A **spoiler** is a candidate that loses, but whose inclusion changes the winner. I like to restrict it to a majority loser - nobody likes them, but their mere presence changes the group's mind on who wins.

The entrance quiz gave an example of a majority loser that changed the result of a Plurality election from B (40 to 60) to A (40 to 35 to 25).

This problem makes some people (B supporters) think that C "spoiled" the election, and that nobody should be allowed to vote for C. Unfortunately, until we vote on C, we don't know whether it is a majority loser.

The voting method Plurality With Elimination was designed to allow both people to be happy – we can vote and see that C loses, but then the people who voted for C are allowed to change their vote to something more reasonable for them.

1. (a) Which candidate did the voting method "plurality" choose		40%	60%
as the winner in each election?	1st	А	В
	2nd	В	A
		$\downarrow$	
(b) Could the 25% voters have lied to get a better result?	40%	35%	25%
1st	А	В	С
(c) Which candidate does the voting method $PwE$ <sup>2nd</sup>	В	$\mathbf{C}$	В
("plurality with elimination") choose as the winner in each election? $3^{rd}$	C	А	A
( pluranty with eminiation ) choose as the winner in each election.			

(d) Why does that suggest "PwE" is a better voting method?

2. (a) Who wins before C enters? (using any reasonable method at all)

(b) Who is eliminated first in Plurality With Elimination?

(c) Who wins (with how many votes) after the candidate from (b) is eliminated?

(d) Does any candidate have a majority of last place votes?

(f) Who wins PwE (with how many votes) after the candidate from (e) is eliminated?

(g) What does this say about C in this election with Plurality With Elimination?

**IIA** is the fairness criterion that says a voting method must not have spoilers. If a new candidate is added, either that candidate becomes the winner (they are better than all the old candidates), or the old winner still wins (not better than the best).

(h) Does Plurality satisfy IIA? Does Plurality With Elimination satisfy IIA?

(	i)	Puzzle!	Does	Borda	Count	satisfy	IIA?	Can	vou	make	a spoiler?	
· \											The second se	

	60%		
1st	А	В	С
2nd	В	С	В
3rd	$\mathbf{C}$	А	А

ll)		40%	60%
	1st	А	В
	2nd	В	А
		$\downarrow$	
		•	
	40%	35%	25%
1st	40% A	35% C	25% B
1st 2nd	40% A B	35% C B	25% B A

	35%	33%	32%			37%	31%	32%
1st	А	В	С	、	1st	А	В	С
2nd	В	$\mathbf{C}$	А	$\rightarrow$	2nd	В	$\mathbf{C}$	А
3rd	C	А	В		3rd	C	А	В

3. (a) Who wins plurality with elimination on the left?

(b) Who is unhappy with the result? (which voters)

(c) They call for a re-vote, but 2 of their 31 percent change their votes from B > C > A (B better than C, but A worst) to A > B > C (B better than C, but A best). Why would the 29 of the 31 percent call them traitors?

(d) Who wins plurality with elimination on the right?

(e) How would you explain this strategy?

**Monotonicity** is the requirement that voting for the winner shouldn't make the winner lose. Technically, a voter is only allowed to change the winner. Every other candidate has to stay in the same relative order; the voter just moves the winner up.

4. (a) Explain why points methods satisfy monotonicity ALL the time.

(b) Explain why head-to-head methods satisfy monotonicity ALL the time. Hint: which head-to-head results can change. which candidates benefit?

(c) Explain why elimination methods have a hard time with monotonicity.