MA111: Contemporary mathematics

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Entrance Slip (due 5 min past the hour):

- Is it better to choose the option liked by most, or is it better to choose the option hated by fewest?
- Give an example where they are different options.

Schedule:

- HW 0 is due Friday, Aug 24th, 2012.
- HW 1A,1B is due Friday, Aug 31st, 2012.
- HW 1C,1D,1E,1G is due Friday, Sep 7th, 2012.
- Exam 1 is Monday, Sep 17th, during class.

Today we discuss summarizing collective preferences.

Expectations

- Everyone should have turned in the entrance slip now
- Everyone should have read the 2 (or 4) pages from the textbook

  No excuses. Free online and approximately one million students used the free trial this week. We have a library. You are adults.
- Everyone should be ready to take notes.

  Consider labelling the page with today's date and the section number: chapter 1.1, preference schedules
- Everyone should be eager to see what the answer to the entrance slip is, and should be thinking about how is it math
- The online homework should be completed by most of you, and the rest should be waiting patiently for a little help

  We'll open up the website today in class, and my office hours are 4pm to 5pm tody in the mathskeller.

Context: Choosing for the group

- The entrance slip asked whether the good of the many outweighs the bad of the many.
- This is not yet math, because it is much too subjective.
- We want to be **creative**, but we also want to be **certain**.
- We need to replace "good" and "bad" with something **precise**.
- People's hearts and feelings are too complex for math
- Here is a **precise** substitute: given a list of options, we ask each person to rank those options from best to worst, no ties, no take-backs.

  Notice how we are forced to sacrifice a little **relevance** and **generality** in order to get to something **precise**.

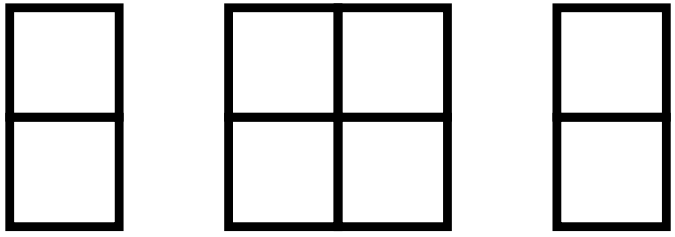
Activity: can we do it for ice cream?

- Individually: write down your personal ranking of:
  - Chocolate ice cream
  - Strawberry ice cream
  - Cookies and creme and ice cream

  So which do you like best, then second best, then third best.

  (It doesn't have to be "true", but stick to first, second, third; be precise.)

- The room has 8 groups in it:



- As a group: write down a summary of what everyone thinks.
  It needs to be
  - Brief. Listing everybody makes my eyes cross. (See exercise #1 in the book.)
  - Fair. Make sure everyone has a voice, but no one has "undue weight"

- In 10 minutes we'll write some of these on the board.

Fast: Linear Ballots and single person ranking

- How do we write down the "feelings" of one person?
- A **linear ballot** for a set of options is just an ordering of the options (from "best" to "worst")
- For example here are two linear ballots:

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
1st	Straw
2nd	Cookies
3rd	Choc

- Notice there are no ties or explanations: just numbers 1,2,3

Fast: Preference schedules and group rankings

- How do we record the preferences from many people?
- A **preference schedule** associates to each possible linear ballot a number representing how many people voted that way
- For example if four people turned in ballots like the left, and two people turned in ballots like the right:

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
1st	Straw
2nd	Cookies
3rd	Choc

Then the preference schedule is:

	4	2
1st	Choc	Straw
2nd	Straw	Cookies
3rd	Cookies	Choc

Fast: Transitivity and elimination

- A linear ballot orders ALL of the options
- But it also orders SOME of the options
- For instance the ballots:

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
1st	Straw
2nd	Cookies
3rd	Choc

  tell us that both guys prefer Strawberry to Cookies and Creme.

- If we get rid of an option, we just erase that option from the linear ballots, scoot up the entries to fill in the holes, and we get new linear ballots

	Ballot
1st	Straw
2nd	Cookies

	Ballot
1st	Straw
2nd	Cookies

Fast: Alternative summary #1: Gary

- A popular alternative to the preference schedule records how many ballots have each option as first, second, third, etc.

  We call it the Gary schedule, in honor of the student who popularized its use last year.

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
1st	Straw
2nd	Cookies
3rd	Choc

  becomes

	1st	2nd	3rd
Choc	4	0	2
Straw	2	4	0
Cookies	0	2	4

- This table loses information: we cannot eliminate candidates!
- Puzzle: find two preference schedules with the same Gary schedule

Fast: Alternative summary #2: Exercise

- The book suggests a compromise in exercises #9 and #10
- For example

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
1st	Straw
2nd	Cookies
3rd	Choc

	4	2
1st	Choc	Straw
2nd	Straw	Cookies
3rd	Cookies	Choc

becomes

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
3rd	Choc
1st	Straw
2nd	Cookies

	4	2
Choc	1st	3rd
Straw	2nd	1st
Cookies	3rd	2nd

- This keeps all information, and has most of the advantages of Gary's schedule
- If there are lots of candidates, Gary's method is much briefer

Fast: Application

- If we can turn the world's problems into a list of rankable options, then we now have a very precise and certain way to write down the world's opinion
- We still need to decide which option to pick (the rest of the chapter), but at least now we know what people want
- Linear ballots such as this are used in many elections with more than 2 or 3 candidates
- Ballots with ties are a little more complicated, but the end results of this chapter remain the same, so we ignore these.

Old stuff: Logging into Pearson

- The textbook and homework are available at http://mymathlab.com
- Our course code is on the syllabus:
  - 10am: schmidt96545
  - 11am: schmidt94783
- The first time, you register for a new student account
  - Enter the course code
  - Enter your name, etc.
  - Scroll down and choose Trial version
  - Go to the class

Old stuff: Finding the homework and book

- The textbook and homework are available at `http://mymathlab.com`
- First log in using the user name and password you registered with
- Now click on the MA111 course
- The homework button is on the left near the top
- The ebook button is on the left in the middle

Assignments and exit slip

- Assignment: reread pages 2-5 and make sure you understand everything on pages 4-5 (Ch 1.1)
- Assignment: read pages 6-9 (Ch 1.2) and try exercises #1 and #2 in the book (page 29)
- Assignment: complete homework 0 online ("What is my name?")
- Exit slip: Convert the following ballots to a preference schedule (standard, not alternate)

	Ballot
1st	Choc
2nd	Straw
3rd	Cookies

	Ballot
1st	Choc
2nd	Cookies
3rd	Straw

	Ballot
1st	Straw
2nd	Choc
3rd	Cookies

- First three people to finish and check with your neighbors put your answer on the board!