**SQL Practice Exercise**

SQL Database Platform: SQLite

Data Analysed: 2022 Johor state election, formally the 15th Johor general election

**Reference:**

1. E-Nanyang

(https://www.enanyang.my/%E6%94%BF%E6%B2%BB/%E6%9F%94%E4%BD%9B%E5%B7%9E%E9%80%89%E6%88%90%E7%BB%A9?fbclid=IwAR0yRJ5TwI57ui3ksZ6y-uygPX7V6orIqRVXQKE2WF3CS1u4w\_ivE7kMx2I)

1. Wikipedia

(https://en.wikipedia.org/wiki/2022\_Johor\_state\_election)

1. Channel News Asia

(https://www.channelnewsasia.com/asia/malaysia-johor-state-polls-barisan-nasional-victory-general-election-pakatan-harapan-2561196)

**General Notes:**

1. All data are obtained from Ref [1] (constituency data, numbers) and Ref [2] (Romanised names, party coalition).
2. All data are collected and arranged in file “JohorPolls2022\_Data.xlsb”.
3. Some data from Ref [1] (voters count) are slightly adjusted to round them to integers since they are provided in terms of percentage.
4. Analysis done are based on common questions asked, author’s questions and checking for hypothesis.

**Party / Coalition Abbreviations, Coalition Members**

Full list of party / coalition abbreviations and coalition members are listed below. Note that data uses abbreviations only.

|  |  |  |
| --- | --- | --- |
| **Coalition** | **Party Abbreviation** | **Party Full Name (English)** |
| BN (Barisan National) | UMNO | United Malays National Organisation |
| MCA | Malaysian Chinese Association |
| MIC | Malaysian Indian Congress |
|  |  |  |
| PH (Pakatan Harapan) | DAP | Democratic Action Party |
| PKR | People's Justice Party |
| AMANAH | National Trust Party |
|  |  |  |
| PN (Perikatan Nasional) | BERSATU | Malaysian United Indigenous Party |
| PAS | Malaysian Islamic Party |
| GERAKAN | Malaysian People's Movement Party |
|  |  |  |
| No coalition | PEJUANG | Homeland Fighters' Party |
| WARISAN | Heritage Party |
| MUDA | Malaysian United Democratic Alliance |
| PBM | Malaysian Nation Party |
| PSM | Socialist Party of Malaysia |
| PUTRA | Malaysian Mighty Bumiputera Party |
| IND | Independent contestant |

**Analysis 1**

**Question:**

Who are the winners (candidate name, affiliated party, party coalition) for each constituency (constituency ID and name)?

**Answer:**

All 4 tables are to be joined to show all necessary data. Group the joined table by Constituency\_ID and aggregate the vote count maximum value.

1. Join Candidate\_Data and Constituency\_Data by matching Constituency\_ID.
2. Join step 1 table and Coalition\_Data by matching party.
3. Join step 2 table and Vote\_Data by matching party and Constituency\_ID
4. Group table in step 3 by Constituency\_ID and find the maximum Vote\_Count.
5. (Optional) Sort results by party if required.

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*SELECT*

*Cand.Candidate\_Name,*

*Cand.Party,*

*Coal.Coalition,*

*Cand.Contest\_Constituency\_ID AS Constituency\_ID,*

*Cons.Constituency\_Name,*

*Max(Vote.Vote\_Count) AS Vote\_Count*

*FROM Candidate\_Data AS Cand*

*LEFT JOIN Constituency\_Data AS Cons ON Cand.Contest\_Constituency\_ID = Cons.Constituency\_ID*

*LEFT JOIN Coalition\_Data AS Coal ON Cand.Party = Coal.Party*

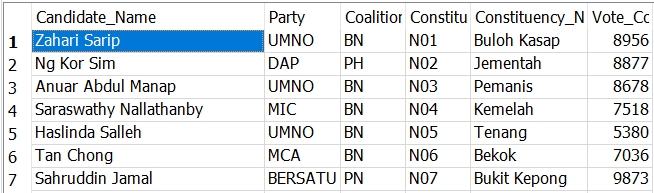
*LEFT JOIN Vote\_Data AS Vote ON Cand.Contest\_Constituency\_ID = Vote.Constituency\_ID AND Cand.Party = Vote.Party*

*GROUP BY Cand.Contest\_Constituency\_ID*

*ORDER BY Cand.Party;*

=========================================================================================

**Findings:**



**Analysis 2**

**Question:**

How many constituencies did each party and coalition win?

**Answer:**

Join only necessary tables, group and aggregate to list out the winning parties/coalitions for each constituency as done in Analysis 1, then aggregate to count the parties/coalitions. Grouping is done 2 times, first to generate the winners list, second to count the constituency won by each party/coalition.

