

— JADS Professional Education—

SQL for Data Science Exploring the US president database

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Introduction

Background Information

Electoral meetings in which the US-electors choose the president every four years, by and large are of ceremonial significance. They carry on with a more than two hundred year old system. Many citizens of the United States do not even realize it is not them who elect the president, but the electors.

Each federal state is represented by as many electors as delegates in Congress, two electors and two delegates at minimum. The District of Columbia, with the capital of the United States, has three electors of its own. It is due to this ratio of distribution that candidates really battle for large states while hardly ever showing up in small ones.

A total of 538 electors turn in their votes in their state capital. There are 48 states where the candidate with the most votes is rewarded the votes of all electors of the state. It is only in Nebraska and Maine where a candidate receives the exact number of votes submitted for her or him.

There have been three occasions in US-American history, when the candidate who accumulated the majority of the people's votes could not obtain this majority with the electors and lost the election.

Electors are not autonomous in whom they vote for. They generally abide by popular tendency in their home state. However, electors have deviated from this imperative. In 1988, one of the electors from West Virginia did not vote for the democratic presidential candidate, Michael Dukakis, but for his opponent Lloyd Bentsen instead. It cost Dukakis one vote.

In order to win the presidential election, a candidate must obtain 270 of the total of 538 votes.

Alabama	9	Massachusetts	12	Tennessee	11
Alaska	3	Michigan	18	Texas	32
Arizona	8	Minnesota	10	Utah	5
Arkansas	6	Mississippi	7	Vermont	3
California	54	Missouri	11	Virginia	13
Colorado	8	Montana	3	Washington	11
Connecticut	8	Nebraska	5	West Virginia	5
Delaware	3	Nevada	4	Wisconsin	11
Distr. of Columbia	3	New Hampshire	4	Wyoming	3
Florida	25	New Jersey	15		
Georgia	13	New Mexico	5		
Hawaii	4	New York	33		
Idaho	4	North Carolina	14		
Illinois	22	North Dakota	3		
Indiana	12	Ohio	21		
Iowa	7	Oklahoma	8		
Kansas	6	Oregon	7		
Kentucky	8	Pennsylvania	23		
Louisiana	9	Rhode Island	4		
Maine	4	South Carolina	8		
Maryland	10	South Dakota	3		

