

MARK DION (MAYOR)
PIOUS ALI (A/L)
APRIL FOURNIER (A/L)
BENJAMIN GRANT (A/L)



SARAH MICHNIEWICZ (1)
WESLEY PELLETIER (2)
REGINA L. PHILLIPS (3)
ANNA BULLETT (4)
KATE SYKES (5)

CITY COUNCIL WORKSHOP

Proportional Ranked Choice Voting

March 24, 2025 at 5:00 PM in Council Chambers

PARTICIPATION:

The City Council will conduct this meeting from Council Chambers, located on the second floor of City Hall. The public may attend the meeting. If you are not able to attend live, a recording will be available in the [Agenda Center](#) following the meeting.

<https://portlandme.portal.civicclerk.com/event/7697/media>

AGENDA ITEMS:

Discussion of Amendment to Chapter 9 RE: Proportional Ranked Choice Voting

ADJOURNMENT:

MARK DION (MAYOR)
PIOUS ALI (A/L)
APRIL D. FOURNIER (A/L)
BENJAMIN GRANT (A/L)

**CITY OF PORTLAND
IN THE CITY COUNCIL**

SARAH MICHNIEWICZ (1)
WESLEY PELLETIER (2)
REGINA L. PHILLIPS (3)
ANNA BULLETT (4)
KATE SYKES (5)

**AMENDMENT TO PORTLAND CITY CODE
CHAPTER 9 RE: PROPORTIONAL RANKED CHOICE VOTING**

**BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF PORTLAND,
MAINE IN CITY COUNCIL ASSEMBLED AS FOLLOWS:**

- 1. That the Sections 9-2 and 9-3, are hereby amended to read as follows:*

Sec. 9-2. Ranked choice voting; instant runoff tabulation.

For the positions of mayor, city councilor, and school board member-only, the city clerk shall implement a ranked choice voting protocol according to these guidelines:

...

Sec. 9-3. Proportional ranked choice voting for multiple seat elections.

Where a single contest is held to fill two or more seats for the same office, the City Clerk shall implement proportional ranked choice voting according to these guidelines:

(a) Definitions.

- (1) "Active ballot" means a ballot with at least one active candidate ranked ahead of any overvote.

- (2) "Active candidate" means a candidate that has neither been elected nor eliminated, and who has not died, withdrawn, or become disqualified.
- (3) "Active value" means the portion of a vote that a ballot contributes to the highest-ranked active candidate. Each ballot begins with an active value of 1. When a ballot contributes to the election of a candidate, it receives a new active value, as calculated in subsection c.2.
- (4) "Election threshold" means the number of votes sufficient for the election of a candidate. The election threshold equals the total number of active ballots in the first round, divided by the sum of one plus the number of seats to be elected, then adding one and disregarding any fraction.
$$\text{Election Threshold} = [(Total\ Ballots) / (1 + Seats)] + 1, \text{ disregarding any fraction.}$$
- (5) "Overvote" means a circumstance in which a voter has ranked more than one candidate at the same ranking.
- (6) "Ranking" means the number available to be assigned by a voter to a candidate to express the voter's preference for that candidate. The number "1" is the highest ranking, followed by "2" and then "3" and so on.
- (7) "Surplus fraction" means the proportion of a winning candidate's votes that are in excess of the election threshold. To determine the surplus fraction, subtract the election threshold from an elected candidate's vote total, then divide that number by the candidate's vote total, with the result truncated after five decimal places.

Surplus Fraction = (Vote Total - Election Threshold) / Vote Total, truncated after five decimal places.

(b) Ranked Choice Voting Ballot

(1) The ballot shall include all qualified candidates for the election.

(2) The ballot shall include the option to rank at least one write-in candidate. When the number of qualified candidates is less than the number of seats to be filled, the ballot shall include additional write-in lines, such that the sum of listed candidates and write-in lines equals the number of seats to be filled.

(3) To the degree possible, the ballot format and ballot instructions shall match the format of ranked choice ballots issued by the Secretary of State.

(c) Ranked-choice count. The proportional ranked-choice voting count is a public proceeding and shall be promptly conducted by the city clerk and completed within five (5) business days of the election. The count proceeds in rounds until all seats have been filled. In a given round, each active ballot shall count at its current active value for its highest-ranked active candidate.

Any active candidate with a vote count greater than or equal to the election threshold is declared elected, and the round concludes with one of the following actions:

(1) Completion. If the number of elected candidates is equal to the number of seats to be filled in the

contest, tabulation is complete. Alternatively, if the number of elected candidates plus the number of active candidates is less than or equal to the number of seats to be filled, then all active candidates are declared elected, and the tabulation is complete.

- (2) Election round. If one or more candidates are elected, but the tabulation is not complete, each ballot counting for an elected candidate is assigned a new active value by multiplying the current active value by the surplus fraction for the elected candidate, with the result truncated after five decimal places.

*New value = old value x surplus fraction,
truncated after five decimal places.*

A new round begins, in which each ballot held by the elected candidate(s) counts, at each ballot's new active value, for the next-highest-ranked active candidate.

- (3) Elimination round. If no candidate is elected, the active candidate with the fewest votes is eliminated. Any tie must be decided by lot, and the candidate chosen by lot is eliminated. The result of any tie resolution must be recorded and reused in the event of a recount.

A new round begins, in which each ballot held by the eliminated candidate counts, at each ballot's current active value, for the next-highest-ranked active candidate.

(d) Results Reporting. The city clerk shall develop procedures to ensure the timely release of results, including:

- (1) The cast vote record, which provides ballot-level ranking data. The cast-vote record shall be published online in a machine-readable format that can be retrieved, downloaded, indexed, sorted, and searched by commonly used applications.
- (2) The summary report of the ranked-choice count, which provides the number and percentage of votes held by each candidate as well as the number of inactive votes in each round. The summary report shall be presented during the public proceeding of the ranked-choice count and published online.
- (3) Any action to update the cast vote record or the summary report shall occur at a public proceeding, which must be announced at least two hours in advance. Any update shall be published online. Earlier records or reports may not be removed.

(e) Notwithstanding any ordinance to the contrary, the city clerk may adopt additional regulations consistent with Article II, section 3 of the Charter and this section 9-3 to implement these provisions.

(f) If any section, paragraph, sentence, word or phrase of this ordinance is for any reason held to be invalid or unenforceable by any court, such decision shall not affect the validity of the remaining provisions of this ordinance.

~~Whenever two (2) or more persons are to be elected to the same office (a "multiple seat election"), the several persons up to the number to be chosen shall be elected by proportional representation. The City Clerk shall implement a proportional representation voting protocol according to these guidelines:~~

~~(a) The total number of ballots indicating a valid vote for a candidate shall be determined prior to counting of ballots for individual candidates.~~

~~(b) Each candidate shall be credited with one vote for every valid ballot that is sorted to that candidate as first choice, or otherwise credited to that candidate as hereinafter provided, and no ballot shall ever be credited to more than one candidate at the same time.~~

~~(c) A "quota" is the smallest number of votes that any candidate must receive in order to be assured of election without more candidates being elected than there are offices to be filled. A quota will be determined by dividing the total number of valid ballots by one more than the total number of candidates to be elected and adding one to the result, disregarding fractions. Whenever, at any stage of the counting, the number of ballots credited to a candidate becomes equal to the quota, that candidate shall be declared elected, and no ballots in excess of the quota shall be credited to that candidate except as provided in (f) or (l) of this section.~~

~~(d) The ballots shall be sorted according to the first choices marked on them.~~

~~(e) If a candidate is elected while the ballots are being sorted according to first choices, any subsequent ballots that show that candidate as first choice shall each be credited to the second choice marked on it, or, if the second choice also has been elected, to the next choice marked on it for a candidate not yet elected.~~

~~(f) If during the first sorting of ballots, ballots are found that are marked for a candidate already elected as first choice, but show no clear choice for any unelected candidate, such ballots shall at the end of the sorting be given to the candidate of their first choice, and in their place an equal number, as nearly as possible, of the last ballots sorted to that candidate that show a clear choice for unelected candidates, all as determined by the City Clerk, shall be taken and re-sorted to~~

~~unelected candidates as if they were then being sorted for the first time.~~

~~(g) When all the ballots have been thus sorted and credited to the first available choices marked on them, every candidate who is credited with fewer ballots than the number of signatures required for that candidate's nomination shall be declared defeated.~~

