

Name	File loaded into program
ID	VS01
Description	A file is loaded and opened for use by the program.
Actors	System, User
Frequency of Use	This will occur in every run of the program.
Organizational Benefits	Election file is loaded, allowing the system to read and tabulate the result.
Triggers	A user loads the program.
Preconditions	A file containing valid election information has been created and the program is opened.
Postcondition	An election file is opened and ready to be read in by the program.
Main Course	<ol style="list-style-type: none"> 1. The program is run along with the election filename. 2. The system opens the file.
Alternate Courses	AC1 - The program is run without a filename: <ol style="list-style-type: none"> 1. The system prompts the user to enter a filename when the program opens. 2. Return to MC2.
Exceptions	EX1: <ol style="list-style-type: none"> 1. A valid filename is not found. 2. The system prints an error and closes the program.

Name	Ballot read in
ID	VS02
Description	A voting ballot file is read into the program.
Actors	System
Frequency of Use	Every time the program is run this will occur.
Organizational Benefits	The information on the ballot is available for analysis.
Triggers	A valid file has been loaded into the program.
Preconditions	A valid file has been loaded into the program.
Postcondition	The system can run either the CPL or OPL ballot analysis.
Main Course	<ol style="list-style-type: none"> 1. The system has started to read in the loaded file. 2. The system decides if the ballot is an OPL ballot or a CPL ballot. 3. If the top line read in is OPL, continue to VS05. 4. If the top line read in is CPL, continue to VS06.
Alternate Courses	N/A
Exceptions	EX1 - Invalid ballot: <ol style="list-style-type: none"> 1. The ballot contains invalid information. 2. The system prints an error and closes the program.

Name	Tie breaking
ID	VS03
Description	When multiple candidates have the same number of votes, there must be a tie breaking decision.
Actors	System
Frequency of Use	Every instance of a tie.
Organizational Benefits	There must be a fair way to break ties, to ensure fair election results.
Triggers	The tie breaking function will be called when a tie exception is thrown.
Preconditions	There must be a list of candidates with their associated voting totals. There must be two or more candidates with the same aggregate voting total.
Postcondition	All candidates will have a unique ranking.
Main Course	<ol style="list-style-type: none"> 1. Create a list of all tied candidates. 2. Randomly select candidates for each ranking based on an n sided die. (n tied candidates). 3. Edit the original rankings to incorporate the tie breaker ranks.
Alternate Courses	N/A
Exceptions	N/A

Name	File validation
ID	VS04
Description	Check that the file has the expected format header information.
Actors	System
Frequency of Use	Every time the program is run.
Organizational Benefits	Initially check that the file is correct to avoid faulty results down the line.
Triggers	The user enters the file name into the program.
Preconditions	There user must have entered a file name (to be checked).
Postcondition	The system will recognize the file as correct / incorrect.
Main Course	<ol style="list-style-type: none"> 1. System checks that the file exists in the folder. 2. System verifies the header information based on the voting type.
Alternate Courses	N/A
Exceptions	EX1 - File doesn't exist <ol style="list-style-type: none"> 1. Prompt the user to re-enter the file name EX2 - Header data inconsistent <ol style="list-style-type: none"> 1. Inform the user that the header information is inconsistent with the voting type.

Name	Run OPL ballot tabulation
ID	VS05
Description	An OPL voting file is read into the system and analyzed.
Actors	System
Frequency of Use	Potentially every time the system is run, an OPL vote can be tabulated.
Organizational Benefits	Results of an OPL election are tallied and ready for analysis.
Triggers	An OPL voting file has been read by the system.
Preconditions	The program is loaded with a file that is determined to be an OPL election.
Postcondition	An OPL ballot is fully read into the system, with vote totals and relevant information saved for further use.
Main Course	<ol style="list-style-type: none"> 1. The number of seats available is read in and saved. 2. The number of ballots cast is read in and saved. 3. The number of candidates is read in and saved. 4. A list is created of candidates, in order, along with their respective party. 5. The votes are read in, line by line, with results saved into a list. This list will match the order of the list of candidates.
Alternate Courses	N/A
Exceptions	EX1 - Ballots not formatted correctly: <ol style="list-style-type: none"> 1. File is not formatted correctly, and an incorrect value is found. 2. System prints error messages, and closes the program.