Diagram of the President Database

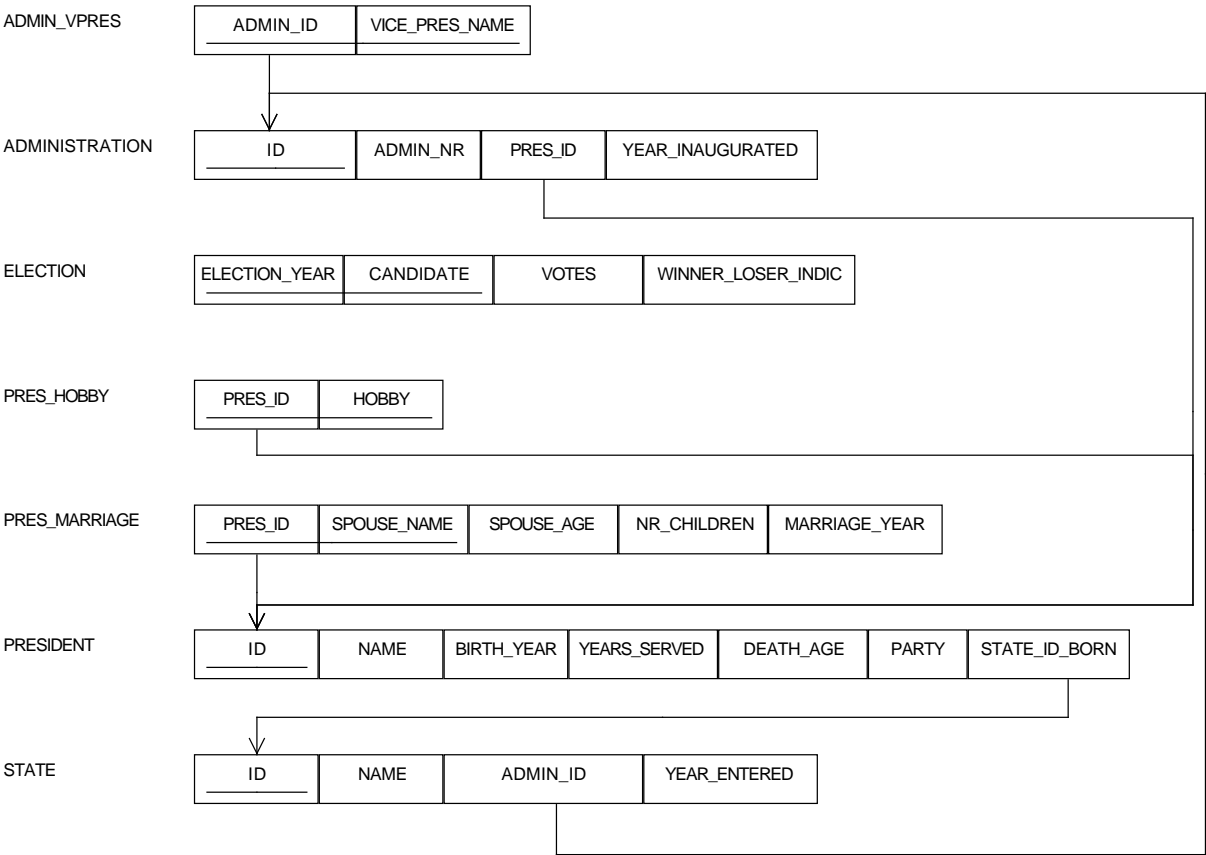


Figure: Relational model of President database

SQL basics and GROUP BY

1	How many states brought forth a president born before 1900? (1)		
<table><tr><td>count</td></tr><tr><td>14</td></tr></table>		count	14
count			
14			

2	Determine the maximum difference between the youngest died and oldest died president that served more than 4 years. (1)		
<table><tr><td>difference</td></tr><tr><td>33</td></tr></table>		difference	33
difference			
33			

3	Determine, for each election after 1850, with more than two candidates, in which the winner obtained at least 80% of all votes, election year and number of candidates. (2)										
<table> <tr> <th>election_year</th><th>count</th></tr> <tr> <td>1872</td><td>5</td></tr> <tr> <td>1912</td><td>3</td></tr> <tr> <td>1956</td><td>3</td></tr> <tr> <td>1972</td><td>3</td></tr> </table>		election_year	count	1872	5	1912	3	1956	3	1972	3
election_year	count										
1872	5										
1912	3										
1956	3										
1972	3										

4	Select, of all elections after 1900 with 2 candidates, the maximum difference between the winning number of votes and the loser's number of votes. HINT: Use the SQL keyword WITH , which is also referred to as a <i>common table expression</i> , that allows you to define a kind of temporary table that can be used in the FROM clause.
<div>max</div> <div>515</div>	

5	Determine names and election results (election year and number of votes) for all democratic presidents taking part in elections after 1900 and born in a state that joined the federation after 1800. (1)																							
<table><tr><td>name</td><td>election_year</td><td>votes</td></tr><tr><td>CLINTON W J</td><td>1992</td><td>370</td></tr><tr><td>CLINTON W J</td><td>1996</td><td>379</td></tr><tr><td>JOHNSON L B</td><td>1964</td><td>486</td></tr><tr><td>OBAMA B</td><td>2008</td><td>365</td></tr><tr><td>OBAMA B</td><td>2012</td><td>332</td></tr><tr><td>TRUMAN H S</td><td>1948</td><td>303</td></tr></table>				name	election_year	votes	CLINTON W J	1992	370	CLINTON W J	1996	379	JOHNSON L B	1964	486	OBAMA B	2008	365	OBAMA B	2012	332	TRUMAN H S	1948	303
name	election_year	votes																						
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OBAMA B	2012	332																						
TRUMAN H S	1948	303																						