~~(h) All the ballots of the candidates thus defeated shall be transferred, each to the candidate indicated on it as next choice among the continuing candidates. A "continuing candidate" is a candidate not as yet either elected or defeated. Any ballot taken for transfer which does not clearly indicate any candidate as next choice among the continuing candidates shall be set aside as "exhausted."~~

~~(i) When all the ballots of the candidates thus defeated have been transferred, the one candidate who is then lowest on the poll shall be declared defeated and all that candidate's ballots transferred in the same way.~~

~~(j) Thereupon the candidate who is then lowest shall be declared defeated and all that candidate's ballots similarly transferred; and in like manner candidates shall be declared defeated one at a time and all their ballots transferred.~~

~~(k) If, when a candidate is to be declared defeated, two or more candidates are tied at the bottom of the poll, that one of the tied candidates shall be declared defeated who was credited with fewest ballots immediately prior to the last transfer of ballots. If two or more of the tied candidates were tied at that stage of the count, also, the second tie shall be decided by referring similarly to the standing of candidates immediately prior to the last transfer of ballots before that. This principle shall be applied successively as many times as may be necessary, a tie shown at any stage of the count being decided by referring to the standing of the tied candidates immediately prior to the last preceding transfer of ballots. In interpreting this and other rules contained in this section the transfer of all ballots from candidates defeated together under rule (g) of this section, and~~

~~the transfer of all ballots from each candidate defeated thereafter shall each constitute a single separate transfer.~~

~~(l) Whenever candidates to the number to be elected have received the quota, any transfer of ballots in progress when the last quota was reached shall be completed, but immediately thereafter all continuing candidates shall be declared defeated and the election shall be at an end. Whenever all ballots of all defeated candidates have been transferred, and it is impossible to defeat another candidate without reducing the continuing candidates below the number still to be elected, all the continuing candidates shall be declared elected and the election shall be at an end.~~

~~(m) A record of the count shall be kept in such form as to show, after each sorting or transfer of ballots, the number thereby credited to each candidate, the number thereby set aside as exhausted, the total for each candidate, the total set aside as exhausted, and the total number of valid ballots found by adding the totals of all candidates and the total set aside as exhausted.~~

~~(n) Every ballot that is transferred from one candidate to another shall be stamped or marked so that its entire course from candidate to candidate can be conveniently traced.~~

~~(o) If at any time after the first sorting of the ballots a ballot is found to have been credited to the wrong candidate, it may be transferred, as part of the transfer that is in progress, to the continuing candidate, if any, to whom it should have been credited at the time the error was made, or, if it should previously have become exhausted, may be set aside as exhausted as part of the transfer that is in progress; provided, that if the number of misplaced ballots found is sufficient to make it possible that any candidate has been wrongly defeated, so much of the sorting and transferring as may be required to correct the error shall be done over again before the count proceeds. If in correcting an error any ballots are re-sorted or re-transferred, every ballot shall be made to take the same course that it took in the original count unless the correction of an error requires its taking a different course. The principles of the rules of~~

~~this section shall apply also to any recount which may be made after the original count has been completed.~~

~~(p) The city clerk may adopt additional regulations consistent with Article II, section 3 of the Charter and this section 9-3 to implement these provisions. The ballot shall contain instructions on how to vote for each office.~~

...



To: Angela Holmes, Westbrook City Clerk
Ashley Rand, Portland City Clerk

From: Debra McDonough, Advocacy Team, League of Women Voters of Maine
Caleb Kleppner, Principal, MK Election Services
Deb Otis, Director of Policy and Research, FairVote
Chris Hughes, Senior Director of Policy, Ranked Choice Voting Resource Center

CC: Anna Kellar, Executive Director, League of Women Voters of Maine
Will Hayward, Advocacy Program Director, League of Women Voters of Maine

Date:

Re: Tabulating Multi-Winner RCV Contests

We are pleased that both Westbrook and Portland have adopted Ranked Choice Voting for municipal elections, and that both municipalities have specified a proportional tabulation for any multi-winner ranked choice contests. However, we would like to bring your attention to an arcane problem with the implementation language, as found in both the [Westbrook City Charter](#) and the [Portland City Code](#). As currently specified, the outcome of a multi-winner RCV election can be affected by the order in which the ballots are processed. This issue can be addressed through an update to the **surplus transfer rule**, which describes the distribution of any excess votes each time a candidate is elected.

It would appear that Portland and Westbrook have both adopted the tabulation rules used in Cambridge, MA. For decades, Cambridge was one of just two U.S jurisdictions using proportional Ranked Choice Voting (pRCV), and the Cambridge elections remain the most well known example of pRCV in the country.¹ Unfortunately, their statutory language dates back to 1941, when all RCV contests were counted manually. The surplus transfer rule specifies that if a candidate reaches the election threshold before all of the ballots have been sorted, any additional votes for this candidate are diverted to the next active candidate on the ballot. This **whole-vote transfer** approach is a bit of an anachronism and is no longer recommended.

¹ Arden, DE has a longer history of pRCV elections, but with a population under 500, their experience hasn't generated the same level of interest.

Modern implementations of pRCV use a process of **fractional transfer** to distribute any surplus votes. Rather than transferring the whole vote associated with whichever ballots happen to be processed last, tabulation software transfers a fraction of every vote assigned to a winning candidate. Fractional transfer ensures that each ballot is treated equitably, and that the outcome of the election will never depend on the order of the ballots.

Fractional transfer of surplus votes is widely considered best practice and is the approach used by [RCTab](#) when tabulating multi-winner pRCV contests. (This is the software package that has been used by MK Voting Solutions to tabulate Portland's single-winner RCV contests.) RCTab meets the Voluntary Voting System Guidelines from the U.S. Election Assistance Commission and is available at no charge from the Ranked Choice Voting Resource Center.

RCTab does not support the whole-vote transfer approach used in Cambridge, so if a multi-winner RCV contest occurs in Portland or Westbrook before it is possible to update the counting rules, alternate software will be required. Cambridge has used [ChoicePlus Pro](#), a software package available from Voting Solutions. This is older software, last updated in 2009 and no longer supported by Voting Solutions. ChoicePlus Pro predates the Voluntary Voting System Guidelines and has not been submitted for federal testing.

Whole vote transfer can also complicate recounts. Processing the ballots in a different order would designate a different set of ballots as 'surplus,' which could be enough to change the outcome of a close race. To prevent this, the ballots must be manually re-ordered to ensure that the ballot order matches the cast vote record from the machine counted election. Cambridge has had 3 such recounts in the past 25 years (2001, 2011 and 2013), and the need to manually re-order ballots has resulted in significant delays.

We recommend replacing the current language describing the tabulation of multi-winner RCV contests with language similar to that found in the City Code of Portland, OR, [Section 2.08.030.C](#).² We are available to assist in evaluating this language and in making any adjustments that may be necessary in the local context.

We can also be available to review the prepared language in advance of any council action, or to assist in presenting the recommended changes to the council and the public. Please do not hesitate to contact us with any further questions – regarding either this recommendation or pRCV more generally.

² We do recommend replacing "four decimal places" with "five decimal places" for contests in which more than 1000 ballots and fewer than 100,000 ballots are expected.

NOTE: These slides are not intended to stand alone without the narrative. If you are reviewing these slides on your own, please consider entering “Presenter View” by clicking the down arrow in the “Slideshow” button and adjusting the display balance between slides and narrative by dragging the bar between them.

If you happen to notice that there are over 100 slides, please don’t panic! Several blocks of slides (eg. 14-21 or 22-27) are essentially a single image built up slide-by-slide – each with just a line or two of narrative – in order to draw your attention to different aspects of the image.

Questions, comments and corrections can be directed to
deb@themcdonoughs.org

A video of this presentation is (will be. . .) available at (link).