Name	Run CPL ballot tabulation
ID	VS06
Description	A CPL voting file is read into the system and analyzed.
Actors	System
Frequency of Use	Potentially every time the system is run, a CPL vote can be tabulated.
Organizational Benefits	Results of a CPL election are tallied and ready for analysis.
Triggers	A CPL voting file has been read by the system.
Preconditions	The program is loaded with a file that is determined to be a CPL election.
Postcondition	A CPL ballot is fully read into the system, with vote totals and relevant information saved for further use.
Main Course	<ol style="list-style-type: none"> 1. The number of parties is read in and saved. 2. The order of parties in the ballots is read in and saved. 3. The number of seats up for election is read in and saved. 4. The number of ballots cast is read in and saved. 5. The number of candidates is read in and saved. 6. A list is created of the candidates, their party, and their order within the party list is saved. 7. The votes are read in, line by line, with results saved into a list. This list will match the order of the list of parties.
Alternate Courses	N/A
Exceptions	EX1 - Ballots not formatted correctly: <ol style="list-style-type: none"> 1. File is not formatted correctly, and an incorrect value is found. 2. System prints error messages, and closes the program.

Name	Determine winners in OPL
ID	VS07
Description	After the results of an OPL election have been tabulated, the results are analyzed to determine the winner(s).
Actors	System
Frequency of Use	Every time an OPL election is run by the program, the winner(s) will be determined.
Organizational Benefits	Winner(s) are determined for an OPL election.
Triggers	An OPL election has been tabulated by the program, and all of the relevant data is ready to be analyzed.
Preconditions	The program is loaded with an OPL election. The election results have been read in and saved.
Postcondition	One or more winners are determined and saved.
Main Course	<ol style="list-style-type: none"> 1. The number of ballots cast is divided by the number of available seats. 2. Rounded down, this is the minimum number of votes required, or quota, for earning a seat in the first allocation of seats. 3. Each party is awarded a number of seats equal to their vote total divided by the quota. A seat is only awarded if the party has enough votes to meet the quota. 4. Any leftover votes for each party are saved. 5. If there are still seats left to be awarded, the leftover votes are used. The party with the most leftover votes is awarded the first seat. This continues until all seats are awarded. 6. For each party that has earned at least one seat, the top vote getter in that party is awarded a seat. If the party has earned further seats, the next highest vote getter is awarded a seat. 7. This continues until a party has no further earned seats.
Alternate Courses	N/A
Exceptions	<p>EX1 - A tie occurs:</p> <ol style="list-style-type: none"> 1. If two or more parties have an equal number of votes and there are not enough seats left to award both parties a seat, a tie has occurred. 2. See VS03 for tie resolving procedures.

Name	Determine winner in CPL
ID	VS08
Description	After the results of a CPL election have been tabulated, the results are analyzed to determine the winner(s).
Actors	System
Frequency of Use	Every time a CPL election is run by the program, the winner(s) will be determined.
Organizational Benefits	Winner(s) are determined for a CPL election.
Triggers	A CPL election has been tabulated by the program, and all of the relevant data is ready to be analyzed.
Preconditions	The program is loaded with a CPL election. The election results have been read in and saved.
Postcondition	One or more winners are determined and saved.
Main Course	<ol style="list-style-type: none"> 1. The number of ballots cast is divided by the number of available seats. 2. Rounded down, this is the minimum number of votes required, or quota, for earning a seat in the first allocation of seats. 3. Each party is awarded a number of seats equal to their vote total divided by the quota. A seat is only awarded if the party has enough votes to meet the quota. 4. Any leftover votes for each party are saved. 5. If there are still seats left to be awarded, the leftover votes are used. The party with the most leftover votes is awarded the first seat. This continues until all seats are awarded. 6. For each party that has earned at least one seat, the top ranked candidate in that party is awarded a seat. If the party has earned further seats, the next highest ranked candidate is awarded a seat. 7. This continues until a party has no further earned seats, and repeats for the next party that has been awarded seats.
Alternate Courses	N/A
Exceptions	<p>EX1 - A tie occurs:</p> <ol style="list-style-type: none"> 1. If two or more parties have an equal number of votes and there are not enough seats left to award both parties a seat, a tie has occurred. 2. See VS03 for tie resolving procedures.

