Self-Referential Polls

Mathematical Foundations of Democracy
AMS-IMD Engaged Pedagogy Series
April 25-27, 2023

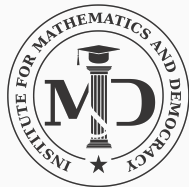**Daryl DeFord**

Department of Mathematics and Statistics
Washington State University

daryl.deford@wsu.edu
math.wsu.edu/faculty/ddeford/

- This is a fun exercise to get our brains engaged with some practical democracy ☺
- Start by introducing yourself to the other people in your breakout room:
  - Name
  - Favorite Number
  - Approximate number of zoom meetings you've been on this week
- The subsequent slides contain a poll whose answers will depend on the votes that are cast:

  Example: An odd number of votes will be cast for each answer:

  A True
  B False
- You score one point if your answer is correct after all the votes are tallied

How many of these answers will get no votes?

A 0

B 1

C 2

D 3

E 4

How many of these answers will get at least one vote?

A 1

B 2

C 3

D 4

E 5

How many of these answers will be chosen by at least $\frac{1}{3}$ of the voters?

A 0

B 1

C 2

D 3

What is the highest percentage an answer will get in this poll?

A $< 20\%$

B $20 - 40\%$

C $40 - 60\%$

D $60 - 80\%$

E $< 80\%$

What percentage of respondents will pick this option?

A $< 2\%$

B $2 - 20\%$

C $20 - 40\%$

D $40 - 60\%$

E $60 - 80\%$

F $80 - 98\%$

G $98 - 100\%$

How many of these answers will get at least half of the votes?

A 0

B 1

C 2

D 3

How many of these answers will get at least two votes?

A 0

B 1

C 2

D 3

E 4

What is the lowest percentage an answer will get in this poll?

A $< 2\%$

B $2 - 20\%$

C $20 - 40\%$

D $40 - 60\%$

E $60 - 80\%$

F $80 - 98\%$

G $98 - 100\%$

How many responses labelled with a vowel will get an odd number of votes?

A 0

B 1

C 2

D None

E At most one

What will be the difference between the percentage of votes received by the most popular option and the percentage received by the least popular option?

A $< 20\%$

B $20 - 40\%$

C $40 - 60\%$

D $60 - 80\%$

E $< 80\%$

- Now we'll get into larger groups and try these polls again.
- You'll be allowed to strategize within you group for a couple of minutes
- Each group will get one vote per member and you are allowed to split your repsonses between the options
- You team will get one point for each vote placed on an option that ends up being correct after all votes are tallied

How many of these answers will get no votes?

A 0

B 1

C 2

D 3

E 4

How many of these answers will get at least one vote?

A 1

B 2

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E 5

How many of these answers will be chosen by at least $\frac{1}{3}$ of the voters?

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What is the lowest percentage an answer will get in this poll?

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E At most one

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D $60 - 80\%$

E $< 80\%$

- We queried 100 AWS Mechanical Turkers about graduate school and academia ...
- Your goal is to guess their most common responses to the following questions about graduate school life
- For each correct response you get 11-k points, where k is the ranking of the answer (so 10 points for the most common answer, 9 points for the second most commone, etc.) and zero points if your answer wasn't mentioned.

  Example: How many math PhDs are awarded each year in the US?
  1. $< 1,000$ (45)
  2. $2,000 - 5,000$ (31)
  3. $> 10,000$ (14)
  4. $5,000 - 10,000$ (8)
- If you answered $2,500$ you would get $11 - 2 = 9$ points.
- However, if you gave the correct answer of $1,500$ you would get no points!

1. How many years fo you think most people spend in graduate school?
2. What is the best educational institution in the US?
3. What percentage of the US population do you think has a PhD?
4. What was your favorite subject in school?
5. Which US state do you think contains the most universities?

1. 3 (25)
2. 4 (24)
3. 2 (20)
4. 5 (13)
5. 6 (8)
6. 7 (7)
7. 8+ (3)

1. Harvard (56)
2. MIT (19)
3. Yale (8)
4. Stanford (5)
5. UChicago (4)
6. Texas (3)
7. Arizona (2)
8. Michigan (1)
 8 NYU (1)
 8 Penn State(1)

1. 1-5% (41)
2. 20+% (24)
3. 10-20% (14)
4. $< 1\%$ (12)
5. $5 - 10\%$ (9)

Favorite Subject

1. Math (28)
2. Languages (26)
3. History (13)
4. Science (12)
5. Social Studies (6)
6. Geography (5)
7. Other (10)

State with Most Universities

1. NY (39)
2. CA (34)
3. MA (12)
4. WA (5)
5. TX (4)
6. VA (3)
7. MI (2)
8. IL (1)

1. What is the most common career for people with a PhD?
2. What do you think is the average lengths of a PhD dissertation?
3. How many words are there on average in the title of a PhD dissertation?
4. What is the average salary of a graduate student?
5. What is the average age of math professors in the US?

1. Professor (64)
2. Medical Doctor (25)
3. Scientist (6)
4. Manager (3)
5. Mechanical Engineer (2)

1. 100 pages exactly (31)
2. > 200 pages (25)
3. < 100 pages (22)
4. 200 pages exactly (11)
5. ...
6. 1 hour (6)
7. 2 hours (5)

1. 10-20 (36)
2. > 30 (27)
3. < 10 (24)
4. 20-30 (13)

1. 20-40k (25)
2. 40-60k (21)
3. 60-80k (20)
4. < 20k (18)
5. > 80k (16)

1. 40s (39)
2. 50s (34)
3. over 100 (18)
4. 30s (6)
5. 60s (3)