Math 105 Exam 3 Review

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Jordan Bennett

For questions 1-4, please refer to the following table. 111 first graders are polled in order to obtain data on the Common Core. First graders were asked to rank Language Arts (LA), Social Studies (SS), Science (S), and Mathematics (M) in their preferred order of enjoyment as to improve learning outcomes in poor scoring subjects.

Number of Voters	39	10	24	15	3
First	S	M	SS	LA	M
Second	LA	LA	M	SS	SS
Third	M	SS	LA	M	LA
Fourth	SS	S	S	S	S

Problem 1 - If we use the method of Plurality, what subject is the most enjoyed by First Graders?

Problem 2 - If we use the method of Plurality with Elimination, what subject is the most enjoyed by First Graders?

Problem 3 - If we use the Method of Pairwise Comparison, what subject is the most enjoyed by First Graders?

Problem 4 - If we use the Borda Count method, what subject is the most enjoyed by First Graders?

Below are the definitions of the four fairness criterion. Here are some hints for deciding if a particular preference schedule shows a violation of one of these criterion.
The first two criterion deal with a special type of candidate. If that candidate (Majority or Condorcet) is not present in the preference schedule, there is no violation. If that candidate is present but loses, that is a violation.
The last two criterion deal with a second election. Both of these criterion require a first election to choose a winner. Then, hold a second election. Monotonicity requires that the winning candidate only move up, while IIA requires that one of the losing candidates from the first election drop out. You have to alter the preference schedule you are given accordingly.
For Monotonicity, take a column that the winner isn't first place in and move

them to first place. See if that candidate still wins.
For IIA, take the last place candidate and remove them. See if the candidate from the first election still wins.

Definition - A voting method satisfies the Majority Fairness Criterion if whenever there is a Majority Candidate (A candidate with more than fifty percent of the total first place votes) then the voting method chooses that candidate as the winner.

Definition - A voting method satisfies the Condorcet Fairness Criterion if whenever there is a Condorcet Candidate (A candidate that wins all of its pairwise comparisons) then the voting method chooses that candidate as the winner.

Definition - A voting method satisfies the Monotonicity Fairness Criterion if whenever a candidate wins an election, then the same candidate wins the second election with the same voting method if the only change in the preference schedule is the winning candidate moves up on a ballot.

Definition - A voting method satisfies the Independence of Irrelevant Alternatives Criterion if whenever a candidate wins an election, then the same candidate wins the second election with the same voting method if the only change in the preference schedule is a losing candidate drops out.

Problem 5 - Does this preference schedule show a violation of the Condorcet Fairness Criterion using the Plurality method? Explain your reasoning.
Problem 6 - Does this preference schedule show a violation of the Independence of Irrelavant Alternatives Fairness Criterion using the Borda Count method? Explain your reasoning.
Problem 7 - Does this preference schedule show a violation of the Monotonicity Fairness Criterion using the Plurality with Elimination method? Explain your reasoning.
Problem 8 - Does this preference schedule show a violation of the Majority Fairness Criterion using the Pairwise Comparison method? Explain your reasoning.

Note: I am looking more of an explanation here than I am the correct yes/no answer.