Voting Rules - Case Study

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$$Candidates\ (m = 6) : \{a, b, c, d, e, f\}$$

$$Voters\ (n) = 40$$

$$2\ voters:\ \ c \succ a \succ d \succ f \succ e \succ b$$
$$27\ voters:\ f \succ b \succ a \succ d \succ e \succ c$$
$$11\ voters:\ b \succ f \succ d \succ e \succ c \succ a$$

Winner for All: f

Unique Winner

Q6. Solution

At least 10% of voters should have different preferences and no more than 70% of voters has the same “best candidate”

Results Validation

Condorcet:

Option	a	b	c	d	e	f
a	0	2	27	29	29	2
b	38	0	38	38	38	11
c	13	2	0	2	2	2
d	11	2	38	0	40	2
e	11	2	38	0	0	0
f	38	29	38	38	40	0

Option	a	b	c	d	e	f
a	0	0	1	1	1	0
b	1	0	1	1	1	0
c	0	0	0	0	0	0
d	0	0	1	0	1	0
e	0	0	1	0	0	0
f	1	1	1	1	1	0

Borda:

Number of Ballots:	2	27	11
Option A	2	3	6
Option B	6	2	1
Option C	1	6	5
Option D	3	4	3
Option E	5	5	4
Option F	4	1	2

Subtotals				Final Score
Option A	8	81	0	89
Option B	0	108	55	163
Option C	10	0	11	21
Option D	6	54	33	93
Option E	2	27	22	51
Option F	4	135	44	183

Results Validation

Plurality:

***f*: 27**, *b*: 11, *c*: 2

Plurality with Runoff:

Round 1: ***f*: 27**, *b*: 11, *c*: 2

Max Count = 27, 27/40=0.675% > 50% → ***f is the winner***

$Candidates\ (m = 6) : \{a, b, c, d, e, f\}$
$Voters\ (n) = 100$

$46\ voters: e > b > f > d > c > a$
$23\ voters: d > f > c > b > e > a$
$2\ voters: f > a > e > d > b > c$
$12\ voters: d > b > a > f > e > c$
$17\ voters: a > f > b > d > e > c$

Plurality Winner: e
Plurality with Run-Off Winner: d
Condorcet Winner: b
Borda Winner: f

Non-Unique Winner

Q7. Solution

At least 10% of voters should have different preferences and no more than 70% of voters has the same “best candidate”

Results Validation

Condorcet:

Option	a	b	c	d	e	f
a	0	19	31	19	31	29
b	81	0	77	63	52	58
c	69	23	0	0	23	0
d	81	37	100	0	52	35
e	69	48	77	48	0	46
f	71	42	100	65	54	0

Option	a	b	c	d	e	f
a	0	0	0	0	0	0
b	1	0	1	1	1	1
c	1	0	0	0	0	0
d	1	0	1	0	1	0
e	1	0	1	0	0	0
f	1	0	1	1	1	0

Borda:

Number of Ballots:	46	23	2	12	17
Option A	6	6	2	3	1
Option B	2	4	5	2	3
Option C	5	3	6	6	6
Option D	4	1	4	1	4
Option E	1	5	3	5	5
Option F	3	2	1	4	2

Option A	0	0	8	36	85	129
Option B	184	46	2	48	51	331
Option C	46	69	0	0	0	115
Option D	92	115	4	60	34	305
Option E	230	23	6	12	17	288
Option F	138	92	10	24	68	332

Confirming Results

Plurality:

e: 46, *d*: 23, *a*: 17, *d*: 12, *f*: 2

Plurality with Runoff:

Round 1:

e: **46**, *d*: 23, *a*: 17, *d*: 12, *f*: 2

Max Count = 46, 46/100=0.46% → *go to Round 2*

Round 2:

select top 2 candidates: *e*, *d*

46: *e*>*d*

23: *d*>*e*

2: *e*>*d*

12: *d*>*e*

17: *d*>*e*

e: 46+2=48, *d*: 23+12+17=52 → ***d is the winner***

Resources

Condorcet Calculator: https://condorcet.ericgorr.net/
Borda Calculator: https://www.mshearnmath.com/borda-count-calculator.html