Proportional
RANKED
CHOICE
VOTING
STUDY

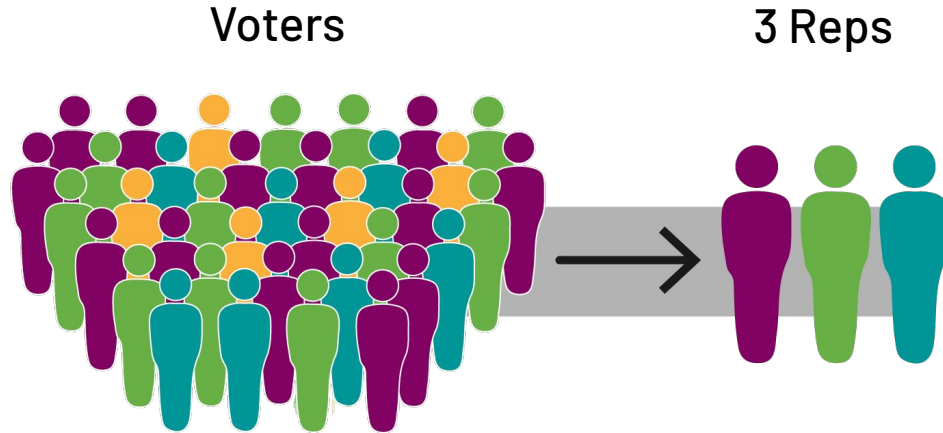


An Annotated pRCV Tabulation

(These slides, along with the speaker notes and a few additional comments, are available at <http://bit.ly/3S7xigt>)

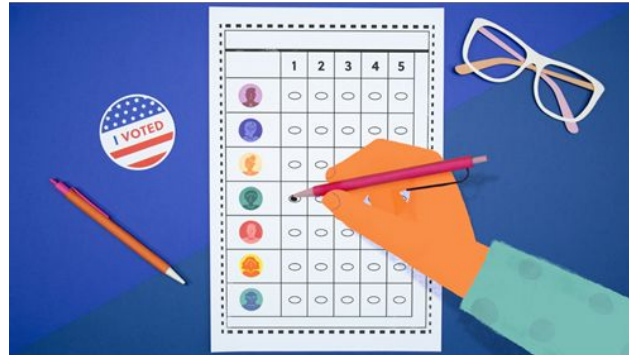
pRCV (proportional Ranked Choice Voting) is

- a multi-winner election method
- designed for proportional representation



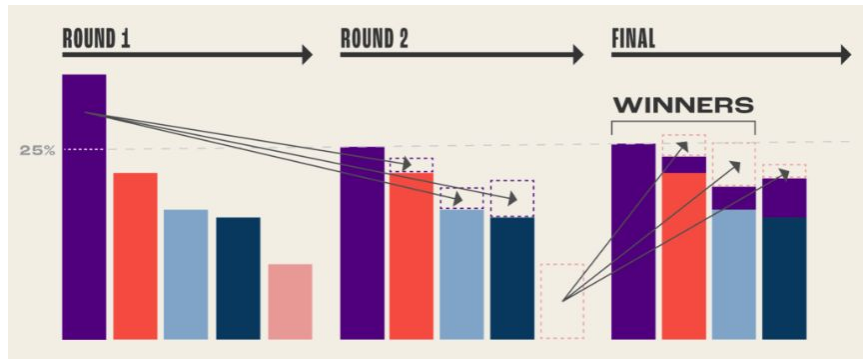
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pRCV (proportional Ranked Choice Voting) is

- a multi-winner election method
- designed for proportional representation
- using standard ranked choice ballots and
- the Single Transferable Vote (STV) counting rules.



	First Choice	
Sheikh-Yousef	1959	(22.4%)
DiMillo	1850	(21.1%)
Chann	1486	(17.0%)
Grant	1088	(12.4%)
Buxton	978	(11.2%)
Bailey	418	(4.8%)
Washburn	378	(4.3%)
Emerson	218	(2.5%)
Houseal	205	(2.3%)
Condrey	175	(2.0%)
Total	8755	(100%)

Portland, ME

Charter Commission Election

June 2021

Four at-large seats

Counting the Votes

Single-Winner RCV (Majority)

- 1) Determine “election threshold”
Always 50% (+ 1 vote)
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Tabulation complete
 - b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
Depends on # of seats
- 2) Run-off rounds
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Counting the Votes

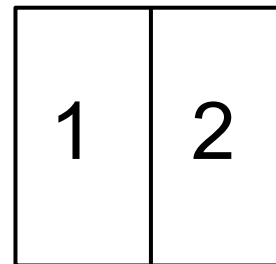
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(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
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Counting the Votes

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Transfer to next choice

(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
Depends on # of seats

1	2
3	4

	First Choice	
Sheikh-Yousef	1959	(22.4%)
DiMillo	1850	(21.1%)
Chann	1486	(17.0%)
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Washburn	378	(4.3%)
Emerson	218	(2.5%)
Houseal	205	(2.3%)
Condrey	175	(2.0%)
Total	8755	(100%)

Step 1: Determine election threshold.

Depends on # of seats

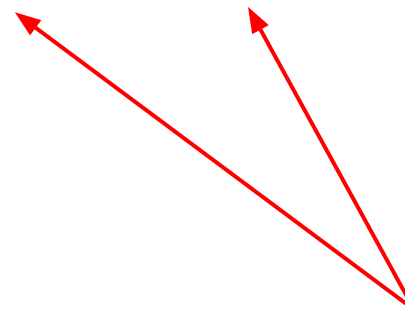
$$Threshold = \left\lfloor \frac{votes}{seats + 1} \right\rfloor + 1$$

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$$Threshold = \left\lfloor \frac{votes}{seats + 1} \right\rfloor + 1$$

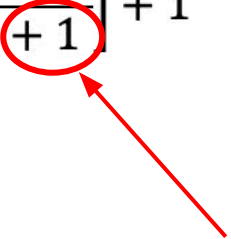


(floor brackets. . .)

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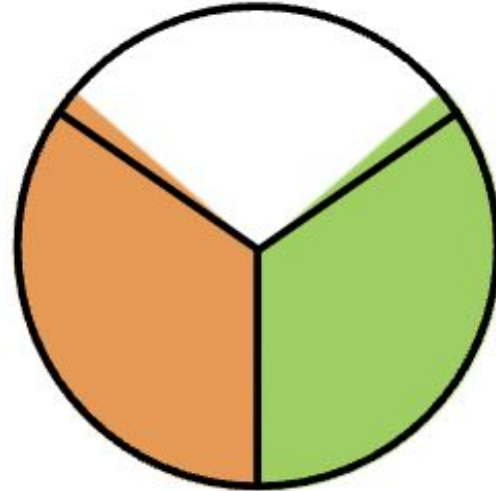
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Step 1: Determine election threshold.

Depends on # of seats

$$Threshold = \left\lfloor \frac{votes}{seats + 1} \right\rfloor + 1$$

2 seats?



	First Choice	
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Total	8755	(100%)

Step 1: Determine election threshold.

Depends on # of seats

$$\text{Threshold} = \left\lfloor \frac{\text{votes}}{\text{seats} + 1} \right\rfloor + 1$$

$$= \left\lfloor \frac{8755}{4 + 1} \right\rfloor + 1$$

(This was a 4-seat election.)

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Total	8755	(100%)

Step 1: Determine election threshold.

Depends on # of seats

$$\text{Threshold} = \left\lfloor \frac{\text{votes}}{\text{seats} + 1} \right\rfloor + 1$$

$$= \left\lfloor \frac{8755}{4 + 1} \right\rfloor + 1$$

$$= \lfloor 1751.0 \rfloor + 1$$

$$= 1751 + 1$$

$$= 1752$$

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Step 1: Determine election threshold.

Depends on # of seats

$$Threshold = \left\lfloor \frac{votes}{seats + 1} \right\rfloor + 1$$

$$= \left\lfloor \frac{8755}{4 + 1} \right\rfloor + 1$$

$$= \lfloor 1751.0 \rfloor + 1$$

$$= 1751 + 1$$

$$= 1752$$

Counting the Votes

Single-Winner RCV (Majority)

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Always 50% (+ 1 vote)
- 2) Run-off rounds
 - a) Cross threshold? → Elected
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Multi-Winner pRCV (Proportional)

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Depends on # of seats
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Surplus transfer
 - b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Counting the Votes

Single-Winner RCV (Majority)

- 1) Determine “election threshold”
Always 50% (+ 1 vote)
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Tabulation complete
 - b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
Depends on # of seats
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Surplus transfer
 - b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Counting the Votes

Single-Winner RCV (Majority)

- 1) Determine “election threshold”
Always 50% (+ 1 vote)
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Tabulation complete
 - b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
Depends on # of seats
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Surplus transfer
 - b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Counting the Votes

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- 1) Determine “election threshold”
Always 50% (+ 1 vote)
- 2) Run-off rounds

a) Cross threshold? → Elected
Tabulation complete

b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
Depends on # of seats
- 2) Run-off rounds

a) Cross threshold? → Elected
Surplus transfer

b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

Counting the Votes

Single-Winner RCV (Majority)

- 1) Determine “election threshold”
Always 50% (+ 1 vote)
 - 2) Run-off rounds
 - a) Cross threshold? → Elected
Tabulation complete
 - b) No winner? → Eliminate lowest
Transfer to next choice
- (Repeat as needed.)

