

Adapting liberal arts mathematics hands-on activities to a large-lecture format

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MAA Session on Projects, Demonstrations, and Activities that Engage
Liberal Arts Mathematics Students
Joint Mathematics Meetings
Baltimore, MD
January 15, 2014

The course

- Math 11008: Explorations in Modern Mathematics
- 3 credit hours
- **Excursions in Modern Mathematics** by Tannenbaum with exercises in MyLabsPlus



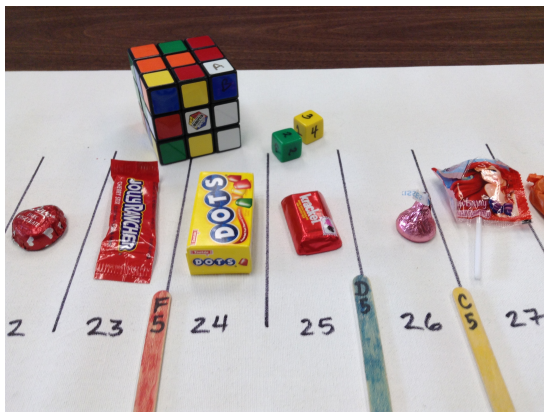
Change in class size

- Class max
 - was 35–40
 - now 75–100–200—?
- My Fall 2013 classes:
 - 65 students:
3 days/week @ 50 min/class
in a 78-seat lecture hall
 - 91 students:
2 days/week @ 75 min/class
in a 200-seat lecture hall
(pictured during final exam)

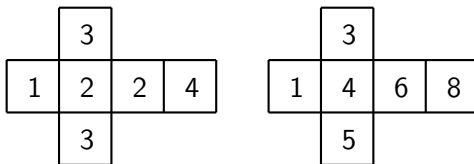


The activities

- Sicherman Dice (Chapter 16: Probabilities, Odds, Expectations)
- Rubik's Cube (Notes by Morley Davidson)
- Method of Markers (Chapter 3: Fair Division)



Sicherman Dice



Sicherman Dice: empirical & theoretical probabilities

- Pairs of students roll dice 25 times, recording sums
- Compile results & compute relative frequencies as a class
- Student pairs compute theoretical probabilities: compare
- In higher-level class: Use generating functions to prove Sicherman dice are the only others with same probabilities as ordinary dice
- One class period (easily)
- Scales well to large class: total the frequencies in stages
- Good ice-breaker for early in term



Rubik's Cube

- Materials developed by Morley Davidson, Kent State University
 - part of team that proved that God's Number is 20
 - he is an expert cube-solver, but I AM NOT!



Rubik's Cube Unit

- 2–3 weeks
- Algorithms given for solving the cube in layers
 - students not required to memorize them
 - great feeling of accomplishment for those who solve whole cube (most, but not all, students do)
- Group theory notions taught in a gentle way
 - inverses,
 - order of an element
 - commutators
- Difficult in large class to help every student
- Many students feel a lot of frustration
- Next time: more worksheets for students to do in pairs



Method of Markers

- Treat string of discrete objects as continuous
- Students must pretend they can't see other markers (attempts at strategizing often backfire)
- Do after Halloween or Easter (cheap candy)



Method of Markers

- Challenge:
 - Demonstration takes 10 min per group of (6) students
 - For large class: one week of class time
 - What do the students do the rest of the time?



Method of Markers

- Solution:

- Teach other fair division methods first
- Students work on worksheets in small groups
- Very successful: will do this more in Rubik's Cube unit next time

