2.6: Instant Runoff Voting

Instant Runoff Voting (IRV), also called Plurality with Elimination, is a modification of the plurality method that attempts to address the issue of insincere voting.

Instant Runoff Voting (IRV)

In IRV, voting is done with preference ballots, and a preference schedule is generated. The choice with the least first-place votes is then eliminated from the election, and any votes for that candidate are redistributed to the voters’ next choice. This continues until a choice has a majority (over 50%).

This is similar to the idea of holding runoff elections, but since every voter’s order of preference is recorded on the ballot, the runoff can be computed without requiring a second costly election.

This voting method is used in several political elections around the world, including election of members of the Australian House of Representatives, and was used for county positions in Pierce County, Washington until it was eliminated by voters in 2009. A version of IRV is used by the International Olympic Committee to select host nations.

Example 5

Consider the preference schedule below, in which a company’s advertising team is voting on five different advertising slogans, called A, B, C, D, and E here for simplicity.

Initial votes
If this was a plurality election, note that B would be the winner with 9 first-choice votes, compared to 6 for D, 4 for C, and 1 for E.

There are total of $3+4+4+6+2+1 = 20$ votes. A majority would be 11 votes. No one yet has a majority, so we proceed to elimination rounds.

**Solution**

**Round 1**: We make our first elimination. Choice A has the fewest first-place votes, so we remove that choice.

We then shift everyone’s choices up to fill the gaps. There is still no choice with a majority, so we eliminate again.
<table>
<thead>
<tr>
<th>Round 2: We make our second elimination. Choice E has the fewest first-place votes, so we remove that choice, shifting everyone’s options to fill the gaps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round 3: We make our third elimination. C has the fewest votes.</td>
</tr>
</tbody>
</table>
Condensing this down:

\[
\begin{array}{|l|l|l|}
\hline
\text{1}^\text{st} \text{ choice} & \text{B} & \text{D} \\
\hline
\text{2}^\text{nd} \text{ choice} & \text{D} & \text{B} \\
\hline
\end{array}
\]

D has now gained a majority, and is declared the winner under IRV.

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**Try it Now 3**

Consider again the election from Try it Now 1. Find the winner using IRV.

\[
\begin{array}{|l|l|l|l|l|l|l|l|}
\hline
\text{1}^\text{st} \text{ choice} & \text{G} & \text{G} & \text{G} & \text{M} & \text{M} & \text{B} & \text{B} \\
\hline
\text{2}^\text{nd} \text{ choice} & \text{M} & \text{B} & \text{M} & \text{G} & \text{B} & \text{M} & \text{G} \\
\hline
\text{3}^\text{rd} \text{ choice} & \text{B} & \text{M} & \text{B} & \text{G} & \text{G} & \text{B} & \text{M} \\
\hline
\end{array}
\]

**Answer**

G has the fewest first-choice votes, so is eliminated first. The 20 voters who did not list a second choice do not get transferred - they simply get eliminated.

\[
\begin{array}{|l|l|}
\hline
\text{1}^\text{st} \text{ choice} & \text{M} & \text{B} \\
\hline
\text{2}^\text{nd} \text{ choice} & \text{B} & \text{M} \\
\hline
\end{array}
\]

McCarthy (M) now has a majority, and is declared the winner.