1. Join Candidate\_Data and Coalition\_Data by matching Party\_ID.
2. Join step 1 table and Vote\_Data by matching party and Constituency\_ID.
3. Group table in step 2 by Constituency\_ID and find the maximum vote count.
4. Make the result in step 3 a subselect, then group it by Party/Coalition and find the parties/coalitions count.
5. Parties/Coalitions not in end results means they did not win any constituency.

=========================================================================================

--By Party

*SELECT WinList.Party, Count(WinList.Party) AS Win\_Count FROM*

*(SELECT*

*Cand.Party,*

*Coal.Coalition,*

*Max(Vote.Vote\_Count) AS Vote\_Count*

*FROM Candidate\_Data AS Cand*

*LEFT JOIN Coalition\_Data AS Coal ON Cand.Party = Coal.Party*

*LEFT JOIN Vote\_Data AS Vote ON Cand.Contest\_Constituency\_ID = Vote.Constituency\_ID AND Cand.Party = Vote.Party*

*GROUP BY Cand.Contest\_Constituency\_ID) AS WinList*

*GROUP BY WinList.Party;*

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--By Coalition

*SELECT WinList.Coalition, Count(WinList.Coalition) AS Win\_Count FROM*

*(SELECT*

*Cand.Party,*

*Coal.Coalition,*

*Max(Vote.Vote\_Count) AS Vote\_Count*

*FROM Candidate\_Data AS Cand*

*LEFT JOIN Coalition\_Data AS Coal ON Cand.Party = Coal.Party*

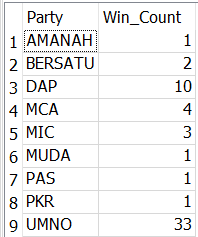
*LEFT JOIN Vote\_Data AS Vote ON Cand.Contest\_Constituency\_ID = Vote.Constituency\_ID AND Cand.Party = Vote.Party*

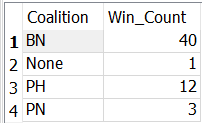
*GROUP BY Cand.Contest\_Constituency\_ID) AS WinList*

*GROUP BY WinList.Coalition;*

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**Findings:**





**Analysis 3**

**Question:**

What is the voter turnout in percentage for each constituency and the overall voter turnout for all constituencies? Show the corresponding casted vote count and total eligible voters in results.

**Answer (Each constituency):**

First calculate the total votes casted from Vote\_Data, then join with the Constituency\_Data to get the total eligible voters for each constituency. Finally, calculate the voters turnout.

1. Group Vote\_Data by Constituency\_ID and sum Vote\_Count.
2. Make the result in step 1 a subselect, then join with Constituency\_Data by matching Constituency\_ID to get the total eligible voters for each constituency.
3. Calculate the voters turnout percentage using total Vote\_Count and total eligible voters for each constituency.

**Answer (Overall):**

First calculate the total votes casted from Vote\_Data, and calculate the total eligible voters from Constituency\_Data. Join both tables and finally, calculate the voters turnout.

1. Sum Vote\_Count in Vote\_Data.
2. Sum Total\_Voters in Constituency\_Data.
3. Make the results in step 1 and 2 subselect, then join them without matching.
4. Calculate the voters turnout percentage using total Vote\_Count and total eligible voters.

=========================================================================================

--Each constituency

*SELECT*

*Turnout.Constituency\_ID,*

*Turnout.Vote\_Count,*

*Cons.Total\_Voters,*

*ROUND(CAST(Turnout.Vote\_Count AS REAL) / Cons.Total\_Voters \* 100, 2) AS Voters\_Turnout FROM*

*(SELECT*

*Vote.Constituency\_ID,*

*Sum(Vote.Vote\_Count) AS Vote\_Count*

*FROM Vote\_Data AS Vote*

*GROUP BY Vote.Constituency\_ID) Turnout*

*JOIN Constituency\_Data AS Cons ON Turnout.Constituency\_ID = Cons.Constituency\_ID;*

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=========================================================================================

--Overall

*SELECT*

*\*,*

*ROUND(CAST(Total\_Votes AS REAL) / Total\_Voters \* 100, 2) AS Voters\_Turnout FROM*

*(SELECT*

*Sum(Vote.Vote\_Count) AS Total\_Votes*

*FROM Vote\_Data AS Vote)*

*JOIN*

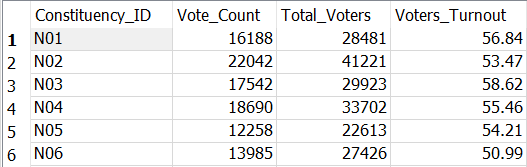
*(SELECT*

*Sum(Cons.Total\_Voters) AS Total\_Voters*

*FROM Constituency\_Data AS Cons);*

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**Findings:**





**Analysis 4**

**Question:**

What are the invalid votes in percentage for each constituency and the overall invalid votes for all constituencies?

