Worksheet 1: Voting Theory

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 as in the following table.

	1	?	otte 🗙	¥	5	6	ieve	C	9	10	11	12
student	Anne	Brian	Charle	Dafna	Eric	Frank	Genev	Horac	Isaac	Juan	Kate	Layla
1st choice	S	V	S	V	V	\mathbf{S}	V	C	С	C	С	V
2nd choice	V	\mathbf{C}	V	\mathbf{C}	\mathbf{C}	\mathbf{C}	\mathbf{C}	\mathbf{S}	V	\mathbf{S}	V	XC
3rd choice	\mathbf{C}	S	\mathbf{C}	\mathbf{S}	\mathbf{S}	\mathbf{V}	\mathbf{S}	V	\mathbf{S}	V	\mathbf{S}	S

- (a) How many possible columns can there be in a preference schedule for this ranking? How many columns does your preference schedule need?
 - SSVVCC VCSCSV-76 columns CVCSVS possible.
- (b) Fill in the preference schedule below. Add columns as you need to.

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

- (c) Who is the plurality winner?
- S = 2 +1 = 3 votes Vanilla is the phrality winner. V = 5 votes C = 2+2 = 4 votes (d) How many votes are needed for a majority winner? Is there a majority winner? Explain
- your answer to a classmate. Total # students = 12, and $\frac{12}{2}$ = 6 but a majority is 50% +1 so 7 votes are nucled for a majority.
- (e) Do you think the plurality winner accurately represents the class's preference for ice cream? Explain your answer in a sentence or two.

 $S = \frac{3}{12} = .25 = .25\%$ Nore people wanted some other flavo of $V = \frac{5}{12} = .416.... \approx 42\%$ Nore people wanted some other flavo of ice cream than wanted vanilla, so this $C = \frac{4}{12} = \frac{1}{3} \approx 33\%$ Not $V = \frac{3+4}{12} = \frac{7}{12} = a$ majority 1
the class's preference. 2. A group of 42 moviegoers is asked to rank the following three movies: "Inside out 2", "Deadpool and Wolverine", and "Despicable Me 4". Their results are provided in the following preference schedule:

number of voters	14	9	8	5	6
1st choice	Deadpool	Despicable Me	Inside Out	Inside Out	Despicable Me
2nd choice	Inside Out	Deadpool	Deadpool	Despicable Me	Inside Out
3rd choice	Despicable Me	Inside Out	Despicable Me	Deadpool	Deadpool

- (a) How many voters were there? <u>42</u>
- (b) How many voters are needed to have a majority of the votes? 22

50% is $(42)(\frac{50}{100}) = \frac{42}{2} = 21$ so to have 50%+1 we need 22 votes ("per cent" = portions of 100) Minimum# (c) How many voters are needed for a movie to have a plurality of the votes? ______ gl votes There are 3 choices, so an even division is 42/3 = 14. So a plurality requires more than 14.

Inside

- (d) Find the winner using the **Plurality Method**, if one exists. Write a sentence to explain
- your answer to a classmate. <u>Jedgool Despicable ne</u> <u>Inside Out</u> <u>Despicable ne</u> <u>Inside Out</u> <u>Despicable ne</u> <u>Inside Out</u> <u>Despicable ne</u> <u>Inside Out</u> <u>Despicable is the plurality</u> <u>i'' choice it 916 = 15</u> <u>8t5 = 13</u> <u>winner because it got the most</u> (e) Is there a Condorcet winner? Show some work and explain your answer. *Compare your answer to the plurality winner*. *Condorcet winner is the winner of pairwise Comparisons*.

Dea					
number of voters	14	9	8	5	6
1st choice	Deadpool	Despicable Me	Inside Out	Inside Out	Despicable Me
2nd choice	Inside Out	Deadpool	Deadpool	Despicable Me	Inside Out
3rd choice	Despicable Me	Inside Out	Despicable Me	Deadpool	Deadpool
prefer	DP : 1 DM : 9	4 + 8 1+5 + 6	= 22 = 20	Dec	heod bins

Despicalale Me vs Inside Out

number of voters	14	9	8	5	6
1st choice	Deadpool	Despicable Me	Inside Out	Inside Out	Despicable Me
2nd choice	Inside Out	Deadpool	Deadpool	Despicable Me	Inside Out
3rd choice	Despicable Me	Inside Out	Despicable Me	Deadpool	Deadpool

Despicable Me: 9+6 = 15

Inside Out: 14 +8+5 = 27

Dealpool vs Insule Out

number of voters	14	9	8	5	6
1st choice	Deadpool	Despicable Me	Inside Out	Inside Out	Despicable Me
2nd choice	Inside Out	Deadpool	Deadpool	Despicable Me	Inside Out
3rd choice	Despicable Me	Inside Out	Despicable Me	Deadpool	Deadpool

prefer Deadpool: 14 + 9 = 23 prefer Inside Dut: 81516 = 19

- Deadpool Wins
- D No condercet winner!
 2 Even though Despicable me Non a plurality it won No head-to-head comparison!