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Transfer to next choice
- (Repeat as needed.)

Counting the Votes

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Always 50% (+ 1 vote)
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Tabulation complete

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Transfer to next choice

(Repeat as needed.)

Multi-Winner pRCV (Proportional)

- 1) Determine “election threshold”
Depends on # of seats
- 2) Run-off rounds
 - a) Cross threshold? → Elected
Surplus transfer

- b) No winner? → Eliminate lowest
Transfer to next choice

(Repeat as needed.)

	First Choice	
Sheikh-Yousef	1959	(22.4%)
DiMillo	1850	(21.1%)
Chann	1486	(17.0%)
Grant	1088	(12.4%)
Buxton	978	(11.2%)
Bailey	418	(4.8%)
Washburn	378	(4.3%)
Emerson	218	(2.5%)
Houseal	205	(2.3%)
Condrey	175	(2.0%)
Total	8755	(100%)

Step 1: Determine election threshold.

Depends on # of seats

$$Threshold = \left\lfloor \frac{votes}{seats + 1} \right\rfloor + 1$$

$$= \left\lfloor \frac{8755}{4 + 1} \right\rfloor + 1$$

$$= \lfloor 1751.0 \rfloor + 1$$

$$= 1751 + 1$$

$$= 1752$$

	Round 1	
Sheikh-Yousef	1959	(22.4%)
DiMillo	1850	(21.1%)
Chann	1486	(17.0%)
Grant	1088	(12.4%)
Buxton	978	(11.2%)
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Emerson	218	(2.5%)
Houseal	205	(2.3%)
Condrey	175	(2.0%)
Total	8755	(100%)

Round 1: Sheik-Yousef and DiMillo elected
→ Surplus Distribution

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175
Total	8755

Round 1a: Sheik-Yousef elected → Surplus Distribution

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175
Total	8755

Round 1a: Sheik-Yousef elected → Surplus Distribution

She has 1959 votes. The threshold is 1752.

$$1959 - 1752 = 207 \text{ surplus votes.}$$

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175
Total	8755

Round 1a: Sheik-Yousef elected → Surplus Distribution

She has 1959 votes. The threshold is 1752.

$1959 - 1752 = 207$ surplus votes.

Historically? **Randomly** choose 207 ballots to transfer.

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175
Total	8755

Round 1a: Sheik-Yousef elected → Surplus Distribution

She has 1959 votes. The threshold is 1752.

~~1959 - 1752 = 207 surplus votes.~~

~~Historically? Randomly choose 207 ballots to transfer.~~

Math to the rescue!

It “costs” 1752 votes to elect a candidate.

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
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Round 1a: Sheik-Yousef elected → Surplus Distribution

She has 1959 votes. The threshold is 1752.

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~~Historically? Randomly choose 207 ballots to transfer.~~

Math to the rescue!

It “costs” 1752 votes to elect a candidate.

$$1752/1959 = 89.43\%$$

“Spend” 89.43% electing Sheikh-Yousef.

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
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Washburn	378
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Condrey	175
Total	8755

Round 1a: Sheik-Yousef elected → Surplus Distribution

She has 1959 votes. The threshold is 1752.

~~1959 - 1752 = 207 surplus votes.~~

~~Historically? Randomly choose 207 ballots to transfer.~~

Math to the rescue!

It “costs” 1752 votes to elect a candidate.

$$1752/1959 = 89.43\%$$

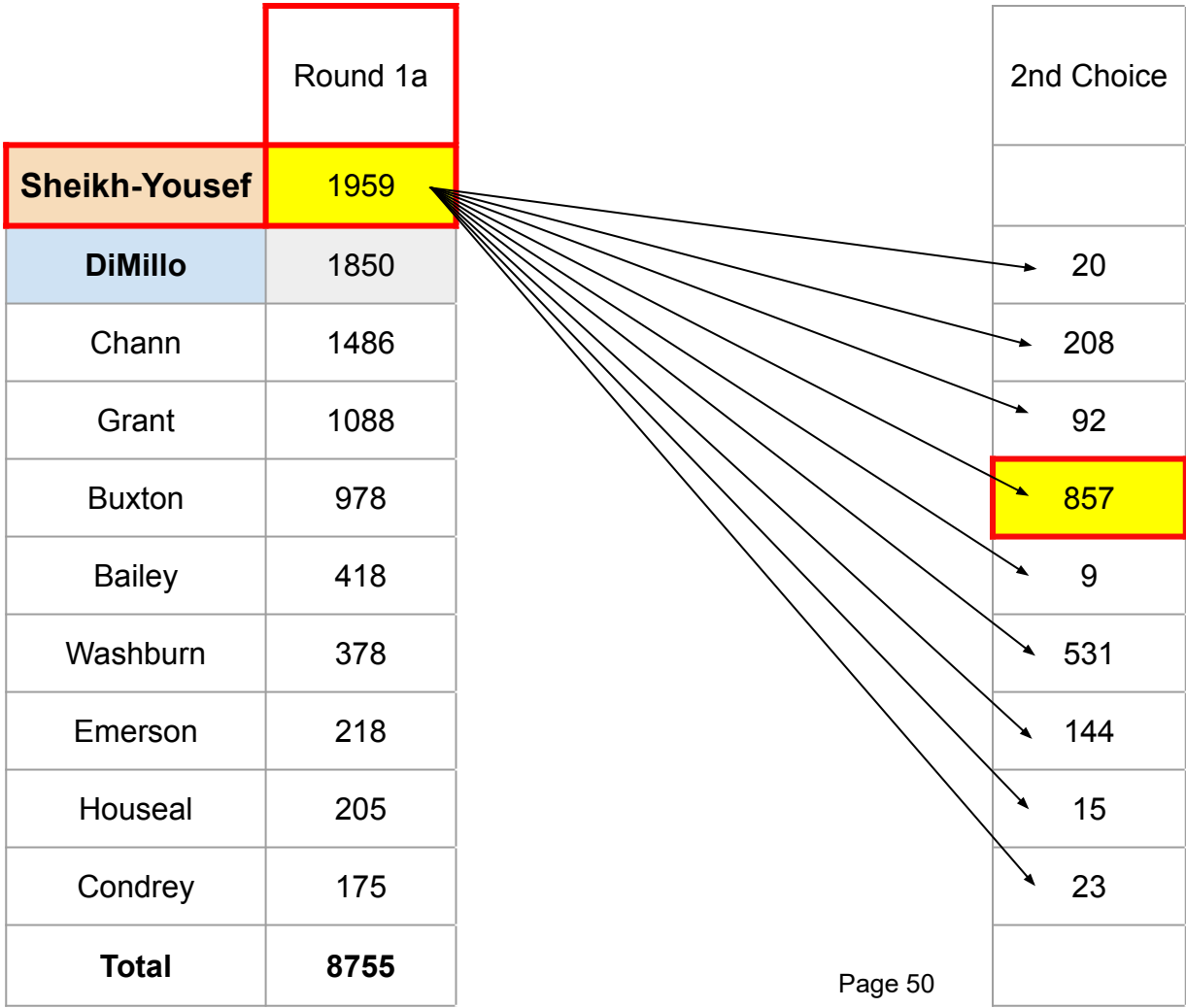
“Spend” 89.43% electing Sheikh-Yousef.

Transfer the “change”.

