Voting Procedures – Plurality

There are a lot of different ways to count votes in order to determine a winner.

- Canada, the United States, and many countries in Africa use **plurality**.
- The Australian House of Representative, the Indian presidential election, and parliament in Papau New Guinea use **majority with elimination**.
- Nauru, a tiny island country in Micronesia (just northeast of Australia) uses **Borda count**.
- The **Condorcet method** is not practical to use in elections, but a modified version of it is the basis for voting in Robert's Rules of Order.
- Most countries in western Europe and South America, as well as Russia, Kazakhstan, and several countries in Africa use **proportional representation**.

Each method has advantages and disadvantages.

Plurality

In voting under a plurality method, people vote for their favorite option. The option with the most votes is the winner.

Advantages: it is easy to calculate and a winner is guaranteed (unless there is a tie)

Disadvantages: A winner could emerge that most people do not want

Ex: Grade 11 students are electing their class president. Of the 150 students in grade 11, 70 vote for Ali, 30 vote for Brenda, and 50 vote for Chris. Under plurality, who wins the election?

In some questions, we will be given a ranked ballot where people put all the options in order.

Ex: Dr. James is going to bring a snack (apples, granola bars, or pepperoni sticks) in for her math students and the students will vote to determine the snack. The following table summarizes the results of the student vote.

# of votes / Preference	45	32	28	23
1st choice	apples	granola bars	pepperoni	granola bars
2nd choice	granola bars	apples	apples	pepperoni
3rd choice	pepperoni	pepperoni	granola bars	apples

Given these results, which snack would win under plurality?

Voting Procedures – Plurality

Practice Questions

1) In a hockey league, a committee of 53 members must select a recipient for the trophy for the hardest-working player from a list of three candidates.

- Candidate A received 16 votes
- Candidate B received 20 votes
- Candidate C received 17 votes

Under plurality voting, which candidate wins?

2) To determine Monday's menu at a high school cafeteria, the school's 250 grade 11 students were asked to rank three menus in order of preference. The results are presented in the table below.

# of votes / Preference	63	51	46	45	24	21
1st choice	Pizza	Hamburgers	Tacos	Tacos	Hamburgers	Pizza
2nd choice	Hamburgers	Pizza	Pizza	Hamburgers	Tacos	Tacos
3rd choice	Tacos	Tacos	Hamburgers	Pizza	Pizza	Hamburgers

Under plurality voting, which menu item would be served?

3) A new school is being built and an election was held to determine if it will be in Village A, Village B, or Village C. Village A received 45% of the vote. Village B received 35% of the vote. Village C received 20% of the vote. Under plurality rule, where will the school be built?

Voting Procedures – Majority
Majority

 In voting under a majority method, people vote for their favorite option. The option with more than half the votes is the winner.

Step 1: determine the total number of votes

Step 2: divide the total number of votes by 2

Step 3: determine the number of first place votes for each option

Step 4: determine a winner (the option with **more than half** the votes).

* Note: if no option has more than half the votes, there is no winner.*

Advantages: more than half the people are guaranteed to like the winner

Disadvantages: there may be no winner

Ex: A group of friends is trying to decide where to eat dinner. They decide to vote for their favorite type of food, and the results are presented in the table below. Which option wins using majority?

# of votes / Preference	4	4	7	5
1st choice	Vietnamese	Italian	Vietnamese	Sushi
2nd choice	Sushi	Vietnamese	Italian	Italian
3rd choice	Italian	Sushi	Sushi	Vietnamese

Ex: Grade 11 students are electing their class president. Of the 140 students in grade 11, 70 vote for Ali, 30 vote for Brenda, and 50 vote for Chris. Under plurality, who wins the election?

Voting Procedures – Majority
Practice Questions

4) The 40 members of the board of directors of a company must vote to elect the president of the board. Three candidates apply for the position and the results of the vote are presented in the table below.

# of votes Preference	16	14	10
1st choice	A	C	B
2nd choice	B	A	A
3rd choice	C	B	C

Given the board of directors use majority to determine the winner, which candidate wins?

5) To determine Monday's menu at a high school cafeteria, the school's 250 grade 11 students were asked to rank three menus in order of preference. The results are presented in the table below.

# of votes Preference	63	51	46	45	24	21
1st choice	Pizza	Pizza	Tacos	Tacos	Tacos	Pizza
2nd choice	Hamburgers	Hamburgers	Pizza	Hamburgers	Hamburgers	Tacos
3rd choice	Tacos	Tacos	Hamburgers	Pizza	Pizza	Hamburgers

Under majority voting, which menu item would be served?

Voting Procedures – Majority with Elimination
Majority with Elimination

In voting under a **majority with elimination** method, people rank the options from favorite to least favorite. The option with more than half the votes is the winner. However, if no option receives more than half the votes, the option with the fewest votes is eliminated and re-assigned.

