

**BACCALAURÉAT GÉNÉRAL ET TECHNOLOGIQUE  
ÉPREUVE SPÉCIFIQUE DES SECTIONS EUROPÉENNES  
MATHÉMATIQUES – ANGLAIS**

**SUJET 17 – The Mathematics and Statistics of Voting Power**

**Thème : Statistics and probability**

**Ce sujet comporte 2 pages. L'usage de la calculatrice est autorisé.**

To decide the outcome of a U.S. presidential election, your vote must be decisive in your own state, and then your state must be decisive in the Electoral College. The different states have different populations, different numbers of electoral votes and different voting patterns, so the probability of casting a decisive vote will vary between states. Even in  
5 much simpler settings, weighted voting can lead to unexpected results. For example, consider an election with four voters representing constituencies of unequal size, who are given weights of 12, 9, 6 and 2, respectively, for a weighted majority vote. The voter with 2 votes has zero voting power in that these 2 votes are irrelevant to the election outcome, no matter what the other three voters do, and the other three voters have equal power in that  
10 any two of them can determine the outcome. The voter with 12 votes has no more power than the voter with 6. In fact, this system is equivalent to assigning the voters 1, 1, 1 and 0 votes.

Andrew Gelman, Jonathan N. Katz and Francis Tuerlinckx

Statistical Science 2002, Vol. 17, No. 4, 420–435 © Institute of Mathematical Statistics, 2002

I. What does the text deal with? Comment on it.

## II. Exercise

Use the table below to answer the questions.

### Tables of results: US presidential election 2016:

Presidential Candidate	Popular Vote	Percentage of popular vote	Electoral Vote	Percentage of electoral vote
Donald J. Trump	62,979,636	45.96 %	304	56.50 %
Hilary Clinton	65,844,61			
Gary Johnson	4,488,912	3.28 %	0	0.00 %
Dr Jill Stein	1,457,038	1.06 %	0	0.00 %
Write -ins	1,096,101	0.80 %	0	1.30 %
Evan McMullin	725,902		0	0.00 %
Other	453,664	0.33 %	0	0.00 %
Total	137,045,863	100.00 %	538	100.00 %

1. Fill in the blank of the table. Explain.
2. What may seem paradoxical about the result of the US 2016 presidential election?
3. In the *New York Times* published on November 12, 2016, Claire Cain Mille wrote: *"Fifty-four percent of Mrs. Clinton's voters were women"*.

Accordingly:

- a. What is the probability that a randomly selected person from Hilary Clinton's voters be a male?
- b. What is the probability that a randomly selected person from this electorate be a female and voted for Hilary Clinton?
- c. Is it possible to compute the percentage of women who voted for Mrs Clinton?