	A	B	C	
1	PCC - Choice 1	PCC - Choice 2	PCC - Choice 3	PCC - Choice 4
2	Buxton, Catherine A.	Chann, Marpheen S.	Sheikh-Yousef, Nasreen A.	Emerson, Anthony M.
3	Chann, Marpheen S.	Sheikh-Yousef, Nasreen A.	undervote	undervote
4	Buxton, Catherine A.	Sheikh-Yousef, Nasreen A.	Emerson, Anthony M.	Washburn, William H.
5	Sheikh-Yousef, Nasreen A.	Chann, Marpheen S.	undervote	undervote
6	Condrey, Lawson T.	Chann, Marpheen S.	Grant, Benjamin K.	DiMillo, Steven A.
7	Sheikh-Yousef, Nasreen A.	Buxton, Catherine A.	Grant, Benjamin K.	Chann, Marpheen S.
8	DiMillo, Steven A.	Bailey, William M.	Houseal, Ian P.	Grant, Benjamin K.
9	Chann, Marpheen S.	Houseal, Ian P.	undervote	undervote
10	Grant, Benjamin K.	Condrey, Lawson T.	Chann, Marpheen S.	Washburn, William H.
11	Sheikh-Yousef, Nasreen A.	DiMillo, Steven A.	Emerson, Anthony M.	Chann, Marpheen S.
12	Chann, Marpheen S.	Buxton, Catherine A.	Houseal, Ian P.	Condrey, Lawson T.
13	Sheikh-Yousef, Nasreen A.	undervote	undervote	undervote
14	Chann, Marpheen S.	Grant, Benjamin K.	Houseal, Ian P.	Buxton, Catherine A.
15	Houseal, Ian P.	Grant, Benjamin K.	Chann, Marpheen S.	DiMillo, Steven A.

	A	B	C	
1	PCC - Choice 1	PCC - Choice 2	PCC - Choice 3	PCC - Choice 4
2	Buxton, Catherine A.	Chann, Marpheen S.	Sheikh-Yousef, Nasreen A.	Emerson, Anthony M.
3	Chann, Marpheen S.	Sheikh-Yousef, Nasreen A.	undervote	undervote
4	Buxton, Catherine A.	Sheikh-Yousef, Nasreen A.	Emerson, Anthony M.	Washburn, William H.
5	Sheikh-Yousef, Nasreen A.	Chann, Marpheen S.	undervote	undervote
6	Condrey, Lawson T.	Chann, Marpheen S.	Grant, Benjamin K.	DiMillo, Steven A.
7	Sheikh-Yousef, Nasreen A.	Buxton, Catherine A.	Grant, Benjamin K.	Chann, Marpheen S.
8	DiMillo, Steven A.	Bailey, William M.	Houseal, Ian P.	Grant, Benjamin K.
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	Round 1a	2nd Choice
Sheikh-Yousef	1959	
DiMillo	1850	20
Chann	1486	208
Grant	1088	92
Buxton	978	857
Bailey	418	9
Washburn	378	531
Emerson	218	144
Houseal	205	15
Condrey	175	23
Total	8755	



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Total	8755	1899?

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Houseal	205		15
Condrey	175		23
Inactive	288		60

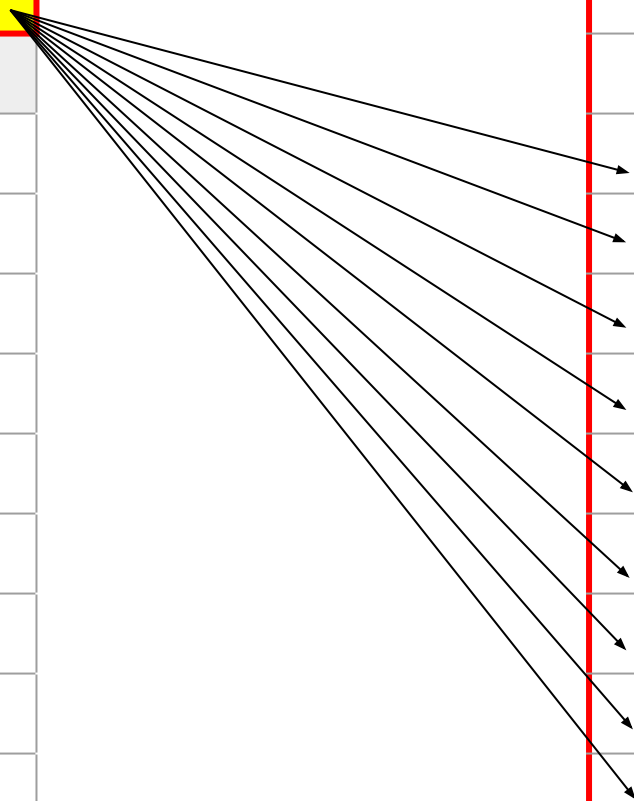
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Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175
Inactive	288

2nd Choice	3rd Choice	'Next' Choice
20		
208	+ 3 =	211
92	+ 2 =	94
857	+ 4 =	861
9	+ 4 =	13
531	+ 3 =	534
144	+ 1 =	145
15	+ 0 =	15
23	+ 0 =	23
60	+ 3 =	63

	Round 1a
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175
Inactive	288



'Next' Choice	x Fraction	Votes to transfer
211		
94		
861		
13		
534		
145		
15		
23		
63		

	Round 1a	Transfer from Sheikh-Yousef	Round 1b
Sheikh-Yousef	1959	x 89.43% =	1752
DiMillo	1850		
Chann	1486		
Grant	1088		
Buxton	978		
Bailey	418		
Washburn	378		
Emerson	218		
Houseal	205		
Condrey	175		
Inactive	288		

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94		
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63		

	Round 1a	Transfer from Sheikh-Yousef	Round 1b
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Grant	1088		
Buxton	978		
Bailey	418		
Washburn	378		
Emerson	218		
Houseal	205		
Condrey	175		
Inactive	288		

'Next' Choice	x Fraction	Votes to transfer
211	x 10.57% =	22.29
94	x 10.57% =	9.93
861	x 10.57% =	90.97
13	x 10.57% =	1.37
534	x 10.57% =	56.42
145	x 10.57% =	15.32
15	x 10.57% =	1.58
23	x 10.57% =	2.43
63	x 10.57% =	6.66

	Round 1a	Transfer from Sheikh-Yousef	Round 1b
Sheikh-Yousef	1959	x 89.43% =	1752
DiMillo	1850		1850
Chann	1486	+ 22.29 =	1508.29
Grant	1088	+ 9.93 =	1097.93
Buxton	978	+ 90.97 =	1068.97
Bailey	418	+ 1.37 =	419.37
Washburn	378	+ 56.42 =	434.42
Emerson	218	+ 15.32 =	233.32
Houseal	205	+ 1.58 =	206.58
Condrey	175	+ 2.43 =	177.43
Inactive	288	+ 6.66 =	294.66

'Next' Choice	x Fraction	Votes to transfer
211	x 10.57% =	22.29
94	x 10.57% =	9.93
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	Round 1a	Transfer from Sheikh-Yousef	Round 1b
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Inactive	288	+ 6.66 =	294.66

Progressive

	Round 1a	Transfer from Sheikh-Yousef	Round 1b
Sheikh-Yousef	1959	x 89.43% =	1752
DiMillo	1850		1850
Chann	1486	+ 22.29 =	1508.29
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Condrey	175	+ 2.43 =	177.43
Inactive	288	+ 6.66 =	294.66

Round 1b: DiMillo Elected → Surplus Transfer

It “costs” 1752 votes to elect a candidate.

$$1752/1850 = 94.70\%$$

“Spend” 94.70% electing DiMillo.

Transfer the “change”.