**Answer (Each constituency):**

Calculate the total votes casted from Vote\_Data for each constituency. List out only invalid votes in separate SELECT. Put both as subselect and join them and calculate invalid votes in percentage.

1. Group Vote\_Data by Constituency\_ID and sum Vote\_Count.
2. List out invalid votes separately using common table exporession.
3. Make the result in step 1 subselect, then join with CTE by matching Constituency\_ID.
4. Calculate the invalid votes percentage using total summed Vote\_Count and invalid votes for each constituency.

**Answer (Overall):**

Calculate the total votes casted and total invalid votes from Vote\_Data, then calculate the overall invalid votes in percentage.

1. Group Vote\_Data by Party and sum Vote\_Count.
2. Sum Vote\_Count in Vote\_Data without grouping.
3. Make the result in step 1 and 2 subselect, then join them.
4. Calculate the invalid votes percentage using total vote and invalid vote.

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--Each constituency

*WITH Invalid\_Vote\_Table AS*

*(SELECT*

*Constituency\_ID AS Constituency\_ID2,*

*Party,*

*Vote\_Count*

*FROM Vote\_Data*

*WHERE Party = 'INVALID')*

*SELECT*

*Constituency\_ID1 AS Constituency\_ID,*

*Total\_Vote,*

*Invalid\_Vote\_Table.Vote\_Count AS Invalid\_Vote,*

*PRINTF("%.2f", ROUND(CAST(Invalid\_Vote\_Table.Vote\_Count AS REAL) / Total\_Vote \* 100, 2)) AS Invalid\_Vote\_Pct*

*FROM*

*(SELECT*

*Vote.Constituency\_ID AS Constituency\_ID1,*

*Sum(Vote.Vote\_Count) AS Total\_Vote*

*FROM Vote\_Data AS Vote*

*GROUP BY Vote.Constituency\_ID)*

*JOIN Invalid\_Vote\_Table*

*ON Constituency\_ID1 = Invalid\_Vote\_Table.Constituency\_ID2;*

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=========================================================================================

--Overall

*SELECT*

*\*,*

*PRINTF("%.2f", ROUND(CAST(Invalid\_Vote AS REAL) / Total\_Vote \* 100, 2)) AS Invalid\_Votes\_Pct*

*FROM*

*(SELECT Sum(Vote\_Count) AS Total\_Vote*

*FROM Vote\_Data)*

*JOIN*

*(SELECT Sum(Vote\_Count) AS Invalid\_Vote*

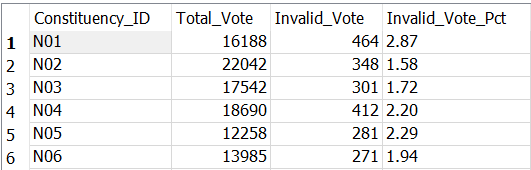
*FROM Vote\_Data*

*GROUP BY Party*

*HAVING Party = 'INVALID');*

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**Findings:**





**Analysis 5**

**Question:**

What is the number of majority votes (difference between vote count of winner and runner-up) for each constituency?

**Answer:**

Create 1 view by aggregating Vote\_Data with max Vote\_Count. Create another view by aggregating another Vote\_Data with second highest Vote\_Count separately. Join them and find the Vote\_Count difference.

1. Group Vote\_Data by Constituency\_ID and find max Vote\_Count for winner vote. Make as one view.
2. Partition Vote\_Data by Constituency\_ID and find second max Vote\_Count for runnerup vote.
3. Result in step 2 requires some cleaning up by grouping them by Constituency\_ID, use any value from result in each constituency. Make as one view.
4. Join the two views by matching Constituency\_ID and calculate the majority votes.

