Worksheet 2: Instant Runoff Voting (Ranked Choice Voting)

Group Names: Solutions

1. A class is voting on what kind of ice cream to have. The choices are strawberry (S), chocolate (C), and vanilla (V). The students in the class ranked their ice cream choices and the following preference table was constructed.

# votes	2	5	1	2	2
1st choice	S	V	S	C	C
2nd choice	V	C	C	S	V
3rd choice	C	S	V	V	S

Totals round 1:
S = 2 + 1 = 3
V = 5
C = 2 + 2

Find the winner under the Instant Runoff Voting (Ranked Choice Voting!) method, by answering the following:

(a) Which flavor gets eliminated in round 1? S is eliminated

(it had the fewest first-place votes)

(b) Construct the new preference table after the first elimination round.

# votes	2	5	1	2	2
1st choice	~~S~~	V	~~S~~	C	C
2nd choice	V	C	C	~~S~~	V
3rd choice	C	S	V	V	~~S~~

→

2	5	1	2	2
V	V	C	C	C
C	C	V	V	V
	S			

Round 2:
V = 2 + 5 = 7
C = 1 + 2 + 2 = 5

(c) Who is the IRV (RCV) winner? Vanilla

(d) Do you think the IRV winner accurately represents the class's preference for ice cream? Explain your answer in a sentence or two.

Yes, vanilla was preferred by a majority of voters, even though it wasn't the first choice of a majority.

2. Consider the following preference schedule for an election, with choices Abbot (a), Bingham (b), Chowdhury (c), and Dennison (d).

	5	6	11	3	6	3	3	4
1st choice	d	d	c	a	b	b	d	a
2nd choice	a	a	a	c	c	a	c	b
3rd choice	b	c	d	b	d	d	b	c
4th choice	c	b	b	d	a	c	a	d

Sum = 41

Note $41/2 = 20.5$

(a) How many people voted? 41 How many are needed for a majority? 21

(b) How many possible rounds of IRV/RCV might this election require? How do you know?

Max of 3, since the last round would be a head-to-head matchup which must end in a majority or tie

(c) Who is the plurality winner? d Do they have a majority? No.

Round 1: a = 3+4 = 7, b = 6+3 = 9, c = 11, d = 5+6+3 = 14

In round 1, a is eliminated.

(d) Determine the IRV/RCV winner, if one exists. Show what choices you made at each step, along with the necessary preference schedules.

	5	6	11	3	6	3	3	4
1st choice	d	d	c	~~a~~	b	b	d	~~a~~
2nd choice	~~a~~	~~a~~	~~a~~	c	c	a	c	b
3rd choice	b	c	d	b	d	d	b	c
4th choice	c	b	b	d	a	c	a	d

Round 2:

b = 6+3+4 = 13

c = 11+3 = 14

d = 5+6+3 = 14

b is eliminated

Round 3

	5	6	11	3	6	3	3	4
1st choice	d	d	c	~~a~~	~~b~~	~~b~~	d	~~a~~
2nd choice	~~a~~	~~a~~	~~a~~	c	c	~~a~~	c	~~b~~
3rd choice	~~b~~	c	d	b	d	d	b	c
4th choice	c	b	b	d	a	c	a	d

c = 11+3+6+4 = 24

d = 5+6+3 = 14

c wins!

Who won the election? Chowdhury

(e) Determine the winner of the head-to-head matchup between a and c. a

What does this answer say about whether this election satisfies the Condorcet Criterion?

	5	6	11	3	6	3	3	4
1st choice	d	d	c	a	b	b	d	a
2nd choice	a	a	a	c	c	a	c	b
3rd choice	b	c	d	b	d	d	b	c
4th choice	c	b	b	d	a	c	a	d

This election does not satisfy the Condorcet Criterion because C won the election but lost one of the head-to-head matchups.

a	vs	c
21		20