
- TransactSQL Only: [A-Z] to match a character between A and Z
- TransactSQL Only: [ABC] to match a characters A, B and C

Add WeChat powcoder List customers whose first initial is P, and have one more initial

SELECT DISTINCT cname FROM account WHERE cname LIKE '%, P. _ . '

SQL WHERE expressions in more detail

Testing Strings against a Pattern

Assignment Project Exam Help Will return TRUE where pattern matches column. The escape_char may be used

before any of the special characters below to allow them to be treated as normal text.

- _ to match a single character
- % to rath an Sunt/e/ In with record the fers COM
- TransactSQL Only: [A-Z] to match a character between A and Z
- TransactSQL Only: [ABC] to match a characters A, B and C

Add WeChat powcoder List customers whose first initial is between A and L

SELECT DISTINCT cname **FROM** account WHERE cname LIKE '%, [A-L].%'

Processing the result of project

Modifications to data

Any processing of data to appear in a result set must be placed in the SELECT clause

ssignment Project Exam Help Abs(number) returns the absolute value of any number

- ROUND(value,dp) rounds a numeric value to dp decimal places
- UPPER(str) returns the string converted to all capitals
- Tends https://piowentoindearis.com/SQL compliant,
 - Postgres: LENGTH(object) returns the length of any object (including strings)
 - TrasnsactSQL: LEN(str) returns the length of any string type column

Display account with just straine natounder atts COOCI

PostgresSQL

```
SELECT no.
```

ROUND(rate,1) AS rate_1dp, SUBSTRING(cname FROM 1 FOR POSITION(',' IN cname)-1) AS surname

FROM

account

Quiz 1: SQL extensions to RA select and project

				Customer		
	cname		phone	address	joined	salary
	'McBrie	n, P.'	'02077651234'	'123 Strand, London WC1A'	1999-01-03	30000
	'Boyd,	М.'	'02077656666'	'33 Aldwych, London'	1999-01-05	NULL
	'Poulov	assilis, A.'	'02089474321'	'13 Haydons Rd, London SW10'	1999-01-05	40000
1	\'Bailey	V1 (1)	1999EH	'21 Object Ref London (W19	1999-01-67	45 00
C		ווצונ		TIUICUL	Mall	
	SELECT	cna 🗪,		J		
		SUBSTRING	G(address,CHA)	ARINDEX(',',address)+2,LEI	V(address))	AS area
	FROM	customer				

WHFRF phone LIKE '02089[4-7]%';

https://powcoder.com

on SW19 Railey, J. 22 Queens Rd cname

London SW19 Bailey, J. Poulovassilis, A. London SW19

Poulovassilis, A. 13 Haydons Rd

cname area

London SW19

cname area Poulovassilis. A. 13 Havdons Rd

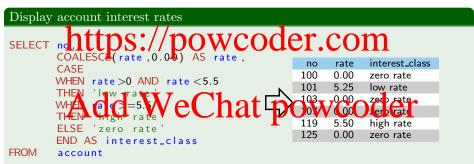
P.J. McBrien (Imperial College London)

Poulovassilis. A.

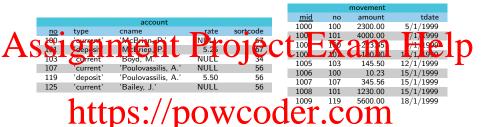
D

Processing the result of project: CASE statements





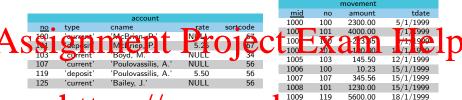
Need for yet another type of Join?



