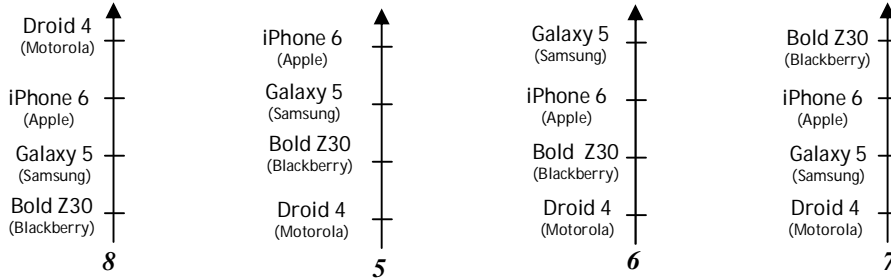


Consider the following preference schedules for an election.



1. How many preference schedules are possible (if ties are not permitted)?

$4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$

#1) 24

2. Who is the **plurality winner**?

What is the percentage of 1st place votes each received? $\frac{8}{26} \approx .3077$

$8 + 5 + 6 + 7 = 26$

#2) DROID 4 ; 30.8%

3. How many first place votes would be needed in this example for there to be a **majority winner**?

$26/2 = 13$

#3) 14 VOTES

If there is a **majority winner** who is it?

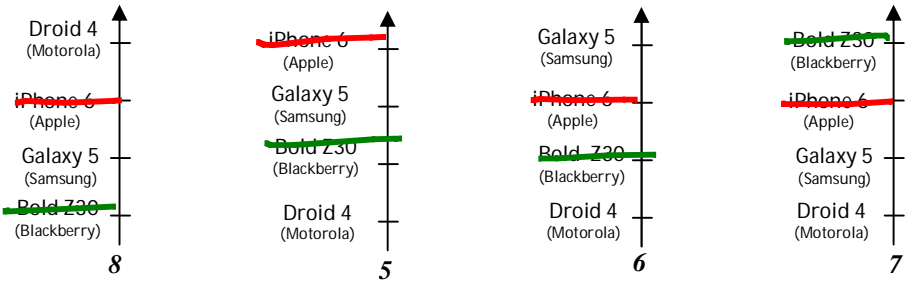
#3) NO MAJORITY WINNER

4. Who is the **'run off' winner**? BETWEEN DROID & BOLD

#4) BOLD ; 18

5. Who is the **'sequential run off' winner**?

#5) GALAXY



D: 8 ~~18~~ 5 G: 6 B: 7
1ST ELIMINATION: iPhone
D: 8 G: 11 ~~18~~
2ND ELIMINATION: BOLD
~~D: 8~~ G: 18
3RD ELIMINATION: DROID

6. What is each candidates Borda count?

DROID: $8(4) + 5(1) + 6(1) + 7(1) = 50$
 iPhone: $8(3) + 5(4) + 6(3) + 7(3) = 83$
 GALAXY: $8(2) + 5(3) + 6(4) + 7(2) = 69$
 BOLD: $8(1) + 5(2) + 6(2) + 7(4) = 58$

#6) Droid: 50
iPhone: 83
Glx5: 69
Z30: 58

Who is the **'Borda Count' winner**?

Demonstrate how this can be done with matrix multiplication*

7. What is each candidates Condorcet winner?

#7) iPhone

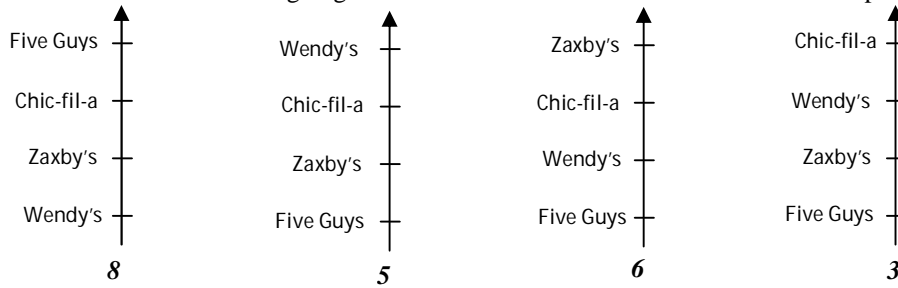
⇒	Drd	iP6	G5	Z30
Drd	*	L	L	L
iP6	W	*	W	W
G5	W	L	*	W
Z30	W	L	L	*

