

Math 112

Quantitative Reasoning

March 22, 2010

Schedule 3/22/10

- **Fair Division**
- **Review for the Midterm**
- **Midterm**
- **Retest of Test 1 (optional)**

Fair Division

Definitions

- **Cake division procedure for n players:**
 - **A procedure that the players can use to allocate a cake among themselves without an outside arbiter, so that each player has a strategy that will guarantee that player a piece with which he is satisfied**

Cake Division

Proportional Procedure

- A cake-division procedure for n players is *proportional* if each player's strategy guarantees that player a piece of size at least $1/n$ of the whole, in his estimation

Cake Division

Proportional Procedure

- **Cake division for two people:**
 - **Divide-and-choose: One party divides the cake into two parts in any way he wants, and the other party chooses whichever part she wants**

Steinhaus Proportional Procedure

Lone Divider

- **Person 1 divides the cake into 3 equal pieces**
- **Persons 2 and 3 decide which piece(s) they *approve* of (they think that piece is at least $1/3$ of the whole)**
 - **If Persons 2 and 3 approve of two different pieces, the third piece goes to Person 1, and Persons 2 and 3 get the pieces they selected**
 - **If Persons 2 and 3 approve of the same piece:**
 - **Put the approved piece back together with one of the disapproved pieces and give the other disapproved piece to Person 1**
 - **Let Persons 2 and 3 use “divide and choose” on what’s left**

Homework

- **Page 429:**
 - Hand in: **22, 23, 33**