Listing of movement mid for all customers with movements



Need for yet another type of Join?



https://powcoder.com

Listing any movements for all <u>customers</u>

SELECT Add WeChat

SELECI cname mid

FROM account NATURAL LEFT JOIN

	McBrien, P.	1000
n	MgBrien, P.	1001
Ρ,	McBrien, P.	1002
N	Poulovassilis, A.	1004
┌ / 〉	Boyd, M.	1005
'	McBrien, P.	1006
,	Poulovassilis, A.	1007
	McBrien, P.	1008
	Poulovassilis, A.	1009

cname

Bailev. J.

mid

NULL

Left and Right Joins

Left Join

A left join R > S returns every rown R even if no rows in S match. In such cases where no row in R in the following of S refiled with 1 C values.

Right Join

A right join R returns even from S, even in a rows in R match. In such cases where no row in R matches a row from S, the columns of R are filled with NULL values.

Outer Join Add We Chat powcoder

An outer join $R \overset{\circ}{\bowtie} S$ returns every row in R, even if no rows in S match, and also returns every row in S even if no row in R matches.

$$R \overset{\mathsf{o}}{\bowtie} S \equiv (R \overset{\mathsf{L}}{\bowtie} S) \cup (R \overset{\mathsf{R}}{\bowtie} S)$$

Assignment, Project Exam Help

WHERE P₁

https://powcoder.com

 $\overset{\pi_{A_1,\dots,A_i},\sigma_{P_1},\dots,\sigma_{R_i}}{Add} \overset{\sigma_{O_1},\dots,\sigma_{O_i}}{We} \overset{R_1}{C} \overset{R_2}{t} \overset{U}{t} \overset{(R_1-\sigma_{O_1},\dots,o_i}{t}(R_1+R_2) \times \omega(R_2)))}{t}$

lacktriangledown $\omega(R_2)$ returns a row of NULLs with the same number of columns as R_2

Quiz 2: SQL LEFT JOIN ... ON (1)

ASSIGNMENT AND movement amount Exam Help

What is thttps://powcoder.com

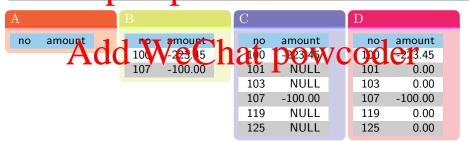


Quiz 3: SQL LEFT JOIN ... ON (2)

ASSISTINGENT Amount

ASSISTINGENT AMOUNT FOR THE MOVEMENT AMOUNT OF THE MOVEMENT OF THE MOVEMENT AMOUNT OF THE MOVEMENT OF THE M

What is thttps://powcoder.com



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フー	movemer	nt	
no	amount	tdate	
119	45.00	null	
100	2300.00	5/1/1999	
1 0	1000 00	5/1/1999	7
100	223.45	•8/1/1 <mark>99</mark> 9	_
107	-100.00	11/1/1999	
103	145.50	12/1/1999	
100	10.23	15/1/1999	
101	1230.10	15/1/1999	1
119	5600.0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Ĺ
100	null	20/1/1999	١
null	null	20/1/1999	
null	600.00	20/1/1999	
null			
	119 100 101 107 103 100 101 119 100 null	no amount 119 45.00 100 2300.00 101 100 00 101 123.45 107 -100.00 103 145.50 100 10.23 101 130.10 109 56(0.10 100 null null null 600.00	119

TUOO	dor	0100	
WCU	Coult		
no type	cname	rate	sortcode
100 'current'	'McBrien, P.'	null	67
101 'deposit'	'McBrien, P.'	5.25	67
119 'deposit'	'Poulovassilis, A	٩.' 5.5Q	56
12 corrent'	DOWC	C nati	1 56
ınaı ار		JUU	

OLTP and OLAP

OLTP . ssignments.Project. ExamssiHelp reads and writes to a few rows reads many rows • 'standard' data processing management information BEGIN TRANSACTION TO SELECT SUM(cash) SFT cash=cash-10000 00 FROM branch WHERE sortcode=56 **COMMIT TRANSACTION T4** eChat powcoder SET cash=cash+10000.00 WHERE sortcode=34 COMMIT TRANSACTION T1

