

# MA111: Contemporary mathematics

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Entrance Slip (due 5 min past the hour):

- We have five office supplies lined up in a row

Two players are dividing

First player thinks an even division is the left two and the right three

Second player thinks an even division is the left three and the right two

- How can you give both players a fair share?

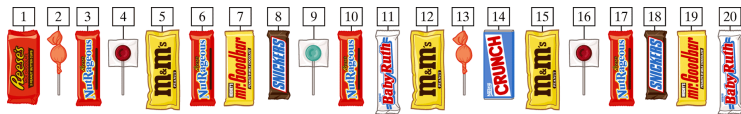
Today we investigate method of markers.

Exam and HW is Nov 19.

## Context: A method for children and candy

- Sealed bids only requires elementary school arithmetic
- But pre-schoolers have conflict too; especially Oct 31
- We want a method like “I cut, you choose”
- But as many players as a classroom
- Quick division of the goods
- So we let everyone divide at once

# Activity: Method of markers



- Divide this up into 4 equal shares (contiguous)
- Record your division by listing the last item in each share
- Now 4 people come to the front, and we'll divide this up
- Then try it in groups of 4 yourself

## Activity recap

- Everybody gets a share they think is fair, but other people think is small
- That means when everyone is done, there is still candy leftover
- We can split the extra however we want
- If there is a lot, split it using a fair division game
- If there is a little, draw straws to see who gets to pick first
- Random is not “fair” but it is the best we can do with 2 pieces of candy and 4 kids

## Fast: Method of markers

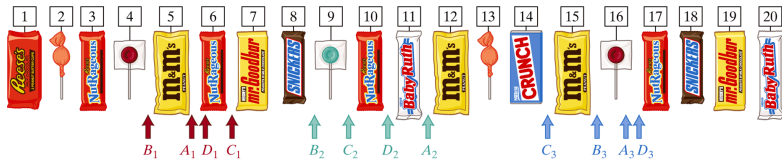
- Requirements:  $N$  players, lots ( $\gg N$ ) of nearly homogeneous loot
- Rules:
  - ① Line the loot up and number it
  - ② Each player writes down a division into  $N$  pieces
  - ③ For  $X$  from 1 to  $N$ , look at the  $X$ th piece
  - ④ Whoever's piece ends first, gets it (resolve ties by whoever's piece is smallest in terms of number of loot items) and leaves the game for a bit
  - ⑤ Repeat until everyone has a fair share
  - ⑥ Divide the left-over loot somehow (?)
- This method is simple enough for small children

## Fast: strategy

- This method makes more or less no guarantees (there is no winning strategy, it can be unfair to everyone, etc.)
- If the loot is “nice and even”, it works, but so does letting Mommy and Daddy divide it.
- Attempt at winning strategy: Be honest!
- You will take a piece, you don't know which one, so make all even
- If you can. If the loot is not “nice and even” to you, it might be pretty hard
- We play a version of this called “Piece O' Cake” as a strategy game
- I find that Be Honest is pretty good, but it can be hard to divide 11 pieces of cake into 4 even piles

# Assignment and exit slip

- Read and understand 3.1-3.7.
- Homework due Nov 19.
- **Exit slip:** Who gets the first piece? What is in it?



- Who gets the second piece? What is in it?