=========================================================================================

--View for winner

*DROP VIEW IF EXISTS Winner\_View;*

*CREATE VIEW Winner\_View AS*

*SELECT*

*Vote.Constituency\_ID,*

*Cand.Candidate\_Name AS Winner\_Candidate\_Name,*

*Cand.Party AS Winner\_Party,*

*Max(Vote.Vote\_Count) AS Winner\_Vote\_Count*

*FROM Candidate\_Data AS Cand*

*JOIN Vote\_Data AS Vote*

*ON Cand.Party = Vote.Party and Cand.Contest\_Constituency\_ID = Vote.Constituency\_ID*

*GROUP BY Vote.Constituency\_ID;*

--View for runnerup

*DROP VIEW IF EXISTS RunnerUp\_View;*

*CREATE VIEW RunnerUp\_View AS*

*SELECT*

*RunnerUp\_Table.Constituency\_ID,*

*RunnerUp\_Table.Candidate\_Name AS RunnerUp\_Candidate\_Name,*

*RunnerUp\_Table.Party AS RunnerUp\_Party,*

*Max(RunnerUp\_Table.Vote\_Count) AS RunnerUp\_Vote\_Count*

*FROM*

*(SELECT*

*Cand.Candidate\_Name,*

*Vote.Constituency\_ID,*

*Cand.Party,*

*Nth\_Value(Vote.Vote\_Count, 2) OVER (PARTITION BY Vote.Constituency\_ID ORDER BY Vote.Vote\_Count DESC) AS Vote\_Count*

*FROM Candidate\_Data AS Cand*

*JOIN Vote\_Data AS Vote*

*ON Cand.Party = Vote.Party and Cand.Contest\_Constituency\_ID = Vote.Constituency\_ID) AS RunnerUp\_Table*

*GROUP BY RunnerUp\_Table.Constituency\_ID;*

--Calculate majority votes

*SELECT*

*Winner.Constituency\_ID,*

*Winner.Winner\_Candidate\_Name, Winner.Winner\_Party, Winner.Winner\_Vote\_Count,*

*RunnerUp.RunnerUp\_Candidate\_Name, RunnerUp.RunnerUp\_Party, RunnerUp.RunnerUp\_Vote\_Count,*

*(Winner.Winner\_Vote\_Count - RunnerUp.RunnerUp\_Vote\_Count) AS Majority\_Vote\_Count*

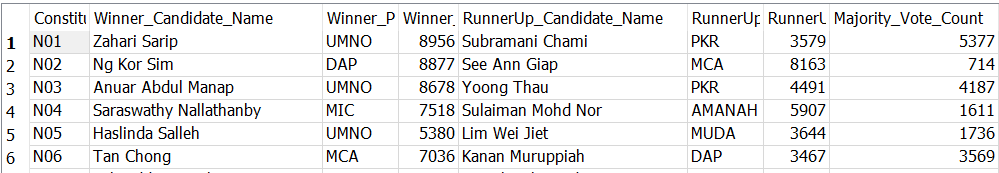
*FROM Winner\_View AS Winner*

*JOIN RunnerUp\_View AS RunnerUp*

*ON Winner.Constituency\_ID = RunnerUp.Constituency\_ID;*

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**Findings:**



**Analysis 6**

**Question:**

Show all details of my (or specific) constituency.

**Answer:**

For better presentation, Constituency\_Data is displayed on its in 1 line for specified row. The remaining tables are joined to show all necessary data for specified row.

1. Show specified row of Constituency\_Data.
2. Join Candidate\_Data, Coalition\_Data and Vote\_Data, then show specified rows.

=========================================================================================

*SELECT \* FROM Constituency\_Data WHERE Constituency\_ID = 'N41';*

*SELECT*

*Cand.Candidate\_Name,*

*Cand.Contest\_Constituency\_ID AS Constituency\_ID,*

*Cons.Constituency\_Name,*

*Cand.Party,*

*Coal.Coalition,*

*Vote.Vote\_Count*

*FROM Candidate\_Data AS Cand*

*LEFT JOIN Constituency\_Data AS Cons ON Cand.Contest\_Constituency\_ID = Cons.Constituency\_ID*

*LEFT JOIN Coalition\_Data AS Coal ON Cand.Party = Coal.Party*

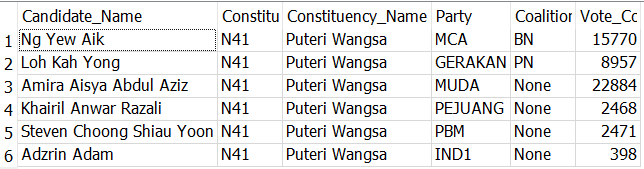
*LEFT JOIN Vote\_Data AS Vote ON Cand.Contest\_Constituency\_ID = Vote.Constituency\_ID AND Cand.Party = Vote.Party*

*WHERE Vote.Constituency\_ID = 'N41';*

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**Findings:**





**Analysis 7**

**Statement:**

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The Malays are still more likely to vote for BN, while the Chinese will go for PH.