	Round 1a	Transfer from Sheikh-Yousef	Round 1b	Transfer from DiMillo	Round 2
Sheikh-Yousef	1959	x 89.43% =	1752		1752
DiMillo	1850		1850	x 94.70% =	1752
Chann	1486	+ 22.29 =	1508.29		
Grant	1088	+ 9.93 =	1097.93		
Buxton	978	+ 90.97 =	1068.97		
Bailey	418	+ 1.37 =	419.37		
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Progressive

	Round 1a	Transfer from Sheikh-Yousef	Round 1b	Transfer from DiMillo	Round 2
Sheikh-Yousef	1959	x 89.43% =	1752		1752
DiMillo	1850		1850	x 94.70% =	1752
Chann	1486	+ 22.29 =	1508.29	+ 16.63 =	1524.93
Grant	1088	+ 9.93 =	1097.93	+ 8.69 =	1106.62
Buxton	978	+ 90.97 =	1068.97	+ 3.44 =	1072.42
Bailey	418	+ 1.37 =	419.37	+ 32.26 =	451.63
Washburn	378	+ 56.42 +	434.42	+ 1.70 =	436.12
Emerson	218	+ 15.32 =	233.32	+ 2.01 =	235.33
Houseal	205	+ 1.58 =	206.58	+ 5.88 =	212.46
Condrey	175	+ 2.43 =	177.43	+ 3.60 =	181.03
Inactive	288	+ 6.66 =	294.66	+ 23.78 =	318.44

Progressive

	Round 1a	Transfer from Sheikh-Yousef	Round 1b	Transfer from DiMillo	Round 2
Sheikh-Yousef	1959	x 89.43% =	1752		1752
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Progressive

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Progressive

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Houseal	205	+ 1.58 =	206.58	+ 5.88 =	212.46
Condrey	175	+ 2.43 =	177.43	+ 3.60 =	181.03
Inactive	288	+ 6.66 =	294.66	+ 23.78 =	318.44

Progressive

	Round 1a	Transfer from Sheikh-Yousef	Round 1b	Transfer from DiMillo	Round 2
Sheikh-Yousef	1959	x 89.43% =	1752		1752
DiMillo	1850		1850	x 94.70% =	1752
Chann	1486	+ 22.29 =	1508.29	+ 16.63 =	1524.93
Grant	1088	+ 9.93 =	1097.93	+ 8.69 =	1106.62
Buxton	978	+ 90.97 =	1068.97	+ 3.44 =	1072.42
Bailey	418	+ 1.37 =	419.37	+ 32.26 =	451.63
Washburn	378	+ 56.42 =	434.42	+ 1.70 =	436.12
Emerson	218	+ 15.32 =	233.32	+ 2.01 =	235.33
Houseal	205	+ 1.58 =	206.58	+ 5.88 =	212.46
Condrey	175	+ 2.43 =	177.43	+ 3.60 =	181.03
Inactive	288	+ 6.66 =	294.66	+ 23.78 =	318.44

Progressive
Conservative

	Round 1a	Transfer from Sheikh-Yousef	Round 1b	Transfer from DiMillo	Round 2
Sheikh-Yousef	1959	x 89.43% =	1752		1752
DiMillo	1850		1850	x 94.70% =	1752
Chann	1486	+ 22.29 =	1508.29	+ 16.63 =	1524.93
Grant	1088	+ 9.93 =	1097.93	+ 8.69 =	1106.62
Buxton	978	+ 90.97 =	1068.97	+ 3.44 =	1072.42
Bailey	418	+ 1.37 =	419.37	+ 32.26 =	451.63
Washburn	378	+ 56.42 +	434.42	+ 1.70 =	436.12
Emerson	218	+ 15.32 =	233.32	+ 2.01 =	235.33
Houseal	205	+ 1.58 =	206.58	+ 5.88 =	212.46
Condrey	175	+ 2.43 =	177.43	+ 3.60 =	181.03
Inactive	288	+ 6.66 =	294.66	+ 23.78 =	318.44

Progressive
Conservative

	Round 1a	Transfer from Sheikh-Yousef	Round 1b	Transfer from DiMillo	Round 2
Sheikh-Yousef	1959	x 89.43% =	1752		1752
DiMillo	1850		1850	x 94.70% =	1752
Chann	1486	+ 22.29 =	1508.29	+ 16.63 =	1524.93
Grant	1088	+ 9.93 =	1097.93	+ 8.69 =	1106.62
Buxton	978	+ 90.97 =	1068.97	+ 3.44 =	1072.42
Bailey	418	+ 1.37 =	419.37	+ 32.26 =	451.63
Washburn	378	+ 56.42 =	434.42	+ 1.70 =	436.12
Emerson	218	+ 15.32 =	233.32	+ 2.01 =	235.33
Houseal	205	+ 1.58 =	206.58	+ 5.88 =	212.46
Condrey	175	+ 2.43 =	177.43	+ 3.60 =	181.03
Inactive	288	+ 6.66 =	294.66	+ 23.78 =	318.44

Progressive
Center
Conservative

	Round 1a	Round 1b	Round 2
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1524.93
Grant	1088	1097.93	1106.62
Buxton	978	1068.97	1072.42
Bailey	418	419.37	451.63
Washburn	378	434.42	436.12
Emerson	218	233.32	235.33
Houseal	205	206.58	212.46
Condrey	175	177.43	181.03
Inactive	288	294.66	318.44

Round 2:

	Round 1a	Round 1b	Round 2
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1524.93
Grant	1088	1097.93	1106.62
Buxton	978	1068.97	1072.42
Bailey	418	419.37	451.63
Washburn	378	434.42	436.12
Emerson	218	233.32	235.33
Houseal	205	206.58	212.46
Condrey	175	177.43	181.03
Inactive	288	294.66	318.44

Round 2: Condrey Eliminated

	Round 1a	Round 1b	Round 2
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1524.93
Grant	1088	1097.93	1106.62
Buxton	978	1068.97	1072.42
Bailey	418	419.37	451.63
Washburn	378	434.42	436.12
Emerson	218	233.32	235.33
Houseal	205	206.58	212.46
Condrey	175	177.43	181.03
Inactive	288	294.66	318.44

Round 2: Condrey Eliminated

He has 175 whole votes. . .

	Round 1a	Round 1b	Round 2
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1524.93
Grant	1088	1097.93	1106.62
Buxton	978	1068.97	1072.42
Bailey	418	419.37	451.63
Washburn	378	434.42	436.12
Emerson	218	233.32	235.33
Houseal	205	205.58	212.46
Condrey	175	177.43	181.03
Inactive	288	294.66	318.44

Round 2: Condrey Eliminated

He has 175 whole votes, **and 6.03 votes in “change.”**

	Round 1a	Round 1b	Round 2
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1524.93
Grant	1088	1097.93	1106.62
Buxton	978	1068.97	1072.42
Bailey	418	419.37	451.63
Washburn	378	434.42	436.12
Emerson	218	233.32	235.33
Houseal	205	206.58	212.46
Condrey	175	177.43	181.03
Inactive	288	294.66	318.44

Round 6: Bailey Eliminated

Round 5: Washburn Eliminated

Round 4: Emerson Eliminated

Round 3: Houseal Eliminated

Round 2: Condrey Eliminated

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Round 3
Sheikh-Yousef	1959	1752	1752		1752
DiMillo	1850	1850	1752		1752
Chann	1486	1508.29	1524.93	+ 33.85	1558.77
Grant	1088	1097.93	1106.62	+ 30.69	1137.31
Buxton	978	1068.97	1072.42	+ 40.90	1113.32
Bailey	418	419.37	451.63	+ 13.58	465.21
Washburn	378	434.42	436.12	+ 13.37	449.49
Emerson	218	233.32	235.33	+ 14.26	249.60
Houseal	205	206.58	212.46	+ 10.53	222.99
Condrey	175	177.43	181.03	- 181.03	0
Inactive	288	294.66	318.44	+ 23.85	342.29

Progressive
Center
Conservative

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Round 4
Sheikh-Yousef	1959	1752	1752			1752
DiMillo	1850	1850	1752			1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	1621.16
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	1189.31
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	1126.90
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	519.81
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	459.59
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	252.76
Houseal	205	206.58	212.46	+ 10.53	- 222.99	0
Condrey	175	177.43	181.03	- 181.03		0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	369.45

Progressive
Center
Conservative

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Round 5
Sheikh-Yousef	1959	1752	1752				1752
DiMillo	1850	1850	1752				1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	1652.85
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	1214.64
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	1218.03
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	530.50
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	527.51
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77	0
Houseal	205	206.58	212.46	+ 10.53	- 222.99		0
Condrey	175	177.43	181.03	- 181.03			0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	395.46

Progressive
Center
Conservative

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Round 5
Sheikh-Yousef	1959	1752	1752				1752
DiMillo	1850	1850	1752				1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	1652.85
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	1214.64
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	1218.03
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	530.50
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	527.51
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77	0
Houseal	205	206.58	212.46	+ 10.53	- 222.99		0
Condrey	175	177.43	181.03	- 181.03			0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	395.46

