The Maths of Voting Masterclass Worksheet 3 – Borda

Instead of just putting down their favourite pizzas (or their first preferences), each family member has ranked their preferences, based on the four toppings available. You can see these rankings below.

Start by determining how many points each of the preferences gets. Once you know this, calculate the number of points each pizza topping gets and the one with the highest number is the winner.

Which pizza wins?

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** | **K** | **L** |
| **1st** | Cheese with solid fill | Onion with solid fill | Cheese with solid fill | Pizza with solid fill | Pizza with solid fill | Pineapple with solid fill | Cheese with solid fill | Pizza with solid fill | Pineapple with solid fill | Pineapple with solid fill | Onion with solid fill | Pineapple with solid fill |
| **2nd** | Onion with solid fill | Cheese with solid fill | Pizza with solid fill | Onion with solid fill | Cheese with solid fill | Pizza with solid fill | Onion with solid fill | Cheese with solid fill | Pizza with solid fill | Cheese with solid fill | Cheese with solid fill | Pizza with solid fill |
| **3rd** | Pizza with solid fill | Pineapple with solid fill | Pineapple with solid fill | Cheese with solid fill | Pineapple with solid fill | Onion with solid fill | Pineapple with solid fill | Pineapple with solid fill | Onion with solid fill | Pizza with solid fill | Pizza with solid fill | Onion with solid fill |
| **4th** | Pineapple with solid fill | Pizza with solid fill | Onion with solid fill | Pineapple with solid fill | Onion with solid fill | Cheese with solid fill | Pizza with solid fill | Onion with solid fill | Cheese with solid fill | Onion with solid fill | Pineapple with solid fill | Cheese with solid fill |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Votes** | Cheese with solid fill | Pineapple with solid fill | Onion with solid fill | Pizza with solid fill |
| **Number of 1st votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Number of 2nd votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Number of 3rd votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Number of 4th votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Total points** |  |  |  |  |
| **Winner:** |  |  |  |  |

The formulae below should be used to calculate the number of points earned by each topping. **P = 4** (the total number of options)

1st preference: P-1 = 3

2nd preference: P-2 = 2

3rd preference: P-3= 1

4th preference: 0

Extension questions

Discuss with your neighbour ways you can break the tie and write them down.

Could changing the rankings of a single voter change the winner? If so, which one(s)?

Can you come up with a new way of distributing points that changes the winner?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Votes** | Cheese with solid fill | Pineapple with solid fill | Onion with solid fill | Pizza with solid fill |
| **Number of 1st votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Number of 2nd votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Number of 3rd votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Number of 4th votes** |  |  |  |  |
| **Points** |  |  |  |  |
| **Total points** |  |  |  |  |
| **Winner:** |  |  |  |  |

Write down your new formulae below: