

Name: Solutions score: \_\_\_\_\_ / 10

There are 10 points possible on this quiz. No aids (book, notes, etc.) are permitted. You may use a non-programmable calculator. **Show all work and supporting calculations for full credit. Explain how you get your answers.**

Do not write in the “write corrections here” boxes while you’re taking the main quiz.

1. (4 points) A state is holding elections for governor. There are four candidates (A, B, C, and D for convenience). The preference schedule is below.

| number of voters | 40 | 30 | 20 | 5 | 5 |
|------------------|----|----|----|---|---|
| 1st choice       | B  | C  | D  | D | B |
| 2nd choice       | A  | A  | A  | C | C |
| 3rd choice       | D  | D  | B  | A | A |
| 4th choice       | C  | B  | C  | B | D |

For each of the following, provide supporting calculations.

- (a) (1 point) How many voters voted in this election? 100

$$40 + 30 + 20 + 5 + 5 = 100$$

Write corrections here

- (b) (1 point) Find a winner under the plurality method. Show some work. B

$$\begin{aligned} A &= 0 & C &= 30 \\ B &= 45 & D &= 25 \\ &\uparrow \text{most!} \end{aligned}$$

Write corrections here

- (c) (2 points) Find a winner under Instant Runoff Voting. B

Show some work for each round and clearly state who gets eliminated.

from (b), A is eliminated

Round 2

$$\begin{aligned} B &= 45 \\ C &= 30 \\ D &= 25 \end{aligned} \left\{ \begin{array}{l} \text{sum} \\ = 100 \end{array} \right.$$

D is eliminated

Round 3

$$B = 40 + 20 + 5 = 65$$

$$C = 30 + 5 = 35$$

(sum = 100)

B wins!

Write corrections here

Math F113X: Quiz 1

2. (6 points) Below is the same preference schedule.

| pts | number of voters | 40 | 30 | 20 | 5 | 5 |
|-----|------------------|----|----|----|---|---|
| 4   | 1st choice       | B  | C  | D  | D | B |
| 3   | 2nd choice       | A  | A  | A  | C | C |
| 2   | 3rd choice       | D  | D  | B  | A | A |
| 1   | 4th choice       | C  | B  | C  | B | D |

(a) (2 points) Find a winner under the Borda Count method. Show some work. A

$$A = 3(40) + 3(30) + 3(20) + 2(5) + 2(5) = 290 \leftarrow A \text{ wins}$$

$$B = 4(40) + 1(30) + 2(20) + 1(5) + 4(5) = 255$$

$$C = 1(40) + 4(30) + 1(20) + 3(5) + 3(5) = 210$$

$$D = 2(40) + 2(30) + 4(20) + 4(5) + 1(5) = 245$$

Write corrections here

(b) (2 point) In a one-to-one comparison, who is preferred, candidate A or candidate B? (You must show your calculation.)

Candidate A is preferred.

| 40 | 30 | 20 | 5 | 5 |
|----|----|----|---|---|
| B  | A  | A  | A | B |
| A  | B  | B  | B | A |

$$B = 45$$

$$A = 55 \leftarrow \text{wins!}$$

Write corrections here

(c) (2 points) Fill in the your result from part (b) and determine the winner under Copeland's method. The results of each one-on-one comparison (except A vs B) are provided below.

The winner under Copeland's Method is A

| matchup | A vs B         | A vs C         | A vs D         | B vs C         | B vs D         | C vs D         |
|---------|----------------|----------------|----------------|----------------|----------------|----------------|
| tally   | A: 55<br>B: 45 | A: 60<br>C: 40 | A: 75<br>D: 25 | B: 65<br>C: 35 | B: 45<br>D: 55 | C: 35<br>D: 65 |
| winner  | A              | A              | A              | B              | D              | D              |

$$\begin{aligned} \text{pts} \\ A &= 3 \\ B &= 1 \\ D &= 2 \end{aligned}$$

A wins!

Write corrections here