Progressive
Center
Conservative

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Round 5
Sheikh-Yousef	1959	1752	1752				1752
DiMillo	1850	1850	1752				1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	1652.85
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	1214.64
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	1218.03
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	530.50
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	527.51
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77	0
Houseal	205	206.58	212.46	+ 10.53	- 222.99		0
Condrey	175	177.43	181.03	- 181.03			0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	395.46



Progressive
Center
Conservative

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Transfer from Washburn	Round 6
Sheikh-Yousef	1959	1752	1752					1752
DiMillo	1850	1850	1752					1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	+ 48.07	1700.92
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	+ 62.85	1277.49
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	+ 373.57	1591.60
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	+ 10.85	541.35
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	- 527.51	0
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77		0
Houseal	205	206.58	212.46	+ 10.53	- 222.99			0
Condrey	175	177.43	181.03	- 181.03				0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	+ 32.17	427.63

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Transfer from Washburn	Round 6
Sheikh-Yousef	1959	1752	1752					1752
DiMillo	1850	1850	1752					1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	+ 48.07	1700.92
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	+ 62.85	1277.49
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	+ 373.57	1591.60
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	+ 10.85	541.35
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	- 527.51	0
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77		0
Houseal	205	206.58	212.46	+ 10.53	- 222.99			0
Condrey	175	177.43	181.03	- 181.03				0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	+ 32.17	427.63

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Transfer from Washburn	Round 6
Sheikh-Yousef	1959	1752	1752					1752
DiMillo	1850	1850	1752					1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	+ 48.07	1700.92
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	+ 62.85	1277.49
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	+ 373.57	1591.60
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	+ 10.85	541.35
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	- 527.51	0
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77		0
Houseal	205	206.58	212.46	+ 10.53	- 222.99			0
Condrey	175	177.43	181.03	- 181.03				0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	+ 32.17	427.63

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Transfer from Washburn	Transfer from Bailey	Round 7
Sheikh-Yousef	1959	1752	1752						1752
DiMillo	1850	1850	1752						1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	+ 48.07	+ 211.84	1922.76
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	+ 62.85	+ 81.67	1359.16
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	+ 373.57	+ 56.44	1648.04
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	+ 10.85	- 541.35	0
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	- 527.51		0
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77			0
Houseal	205	206.58	212.46	+ 10.53	- 222.99				0
Condrey	175	177.43	181.03	- 181.03					0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	+ 32.17	+ 181.39	609.02

	Round 1a	Round 1b	Round 2	Transfer from Condrey	Transfer from Houseal	Transfer from Emerson	Transfer from Washburn	Transfer from Bailey	Round 7
Sheikh-Yousef	1959	1752	1752						1752
DiMillo	1850	1850	1752						1752
Chann	1486	1508.29	1524.93	+ 33.85	+ 62.38	+ 31.69	+ 48.07	+ 211.84	1922.76
Grant	1088	1097.93	1106.62	+ 30.69	+ 52.01	+ 25.32	+ 62.85	+ 81.67	1359.16
Buxton	978	1068.97	1072.42	+ 40.90	+ 13.58	+ 91.13	+ 373.57	+ 56.44	1648.04
Bailey	418	419.37	451.63	+ 13.58	+ 54.60	+ 10.69	+ 10.85	- 541.35	0
Washburn	378	434.42	436.12	+ 13.37	+ 10.11	+ 67.92	- 527.51		0
Emerson	218	233.32	235.33	+ 14.26	+ 3.16	- 252.77			0
Houseal	205	206.58	212.46	+ 10.53	- 222.99				0
Condrey	175	177.43	181.03	- 181.03					0
Inactive	288	294.66	318.44	+ 23.85	+ 27.16	+ 26.01	+ 32.17	+ 181.39	609.02

	Round 1a	Round 1b	Round 7
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1922.76
Grant	1088	1097.93	1359.16
Buxton	978	1068.97	1648.04
Bailey	418	419.37	0
Washburn	378	434.42	0
Emerson	218	233.32	0
Houseal	205	206.58	0
Condrey	175	177.43	0
Inactive	288	294.66	609.02

Round 7: Chann elected → Surplus Distribution

It “costs” 1752 votes to elect a candidate.

$$1752/1922.76 = 91.12\%$$

“Spend” 91.12% electing Chann.

Transfer the “Change”.

	Round 1a	Round 1b	Round 7
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1922.76
Grant	1088	1097.93	1359.16
Buxton	978	1068.97	1648.04
Bailey	418	419.37	0
Washburn	378	434.42	0
Emerson	218	233.32	0
Houseal	205	206.58	0
Condrey	175	177.43	0
Inactive	288	294.66	609.02

Round 7: Chann elected → Surplus Distribution

It “costs” 1752 votes to elect a candidate.

$$1752/1922.76 = 91.12\%$$

“Spend” 91.12% electing Chann.

Transfer the “Change”.

Chann’s 1922.76 vote total includes:

**1486 whole votes with Chann marked first
+ 372 whole votes from eliminated candidates**

	Round 1a	Round 1b	Round 7
Sheikh-Yousef	1959	1752	1752
DiMillo	1850	1850	1752
Chann	1486	1508.29	1922.76
Grant	1088	1097.93	1359.16
Buxton	978	1068.97	1648.04
Bailey	418	419.37	0
Washburn	378	434.42	0
Emerson	218	233.32	0
Houseal	205	206.58	0
Condrey	175	177.43	0
Inactive	288	294.66	609.02

Round 7: Chann elected → Surplus Distribution

It “costs” 1752 votes to elect a candidate.

$$1752/1922.76 = 91.12\%$$

“Spend” 91.12% electing Chann.

Transfer the “Change”.

(and the change of change. . .)

Chann’s 1922.76 vote total includes:

1486 full ballots with Chann marked first
+ 372 full ballots from eliminated candidates
+ 64.76 in partials from S-Y or DiMillo
(some by way of an elimination)

	Round 1a	Round 1b	Round 7	Transfer from Chann	Round 8
Sheikh-Yousef	1959	1752	1752		1752
DiMillo	1850	1850	1752		1752
Chann	1486	1508.29	1922.76	x 91.12% =	1752
Grant	1088	1097.93	1359.16	+ 78.39 =	1437.56
Buxton	978	1068.97	1648.04	+ 46.68 =	1694.72
Bailey	418	419.37	0		0
Washburn	378	434.42	0		0
Emerson	218	233.32	0		0
Houseal	205	206.58	0		0
Condrey	175	177.43	0		0
Inactive	288	294.66	609.02	+ 45.67 =	654.69

Round 7: Chann elected
→ Surplus Distribution



Progressive
Center
Conservative

	Round 1a	Round 1b	Round 7	Round 8
Sheikh-Yousef	1959	1752	1752	1752
DiMillo	1850	1850	1752	1752
Chann	1486	1508.29	1922.76	1752
Grant	1088	1097.93	1359.16	1437.56
Buxton	978	1068.97	1648.04	1694.72
Bailey	418	419.37	0	0
Washburn	378	434.42	0	0
Emerson	218	233.32	0	0
Houseal	205	206.58	0	0
Condrey	175	177.43	0	0
Inactive	288	294.66	609.02	654.69

Round 8: Buxton elected

... because she has more votes than Grant.



Progressive
Center
Conservative

. . . but is it proportional?

	Round 1a	Round 1b	Round 7	Round 8
Sheikh-Yousef	1959	1752	1752	1752
DiMillo	1850	1850	1752	1752
Chann	1486	1508.29	1922.76	1752
Grant	1088	1097.93	1359.16	1437.56
Buxton	978	1068.97	1648.04	1694.72
Bailey	418	419.37	0	0
Washburn	378	434.42	0	0
Emerson	218	233.32	0	0
Houseal	205	206.58	0	0
Condrey	175	177.43	0	0

Progressive
Center
Conservative

. . . but is it proportional?

	1st Choice
Sheikh-Yousef	1959
DiMillo	1850
Chann	1486
Grant	1088
Buxton	978
Bailey	418
Washburn	378
Emerson	218
Houseal	205
Condrey	175

	Voters	
Progressive	3533	40.4%
Center	2574	29.4%
Conservative	2268	25.9%
Others	380	4.3%

... but is it proportional?