6	Determine, for all presidents whose tenure lasted at least eight years and who married at least twice, names, number of years in tenure, number of marriages and total number of children in all marriages. (1)			
	name	sum	nummar	sumchi
	WILSON W	8	2	3
REAGAN R	8	2	4	

Nested queries

Subqueries without correlation

1	Determine name and party of all presidents born after 1800, who were married at least twice. (1)														
<table><tr><th>name</th><th>party</th></tr><tr><td>HARRISON B</td><td>REPUBLICAN</td></tr><tr><td>ROOSEVELT T</td><td>REPUBLICAN</td></tr><tr><td>WILSON W</td><td>DEMOCRATIC</td></tr><tr><td>REAGAN R</td><td>REPUBLICAN</td></tr><tr><td>TRUMP D J</td><td>REPUBLICAN</td></tr><tr><td>BIDEN J R</td><td>DEMOCRATIC</td></tr></table>		name	party	HARRISON B	REPUBLICAN	ROOSEVELT T	REPUBLICAN	WILSON W	DEMOCRATIC	REAGAN R	REPUBLICAN	TRUMP D J	REPUBLICAN	BIDEN J R	DEMOCRATIC
name	party														
HARRISON B	REPUBLICAN														
ROOSEVELT T	REPUBLICAN														
WILSON W	DEMOCRATIC														
REAGAN R	REPUBLICAN														
TRUMP D J	REPUBLICAN														
BIDEN J R	DEMOCRATIC														

2	Determine, for all parties where more than two presidents born after 1900 belonged to, the total number of presidents it brought forth. (1)						
<table><tr><th>party</th><th>num</th></tr><tr><td>REPUBLICAN</td><td>19</td></tr><tr><td>DEMOCRATIC</td><td>16</td></tr></table>		party	num	REPUBLICAN	19	DEMOCRATIC	16
party	num						
REPUBLICAN	19						
DEMOCRATIC	16						

Subqueries with correlation

1	Determine name, party and years served of the presidents with the most years of tenure in their party. (1)																																			
<table><tr><th>name</th><th>party</th><th>years_served</th></tr><tr><td>ROOSEVELT F D</td><td>DEMOCRATIC</td><td>12</td></tr><tr><td>JEFFERSON T</td><td>DEMO-REP</td><td>8</td></tr><tr><td>MADISON J</td><td>DEMO-REP</td><td>8</td></tr><tr><td>MONROE J</td><td>DEMO-REP</td><td>8</td></tr><tr><td>GRANT U S</td><td>REPUBLICAN</td><td>8</td></tr><tr><td>BUSH G W</td><td>REPUBLICAN</td><td>8</td></tr><tr><td>EISENHOWER D D</td><td>REPUBLICAN</td><td>8</td></tr><tr><td>REAGAN R</td><td>REPUBLICAN</td><td>8</td></tr><tr><td>WASHINGTON G</td><td>FEDERALIST</td><td>7</td></tr><tr><td>TYLER J</td><td>WHIG</td><td>3</td></tr></table>				name	party	years_served	ROOSEVELT F D	DEMOCRATIC	12	JEFFERSON T	DEMO-REP	8	MADISON J	DEMO-REP	8	MONROE J	DEMO-REP	8	GRANT U S	REPUBLICAN	8	BUSH G W	REPUBLICAN	8	EISENHOWER D D	REPUBLICAN	8	REAGAN R	REPUBLICAN	8	WASHINGTON G	FEDERALIST	7	TYLER J	WHIG	3
name	party	years_served																																		
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WASHINGTON G	FEDERALIST	7																																		
TYLER J	WHIG	3																																		

