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Lab 2

1. For these screenshots, please excuse the Windows 10, I had to use my other computer since I had trouble getting pgAdmin to work on my school computer.

The first screenshot shows a web browser window with the URL labouseur.com/courses/db/lab2-CAP. The page title is "lab2-CAPdatabase.pages". On the left, there is a sidebar with "Lab 2: CAP", "Goals", and "Instructions". A blue elephant icon is visible. The main content area shows a pgAdmin SQL editor window titled "Query - cap3 on postgres@localhost:5432". The SQL editor has a menu bar (File, Edit, Query, Favourites, Macros, View, Help) and a toolbar. The SQL text is `select * from customers;`. The output pane shows a table with 6 rows and 5 columns: `cid` (character(4)), `name` (text), `city` (text), and `discount` (numeric(5,2)).

	cid	name	city	discount
1	c001	Tiptop	Duluth	10.00
2	c002	Tyrell	Dallas	12.00
3	c003	Allied	Dallas	8.00
4	c004	ACME	Duluth	8.50
5	c005	Weyland	Acheron	0.00
6	c006	ACME	Kyoto	0.00

The second screenshot shows the same web browser window, but the SQL editor window now has the SQL text `select * from agents;`. The output pane shows a table with 7 rows and 5 columns: `aid` (character(3)), `name` (text), `city` (text), and `commission` (numeric(5,2)).

	aid	name	city	commission
1	a01	Smith	New York	6.50
2	a02	Jones	Newark	6.00
3	a03	Perry	Tokyo	7.00
4	a04	Grey	New York	6.00
5	a05	Otasi	Duluth	5.00
6	a06	Smith	Dallas	5.00
7	a08	Bond	London	7.07

Lab 2: CAP

Goals

Instructions

Query - cap3 on postgres@localhost:5432 *

SQL Editor | Graphical Query Builder

Previous queries

select * from product;

Output pane

	pid character(3)	name text	city text	quantity integer	priceusd numeric(10,2)
1	p01	comb	Dallas	111400	0.50
2	p02	brush	Newark	203000	0.50
3	p03	razor	Duluth	150600	1.00
4	p04	pen	Duluth	125300	1.00
5	p05	pencil	Dallas	221400	1.00
6	p06	folder	Dallas	123100	2.00
7	p07	case	Newark	100500	1.00
8	p08	eraser	Newark	200600	1.25

4. Explain the following relational "rules" with examples and reasons why they are important

Query - cap3 on postgres@localhost:5432 *

SQL Editor | Graphical Query Builder

Previous queries

select * from order;

Output pane

	ordnum integer	mon character(3)	cid character(4)	pid character(3)	qty integer	totalusd numeric(12,2)
1	1011	jan	c001	a01	1000	450.00
2	1013	jan	c002	a03	1000	880.00
3	1015	jan	c003	a03	1200	1104.00
4	1016	jan	c006	a01	1000	500.00
5	1017	feb	c001	a06	600	540.00
6	1018	feb	c001	a03	600	540.00
7	1019	feb	c001	a02	400	180.00
8	1020	feb	c006	a03	600	600.00
9	1021	feb	c004	a06	1000	460.00
10	1022	mar	c001	a05	400	720.00
11	1023	mar	c001	a04	500	450.00
12	1024	mar	c006	a06	800	400.00
13	1025	apr	c001	a05	800	720.00
14	1026	may	c002	a05	800	744.00

4. Explain the following relational "rules" with examples and reasons why they are important

- In a relational database, the function of a primary key is to distinguish a specific row in a table among all other rows such that other tables may identify and use data from that specific row. Alternatively, a candidate key can also be used to identify a specific row in a table, however, a single table may contain multiple candidate keys while it may only have a single primary key. A super key is a type of candidate key, as is a primary key, however it does not require that all associated fields be filled in in every row, as a primary key does.

3. An example of where a database table may be needed would be to store the data of a library catalog. Some of the fields that could be included in such a table would be the ISBN of every book, its title, the author's name, the copyright date, and the number of pages, among others. The ISBN would be an integer, being a number, and would not be nullable due to the fact that this number acts as an identifier for any book, and thus may be used as a primary key in this case. The book title and author would be text fields, given that either can use any number and type of characters, and could be nullable due to the fact that the ISBN is enough information to identify any given book. The copyright date of the book would be of the datetime data type and would also be nullable because it is not as important as the ISBN in identifying a book. Lastly, the number of pages in a book would be of the integer data type and would also be nullable because it, too, would not be necessary in identifying a specific book.
4. The first relational rule is that all fields must be atomic. This means that all intersections between a row and a column cannot have any further structure and thus may only contain one piece of data. This rule is important for the proper function of a database because if a given field was allowed to have further structure and multiple pieces of data, it would become very difficult to access any one specific piece of data due to the need to work around the extra structure. For example, if in the library table, all of a single book's information was stored within one field, it would be very difficult to find the title of a given book due to the amount of unnecessary data that is stored alongside the title that you are looking for. The second relational rule is that information may only be accessed by what it is, rather than where it is on the table. This is because the actual database is stored in sets, which have no intrinsic order despite the tabular form that we imply databases have. This rule is important because one cannot query the database for the data in the third row and the second column, for example, because rows and columns are simply not stored and numbered in this way. Instead, one must query the database for the information that each row and column represents. For example, when querying the library database, one must search for a specific ISBN, title, or any other specific piece of information rather than a location on a theoretical table. The third relational rule is that all rows must be unique in at least one column. This rule is important because the relational model is based on set theory, and according to this theory, a single set may not contain duplicate values. So in the library example, any two books stored in the table may not be the same in every single column and while this does not inherently break the database, it violates the theory that the database is built upon and is therefore poor design.