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(Source: Casual talk among voters)

**Question:**

How did BN and PH perform in Malay and Chinese majority constituencies respectively? Show in terms of Malay and Chinese majority constituencies count and the constituencies won by BN and PH in Malay and Chinese majority constituencies respectively. Constituency is considered to be Malay/Chinese majority if the respective voter percentage is more than 45%.

**Answer:**

Join the tables with necessary data. Calculate and determine the majority race for each constituency, then confirm the BN/PH won count. Finally, group the data by Malay/Chinese majority and aggregate the BN/PH won count.

1. Join Constituency\_Data, Vote\_Data and Coalition\_Data for all necessary data.
2. Group table in step 1 by Constituency\_ID and find max vote count to determine the winners for each constituency.
3. Also calculate the race voter percentage for the table in step 1.
4. Determine the race majority based on the calculated race voter percentage.
5. Determine if BN won in Malay majority constituency. Give value of 1 if true, else give value of 0.
6. Determine if PH won in Chinese majority constituency. Give value of 1 if true, else give value of 0.
7. Group the table after step 6 by majority race. Aggregate with the corresponding count of constituency and sum of BN/PH won count.

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*SELECT*

*Majority\_Race,*

*Count(Majority\_Race) AS Constituency\_Count,*

*Sum(BN\_MalayMajority\_Won) AS BN\_Won\_Count,*

*Sum(PH\_ChineseMajority\_Won) AS PH\_Won\_Count*

*FROM*

*(SELECT*

*\*,*

*CASE*

*WHEN Majority\_Race = 'Malay' AND Coalition = 'BN' THEN 1*

*ELSE 0*

*END AS BN\_MalayMajority\_Won,*

*CASE*

*WHEN Majority\_Race = 'Chinese' AND Coalition = 'PH' THEN 1*

*ELSE 0*

*END AS PH\_ChineseMajority\_Won*

*FROM*

*(SELECT*

*\*,*

*CASE*

*WHEN Pct\_Malay\_Voters >= CAST(45 AS REAL) THEN 'Malay'*

*WHEN Pct\_Chinese\_Voters >= CAST(45 AS REAL) THEN 'Chinese'*

*ELSE 'None'*

*END AS Majority\_Race*

*FROM*

*(SELECT*

*Vote.Constituency\_ID AS Constituency\_ID,*

*Cons.Total\_Voters,*

*Cons.Malay\_Voters,*

*Cons.Chinese\_Voters,*

*PRINTF("%.2f", ROUND(CAST(Cons.Malay\_Voters AS REAL) / Cons.Total\_Voters \* 100, 2)) AS Pct\_Malay\_Voters,*

*PRINTF("%.2f", ROUND(CAST(Cons.Chinese\_Voters AS REAL) / Cons.Total\_Voters \* 100, 2)) AS Pct\_Chinese\_Voters,*

*Coal.Coalition,*

*Cons.Constituency\_Name,*

*Max(Vote.Vote\_Count) AS Winner\_Vote\_Count*

*FROM Constituency\_Data AS Cons*

*LEFT JOIN Vote\_Data AS Vote ON Vote.Constituency\_ID = Cons.Constituency\_ID*

*LEFT JOIN Coalition\_Data AS Coal ON Vote.Party = Coal.Party*

*GROUP BY Vote.Constituency\_ID)*

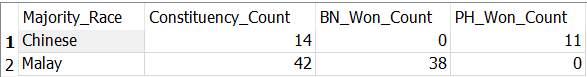
*)*

*)*

*GROUP BY Majority\_Race;*

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**Findings:**



**Analysis 8**

Statement:

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Parti Pejuang Tanah Air (Pejuang), which was founded by Dr Mahathir after he left Bersatu, contested 42 seats, while the Sabah-based Parti Warisan (Warisan) and MUDA contested seven seats respectively. Pejuang president Mukhriz Mahathir said that the party’s poor performance could be attributed to a lack of recognition by voters as it was a new party.

Dr Oh said teaming up appeared to be beneficial to both PH and MUDA.

“DAP depended on MUDA to pull some Malay votes in urban and suburban mixed seats, while MUDA benefited from PH supporters, such as in Puteri Wangsa,” he said.

He however said that it was still too early to tell if the party helmed by former youth and sports minister Syed Saddiq Syed Abdul Rahman could be a rising force in Malaysian politics.

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(Source: Channel News Asia, Ref [3])

**Question:**

How are PEJUANG and MUDA faring in the debuting election? Determine how many constituencies won by each party and the percentage of votes obtained in each constituency if they contested.

**Answer (won constituencies count):**

Aggregate Vote\_Count in Vote\_Data to find the winners first, then aggregate Party to find the constituencies winning count for each party.

