Intro to Contemporary Math

Mathematics and Voting

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Agenda

- Syllabi and Course Websites
- Class Information
- Voting Example
- Plurality Voting Method
- Counting Ballots with Preference Schedules
- More Class Information

Course Websites

My website: `http://www.ms.uky.edu/~ndng224/MA111/`

- Links to syllabus, slides

Canvas website: `https://uk.instructure.com`

- Grades, Backup link to my website

Homework: TBA on Canvas

- Online homework assignments

Class Information

- We will be using REEF polling in this class. Be sure to get an account. See the course syllabus for details.

Class Information

- Mathematics is about approaching problems, solving them, and evaluating solutions.

Voting Example: Most Favorite

I asked some people to choose their **most favorite** color among Azure, Baby blue, Cobalt, and Denim:

- **Seven** chose **A**
- **Five** chose **B**
- **Seven** chose **C**
- **Eight** chose **D**

Which color you think is the most popular? Press its first letter.

Voting Example: Least Favorite

I asked some people to choose their **least favorite** color among Azure, Baby blue, Cobalt, and Denim:

- **Eight** dislike **A** the most
- **Nineteen** dislike **D** the most
- **No one** chose **B or C** as their least favorite

Knowing this, do you think **Denim** deserves to be the most popular color? Should a different color be chosen as "the most popular?" Press its first letter.

Voting Example: Second Favorite

I asked some people to choose their **second favorite** color among Azure, Baby blue, Cobalt, and Denim:

- **Five** picked **A**
- **Fourteen** voted **B**
- **Eight** picked **C**
- **No one** picked **D** as their second favorite

Knowing this, which color is overall the most popular among these people? Press its first letter.

Plurality Voting

In the *plurality method of voting*, the candidate or choice with the most votes wins.

- A candidate in an election is a *plurality candidate* if it receives the most votes.

Plurality Voting + Majority Candidate

In the *plurality method of voting*, the candidate or choice with the most votes wins.

- A candidate in an election is a *plurality candidate* if it receives the most votes.

- A candidate in an election is a *majority candidate* if it receives more than half of the votes.
  Find the **number of voters**, **add one, divide** it **by two**, and **round up** to get the minimum number of votes needed to be a majority candidate.

Majority Candidate

- A candidate in an election is a *majority candidate* if it receives more than half of the votes.
  Find the **number of voters**, **add one**, **divide** it **by two**, and **round up** to get the minimum number of votes needed to be a majority candidate.

?(1.1) Plurality and Majority Candidate?

Recall the vote for most favorite color:

- **Seven** chose **A**
- **Five** chose **B**
- **Seven** chose **C**
- **Eight** chose **D**

Which color is the plurality candidate? Press its first letter on your Clicker.

Plurality Candidate

- **Denim** got the most votes (eight), so in the plurality method, it would be the **winner** and the **plurality candidate**.

?(1.2) Majority Candidate?

Recall the vote for most favorite color:

- **Seven** chose **A**
- **Five** chose **B**
- **Seven** chose **C**
- **Eight** chose **D**

How many votes does a candidate need to qualify as a majority candidate? *Type in a number.*

Majority Candidate

There were

$$7+5+7+8=27 \text{ voters}$$

$$27+1=28$$

$$28 \div 2 = 14, \text{ which rounds up to } \boxed{14}.$$

Thus, a candidate needs 14 or more votes to be a majority candidate.

?(1.3) Majority Candidate?

Recall the vote for most favorite color:

- **Seven** chose **A**
- **Five** chose **B**
- **Seven** chose **C**
- **Eight** chose **D**

Determine if the plurality candidate is a *majority candidate or not. Type "Yes" or "No."*

Majority Candidate

Denim got fewer than 14 votes, so it is not a majority candidate.

Problems with Plurality?

- Many people (19 out of 27) dislike Denim. Should that matter?
- Many people chose Baby blue as their second most favorite color. Should that matter?

Preference Ballots

Definition

A *preference ballot* is a ballot in which the voter ranks candidates/choices in order of preference.

Example

Between the colors Blue, Green, and Red, my most favorite is Blue and my least favorite is Red. So my ballot would look like

Nguyen
B
G
R

Multiple Preference Ballots

We combine multiple preference ballots into a *preference schedule*. The number at the top of each column shows how many people ranked their choices in that order.

4	2	3
B	G	B
G	B	R
R	R	G

Next Time

- We will see a voting method that takes into account second favorite, third favorite, etc. choices in a vote.
- We will compare this new voting method with plurality voting. Will both methods pick the same winners?

Course Content

We will be exploring four topics:

1. Voting
2. Probability
3. Compensation and Fair Division
4. Graph Theory

We will spend about a month on each topic. They are independent of each other.

Exams and Mini-Exams

- There are a total of four exams and four mini-exams.
- Each topic has a mini-exam at the halfway point, and an exam at the end.
- Your grade is based on your best two mini-exams and your best three exams.

Homework Assignments

You will be given problem sets at the WebWork site.

- Most homework problems will let you try again and again and again until you get it.
- The problems are randomized.

The Project

You will have a project. I am still designing this assignment.

Professionalism

Your conduct will affect your grade. For every class meeting,

- Arrive on time and do not leave early.
- Silence your phones. Do not answer them in class.
- Be part of the class discussion.
- Be respectful, especially when others are confused.

"Homework"

- Please visit
  `http://www.ms.uky.edu/~ndng224/MA111/`
  - Look for the syllabus for this class and read it.

Help and Assistance

- I hold office hours. Check the class syllabus for times and locations.
- You can also email me at nicholas.nguyen@uky.edu