2	Determine names and birth year of all presidents who died at an older age than the average age of all those presidents who were born in the same state. (1)																																
<table> <tr> <th>name</th><th>birth_year</th></tr> <tr><td>ADAMS J</td><td>1735</td></tr> <tr><td>JEFFERSON T</td><td>1743</td></tr> <tr><td>MADISON J</td><td>1751</td></tr> <tr><td>MONROE J</td><td>1758</td></tr> <tr><td>ADAMS J Q</td><td>1767</td></tr> <tr><td>VAN BUREN M</td><td>1782</td></tr> <tr><td>FILLMORE M</td><td>1800</td></tr> <tr><td>BUCHANAN J</td><td>1791</td></tr> <tr><td>GRANT U S</td><td>1822</td></tr> <tr><td>HAYES R B</td><td>1822</td></tr> <tr><td>HARRISON B</td><td>1833</td></tr> <tr><td>TAFT W H</td><td>1857</td></tr> <tr><td>COOLIDGE C</td><td>1872</td></tr> <tr><td>EISENHOWER D D</td><td>1890</td></tr> <tr><td>BUSH G H W</td><td>1924</td></tr> </table>		name	birth_year	ADAMS J	1735	JEFFERSON T	1743	MADISON J	1751	MONROE J	1758	ADAMS J Q	1767	VAN BUREN M	1782	FILLMORE M	1800	BUCHANAN J	1791	GRANT U S	1822	HAYES R B	1822	HARRISON B	1833	TAFT W H	1857	COOLIDGE C	1872	EISENHOWER D D	1890	BUSH G H W	1924
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EISENHOWER D D	1890																																
BUSH G H W	1924																																

3	Which president took part in more elections than he had children? (3)								
<table><tr><th>candidate</th></tr><tr><td>CLINTON W J</td></tr><tr><td>HARDING W G</td></tr><tr><td>JACKSON A</td></tr><tr><td>MADISON J</td></tr><tr><td>NIXON R M</td></tr><tr><td>POLK J K</td></tr><tr><td>WASHINGTON G</td></tr></table>		candidate	CLINTON W J	HARDING W G	JACKSON A	MADISON J	NIXON R M	POLK J K	WASHINGTON G
candidate									
CLINTON W J									
HARDING W G									
JACKSON A									
MADISON J									
NIXON R M									
POLK J K									
WASHINGTON G									

Queries with IN

1	Determine the names of all states that only presidents originated from whose inauguration years all lay after 1900. (2)											
<table><tr><td>name</td></tr><tr><td>ARKANSAS</td></tr><tr><td>CALIFORNIA</td></tr><tr><td>CONNECTICUT</td></tr><tr><td>GEORGIA</td></tr><tr><td>HAWAII</td></tr><tr><td>ILLINOIS</td></tr><tr><td>IOWA</td></tr><tr><td>MISSOURI</td></tr><tr><td>NEBRASKA</td></tr><tr><td>TEXAS</td></tr></table>		name	ARKANSAS	CALIFORNIA	CONNECTICUT	GEORGIA	HAWAII	ILLINOIS	IOWA	MISSOURI	NEBRASKA	TEXAS
name												
ARKANSAS												
CALIFORNIA												
CONNECTICUT												
GEORGIA												
HAWAII												
ILLINOIS												
IOWA												
MISSOURI												
NEBRASKA												
TEXAS												

2	Determine the names of all states where presidents were born who had no children at all. (2)
name	NORTH CAROLINA VIRGINIA SOUTH CAROLINA PENNSYLVANIA OHIO

3	Determine the names of the presidents who have the exact same hobbies as “JACKSON A” has - so the same and not more or less hobbies. (2)
name	JOHNSON L B TAYLOR Z VAN BUREN M JACKSON A

OLAP with SQL: rollup, cube and grouping sets

1	Show the number of democratic or republican presidents born in New York, Ohio or Virginia.		
	name	party	count
			12
	NEW YORK	DEMOCRATIC	2
	VIRGINIA	DEMOCRATIC	1
	NEW YORK	REPUBLICAN	2
	OHIO	REPUBLICAN	7
		REPUBLICAN	9
		DEMOCRATIC	3
	OHIO		7
	NEW YORK		4
	VIRGINIA		1

2	For states that joined the federation (see year_entered column) before 1800, how many democratic, republican and whig presidents were born in these states?	
year_entered	party	count
		23
1776	WHIG	4
1776	DEMOCRATIC	12
1776	REPUBLICAN	4
1792	REPUBLICAN	1
1791	REPUBLICAN	2
	REPUBLICAN	7
	WHIG	4
	DEMOCRATIC	12

