Exploring the World of Math

Name: _____ Date: _____

Voting Math Review

1. Using the Borda Count Method. We vote for the company's new CEO. Our choices are R, S, T, U, V and W for the letter in their last name.

1	2	3	4	5	6	7	8	9	10
R	R	S	T	W	R	S	S	T	T
S	S	T	U	S	S	T	W	U	U
T	T	R	W	T	T	R	T	W	V
U	U	V	V	R	U	V	R	V	W
V	V	W	S	V	V	W	V	S	R
W	W	U	R	U	W	U	U	R	S
11	12	13	14	15	16	17	18	19	20
T	S	R	S	T	T	R	T	S	T
U	T	S	W	U	U	S	U	T	U
W	R	T	T	V	W	T	V	R	W
V	V	U	R	W	V	U	W	V	V
S	W	V	V	R	S	V	R	W	S
R	U	W	U	S	R	W	S	U	R
21	22	23	24	25	26	27	28	29	30
T	S	T	S	S	T	T	R	T	T
U	W	U	T	T	U	U	S	U	U
V	T	W	R	R	W	V	T	W	V
W	R	V	V	V	V	W	U	V	W
R	V	S	W	W	S	R	V	S	R
S	U	R	U	U	R	S	W	R	S

2. Organize the different ballots and do a points tally

1st (6)									
2nd (5)									
3rd (4)									
4th (3)									
5th (2)									
6th (1)									

3. Total each choice:

   R =

   S =

   T =

   U =

   V=

   W=

4. Determine the Banzhaf Power Index for the four players. Player one gets 10 votes, player two gets 7 votes, player three gets 4 votes, and player four gets 2 vote. Determine all the possible sets. Add their weighted number to get the total weight. Identify winning sets of 12 and above. Then underline all critical players that will allow the total weight to fall below 12 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. The company of four employees has a payroll of $350,000. Based upon the above Banzhaf power index, what should each employee be paid?

    +

11. Determine the Shapley Shubik Power Index for three players. Player one gets 5 votes, player two gets 3 votes, and player three gets 2 votes. Determine all the possible sets. Identify the pivotal player when adding that causes the weight to equal or exceed 6 and underline all the pivotal player in that set.

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

13. Calculate the Shapley Shubik Power Index for each player (critical divided by 3!)
    P1 = _____ P2 = _____ P3 = _____

14. Determine the Shapley Shubik Power Index for four players. Player one gets 7 votes, player two gets 6 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 9 and underline the pivotal player in that set.

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

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

17. The professional volleyball team of four players has a payroll of $1,500,000. Based upon the above Shapley Shubik Power Index, what should each employee be paid?

18. Using the letters A, B, C, D and E, diagram or explain how the elimination election would work if the person with the lowest votes is removed during each ballot.