SQL OLAP features: GROUP BY



Aggregate Functions // DOWCOGET.COM

Aggregate Semantics
SUM Sum the values of all rows in the group
COUNT Count the number of non-NULL rows in the group
AVG Average of the non-NULL values in the group
Minimum value in the group



GROUP BY rules

- Only one row output per group
- ANSI SQL says must apply aggregate function to non grouped columns

SQL OLAP features: GROUP BY



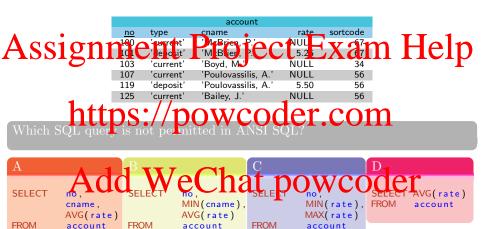
Example of Agranger Functions WCOCET, COII



GROUP BY rules

- Only one row output per group
- ANSI SQL says must apply aggregate function to non grouped columns

Quiz 4: GROUP BY in ANSI SQL



GROUP BY no

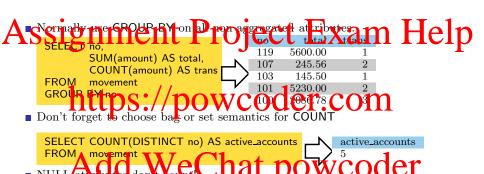
GROUP BY no

GROUP BY no

SQL OLAP features: Aggregate operators

SELECT COUNT(rate) AS no_rates

account



FROM

 no_rates

Quiz 5: GROUP BY over NULL values (1)

			n	novement					acco	ount		
		<u>mid</u>	no	amount	tdate	no	type	c	name		rate	sortcode
		0999	119	45.00	NULL	100	'currer	nt''	McBrien,	P.'	NULL	67
•		1000	100	2300.00	5/1/1999	101	'depos	it⊌ '	McBrien,	P.'	5.25	67
Δ	C	1001	0^{101}	1006 00	5 1/1919	10	depo	it 🖊	Pylovas	silis 🗛'		1776
		1602	10	2 3 45	8/1/1919	25.	curre	nt	Bailey,	نارر		16
		1006	4 00	10.23	15/1/1999		•	J				
		1008	101	1230.00	15/1/1999	SELE	ECT m	ove	ment . no	ο,		
		1009	119	5600.00	18/1/1999		C	NUC	T (move	ment . a	mount) AS no
		1010	100	NULL	20/1/1999		M	IN(moveme	nt . amo	ount) /	AS min_
		1011	TULL	4 NULL	20/1/1999	FRON	4 - m	ove	ment V	ATURAL	MICH	accoun
		1012	I U LI	600.0	20/1//1/999	(RO	NEA PAY	m	ven er t	nο	UL.)
		1013	NULL	-46.00	20/1/1999		* * .	_				

What is the result of the above energ?
Add WeChat powcoder

A			В			С	1		D		
no n	o_trans	min_value	no n	o_trans	min_value	no	no_trans	min_value	no	no_trans	min_value
119	2	45.00	101	2	1230.00	101	. 2	1230.00	101	2	1230.00
101	2	1230.00	100	4	-223.45	100	4	NULL	100	3	-223.45
107	1	-100.00	119	2	45.00	119	2	45.00	119	2	45.00
100	3	-223.45									
103	1	145.50									