	1st Choice	pRCV
Sheikh-Yousef	1959	1752
DiMillo	1850	1752
Chann	1486	1752
Grant	1088	1437.56
Buxton	978	1694.72
Bailey	418	0
Washburn	378	0
Emerson	218	0
Houseal	205	0
Condrey	175	0

	Voters		Seats	
Progressive	3533	40.4%	2	50%
Center	2574	29.4%	1	25%
Conservative	2268	25.9%	1	25%
Others	380	4.3%		

Is pRCV more proportional than other options? “Last-N-Standing”

	1st Choice	pRCV
Sheikh-Yousef	1959	1752
DiMillo	1850	1752
Chann	1486	1752
Grant	1088	1437.56
Buxton	978	1694.72
Bailey	418	0
Washburn	378	0
Emerson	218	0
Houseal	205	0
Condrey	175	0

“Last-4-Standing” would have elected these four, giving the fourth seat to Grant.

	Voters	
Progressive	3533	40.4%
Center	2574	29.4%
Conservative	2268	25.9%
Others	380	4.3%

Is pRCV more proportional than other options? “Last-N-Standing”

	1st Choice	pRCV
Sheikh-Yousef	1959	1752
DiMillo	1850	1752
Chann	1486	1752
Grant	1088	1437.56
Buxton	978	1694.72
Bailey	418	0
Washburn	378	0
Emerson	218	0
Houseal	205	0
Condrey	175	0

“Last-N-Standing” would have elected these four, giving the fourth seat to Grant.

~30% of the vote → 50% of the seats

~40% of the vote → 25% of the seats

	Voters	
Progressive	3533	40.4%
Center	2574	29.4%
Conservative	2268	25.9%
Others	380	4.3%

Is pRCV more proportional than other options? Sequential RCV

	1st Choice	pRCV	Sequential
Sheikh-Yousef	1959	Round 1	Cycle 2
DiMillo	1850	Round 2	
Chann	1486	Round 7	Cycle 1
Grant	1088		
Buxton	978	Round 8	Cycle 3
Bailey	418		
Washburn	378		Cycle 4
Emerson	218		
Houseal	205		
Condrey	175		

	Voters	
Progressive	3533	40.4%
Center	2574	29.4%
Conservative	2268	25.9%
Others	380	4.3%

Is pRCV more proportional than other options? Sequential RCV

	1st Choice	pRCV	Sequential
Sheikh-Yousef	1959	Round 1	Cycle 2
DiMillo	1850	Round 2	??????
Chann	1486	Round 7	Cycle 1
Grant	1088		
Buxton	978	Round 8	Cycle 3
Bailey	418		
Washburn	378		Cycle 4
Emerson	218		
Houseal	205		
Condrey	175		

	Voters	
Progressive	3533	40.4%
Center	2574	29.4%
Conservative	2268	25.9%
Others	380	4.3%

Is pRCV more proportional than other options? “SNTV”

	SNTV	pRCV	Sequential
Sheikh-Yousef	1959	Round 1	Cycle 2
DiMillo	1850	Round 2	
Chann	1486	Round 7	Cycle 1
Grant	1088		
Buxton	978	Round 8	Cycle 3
Bailey	418		
Washburn	378		Cycle 4
Emerson	218		
Houseal	205		
Condrey	175		

Charter Commission

Vote for one.

- ☐ Bailey
- ☐ Buxton
- ☐ Chann
- ☐ Condrey
- ☐ Emerson
- ☐ Grant
- ☐ Houseal
- ☐ Sheikh-Yousef
- ☐ Washburn

Is pRCV more proportional than other options? “SNTV”

	SNTV	pRCV	Sequential
Sheikh-Yousef	1959	Round 1	Cycle 2
DiMillo	1850	Round 2	
Chann	1486	Round 7	Cycle 1
Grant	1088		
Buxton	978	Round 8	Cycle 3
Bailey	418		
Washburn	378		Cycle 4
Emerson	218		
Houseal	205		
Condrey	175		

	Voters	
Progressive	3533	40.4%
Center	2574	29.4%
Conservative	2268	25.9%
Others	380	4.3%

Is it more proportional than other options? “Vote-for-N”

	SNTV	pRCV	Sequential
Sheikh-Yousef	1959	Round 1	Cycle 2
DiMillo	1850	Round 2	
Chann	1486	Round 8	Cycle 1
Grant	1088		
Buxton	978	Round 10	Cycle 3
Bailey	418		
Washburn	378		Cycle 4
Emerson	218		
Houseal	205		
Condrey	175		

Charter Commission

Vote for 4.

- ☐ Bailey
- ☐ Buxton
- ☐ Chann
- ☐ Condrey
- ☐ Emerson
- ☐ Grant
- ☐ Houseal
- ☐ Sheikh-Yousef
- ☐ Washburn

Is it more proportional than other options? “Vote-for-N”

	SNTV	pRCV	Sequential	Vote-for-4
Sheikh-Yousef	1959	Round 1	Cycle 2	4424 (1st)
DiMillo	1850	Round 2		3069
Chann	1486	Round 8	Cycle 1	4390 (3rd)
Grant	1088			3332 (4th)
Buxton	978	Round 10	Cycle 3	4424 (1st)
Bailey	418			1859
Washburn	378		Cycle 4	3104
Emerson	218			2219
Houseal	205			1617
Condrey	175			1592

Charter Commission

Vote for 4.

- ☐ Bailey
- ☐ Buxton
- ☐ Chann
- ☐ Condrey
- ☐ Emerson
- ☐ Grant
- ☐ Houseal
- ☐ Sheikh-Yousef
- ☐ Washburn

How about voter success?

	pRCV	Sequential	Vote-for-4
First choice elected?			
First or second?			
At least 1 top 4?			
(None of top-4?)			
All 4?			

How about voter success?

	pRCV	Sequential	Vote-for-4
First choice elected?			
First or second?			
At least 1 top 4?			
(None of top-4?)			
All 4?			

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV	Sequential (3 + Washburn)	Vote-for-4
First choice elected?		54.6%	
First or second?			
At least 1 top 4?			
(None of top-4?)			
All 4?			

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV	Sequential (3 + Washburn)	Vote-for-4 (3 + Grant)
First choice elected?		54.6%	62.9%
First or second?			
At least 1 top 4?			
(None of top-4?)			
All 4?			

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV (3 + DiMillo)	Sequential (3 + Washburn)	Vote-for-4 (3 + Grant)
First choice elected?	71.7%	54.6%	62.9%
First or second?			
At least 1 top 4?			
(None of top-4?)			
All 4?			

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV (3 + DiMillo)	Sequential (3 + Washburn)	Vote-for-4 (3 + Grant)
First choice elected?	71.7%	54.6%	62.9%
First or second?	86.4%		
At least 1 top 4?	97.0%		
(None of top-4?)			
All 4?			

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV (3 + DiMillo)	Sequential (3 + Washburn)	Vote-for-4 (3 + Grant)
First choice elected?	71.7%		
First or second?	86.4%		
At least 1 top 4?	97.0%		
(None of top-4?)	(3.0%)		
All 4?			

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV (3 + DiMillo)	Sequential (3 + Washburn)	Vote-for-4 (3 + Grant)
First choice elected?	71.7%	54.6%	62.9%
First or second?	86.4%		
At least 1 top 4?	97.0%		
(None of top-4?)	(3.0%)		
All 4?	0.2% (18 voters)		

(3 = Buxton, Chann, Sheikh-Yousef)

How about voter success?

	pRCV (3 + DiMillo)	Sequential (3 + Washburn)	Vote-for-4 (3 + Grant)
First choice elected?	71.7%	54.6%	62.9%
First or second?	86.4%	71.3%	77.4%
At least 1 top 4?	97.0%	84.5%	88.5%
(None of top-4?)	(3.0%)	(15.5%)	(11.5%)
All 4?	0.2% (18 voters)	5.2% (451 voters)	4.7% (415 voters)

(3 = Buxton, Chann, Sheikh-Yousef)

Summary:

The outcome of a pRCV tabulation was more proportional than

- Sequential single-winner RCV
- Vote-for-4
- Last-N-Standing
- Single Non-Transferable Vote

Summary:

The outcome of a pRCV tabulation was more proportional than

- Sequential single-winner RCV
- Vote-for-4
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. . . and more voters successfully elected a candidate of choice.

These slides, along with the speaker notes and a few additional comments, are available at:

<http://bit.ly/3S7xigt>

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