25	37	35	
A	B	A	Looks like A should win.
B	A	C	
C	C	B	

Sometimes it's hard to say:

3	3	3	
A	B	C	Looks like a 3-way tie.
B	C	A	
C	A	B	

Consider pairs of candidates

A vs B 6 prefer A, 3 prefer B.

A vs C 6 prefer C, 3 prefer A.

B vs C 6 prefer B, 3 prefer C.

In general, they prefer A over B,
and they prefer B over C,
and they prefer C over A.

So $A > B$ & $B > C$ & $C > A$

This is nonsensical!

The Condorcet Paradox

French math/politics

Transitive if $a \geq b$ and $b \geq c$, then $a \geq c$

or if $a > b$ and $b > c$ then $a > c$

"The transitive property"

Individual preferences are transitive.

If I like pepperoni better than plain,

and plain better than anchovy,

then I must like pepperoni better than anchovy.

Condorcet's Paradox

Individual preferences are transitive,

but group preferences are not always transitive.

(e.g. for a group, it's possible to have

$A > B$ and $B > C$ and $C > A$)

Group preferences are not guaranteed to make logical sense.

Q's
- Can we create voting methods which make sense as much as possible?
- How can we judge if a voting method is working sensibly?

The Plurality System

In a plurality election, the one with the most 1st place rankings is the winner.

Ex

25	37	12
A	A	B
B	C	C
C	B	A

Find the winner using plurality.

A: 25+37 = 62

B: 12 — A wins!

C: 0

Plurality is how most political elections work.

"plurality" means more votes than anybody else.

"majority" means more than 50%.

Not every plurality winner actually gets a majority.

Plurality often acheives weird results.

Bush (R) vs Gore (D) (2000)

Another candidate: Ralph Nader Green Party

Nader Gore Bush

votes in FL would decide it

votes in FL:

B: 2,912,790

G: 2,912,253

N: 97,421 ← N's were blamed for making Gore lose.

If these voters ranked their choices:

it probably would look like:

2,912,790	2,912,253	97,421
B	G	N
G	B	G
N	N	B

very generous to B.

Using plurality, B wins.

B: 2,912,790
G: 2,912,253
N: 97,421

If we compare B vs G

B is prefered by 2,912,790

G is prefered by 2,912,253 + 97,421

= 3,009,674

A majority of voters preferred G over B.
(but B won)

We should blame the system!
plurality is to blame.

Ranked Choice Voting (RCV)

aka "instant runoff"
or "transferable vote"

Used in Australia & Ireland,
and for congress in ME & AK.

Do rounds, in each round you count 1st place rankings, eliminate the one with fewest votes.

Ex

38	15	15	7	10	15
A	B	B	D	C	C
B	C	C	C	B	B
C	A	D	B	A	D
D	D	A	A	D	A

RCV:

Round 1

A: 38
B: 30
C: 25
D: 7 ← eliminate D.

(A wins plurality)

Round 2

38	15	15	7	10	15
A	B	B	C	C	C
B	C	C	B	B	B
C	A	A	A	A	A

A: 38
B: 30 ← eliminate B
C: 32

Round 3

38	15	15	7	10	15
A	C	C	C	C	C
C	A	A	A	A	A

A: 38

C: 62

C wins!

In AK, Sarah Palin