    Step 1: determine the total number of votes

    Step 2: divide the total number of votes by 2

    Step 3: determine the number of first place votes for each option

    Step 4: determine a winner (the option with **more than half** the votes)

    Step 5: If no winner, the option with the fewest number of votes is eliminated and the votes are re-assigned to the next option on the list. Repeat this step until an option has more than half the votes

Advantages: A winner is guaranteed and people's preferences for all options are included

Disadvantages: Voting and counting the votes can be time-consuming depending on the number of options

Ex: A political party is holding elections to determine its new leader. There are 5 people nominated for the position.

# of votes / Preference	23	56	60	20	41
1st choice	A	B	C	A	D
2nd choice	B	A	B	E	B
3rd choice	C	C	A	C	A
4th choice	D	D	E	D	C
5th choice	E	E	D	B	E

Voting Procedures – Majority with Elimination
Practice Questions

6) The table below presents the results of an election between 3 candidates: A, B, and C.

# of votes / Preference	50	30	27	24	10
1st choice	C	B	A	A	B
2nd choice	B	C	B	C	A
3rd choice	A	A	C	B	C

Which candidate wins using majority with elimination?

7) Philemon Wright is selling grad hoodies, but can only order 1 color of hoodies. Students are asked to vote among the following options: Green, Blue, Red, and Black. The results of the vote are presented in the table below:

# of votes / Preference	52	41	35	33	29	21
1st choice	Blue	Green	Green	Black	Blue	Red
2nd choice	Green	Blue	Black	Blue	Green	Green
3rd choice	Black	Red	Red	Red	Red	Black
4th choice	Red	Black	Blue	Green	Black	Blue

Using majority with elimination, which color hoodie will be ordered?

Voting Procedures – Borda Count
Borda Count

In voting under a **Borda count** method, people rank the options from favorite to least favorite. Points are assigned to each choice. For each option, the number of votes is multiplied by the points, and all are added together. The option with the most points is the winner.

Step 1: Assign points to each option (last choice is 0, next is 1, next is 2, and so on until all choices are assigned)

Step 2: Every time an option is ranked, the number of votes is multiplied by the points assigned

Step 3: All the points for each option are added together

Step 4: The option with the most votes is the winner.

Advantages: This allows for a nuanced interpretation of preferences and will generally lead to a high degree of satisfaction among the electorate

Disadvantages: It's a complicated system to implement

Ex: Dr. James is going to bring a snack (apples, granola bars, or pepperoni sticks) in for her math students and the students will vote to determine the snack. The following table summarizes the results of the student vote.

# of votes / Preference	45	32	28	23
1st choice	apples	granola bars	pepperoni	granola bars
2nd choice	granola bars	apples	apples	pepperoni
3rd choice	pepperoni	pepperoni	granola bars	apples

Given these results, which snack would win under plurality?

Voting Procedures – Borda Count
Practice Questions

8) A group of friends is trying to decide where to eat dinner. They decide to vote for their favorite type of food, and the results are presented in the table below. Which option wins using Borda count?

# of votes / Preference	4	4	7	5
1st choice	Vietnamese	Italian	Vietnamese	Sushi
2nd choice	Sushi	Vietnamese	Italian	Italian
3rd choice	Italian	Sushi	Sushi	Vietnamese

9) To determine Monday's menu at a high school cafeteria, the school's 250 grade 11 students were asked to rank three menus in order of preference. The results are presented in the table below.

# of votes / Preference	63	51	46	45	24	21
1st choice	Pizza	Pizza	Tacos	Tacos	Tacos	Pizza
2nd choice	Hamburgers	Hamburgers	Pizza	Hamburgers	Hamburgers	Tacos
3rd choice	Tacos	Tacos	Hamburgers	Pizza	Pizza	Hamburgers

Condorcet Method

The Condorcet method is a voting system in which the winner is the option that, when compared in a head-to-head competition with every other method, is the preferred option.

Step 1: Compare option A to option B. Determine the number of people who prefer A to B and the number of people who prefer B to A. The option with the most votes is the winner.

Step 2: Compare option A to another option and repeat step 1. Do this for as many options as exist.

Step 3: Compare option B to every other option, one option at a time (as in step 1).

Step 4: Repeat with every possible combination of options.

Step 5: Declare the winner – the option that never loses.

Advantages: this method is the most rigorous and assures the most number of people will be satisfied by the outcome as possible.

Disadvantages: there is often no winner and it is complicated to implement.

Ex: The 40 members of the board of directors of a company must vote to elect the president of the board. Three candidates apply for the position and the results of the vote are presented in the table below.

# of votes / Preference	16	14	10
1st choice	A	C	B
2nd choice	B	A	A
3rd choice	C	B	C

Given the board of directors use the Condorcet method to determine the winner, which candidate wins?