Quiz 6: GROUP BY over NULL values (2)

			n	novement									
		mid	no	amount	tdate			accou	nt				
		0999	119	45.00	NULL	<u>no</u>	type	cname		rate	sortcode		
		1000	100	2300.00	5/1/1999	100	'current'	'McBrien, F	·.'	NULL	67		
A		1001	101	4000.00	5/1/1999	101		'McBrien, F		5.25	67	TT	1
Δ	C	Son 2	Col	2 3 4	(A) 1/10/0	10	depo it	Provasil	is 🗛'	3.50	1116	HA	In
(<u>)</u>	CI.	1000		0.23	13/1/1993	25 -	current	Pailty, J.		AUL	16	He	TD.
		1008	101	1230.00	15/1/1999		J	-					_
			-		, ,	SELE	CT mov	vement no .					
		1009			18/1/1999			l (movement		unt) /	AS bala	nco	
		1010	100	NULL	20/1/1999	FDO		`	. a iiic	ount) /	15 Dala	iice	
		1011	₩ULL	NULL	20/1/1999	FROM	/I mov	vement 🚪					
		1012	I Q_I	60 0.00	20/1/1990	JOHN P	TX7 C			CC	m		
		1013		46.00	2 0/1/199		VV C	Juc	∕┸•		111		

What is the result of the above query?

Add WeChat powcoder balance balance balance balance no no no no NULL NULL NULL 600.00 NULL 554.00 119 5645.00 NULL 600 00 NULL -46.00119 5645 00 101 5230.00 NULL -46.00119 5645 00 101 5230.00 100 2086 78 119 5645.00 101 5230.00 100 2086.78 101 5230.00 100 2086 78 100 2086.78

Selecting results from aggregates: HAVING

GROUP BY in the RA

- An extension to the RA includes a group by operator
- In SQL, the GROUP BY operator is applied outside the σ_P(...×...

 SS-legith Man he RCO BC hus blax de pelicates En 19 HAVING clause



TeChat powcoder

Ordering of SQL clauses

- HAVING is executed after GROUP BY, but before SELECT
- Can be used to avoid divide by zero errors

```
SELECT
              no.
              MAX(amount)/MIN(amount) AS variance_ratio
   FROM
              movement
              movement no
              MIN(amount) < >0
P.J. McBrien (Imperial College London)
```

19 / 35

Quiz 7: HAVING

mid



FROM

WHERE

1006 100 \(\bigcup 10.23 \) 15/1/1999 345.56 15/1/1999 1007 107 1008 101 1230.00 15/1/1999

movement

no amount

1009 119 5600.00 18/1/1999

GROUP BY

account NATURAL IOIN movement movement . amount >200 account.no.

NULL 100 'current' 'McB ien. P. 101 'deposit' 'McBrien, P.' 5.25 67 103 'current' 'Bovd, M. NULL 34 107 'current' 'Poulovassilis, A.' NULL 119 'deposita' 'Pou byas ilis, A

tdate

56 hat powcoder

balance no cname 101 McBrien, P. 5230.00

balance no cname 101 McBrien, P. 5230.00 119 Poulovassilis, A. 5600.00

balance no cname 100 McBrien, P. 2086,78 101 McBrien, P. 5230.00 D balance no cname 100 McBrien, P. 2086.78 101 McBrien, P. 5230.00 119 Poulovassilis, A. 5600.00

SQL OLAP features: PARTITION



PARTITION BY

- One row output per input row
- Aggregates apply to partition

Relationally Complete SQL

Relational Completeness

■ Relational completeness in SQL means being able to fully support the RA in

SQL_{\bullet} ssignment Project Exam Help

- Aggregates require 'relationally complete' SQL
 - Temporary tables
 - SELEÇT statements in FROM clause



SELECT

ROUND(100*SUM(movement.amount))

#total_balance.total,1) AS pc **FROM** movement.

#total_balance

GROUP BY movement.no, #total_balance.total

ORDER BY movement.no

Relationally Complete SQL

Relational Completeness

■ Relational completeness in SQL means being able to fully support the RA in SQL_{\bullet}

ssignment Project Exam Help

- Aggregates require 'relationally complete' SQL
 - Temporary tables
 - SELEÇT statements in FROM clause powcoder.com

SELECT

SUM(movement.amount) AS balance, ROUND(100*SUM(movement.amount)/total_balance.total,1) AS pc

FROM

movement.