#6) iPhone

The BIG QUESTION:

WHO REALLY WINS?
DIFFERENT METHODS SUPPORT
SUPPORT YOUR REASONING.
DIFFERENT WINNERS

Twenty-two Discrete Math students are arguing over which fast food restaurants and listed their preferences below.



TOTAL: 22

1. In your own words, give a description of the **plurality winner**

CANDIDATE WITH MOST FIRST PLACE VOTES

What percentage of 1st place votes does each of the following choices have?

Choice	Five Guys	Chic-fil-a	Zaxby's	Wendy's
Percentage of 1 st place votes	$\frac{8}{22} \approx 36.4\%$	$\frac{3}{22} \approx 13.6\%$	$\frac{6}{22} \approx 27.3\%$	$\frac{5}{22} \approx 22.7\%$

Who is the **plurality winner**?

2. a. What is the minimum number of first place votes needed in this example for there to be a **majority winner**?

2) FIVE GUYS

b. If there is a **majority winner** who is it?

#3a) 12

3. In your own words, give a description of the **'run off' winner** :

#3b) NO MAJORITY WINNER

ELIMINATE ALL OF THE CANDIDATES EXCEPT THE TWO WITH THE MOST FIRST PLACE VOTES. THEN RE-ASSIGN THE FIRST PLACE VOTES OF THE ELIMINATED CANDIDATES AND RE-TALLY VOTES

Who is the **'run off' winner**? FIVE GUYS: 8 ZAXBY'S: 5+6+3

#4) ZAXBY'S

4. In your own words, give a description of the **'sequential run off' winner** :

FIRST, ELIMINATE THE CANDIDATE WITH THE LEAST NUMBER OF FIRST PLACE VOTES. REASSIGN THE ELIMINATED CANDIDATES VOTES. RETALLY AND AGAIN, ELIMINATE THE NEXT CANDIDATE WITH THE LEAST FIRST PLACE VOTES.

Who is the **'sequential run off' winner**?

REPEAT UNTIL ONLY 1 REMAINS

5) WENDY'S

ROUND 1: 5G: 8 W: 5 Z: 6 ~~X~~ ROUND 2: 5G: 8 W: 8 ~~X~~ ROUND 3: 5G: 8 W: 14

5. In your own words, give a description of the **'Borda Count' winner** (on a separate page show how this might be done using Matrices):

THE BORDA COUNT IS A POINT SYSTEM IN WHICH A LAST PLACE VOTE IS WORTH ONE POINT AND FOR EACH PLACE ABOVE LAST PLACE ANOTHER POINT IS AWARDED. THE CANDIDATE WITH THE MOST POINTS WINS.

a. Give the Borda Count for each letter:

#6a) 5G: 46 C: 69 Zx: 56 W: 49

b. Who is the **'Borda Count' winner**?

CHIC-FIL-A

#6b) CHIC-FIL-A

6. Determine the Condorcet Winner.

→	5G	C	Zx	W
5G	*	L	L	L
C	W	*	W	W
Zx	W	L	*	W
W	W	L	L	*

MATRIX BORDA COUNT FOR RESTAURANTS

$$\begin{array}{l} 5G \\ C \\ Zx \\ W \end{array} \begin{bmatrix} 4 & 1 & 1 & 1 \\ 3 & 3 & 3 & 4 \\ 2 & 2 & 4 & 2 \\ 1 & 4 & 2 & 3 \end{bmatrix} \cdot \begin{bmatrix} 8 \\ 5 \\ 6 \\ 3 \end{bmatrix}$$