3	For elections with more than four candidates retrieve the number candidates and the average number of votes of the winners and losers.		
election_year	winner_loser_indic	count	avg
1792	L	4	33.0000000000000000
1796	L	12	17.0833333333333333
1872	L	4	15.7500000000000000
1800	L	4	50.7500000000000000
1792	W	1	132.0000000000000000
1872	W	1	286.0000000000000000
1789	L	11	6.2727272727272727
1836	L	4	31.0000000000000000
1836	W	1	170.0000000000000000
1789	W	1	69.0000000000000000
1796	W	1	71.0000000000000000
1800	W	1	73.0000000000000000
1800		5	55.2000000000000000
1836		5	58.8000000000000000
1872		5	69.8000000000000000
1792		5	52.8000000000000000
1789		12	11.5000000000000000
1796		13	21.2307692307692308

Window functions

1	For each president who has died already, retrieve the name, the death age, the average death age in his/her party and the average death age of presidents coming from the same state.		
name	death_age	avg_deathage_party	avg_deathage_state
JACKSON A	78	68.08333333333333	78.00000000000000
CLEVELAND G	71	68.08333333333333	71.00000000000000
PIERCE F	64	68.08333333333333	64.00000000000000
VAN BUREN M	79	68.08333333333333	69.00000000000000
JOHNSON L B	65	68.08333333333333	72.00000000000000
TRUMAN H S	88	68.08333333333333	88.00000000000000
BUCHANAN J	77	68.08333333333333	71.50000000000000
JOHNSON A	66	68.08333333333333	71.50000000000000
KENNEDY J F	46	68.08333333333333	77.50000000000000
WILSON W	67	68.08333333333333	72.37500000000000
ROOSEVELT F D	63	68.08333333333333	69.00000000000000
POLK J K	53	68.08333333333333	53.00000000000000
MONROE J	73	80.25000000000000	72.37500000000000
JEFFERSON T	83	80.25000000000000	72.37500000000000
ADAMS J Q	80	80.25000000000000	77.50000000000000
MADISON J	85	80.25000000000000	72.37500000000000
WASHINGTON G	67	78.50000000000000	72.37500000000000
ADAMS J	90	78.50000000000000	77.50000000000000
LINCOLN A	56	70.47058823529411	56.00000000000000
HARDING W G	57	70.47058823529411	62.28571428571428
TAFT W H	72	70.47058823529411	62.28571428571428
MCKINLEY W	58	70.47058823529411	62.28571428571428
HARRISON B	67	70.47058823529411	62.28571428571428
GARFIELD J A	49	70.47058823529411	62.28571428571428
HAYES R B	70	70.47058823529411	62.28571428571428
REAGAN R	93	70.47058823529411	93.00000000000000
EISENHOWER D D	79	70.47058823529411	72.00000000000000
HOOVER H C	90	70.47058823529411	90.00000000000000
NIXON R M	81	70.47058823529411	81.00000000000000
FORD G R	93	70.47058823529411	93.00000000000000
ARTHUR C A	56	70.47058823529411	58.00000000000000
COOLIDGE C	60	70.47058823529411	58.00000000000000
BUSH G H W	94	70.47058823529411	77.50000000000000
ROOSEVELT T	60	70.47058823529411	69.00000000000000
GRANT U S	63	70.47058823529411	62.28571428571428
TYLER J	71	69.50000000000000	72.37500000000000
FILLMORE M	74	69.50000000000000	69.00000000000000
HARRISON W H	68	69.50000000000000	72.37500000000000
TAYLOR Z	65	69.50000000000000	72.37500000000000

