

## WORDS AND THEIR NEGATIVES

MATH 195

In the Vigenère cipher, we take plain text and add a key word:  $E_K(\alpha) = K + \alpha$ ; to decrypt, we subtract  $D_K(\beta) = \beta - K$ . The problem is therefore upon us: when are these two processes the same? When is the negative of a word also an English word?

We take the identification  $A = 0, B = 1, C = 2, \dots, Z = 25$ , so e.g.  $-(AT) = AH$ .

Alex Gonzalez ([gr8gonzo@uclink4.berkeley.edu](mailto:gr8gonzo@uclink4.berkeley.edu)) found the following list of words using an exhaustive computer search on 45,254 words:

ad	ax
ah	at
ail	asp
an	an
Ann	Ann
Anna	Anna
fan	van
gut	ugh
had	tax
hag	tau
Hal	tap
Han	tan
hem	two
Ian	San
imp	sol
jail	rasp
jaw	Rae
lab	paz
lac	pay
lamps	Paoli
Lao	Pam
lap	pal
lax	pad
men	own
mew	owe
moan	oman
nan	nan

Pasquale di Paoli (1725–1807) was a Corsican patriot who led (from 1755) the struggle for independence from Genoa. Paoli is also a town in Oklahoma of population 542.