

Class exercise 2 - about the hond't method

Proportional representation systems aim to allocate seats to parties approximately in proportion to the number of votes received. For example, if a party wins one-third of the votes then it should gain about one-third of the seats. In general, exact proportionality is not possible because these divisions produce fractional numbers of seats. As a result, several methods, of which the D'Hondt method is one, have been devised which ensure that the parties' seat allocations, which are of whole numbers, are as proportional as possible.

The Hond't method.

After all the votes have been tallied, successive quotients are calculated for each party. The party with the largest quotient wins one seat, and its quotient is recalculated. This is repeated until the required number of seats is filled. The formula for the quotient is

$$quot = \frac{V}{s + 1}$$

where:

- V is the total number of votes that party received, and
- s is the number of seats that party has been allocated so far (to that party), initially 0 for all parties.

Example

Suppose that are 7 seats to distribute and that the number of votes of parties A,B,C,D are 12000, 7500, 4500, 3000.

The following table shows the successive quotients (the numbers in bold style are the ones that corresponds to the assigned seats)

	divisors						
Party	1	2	3	4	5	6	7
A	12000	6000	4000	3000	2400	2000	1714,3
B	7500	3750	2500	1875	1500	1250	1071,4
C	4500	2250	1500	1125	900	750	642,86
D	3000	1500	1000	750	600	500	428,57

the last seat (7th) is given to party D
this correspond to a variation of the method that decides
in the case of tie to give the seat to the party with least votes

We don't need however to "produce" the entire table.

We can just consider two new tables (besides the votes table), one with the number of seats of each party, and other with the quotients.

Let see how we can use these table to "execute" the hond't method

Votes			
A	B	C	D
12000	7500	4500	3000

Seats			
A	B	C	D
0	0	0	0

Quotients			
A	B	C	D
12000	7500	4500	3000

The highest value in Quotients is 12000, reached by party A, so we increase the Seats of party A and recompute the corresponding Quotient

Seats			
A	B	C	D
1	0	0	0

Quotients			
A	B	C	D
6000	7500	4500	3000

Now the highest quotient is 7500 and so we increase the seats for party B

Seats			
A	B	C	D
1	1	0	0

Quotients			
A	B	C	D
6000	3750	4500	3000

and the procedure continues

Seats			
A	B	C	D
2	1	0	0

Quotients			
A	B	C	D
4000	3750	4500	3000

Seats			
A	B	C	D
2	1	1	0

Quotients			
A	B	C	D
4000	3750	2250	3000

Seats			
A	B	C	D
3	1	1	0

Quotients			
A	B	C	D
3000	3750	2250	3000

Seats			
A	B	C	D
3	2	1	0

Quotients			
A	B	C	D
3000	2500	2250	3000

Seats			
A	B	C	D
3	2	1	1

Quotients			
A	B	C	D
3000	2500	2250	1500

Exercise goal Define a function in python that implements the hond't method.

When doing the implementation start by ignoring the tie rule.

Once the more basic version of the function is done and tested try to create a new version that take into account the tie rule.