1. Group Vote\_Data by Constituency\_ID and find the maximum vote count. Make it a CTE.
2. Group the CTE by Party and find the party’s count.
3. Filter to show only PEJUANG and MUDA.
4. If the party is not listed in the results, it means the party did not win any constituency.

**Answer (Pct vote in each constituency):**

Aggregate Vote\_Count in Vote\_Data to find the total vote in each constituency. Filter out another Vote\_Data with party of PEJUANG and MUDA only. Join them and calculate the percentage vote.

1. Group Vote\_Data by Constituency\_ID and find the sum of vote count. Make it a CTE.
2. Generate another table with Vote\_Data showing only PEJUANG and MUDA Vote\_Count. Make it a CTE.
3. Join both CTE by matching Constituency\_ID, then calculate the percentage vote obtained by PEJUANG and MUDA in each constituency.
4. Sort them by Party or Constituency\_ID as necessary.

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--Won Constituency Count

*WITH Winner\_Table AS*

*(SELECT*

*Constituency\_ID,*

*Party,*

*Max(Vote\_Count)*

*FROM Vote\_Data*

*GROUP BY Constituency\_ID)*

*SELECT*

*Party,*

*Count(Party) AS Constituency\_Won*

*FROM Winner\_Table*

*GROUP BY Party*

*HAVING Party = 'PEJUANG' OR Party = 'MUDA';*

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--Percentage vote in each constituency

*WITH P\_M\_Table AS*

*(SELECT*

*Constituency\_ID,*

*Party,*

*Vote\_Count*

*FROM Vote\_Data*

*WHERE Party = 'PEJUANG' OR Party = 'MUDA'),*

*Total\_Table AS*

*(SELECT*

*Constituency\_ID,*

*Sum(Vote\_Count) AS Total\_Vote*

*FROM Vote\_Data*

*GROUP BY Constituency\_ID)*

*SELECT*

*Total\_Table.Constituency\_ID,*

*Total\_Table.Total\_Vote,*

*P\_M\_Table.Party,*

*P\_M\_Table.Vote\_Count,*

*PRINTF("%.2f", ROUND(CAST(P\_M\_Table.Vote\_Count AS REAL) / Total\_Table.Total\_Vote \* 100, 2)) AS Pct\_Vote*

*FROM Total\_Table*

*JOIN P\_M\_Table*

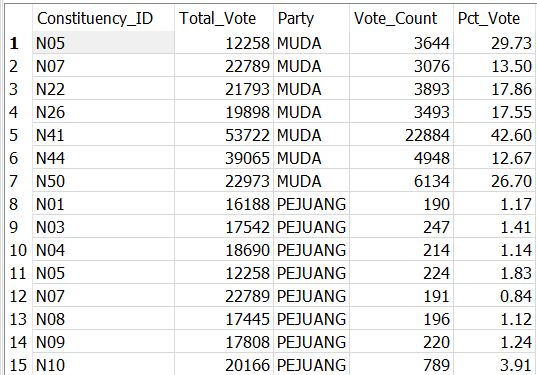
*ON Total\_Table.Constituency\_ID = P\_M\_Table.Constituency\_ID*

*ORDER BY Party;*

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**Findings:**





**Analysis 9**

Statement:

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PH had originally won 30 of the 56 state seats in Johor during the 14th general election in May 2018, when Dr Mahathir Mohamad-led Bersatu was part of the coalition.

The coalition now has just 12 seats left after Saturday.

However, perhaps the writing was already on the wall when PH started their Johor campaign in “disarray”, said Dr Serina.

“They were even disagreeing over logos. It's hard for new voters to find strength in a coalition that does not seem able to work together with a cohesive strategy - and there was an overwhelming sentiment that PH had failed during the short time it was in power,” she said.

The Johor polls also saw many parties making their debuts.

Dr Sivamurugan said these parties contested the Johor election to test the support they have on the ground. Warisan took part in the polls as there is a sizable population of Sabahans in Johor, he said.

“They have to reconsider working with other opposition parties. Going solo as a new party requires machinery, logistics and manpower,” he said.

MUDA, on the other hand, clashed with PKR in one seat even though it had an understanding with PH in the Johor polls.

“They shouldn’t have contested against PKR in Larkin as it created campaigning problems among themselves,” said Dr Sivamurugan.

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(Source: Channel News Asia, Ref [3])

**Question:**

If all other parties (including independent contestants) besides those in BN were to unite as one coalition, how would the election result turn into? Could the opposition coalition deny BN’s two-third majority, or even become the ruling coalition? (Invalid votes excluded)

**Answer:**

Create CTEs finding total votes, BN votes and Invalid votes for each constituency. Calculate the votes for opposition and then compare it against BN votes.

