Exploring the World of Math

Name: _____ Date: _____

Voting Math

1. Using the Borda Count Method. We vote for where to have the company holiday party. At the mall (w) with a $500 gift card, at a nice restaurant (x), at a ski lodge (y) or a $100 holiday cash (z).

1	2	3	4	5	6	7	8	9	10
W	X	Z	X	W	W	W	X	Z	W
X	W	W	W	X	Z	X	W	W	X
Y	Z	X	Z	Y	X	Y	Z	X	Y
Z	Y	Y	Y	Z	Y	Z	Y	Y	Z
11	12	13	14	15	16	17	18	19	20
W	W	X	W	X	W	W	W	Z	X
X	Z	W	X	W	Z	Z	X	W	W
Y	X	Z	Y	Z	X	X	Y	X	Z
Z	Y	Y	Z	Y	Y	Y	Z	Y	Y
21	22	23	24	25	26	27	28	29	30
Z	W	Z	X	X	W	Z	Z	W	Z
W	X	W	W	W	Z	W	Y	X	W
X	Y	X	Z	Z	X	X	W	Y	X
Y	Z	Y	Y	Y	Y	Y	X	Z	Y

2. Organize the different ballots and do a points tally

1st (4)									
2nd (3)									
3rd (2)									
4th (1)									

3. Total each choice:

   W =

   X =

   Y =

   Z =

4. Determine the Banzhaf Power Index for the four players. Player one gets 6 votes, player two gets 4 votes, player three gets 2 votes, and player four gets 1 vote. Determine all the possible sets. Add their weighted number to get the total weight. Identify winning sets of 7 and above. Then underline all critical players that will allow the total weight to fall below 6 if that player was removed from the team.

2 person coalition	Wt	3 person coalition	Wt	4 person coalition	Wt

5. How many times are all players critical?

6. How many times is P_1 critical? Divide P_1 by the total critical to get its Banzhaf power index.

7. How many times is P_2 critical? Divide P_2 by the total critical to get its Banzhaf power index.

8. How many times is P_3 critical? Divide P_3 by the total critical to get its Banzhaf power index.

9. How many times is P_4 critical? Divide P_4 by the total critical to get its Banzhaf power index.

10. Determine the Shapley Shubik Power Index for the four players. Player one gets 5 votes, player two gets 4 votes, player three gets 3 votes, and player four gets 2 votes. Determine all the possible sets. Identify the pivotal player when adding that causes the weight to equal or exceed 10 and underline all the pivotal player in that set.

Coalitions	Wt						

11. How many times are all players pivotal?
    P1 = _____ P2 = _____ P3 = _____ P4 = _____

12. Calculate the Shapley Shubik Power Index for each player (critical divided by 4!)
    P1 = _____ P2 = _____ P3 = _____ P4 = _____