2	For each candidate in elections after 2000 get the candidate name and the percentage of votes they had in each election.																						
<table> <tr> <th>candidate</th><th>votes_percentage</th></tr> <tr><td>BUSH G W</td><td>53.2588454376163873</td></tr> <tr><td>KERRY J</td><td>46.7411545623836127</td></tr> <tr><td>OBAMA B</td><td>67.8438661710037175</td></tr> <tr><td>MCCAIN J</td><td>32.1561338289962825</td></tr> <tr><td>OBAMA B</td><td>61.7100371747211896</td></tr> <tr><td>ROMNEY M</td><td>38.2899628252788104</td></tr> <tr><td>TRUMP D J</td><td>57.2504708097928437</td></tr> <tr><td>CLINTON H D R</td><td>42.7495291902071563</td></tr> <tr><td>TRUMP D J</td><td>43.1226765799256506</td></tr> <tr><td>BIDEN J R</td><td>56.8773234200743494</td></tr> </table>		candidate	votes_percentage	BUSH G W	53.2588454376163873	KERRY J	46.7411545623836127	OBAMA B	67.8438661710037175	MCCAIN J	32.1561338289962825	OBAMA B	61.7100371747211896	ROMNEY M	38.2899628252788104	TRUMP D J	57.2504708097928437	CLINTON H D R	42.7495291902071563	TRUMP D J	43.1226765799256506	BIDEN J R	56.8773234200743494
candidate	votes_percentage																						
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CLINTON H D R	42.7495291902071563																						
TRUMP D J	43.1226765799256506																						
BIDEN J R	56.8773234200743494																						

3	For each president born after 1850, retrieve the president name, birth year, state name where he/she was born and where does he/she fall on the lists of presidents coming from that state he/she was after 1850. Hint: use the row_number() window function.																																																																																										
<table><tr><th>name</th><th>birth_year</th><th>name</th><th>row_number</th></tr><tr><td>TAFT W H</td><td>1857</td><td>OHIO</td><td>1</td></tr><tr><td>HARDING W G</td><td>1865</td><td>OHIO</td><td>2</td></tr><tr><td>REAGAN R</td><td>1911</td><td>ILLINOIS</td><td>1</td></tr><tr><td>TRUMAN H S</td><td>1884</td><td>MISSOURI</td><td>1</td></tr><tr><td>CLINTON W J</td><td>1946</td><td>ARKANSAS</td><td>1</td></tr><tr><td>EISENHOWER D D</td><td>1890</td><td>TEXAS</td><td>1</td></tr><tr><td>JOHNSON L B</td><td>1908</td><td>TEXAS</td><td>2</td></tr><tr><td>HOOVER H C</td><td>1874</td><td>IOWA</td><td>1</td></tr><tr><td>NIXON R M</td><td>1913</td><td>CALIFORNIA</td><td>1</td></tr><tr><td>FORD G R</td><td>1913</td><td>NEBRASKA</td><td>1</td></tr><tr><td>OBAMA B</td><td>1961</td><td>HAWAII</td><td>1</td></tr><tr><td>WILSON W</td><td>1856</td><td>VIRGINIA</td><td>1</td></tr><tr><td>COOLIDGE C</td><td>1872</td><td>VERMONT</td><td>1</td></tr><tr><td>BIDEN J R</td><td>1942</td><td>PENNSYLVANIA</td><td>1</td></tr><tr><td>KENNEDY J F</td><td>1917</td><td>MASSACHUSETTS</td><td>1</td></tr><tr><td>BUSH G H W</td><td>1924</td><td>MASSACHUSETTS</td><td>2</td></tr><tr><td>BUSH G W</td><td>1946</td><td>CONNECTICUT</td><td>1</td></tr><tr><td>CARTER J M</td><td>1924</td><td>GEORGIA</td><td>1</td></tr><tr><td>ROOSEVELT T</td><td>1858</td><td>NEW YORK</td><td>1</td></tr><tr><td>ROOSEVELT F D</td><td>1882</td><td>NEW YORK</td><td>2</td></tr><tr><td>TRUMP D J</td><td>1946</td><td>NEW YORK</td><td>3</td></tr></table>				name	birth_year	name	row_number	TAFT W H	1857	OHIO	1	HARDING W G	1865	OHIO	2	REAGAN R	1911	ILLINOIS	1	TRUMAN H S	1884	MISSOURI	1	CLINTON W J	1946	ARKANSAS	1	EISENHOWER D D	1890	TEXAS	1	JOHNSON L B	1908	TEXAS	2	HOOVER H C	1874	IOWA	1	NIXON R M	1913	CALIFORNIA	1	FORD G R	1913	NEBRASKA	1	OBAMA B	1961	HAWAII	1	WILSON W	1856	VIRGINIA	1	COOLIDGE C	1872	VERMONT	1	BIDEN J R	1942	PENNSYLVANIA	1	KENNEDY J F	1917	MASSACHUSETTS	1	BUSH G H W	1924	MASSACHUSETTS	2	BUSH G W	1946	CONNECTICUT	1	CARTER J M	1924	GEORGIA	1	ROOSEVELT T	1858	NEW YORK	1	ROOSEVELT F D	1882	NEW YORK	2	TRUMP D J	1946	NEW YORK	3
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KENNEDY J F	1917	MASSACHUSETTS	1																																																																																								
BUSH G H W	1924	MASSACHUSETTS	2																																																																																								
BUSH G W	1946	CONNECTICUT	1																																																																																								
CARTER J M	1924	GEORGIA	1																																																																																								
ROOSEVELT T	1858	NEW YORK	1																																																																																								
ROOSEVELT F D	1882	NEW YORK	2																																																																																								
TRUMP D J	1946	NEW YORK	3																																																																																								