Voting Procedures – Condorcet method

Ex: Voters are asked to choose between 4 candidates: A, B, C, and D. The results of the vote are presented in the table below:

# of votes / Preference	70	60	50	45
1st choice	A	D	C	B
2nd choice	B	A	D	C
3rd choice	C	B	A	D
4th choice	D	C	B	A

Using the Condorcet method, which candidate wins?

Voting Procedures – Condorcet method
Practice Questions

10) Philemon Wright is selling grad hoodies, but can only order 1 color of hoodies. Students are asked to vote among the following options: Green, Blue, Red, and Black. The results of the vote are presented in the table below:

# of votes Preference	52	41	35	33	29	21
1st choice	Blue	Green	Green	Black	Blue	Red
2nd choice	Green	Blue	Black	Blue	Green	Green
3rd choice	Black	Red	Red	Red	Red	Black
4th choice	Red	Black	Blue	Green	Black	Blue

Using the Condorcet method, which color hoodie will be ordered?

11) A group of friends is trying to decide where to eat dinner. They decide to vote for their favorite type of food, and the results are presented in the table below. Which option wins using the Condorcet method?

# of votes Preference	4	4	7	5
1st choice	Vietnamese	Italian	Vietnamese	Sushi
2nd choice	Sushi	Vietnamese	Italian	Italian
3rd choice	Italian	Sushi	Sushi	Vietnamese

Voting Unit – Proportional Representation
Proportional Representation

In **proportional representation**, individuals vote for the party they most prefer. The total number of votes for each party are calculated, and then the parties are awarded a number of seats in proportion to the number of votes received.

Step 1: Determine the number of votes for each party

Step 2: Determine the total number of votes

Step 3: Determine the proportion of votes for each party $\dfrac{votes\ for\ the\ party}{total\ number\ of\ votes}$

Step 4: Multiply the proportion of votes for each party by the number of seats available

Step 5: Ignore the decimals (do not round) and assign each party that number of seats

Step 6: Assign any remaining seats by choosing the highest decimal, the next highest, etc until all seats are assigned

Advantages: This system is quite representative of individual preferences and leads to a distribution of power that fairly accurately reflects the will of the electorate

Disadvantages: There is often no majority parts and thus requires a coalition government that can slow the decision making process.

Ex: A country is electing representatives to fill 90 seats in its Parliament. There are 5 parties in the election: A, B, C, D, E. The results of the election are presented in the table below.

Party	A	B	C	D	E
# of votes	113	108	132	86	92

Using proportional representation, how many seats will each party earn?

Voting Unit – Proportional Representation

Ex: A town is holding an election to fill 12 seats on its council. There are 3 parties and the results of the election are in the table below:

Party	Percent of Vote Received
A	38%
B	33.6%
C	28.4%

Using proportional representation, how will the available seats be divided?

Voting Unit – Proportional Representation
Practice Questions

12) In 2019, Canada held a federal election and the number of popular votes each party received is in the table below.

Party	# of Votes
Liberal	6 018 728
Conservative	6 239 227
Bloc Quebecois	1 387 030
New Democratic Party	2 903 722
Green Party	1 189 607
Independent	72 546

a) If Canada used a proportional representation system, how many of the 338 seats in Parliament would each party receive?

b) The actual number of seats won by each party under our current system (districts using plurality) is in the table below. How would proportional representation change these results?

Party	# of Seats
Liberal	157
Conservative	121
Bloc Quebecois	32
New Democratic Party	24
Green Party	3
Independent	1

Voting Unit – Approval Voting

The final method of voting we will consider is Approval voting.

In approval voting, instead of ranking candidates, voters will select as many options as they like. Every option they choose will receive 1 vote. The option with the most votes is the winner.

Ex: The results of an election are presented in the table below.

Number of Voters	45	32	28	23
	A D	B C D	A B C	A

Using approval voting, which option would win?

Practice Questions

13) A group of friends is trying to decide where to eat dinner. They decide to vote for their favorite type of food, and the results are presented in the table below. Which option wins using Approval voting?

# of votes	4	4	7	5
	Vietnamese Sushi	Italian Vietnamese	Vietnamese Italian Sushi	Sushi

14) To determine Monday's menu at a high school cafeteria, the school's 250 grade 11 students were asked to rank three menus in order of preference. The results are presented in the table below.

# of votes	63	51	46	45	24	21
	Pizza Hamburgers	Pizza Tacos	Tacos	Tacos Hamburgers	Hamburgers	Pizza

Answer Key – Voting

1) Candidate B

2) Tacos

3) Village A

4) No winner

5) Pizza

6) Candidate C

7) Blue

8) Vietnamese

9) Pizza

10) Blue

11) Vietnamese

12) a) Liberal: 114 seats; Conservative: 119 seats; BQ: 26 seats; NDP: 55 seats; Green: 23 seats; Independent: 1 seat

b) Liberals would lose 43 seats; Conservatives would lose 2 seats; BQ would lose 6 seats; NDP would gain 31 seats; Green would gain 20 seats; Independents would stay the same

13) Sushi

14) Tacos