1. Group Vote\_Data by Constituency\_ID and find sum of vote count. Make it a CTE.
2. Join Vote\_Data and Coalition\_Data by matching Constituency\_ID. Filter only BN votes. Make it a CTE.
3. Filter Vote\_Data for INVALID votes only. Make it a CTE.
4. Calculate Opposition votes by subtraction, compare with BN votes, then determine the winner.
5. Aggregate the result in step 4 by winning coalition and count the constituency won.

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--CTE for total votes

WITH Total\_Vote\_Table AS

(SELECT

Constituency\_ID,

Sum(Vote\_Count) AS Total\_Vote

FROM Vote\_Data

GROUP BY Constituency\_ID),

--CTE for BN votes

BN\_Vote\_Table AS

(SELECT

Vote.Constituency\_ID,

Coal.Coalition,

Vote.Vote\_Count AS BN\_Vount\_Count

FROM Vote\_Data AS Vote

JOIN Coalition\_Data AS Coal

ON Vote.Party = Coal.Party

WHERE Coal.Coalition = 'BN'),

--CTE for invalid votes

Invalid\_Vote\_Table AS

(SELECT

Constituency\_ID,

Vote\_Count AS Invalid\_Vount\_Count

FROM Vote\_Data

WHERE Party = 'INVALID')

SELECT

Winner AS Coalition,

Count(Winner) AS Constituency\_Won

FROM

(SELECT

\*,

CASE

WHEN BN\_Vount\_Count > Opposition\_Vote\_Count THEN 'BN'

WHEN BN\_Vount\_Count < Opposition\_Vote\_Count THEN 'Opposition'

ELSE 'Draw'

END AS Winner

FROM

(SELECT

Total\_CTE.Constituency\_ID,

BN\_CTE.BN\_Vount\_Count,

(Total\_CTE.Total\_Vote - BN\_CTE.BN\_Vount\_Count - Invalid\_CTE.Invalid\_Vount\_Count) AS Opposition\_Vote\_Count

FROM Total\_Vote\_Table AS Total\_CTE

JOIN BN\_Vote\_Table AS BN\_CTE ON Total\_CTE.Constituency\_ID = BN\_CTE.Constituency\_ID

JOIN Invalid\_Vote\_Table AS Invalid\_CTE ON Total\_CTE.Constituency\_ID = Invalid\_CTE.Constituency\_ID

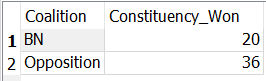
ORDER BY Total\_CTE.Constituency\_ID)

)

GROUP BY Winner;

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**Findings:**



**Analysis 10**

**Statement:**

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Dr Sivamurugan also said that the split votes among the opposition played a role in PH’s loss.

“In 2018, it was one against one and not many multicornered fights. We still need a strong viable opposition for a strong check and balance to the government,” he said.

He added that the low voter turnout of less than 55 per cent also contributed to PH’s poor performance.

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(Source: Channel News Asia, Ref [3])

**Question:**

How would PH/MUDA fare in the election if there were a greater turn out of voters (assume 80%)?

**Assumptions:**

* PH and MUDA had an agreement to not contest with each other in each constituency, except N44.
* Should PH and MUDA be contesting each other in a constituency, PH would get the votes.
* The low voters turn out is primarily due to border restrictions where overseas voters were unable to return for voting, or unable to register for overseas postal voting. Most overseas voters would vote for PH/MUDA due to BN’s policies causing brain drain.
* As such, it is assumed among the remaining voters that make up 80% of turn out, 20% of them would vote for BN, while 80% of them would vote of PH/MUDA.
* None of the votes from the remaining voters that make up 80% of turn out would become invalid.

**Answer:**

Create one view for total current votes and another view for total eligible voters. Join them to determine the additional votes to make up 80% turn out rate. Split the votes to BN and PH/MUDA according to assumptions, then determine the winner. Finally, aggregate to find number of constituencies won by BN and PH/MUDA.

1. Group Vote\_Data by Constituency\_ID and find sum of vote count. Make it a CTE. Join it with Constituency\_Data and calculate the additional votes. Make it a view.
2. Create three CTEs to list out BN, PH and MUDA current votes for each constituency. Join them up and make it a view.
3. Join the views in step 1 and step 2, distribute the additional votes and add to current vote of respective party/coalition to obtain the new vote count. If
4. Compare the new BN and PH/MUDA votes, then determine the winner.
5. Aggregate the result in step 4 by winner and count the constituency won.

