

# Preference Aggregation by Voting: Algorithmics and Complexity

Präferenzaggregation durch Wählen: Algorithmik und Komplexität

Pingo

Wintersemester 2020/2021

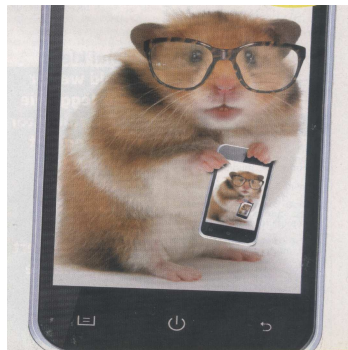
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## Website

<https://pingo.coactum.de/>

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## Question 1

Suppose there are four candidates,  $a, b, c, d$ .

Is it true that a Borda winner always is also a ...

- A ... plurality winner?
- B ... 2-approval winner?
- C ... 3-approval winner?
- D ... 4-approval winner?

## Question 2

Suppose there are four candidates,  $a, b, c, d$ .

Is it true that a veto winner always is also a ...

- A ... plurality winner?
- B ... 2-approval winner?
- C ... 3-approval winner?
- D ... 4-approval winner?

## Question 3

Two candidates are *clones of each other* if they

- A either both win or none of them wins in every election.
- B always have the same score under any scoring protocol.
- C both win every pairwise contest against any other candidate.
- D are ranked next to each other in every individual ranking.

## Question 4

Preference profile	Plurality			Veto			Borda		
	<i>B</i>	<i>M</i>	<i>S</i>	<i>B</i>	<i>M</i>	<i>S</i>	<i>B</i>	<i>M</i>	<i>S</i>
Anna: $B > M > S$	1	0	0	1	1	0	2	1	0
Belle:	0	1	0	0	1	1	0	2	1
Chris: $B > M > S$	1	0	0	1	1	0	2	1	0

What are Belle's preferences?

A  $M > B > S$

B  $B > S > M$

C  $S > M > B$

D  $M > S > B$

## Question 5

Preference profile	Plurality			Veto			Borda		
	<i>B</i>	<i>M</i>	<i>S</i>	<i>B</i>	<i>M</i>	<i>S</i>	<i>B</i>	<i>M</i>	<i>S</i>
Anna: $B > M > S$	1	0	0	1	1	0	2	1	0
Belle: $M > S > B$	0	1	0	0	1	1	0	2	1
Chris: $B > M > S$	1	0	0	1	1	0	2	1	0

Belle's preferences are uniquely determined ...

- A ... by plurality alone
- B ... by veto alone
- C ... by Borda alone
- D ... by all three voting systems only

## Question 6

Preference profile	Plurality			Veto			Borda		
	<i>B</i>	<i>M</i>	<i>S</i>	<i>B</i>	<i>M</i>	<i>S</i>	<i>B</i>	<i>M</i>	<i>S</i>
Anna: $B > M > S$	1	0	0	1	1	0	2	1	0
Belle: $M > S > B$	0	1	0	0	1	1	0	2	1
Chris: $B > M > S$	1	0	0	1	1	0	2	1	0

In this election ...

- A ... the same candidate wins under all three voting systems
- B ... Borda has more winners than either plurality or veto
- C ... all three voting systems have disjoint winner sets
- D ... all three voting systems have a unique winner



## Question 7

Which of the following claims is true?

- A There is always at most one Condorcet winner
- B There is always at least one Condorcet winner
- C A candidate is either a Condorcet winner or a Condorcet loser
- D A Condorcet loser can be a Borda winner

## Question 8

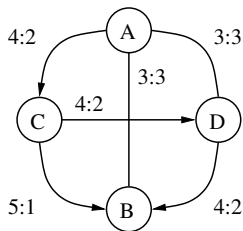


Figure: Majority graph for a Copeland election

Which candidate(s) win this Copeland election?

- A A alone
- B C alone
- C A and C and no one else
- D A and D and no one else