Name	Produce audit file for OPL election
ID	VS09
Description	An audit file is produced that has in depth information about the election. The results of the election could be reproduced from the information in the audit file.
Actors	System, User
Frequency of Use	Every time an OPL election is run in the program, an audit file is produced.
Organizational Benefits	The audit files gives election officials the ability to verify the results of the election. The audit file also allows for easy testing and debugging of the system.
Triggers	Winner(s) of an OPL election has been determined.
Preconditions	The program is run with an OPL election file loaded. The results have been tabulated, and the winner(s) has been selected.
Postcondition	A text file has been created with all of the audit information available for easy viewing.
Main Course	<ol style="list-style-type: none"> 1. A file is created in the same location as the program. 2. A header is printed to that file that contains the time and day that the election results have been created. 3. OPL is printed to the file to designate this as an OPL election audit. 4. The number of open seats prior to the election is printed and labeled. 5. The number of ballots cast in the election is printed and labeled. 6. In a table, the list of candidates are printed. Next to each candidate will also show the number of votes that they got. They will be printed in the same order as received from the original election file. 7. Each party is printed along with the total number of votes they received and the percentage of the total votes that the party received. 8. The quota for winning a seat is printed and labeled. 9. The candidates who won seats are listed along with their party. Seats awarded during first or second allocation of seats are clearly delineated. 10. File is closed.
Alternate Courses	N/A
Exceptions	<p>EX1 - Same file name found:</p> <ol style="list-style-type: none"> 1. If a file is found with the same name as the desired audit file name, choose a new filename that is an iteration of the first name. 2. Return to MC2.

Name	Produce audit file for CPL election
ID	VS10
Description	An audit file is produced that has in depth information about the election. The results of the election could be reproduced from the information in the audit file.
Actors	System, User
Frequency of Use	Every time a CPL election is run in the program, an audit file is produced.
Organizational Benefits	The audit files gives election officials the ability to verify the results of the election. The audit file also allows for easy testing and debugging of the system.
Triggers	Winner(s) of a CPL election has been determined.
Preconditions	The program is run with a CPL election file loaded. The results have been tabulated, and the winner(s) has been selected.
Postcondition	A text file has been created with all of the audit information available for easy viewing.
Main Course	<ol style="list-style-type: none"> 1. A file is created in the same location as the program. 2. A header is printed to that file that contains the time and day that the election results have been created. 3. OPL is printed to the file to designate this as a CPL election audit. 4. The number of open seats prior to the election is printed and labeled. 5. The number of ballots cast in the election is printed and labeled. 6. In a table, the parties participating in the election and the number of votes each party received and percentage of total vote are printed. 7. The list of candidates are printed along with their party and the rank within the party. 8. The quota for winning a seat is printed and labeled. 9. The candidates who won seats are listed along with their party. Seats awarded during first or second allocation of seats are clearly delineated. 10. File is closed.
Alternate Courses	N/A
Exceptions	<p>EX1 - Same file name found:</p> <ol style="list-style-type: none"> 1. If a file is found with the same name as the desired audit file name, choose a new filename that is an iteration of the first name. 2. Return to MC2.

Name	Produce media file
ID	VS11
Description	A media file in txt format is generated that contains the summary of the election results. It contains the winners and parties, percentages of the votes, total seats for the winner.
Actors	System, User
Frequency of Use	Every time an election is run in the program, a media file is produced.
Organizational Benefits	The media file contains the summary of the election and can deliver the result to the media. It is an interpretation of the audit file that contains the key information the media would like to know about.
Triggers	The result of the election has been determined.
Preconditions	The program is run with a CPL file or OPL file loaded. The results have been tabulated, and the winner(s) has been determined.
Postcondition	A text file has been created with the summary of the election.
Main Course	<ol style="list-style-type: none"> 1. A file is created in the same location as the program. 2. A header is printed to that file that contains the time and day that the election results have been created. 3. OPL or CPL is printed to the file to indicate the type of the election. 4. The winner or the winning parties are printed to the file. 5. A list containing percentages of the votes and the seat allocation result is printed to the file. 6. File is closed.
Alternate Courses	N/A
Exceptions	EX1 - Same file name found: <ol style="list-style-type: none"> 1. If a file is found with the same name as the desired media file, choose a new filename that is an iteration of the first name. 2. Return to MC2.

Name	Show winner
ID	VS12
Description	The winner(s), the number of ballots cast and the number of votes received for candidates and parties will be displayed on the screen.
Actors	System, User
Frequency of Use	Everytime an election is run in the program, it should display the result and show the winner on the screen.
Organizational Benefits	The winner information provides a direct way to quickly understand the election result after the running of the program.
Triggers	Winner(s) of an election has been determined after the program runs.
Preconditions	The program is run with a CPL or OPL file loaded. The results have been tabulated, and the winner(s) has been selected.
Postcondition	The winner (s) and information about the election are displayed on the screen.
Main Course	<ol style="list-style-type: none"> 1. The program finishes running. 2. The winner(s) and the winning parties are displayed on the screen. 3. The type of the election is displayed on the screen. 4. The number of ballot casts is displayed on the screen. 5. The number of votes received for all the candidates and parties is displayed on the screen.
Alternate Courses	N/A
Exceptions	N/A