GROUP BY maximum of tower of the province of

```
no balance
119 5600.00 42.1
```

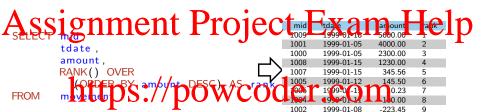
SQL OLAP features: Ordering Rows

	<u>mid</u>	no	amount	tdate		
	1000	100	2300.00	5/1/1999		
A a a i a to to a	1001	.0	4000.00	5/1/ 999_		TT-1-
Assignme	Ldo	00	-223.45	8/1/ 999 X	(am	Help
	1004	107	-100.00	11/1/1999		P
	1005	103	145.50	12/1/1999		
	1006	100	10.23	15/1/1999		
1	1007	107	345.56	15/1/1999		
https:	1008	B	X1230.06 60.00	C C 1999	com	

movement



SQL OLAP features: Ranking Rows



- RANK function provides normal concept of ranking values in order
- functivity vi that skip namber of the day's files all safe identical
- Only in Postgres since verison 9.0

Quiz 8: Execution of SQL clauses

SELECT.

FROM WHERE • Assignment Project Exam Help ORDER BY

What ord https://apow.coder.com

FROM WHERE **SELECT GROUP BY GROUP BY** GROUP BY GROUP BY HAVING WHFRF **HAVING HAVING** SELECT **FROM** ORDER BY ORDER BY ORDER BY SFI FCT

Assignament us throughout Fram Help information spread over rows is instead spread over columns

SELECT https://powcoder.com COUNT(no) AS qty sortcode bname type qty **FROM** account JOIN branch 34 Goodge St current ON account.sortcode= 56 Wimbledon current Wimbledon depesit account.tvpe ORDER BY branch.sortcode, branch bname

P.J. McBrien (Imperial College London)

SQL OLAP: Pivot using CASE statements

SELECT branch sortcode, branch . bname e-Riminante Muanns Help COUNT (CASE WHEN type NOT IN ("current', 'deposit') THEN no ELSE NULL END) AS other JOIN branch ON account.sortcode=branch.sortcode **FROM** GROUP BY branch, sortcode / branch bname powcoder.com ORDER BY hat possecoder sortcode pivoted Goodge St 0 Wimbledon one case for each value Strand n wise to have a default case

Assignment Project Exam Help

	movemer	nt			J	account		
mid no	amount	tdate		<u>no</u>	type	cname	rate	sortcode
1000 100	2300.00	5/1/1999		100	'current'	'McBrien, P.'	NULL	67
1001 101	4000.00	5/1/1099				'McBrien, P.'	5.25	67
1002 00	-121.45	8/1/1919		103	/urrent	Closiovassilis,		34
	-100.00	11/1/19 9	V	107	'current'	Toulovassilis,	A. AULL	56
1005 103		12/1/1999		119	'deposit'	'Poulovassilis,	A.' 5.50	56
1006 100		15/1/1999		125	'current'	'Bailey, J.'	NULL	56
1007 107		15/1/1999						
1008 1	4 4	15 1 1999			nantno	fk	3 3 4	~ 44
1009 119		18 7 / 999	"	IIIqv			J()(16	

3 Write an SQL query returning the scheme

(cname current balance deposit lalance) that lists of e row for each customer in each listing to hall with a column to the net balance accounts held by the customer, and a column for the net balance of all deposit accounts held by the customer.

Pivot

4 Write an SQL query returning the scheme (no, cn, n e type,) Scust fur do, pc) type/(in(s) (h) (h) s s ofe ov fo and for each account, lists the no, cname and type of the account, and in pc_cust_funds the percentage of the customer funds held in the account, and in pc_type_funds the percentage of the total funds in this particular type of account.

