

Detailed description of STV

- Calculating the quota

1. Once the total number of valid ballots (votes) have been counted in each multi-member ward, a calculation will be done to work out the minimum number of votes a candidate needs to be elected. This will be calculated using the “droop quota” formula.

The “droop quota” formula is:

Total number of valid ballots cast in the polling district, divided by number of available seats, plus 1. Plus 1. See below:

$$(\text{Total no. of valid votes} / (\text{no. of available seats} + 1)) + 1$$

For example, if the total number of valid votes counted was 2996, and there were 4 candidates seats available – using the formula:

$$(\text{Total no. of valid votes} / (\text{no. of available seats} + 1)) + 1$$

$$(2996 / (4 + 1)) + 1 = \mathbf{600}$$

The quota is 600. In other words, if a candidate has 600 votes then they would be elected in this case.

- Counting First Preferences

2. All ballots (votes) are counted and the candidate who is chosen as 1st preference on the ballot is given the vote.

Da Gealing	2
Skye Fairweather	4
Flora Campbell	1
Earl Gray	3
Windy Miller	

In this case for example, the vote would go to Flora Campbell in the first instance, as she is 1st preference.

3. If a candidate(s) on the first count has a number of 1st preference votes **exactly equal** to the minimum number of votes needed to be elected, then the candidate(s) is declared elected. The counted ballot papers indicating that candidate(s) as 1st preference are put aside and the other preferences are not examined.

For example, if Flora Campbell and/or any other candidate received exactly 600 1st preference votes (the exact number needed to be elected) then she would be elected and those 600 ballot papers put aside, regardless of other preferences on them. (In the case where a candidate does not receive the EXACT number of votes needed to be elected, the method of distributing surplus votes is shown below!)

- Transferring surplus votes

The Weighted Inclusive Gregory (WIG) system uses proportional representation by the single transferable vote (STV) method. WIG is the calculation to be used in Scotland, for distributing surplus votes from candidates who received more votes than the minimum needed to be elected.

4. If a candidate, on the first count, gains more votes than the minimum number required to be elected, (the candidate will be declared elected and) the number of votes in excess of the number of votes needed (the surplus) is recorded.

For example, if Flora Campbell won 902 1st preference votes but needed only 600 to be elected, she would be elected, and the surplus recorded as 302.

All of the elected candidates ballots are then re-examined for second preferences and assigned to candidates not yet elected. So **all 902** ballots showing a first choice for Flora Campbell would be looked at again to see who, if anyone, was placed as second choice.

Da Gealing	
Skye Fairweather	
Flora Campbell	1
Earl Gray	
Windy Miller	

If no-one was placed as 2nd choice as in this example, the paper would be put aside.

Where ballots do show further preferences, those with a 2 beside their name would have the vote transferred to them (according to a transfer value) provided they had not already been elected. See table below:

Da Gealing	2
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Skye Fairweather	4
Flora Campbell	1
Earl Gray	3
Windy Miller	

So in this case, provided Da Gealing had not already been elected, he would be allocated the paper from Flora Campbell as he is 2nd preference. Votes which are transferred to other candidates are allocated according to a "transfer value". The transfer value represents the proportion of votes to be transferred – the more votes received, the higher the transfer value.

The formula for the transfer value is:

Surplus votes cast for the elected candidate, divided by total number of votes received by the elected candidate. Transfer values are calculated to 5 decimal places. See below:

$$\frac{\text{surplus votes cast for the elected candidate} \quad \times \quad \text{the transfer value of the parcel of ballots received by the candidate}}{\text{total number of votes received by the elected candidate}}$$

For example, if Flora gained 902 votes but needed only 600 to be elected, the surplus number of votes is 302. So the transfer value is:

$$\frac{302 \times 1}{902} = 0.33481$$

This figure (0.33481) is then multiplied by the number of papers which are to be transferred. For instance, if Da Gealing was placed as 2nd preference on 336 of the ballots showing a 1st preference for Flora Campbell, the number of votes to be transferred to him would be calculated as: 0.33481 x 336 = 112.49616.

The table below shows an example of how the transfer of votes works.

STAGE 1			Flora has SURPLUS of 302	STAGE 2			
Candidates standing for election	Votes Received on first count			Papers transferred via F Campbell	No. of Votes Transferred at 0.33481	Results after Transfer	
			302/902 = 0.33481 (transfer value)				
Flora Campbell	902	ELECTED	0.33481 x no. of papers from Flora marked 2 nd preference = no. of votes transferred	~	~	~	
Skye Fairweather	145			75	25.11075	170.11075	
Da Gealing	550			336	112.49616	662.49616	ELECTED
Earl Gray	111			70	23.43670	134.43670	
Windy Miller	400			375	125.55375	525.55375	
			Non-transferable votes	46	This means there was no second preference		

What the table shows is that in this case, the transfer of 2nd preference votes from Flora Campbell has been enough to increase Da Gealing's sum total of votes, giving him enough to reach the quota, and to be elected. Two candidates have now been elected.