4	Retrieve the president name, party, years served and the number of years served by presidents coming from the same party up to that president (limit your results to presidents who are member of a non-democratic and non-republican party).																																															
<table><tr><th>name</th><th>party</th><th>years_served</th><th>years_served_so_far_by_the_party</th></tr><tr><td>WASHINGTON G</td><td>FEDERALIST</td><td>7</td><td>7</td></tr><tr><td>ADAMS J</td><td>FEDERALIST</td><td>4</td><td>11</td></tr><tr><td>JEFFERSON T</td><td>DEMO-REP</td><td>8</td><td>8</td></tr><tr><td>MADISON J</td><td>DEMO-REP</td><td>8</td><td>16</td></tr><tr><td>MONROE J</td><td>DEMO-REP</td><td>8</td><td>24</td></tr><tr><td>ADAMS J Q</td><td>DEMO-REP</td><td>4</td><td>28</td></tr><tr><td>HARRISON W H</td><td>WHIG</td><td>0</td><td>0</td></tr><tr><td>TYLER J</td><td>WHIG</td><td>3</td><td>3</td></tr><tr><td>TAYLOR Z</td><td>WHIG</td><td>1</td><td>4</td></tr><tr><td>FILLMORE M</td><td>WHIG</td><td>2</td><td>6</td></tr></table>					name	party	years_served	years_served_so_far_by_the_party	WASHINGTON G	FEDERALIST	7	7	ADAMS J	FEDERALIST	4	11	JEFFERSON T	DEMO-REP	8	8	MADISON J	DEMO-REP	8	16	MONROE J	DEMO-REP	8	24	ADAMS J Q	DEMO-REP	4	28	HARRISON W H	WHIG	0	0	TYLER J	WHIG	3	3	TAYLOR Z	WHIG	1	4	FILLMORE M	WHIG	2	6
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FILLMORE M	WHIG	2	6																																													

5	For each democratic president, retrieve his/her name and hobbies and the total number of democratic presidents who also have this hobby.		
<hr/>			
name	hobby	count	
<hr/>			
BIDEN J R	BASEBALL	1	
OBAMA B	BASKETBALL	1	
OBAMA B	COIKING	1	
OBAMA B	DANCING	1	
CLEVELAND G	FISHING	3	
ROOSEVELT F D	FISHING	3	
TRUMAN H S	FISHING	3	
WILSON W	GOLF	1	
CLINTON W J	PLAYING SAXOPHONE	1	
TRUMAN H S	POKER	1	
WILSON W	RIDING	4	
JACKSON A	RIDING	4	
VAN BUREN M	RIDING	4	
JOHNSON L B	RIDING	4	
KENNEDY J F	SAILING	2	
ROOSEVELT F D	SAILING	2	
KENNEDY J F	SWIMMING	2	
ROOSEVELT F D	SWIMMING	2	
KENNEDY J F	TOUCH FOOTBALL	1	
TRUMAN H S	WALKING	2	
WILSON W	WALKING	2	