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--View for additional votes

DROP VIEW IF EXISTS AdditionalVote\_View;

CREATE VIEW AdditionalVote\_View AS

WITH Current\_Total\_Vote\_CTE AS

(SELECT

Constituency\_ID,

Sum(Vote\_Count) AS Current\_Total\_Vote

FROM Vote\_Data

GROUP BY Constituency\_ID)

SELECT

\*,

(\_80pct\_Voters - Current\_Total\_Vote) AS Additional\_Vote

FROM

(SELECT

Cons.Constituency\_ID,

Current\_CTE.Current\_Total\_Vote,

Floor(Cons.Total\_Voters \* 0.8) AS \_80pct\_Voters

FROM Constituency\_Data AS Cons

JOIN Current\_Total\_Vote\_CTE AS Current\_CTE

ON Cons.Constituency\_ID = Current\_CTE.Constituency\_ID);

--View for existing votes

DROP VIEW IF EXISTS CurrentVote\_View;

CREATE VIEW CurrentVote\_View AS

--CTE for BN

WITH BN\_CTE AS

(SELECT

Vote.Constituency\_ID,

Coal.Coalition AS Party\_Coalition,

Vote.Vote\_Count

FROM Vote\_Data AS Vote

JOIN Coalition\_Data AS Coal

ON Vote.Party = Coal.Party

WHERE Coal.Coalition = 'BN'

ORDER BY Vote.Constituency\_ID),

--CTE for PH

PH\_CTE AS

(SELECT

Vote.Constituency\_ID,

Coal.Coalition AS Party\_Coalition,

Vote.Vote\_Count

FROM Vote\_Data AS Vote

JOIN Coalition\_Data AS Coal

ON Vote.Party = Coal.Party

WHERE Coal.Coalition = 'PH'

ORDER BY Vote.Constituency\_ID),

--CTE for MUDA

MUDA\_CTE AS

(SELECT

Vote.Constituency\_ID,

Vote.Party AS Party\_Coalition,

Vote.Vote\_Count

FROM Vote\_Data AS Vote

JOIN Coalition\_Data AS Coal

ON Vote.Party = Coal.Party

WHERE Vote.Party = 'MUDA'

ORDER BY Vote.Constituency\_ID)

--Combine all CTEs

SELECT

BN\_CTE.Constituency\_ID,

BN\_CTE.Party\_Coalition AS BN\_Pa\_Co,

BN\_CTE.Vote\_Count AS BN\_Vote,

PH\_CTE.Constituency\_ID,

PH\_CTE.Party\_Coalition AS PH\_Pa\_Co,

PH\_CTE.Vote\_Count AS PH\_Vote,

MUDA\_CTE.Constituency\_ID,

MUDA\_CTE.Party\_Coalition AS MUDA\_Pa\_Co,

MUDA\_CTE.Vote\_Count AS MUDA\_Vote

FROM BN\_CTE

LEFT JOIN PH\_CTE ON BN\_CTE.Constituency\_ID = PH\_CTE.Constituency\_ID

LEFT JOIN MUDA\_CTE ON BN\_CTE.Constituency\_ID = MUDA\_CTE.Constituency\_ID;

--Count new votes and determine winner

SELECT

Winner,

Count(Winner) AS Constituency\_Won

FROM

(WITH Additional\_Vote\_CTE AS

(SELECT

Crt\_Vote.\*,

Add\_Vote.Additional\_Vote,

(BN\_Vote + Floor(Additional\_Vote \* 0.2)) AS New\_BN\_Vote,

CASE

WHEN PH\_Pa\_Co IS NOT NULL THEN (PH\_Vote + Floor(Additional\_Vote \* 0.8))

ELSE (MUDA\_Vote + Floor(Additional\_Vote \* 0.8))

END AS New\_PH\_MUDA\_Vote

FROM CurrentVote\_View AS Crt\_Vote

JOIN AdditionalVote\_View AS Add\_Vote

ON Crt\_Vote.Constituency\_ID = Add\_Vote.Constituency\_ID)

SELECT

Add\_Vote\_CTE.Constituency\_ID,

Add\_Vote\_CTE.New\_BN\_Vote,

Add\_Vote\_CTE.New\_PH\_MUDA\_Vote,

CASE

WHEN New\_BN\_Vote > New\_PH\_MUDA\_Vote THEN 'BN'

WHEN New\_BN\_Vote < New\_PH\_MUDA\_Vote THEN 'PH\_MUDA'

ELSE 'DRAW'

END AS Winner

FROM Additional\_Vote\_CTE AS Add\_Vote\_CTE

)

GROUP BY Winner;

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**Findings:**