5. If a candidate reaches more than the minimum number of votes needed to be elected as the consequence of a transfer of votes from an elected candidate, the number of votes in excess of the number of votes needed to be elected (the surplus) will be transferred to other candidates. For instance, in this case, Da Gealing received 662 votes (62 more than the quota needed to be elected) as a result of the transfer of votes from Flora Campbell. This transfer will be to the next available preference shown on all of the candidate's ballots. These ballots now include 1) the candidate's first preference ballots, and 2) the parcel(s) of ballots transferred to the candidate from one or more elected candidates.

In other words:

- 1) papers showing a first choice for Da Gealing and a next preference for another candidate (not already elected) will be redistributed, and
- 2) papers with a second choice for Da Gealing, originally from Flora Campbell showing a next preference for another candidate (not already elected) will be redistributed.

The same formula as above is used to calculate the transfer value for the candidate's first preference ballots:

$$\frac{\text{surplus votes cast for the elected candidate} \quad \times \quad \text{the transfer value of the parcel of ballots received by the candidate}}{\text{total number of votes received by the elected candidate}}$$

For example, Da Gealing received 662 votes but needed only 600 to be elected, the surplus number of votes is 62. As the table above shows, Da Gealing received 550 1st preference votes, so these will be transferred at the transfer value calculated as:

$$\frac{62 \times 1}{662.49616} = 0.09358$$

The figure 0.09358 is then used to calculate how many votes are to be transferred directly from Da Gealing to the other candidates, where Da Gealing was 1st preference and a 2nd preference was shown on the ballot paper. (e.g. as below) The value 0.09358 would be multiplied by the number of papers received showing a 2nd preference for each candidate to calculate how many votes are to be transferred. **(This can be seen in the table below at Stage 3 where column A shows the number of papers received by each candidate directly from Da Gealing, multiplied by 0.09358 to give the number of votes transferred to each candidate at 0.09358 as shown in column B.)**

Because Da Gealing also received 25.11075 votes from Flora Campbell at the rate of 0.33481 (as shown in the table above at Stage 2) these votes will be transferred to other candidates at a further reduced rate, which will be calculated using the same formula as before. For instance, instead of multiplying by 1 (the full value of a 1st preference vote) the votes received from Da Gealing via Flora Campbell will be calculated at the value of 0.33481. The transfer value for each parcel of ballots transferred to the candidate from one or more elected candidates is:

$$\frac{62 \times 0.33481}{662.49616} = 0.03133$$

In the same way as before, the figure 0.03133 is used to calculate how many votes are to be transferred from Da Gealing, via Flora Campbell, to the other candidates, i.e. papers receiving this value would show a 1st preference for Flora Campbell, a 2nd preference for Da Gealing and then a 3rd preference. **(This can be seen in the table below at Stage 3 where column C shows the number of papers received by each candidate from Da Gealing via Flora Campbell, multiplied by 0.03133 to give the number of votes transferred to each candidate at that rate - shown in column D.)**

6. If no candidate has a number of votes equal to or greater than the minimum number of votes needed to be elected, the candidate with the smallest number of votes is excluded. All of that candidate's ballots--both first preference ballots and any parcel or parcels of ballots transferred from other candidates--are transferred to candidates who have not been elected or excluded according to the next available preference shown on the excluded candidate's ballots. The table below shows how the transfer of votes works:

STAGE 2			Da Gealing has SURPLUS of 62	STAGE 3					
A1	A2			A	B	C	D	E	
Candidates standing for election	Votes Received so far		62/662 = 0.09358 (transfer value)	Papers directly from Da Gealing at 0.09358	No. of Votes Transferred at 0.09358	Papers from Da Gealing at 0.03133 (via Flora Campbell)	No. of Votes Transferred at 0.03133	Results after Transfer	
Flora Campbell	902	ELECTED	62/662 x 0.33481 = no. of votes transferred from Da Gealing via Flora	~	~	~			
Skye Fairweather	170.00000			5	0.4679	250	7.8325	178.3004	
Da Gealing	662.49616;	ELECTED		~	~				
Earl Gray	134.43670			400	37.432	45	1.40985	173.27855	EXCLUDED
Windy Miller	525.55375			75	7.0185	5	0.15665	532.7289	
Non-transferable votes	46	This means there were 46 papers showing no further preference		70		36			

To calculate column **E** 'Results after Transfer' the votes received by each candidate from previous stages (as shown in column A2) is added to the number of transfer votes received in columns B and D. As column E shows, no candidate has received enough votes (the quota of 600) required to be elected. In this instance, the candidate with the least number of votes, Earl Gray, is excluded.

