2023年4月19日 1:11

Problem 1.

1. Plurality

a: 10, b: 3, c: 6, d: 7 Winner (a)

2. Borda.

$S_{Borda}(P,a) = 10\times(4-1)+7\times(4-2)+6\times(4-3)+3\times(4-4)$
$= 50$

$S_{Borda}(P,d) = 10\times(4-4)+7\times(4-1)+6\times(4-2)+3\times(4-3)$
$= 36$

$S_{Borda}(P,c) = 10\times(4-3)+7\times(4-4)+6\times(4-1)+3\times(4-2)$
$= 34$

$S_{Borda}(P,b) = 10\times(4-2)+7\times(4-3)+6\times(4-4)+3\times(4-1)$
$= 36$

Winner = a

3. Veto

$S_{veto}(P,a) = 10+7+6 = 23$
$S_{veto}(P,d) = 7+6+3 = 16$
$S_{veto}(P,c) = 10+6+3 = 19$
$S_{veto}(P,b) = 10+7+3 = 20$

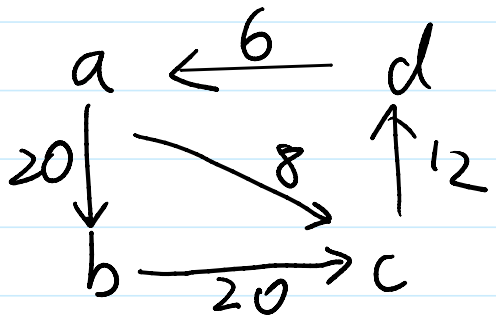
Winner = a

4. pularity

round 1: a: 10, d: 7, c: 6, b: 3
round 2: a: 10 d = 7+6+3 = 16

winner = d

5.



6. Copeland.

	a:2	b:1.5	c:1	d:1.5
avsb	23:3			a+1
avsc	17:9			a+1
avsd	10:16			d+1
bvsc	20:6			b+1
bvsd	13:13			b+0.5, d+0.5
cvsd	19:7			c+1

winner (a)

Problem 2

1. Initial

	a	c	b
R1	27	42	24
R2	27	66	
winner		c	

After.

23@[a>b>c) 46 @[c>a>b] 24 @[b>c>a]

	a	c	b
R1	23	46	24

	a	c	b
R1	23	46	24
R2		46	47
Winner			b

The winner will be b instead of a.

2.

23 @ [a>b>c] 42 @ [c>a>b] 24 @ [b>c>a]

	a	c	b
R1	23	42	24
R2		42	47
winner			b

In the first scenario, the winner is C, after four voters changed, the winner is b. The voting system can produce different outcomes based on small changes.

Problem 3

Let $N = w(a,b) + w(b,a)$ be the total # of voters.
If N is even, both $w(a,b)$, $w(b,a)$ have same parity.
So $|w(a,b) - w(b,a)|$ with same parity must be even.
If N is odd, both $w(a,b)$; $w(b,a)$ have different parity.
So, $|w(a,b) - w(b,a)|$ with different parity must be odd.

Problem 4.

U(5, 1, 4)
C(2, 1, 3) C < U
D(0, 1, 5) eliminate C
⇓

⇓

	L	M	R
U	5,0	1,3	4,0
D	0,1	1,0	5,0

⇓

U(5, 1, 4)
D(0, 1, 5)

⇓

L	M	R
0	3	0
1	1	1
1	0	0

L && M > R
eliminate R

	L	M
U	5,0	1,3
D	0,1	1,0

⇓ check row

U(5,1)
D(0,1)

U > D
eliminate D

⇓

	L	M
U	5,0	1,3

⇓ check colum

L	M
0	3

M > L eliminate L

M
U 1,3

⇒ NE.