Math 118 **Name (Print):** _____
Summer I 2015
Sample questions for Final Exam
7/02/15
Time Limit: 3 hours and 25 minutes. ID number _____

Instructions

This exam contains 4 pages (including this cover page) and 2 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any device that is capable of accessing the internet on this exam(e.g., smartphones, tablets). You are allowed to use a calculator.

You are required to show your work on each problem on this exam. The following rules apply:

- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**. In the practice part of the exam, a correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.

Do not write in the table to the right.

Problem	Points	Score
1	10	
2	14	
Total:	24	

1. (The Mathematics of Social Choice)

   (a) (1 point) Describe the Borda count method.

   (b) (1 point) In the Shapley-Shubik power model, what is a pivotal player in a sequential coalition?

   (c) (3 points) Consider the weighted voting system $[q; 8, 4, 1]$. About this system, answer the following:

   a) What are the values of q for which we don't have a gridlock or anarchy?

   b) If $q = 10$, how many players have veto power?

   c) If $q = 11$ what is the critical count of player 2 (the one with weight 4)?

   (d) (5 points) Describe the lone-divider method with 3 players. You may use pictures to support your explanation, but an explanation consisting only of pictures will not be accepted.

2. (Fairness Criteria) Consider the preference schedules represented by tables A and B below:

Table 1: Table A

Number of voters	6	2	3
1st	A	B	C
2nd	B	C	D
3rd	C	D	B
4th	D	A	A

Table 2: Table B

Number of voters	49	48	3
1st	R	H	F
2nd	H	S	H
3rd	F	O	S
4th	O	F	O
5th	S	R	R

(a) (3 points) Find the winner of the election in Table A under the Borda count Method.

(b) (3 points) Use part (a) to show that the Borda count method violates the Condorcet condition.

(c) (3 points) Find the winner of the election in table B under the plurality method.

(d) (5 points) Eliminate candidate (a) in the election on table F. Find the winner under the plurality method. Based on your results, does the plurality method satisfy the independence of irrelevant alternatives criterion? Explain.