7. The excluded candidate's first preference ballots are transferred to the second (or next available) preferences at full value. Ballots received from previously-elected (or excluded) candidates are transferred at the transfer value at which the ballots were received. For instance, in this case:

1) papers showing a first choice for Earl Gray and a next preference for another candidate (not already elected) will be redistributed, and

2) papers received by Earl Gray either directly from Da Gealing or from Da Gealing, originally from Flora Campbell, showing a next preference for another candidate (not already elected) will be redistributed.

Counting continues in stages as described above, until all vacancies have been filled.

STAGE 4											
A	B	C	D	E	F	G	H	I	J	K	L
Candidates standing for election	Votes Received so far		Votes transferred from Earl Gray at full value of 1	Papers transferred from Earl Gray received via F Campbell at 0.33481	No. of Votes Transferred at 0.33481	Papers transferred from Earl Gray received via Da Gealing at 0.09358	No. of Votes Transferred at 0.09358	Papers transferred from Earl Gray received via Da Gealing via F Campbell at 0.03133	No. of Votes Transferred at 0.03133	Results after Transfer	
Flora Campbell	902	ELECTED									
Skye Fairweather	178.3004		30	50	16.7405	200	18.716	20	0.6266	244.3835	EXCLUDED
Da Gealing	662.49616;	ELECTED									
Earl Gray	173.27855	EXCLUDED									
Windy Miller	532.7289		11	10	3.3481	80	7.4864	5	0.15665	554.72005	
Non-transferable votes			70	10		120		20			

(To explain how the total number of votes are calculated, the votes received so far (shown in column B) is added to the number of votes to be transferred (shown in columns D, F, H and J.))

The table shows no candidate has received enough votes (the quota) required to be elected. In this instance, the candidate with the least number of votes, Skye Fairweather, is excluded leaving only Windy Miller. Even although Windy Miller did not meet the quota of 600, she is still elected. In this case however, the excluded candidate's votes – Skye Fairweather – would be transferred as per the previous calculation. As there is only one candidate left – Windy Miller – transferring Skye Fairweather's votes may or may not take Windy Miller over the quota of 600 – but it would make no difference in the final stage where there is only one seat left and one candidate left.

RESULTS		
Candidates standing for election	Votes Received	Results
Flora Campbell	902	ELECTED
Skye Fairweather	244.3835	EXCLUDED
Da Gealing	662.49616;	ELECTED
Earl Gray	173.27855	EXCLUDED
Windy Miller	554.72005	ELECTED

This example has shown the election of three candidates in a multi-member ward where there were 3 seats available.

The general process for each stage can be summarised as;

- The allocation of votes from the previous stage – either surplus votes from a candidate who has achieved the quota; or votes from the candidate with the lowest number of votes who has been excluded
- The election of any candidate who has achieved the quota; or if none has achieved the quota, then the exclusion of the candidate with the lowest number of votes

At any stage, if the number of candidates elected plus those remaining is equal to the number of seats to be filled; then the remaining candidates are elected (even though they may not have reached the quota).

8. If, during the transfer of preferences, a ballot paper does not indicate an available preference, the ballot is put aside as "non-transferable." This can occur because:

- the voter only indicated one, or a small number of preferences;
 - all the preferred candidates have already been elected or excluded; or
 - there are gaps or repetitions on the ballot in the sequence of numbering preferences.
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- Tied votes

Provisions for tied votes

1. Where two or more candidates have the same number of first preference votes at the end of the first count, and this number is more than the minimum number of votes necessary for election, then the candidate whose surplus is distributed first will be decided by lot.
2. Where no candidate has a number of first preference votes equal to or greater than the number of votes necessary for election at the end of the first count, and two or more candidates have the same number of first preference votes, this number being the smallest number of first preference votes gained by any candidate, then the candidate who is excluded first will be decided by lot.
3. If, at any stage of the count other than during the first count, two candidates have the same number of votes, the candidate who is deemed elected first, or who is not excluded will be:
 - a. the candidate with the highest number of votes at the previous (continuing back thereafter) stage; or
 - b. the candidate whose name is drawn by lot, where there is no difference in the number of votes between the candidates at any preceding stage of the count.