For the urrent data this should result int no 100 McBrien, P. current 101 McBrien, P. deposit 71.48 48 29 103 Bovd. M. 100 00 5 87 current 107 Poulovassilis. A. current 4.20 9.91 119 Poulovassilis. A. deposit 95.80 51 71 125 Bailev. J. NULL 0.00 current

Assignment Project Exam Help account cname.

```
COALESCE(SUM(CASE account type
                   WHEN 'current' THEN movement amount
                   ELSE null END), 0.0) AS deposit_balance
        account LEFT JOIN movement ON account.no=movement.no
      Add WeChat powcoder
GROUP BY
```

FROM

Assignment Project Exam Help

```
SELECT DISTINCT account no.
       account.cname,
       account .type .
       ROUNT (COALESCE (100.0 * SVM movement.amount) OVER (PARTITION BY account.no), 0.0)/
       ROUND(COALES E(100.0 * SUM(Inovement amount) OVER (PARTITION BY account no).0.0)/
               SUM(movement.amount) OVER (PARTITION BY account.type).2
       AS pc_type_funds
```

FROM

movement ON account no-movement no

Add WeChat powcoder

SQL OLAP: Un-pivot using UNION statements

Un-pivot the account table to triple format **Lan Help** Assignment Proje 100 type current **FROM** account 101 cname McBrien, P. UNION 101 rate 5.25 SELECT 101 sortcode 67 typhttps://powc **FROM** sortcode 103 34 UNION 103 type current SELECT no. 107 Poulovassilis, A. cname 107 sortcode 56 accAtdd WeChat **FROM** WHERE 119 rate 5.50 UNION 119 56 sortcode SELECT no. 119 deposit type 'sortcode'. Bailey, J. 125 cname CAST(sortcode AS VARCHAR) 125 sortcode 56 **FROM** account 125 type current

SQL Functions

FUNCTION

END

- Most SQL implementations support some variant of ANSI SQL FUNCTION
- Details vary ... ssignment Project Exam Help

```
CREATE FUNCTION cname_to_initial_first(@cname VARCHAR(20))
                                                                           ARE DITTO SARCHAR (29) / AS ARCHAR DOWCOder.com
   BEGIN
                                 SELECT @ifcname=
                                                                                                                                     SUBSTRING(@cname, CHARINDEX(',', @cname)+2,LEN(@cname))+
SUBSTRING(@cname, 1, CHARINDEX(',', @cname)-1)

CONTROL OF CONTR
```

SELECT no. dbo.cname_to_init account.cname) **FROM** account

ial_first(AS cname	

	no	cname
	100	P.McBrien
_ K	101	P.McBrien
\Box	103	M.Boyd
5 /	107	A.Poulovassilis
,	119	A.Poulovassilis
	125	J.Bailey

SQL Procedures

PROCEDURE

- No specific PROCEDURE construct in Postgres
- A Storight Project Exam Help

TransactSQL Procedure to move cash between branches

```
CREATE PROTECTION CONC. ( @from_branch INTEGER, @to_branch INTEGER, @total DECIMAL(10,2) ) AS

BEGIN

UPDATE And WeChat powcoder

SET cash=cash-@total
WHERE sortcode=@from_branch

UPDATE branch
SET cash=cash+@total
WHERE sortcode=@to_branch
END
```

SQL Constraints

 $\forall \mathsf{No}, \mathsf{Rate}.\mathsf{account}(\mathsf{No}, _, _, \mathsf{Rate}, _) \to \mathsf{Rate} \geq 0.00$

Assignment Project Exam Help

```
CREATE FUNCTION SIT AS
BEGIN

IF EXISTS (SELECT *

FROM 1

OUT TO THE CONTROL OF THE CONTROL OF
```

RETURN 1

RETURN 0 END:

ALTER TABLE account ADD CONSTRAINT check_current_account

CHECK (type \diamond 'current' OR dbo.is_in_current_account(no,cname,sortcode)=1);