

JOSEPHUS WORDS

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In the articles on “Magic Spells” (*Word Ways*, Feb and May 2010) it was proposed that tricks could be performed with a deck of n letter cards. The deck would be prearranged, spelling some word u . There would be a “skip sequence” of integers k_1, k_2, \dots, k_n ; the more natural the sequence the better. The magician would spell a new word $w = w_1 w_2 w_3 \dots w_n$ as follows: skip k_1 cards and set the next card aside making it w_1 , skip k_2 cards and set the next card aside making it w_2 , etc. Each skipped card is returned to the bottom of the deck. Note that the skip sequence defines a permutation π of the the original deck order; $w = \pi(u)$. We say w is a fixed-point if $w = \pi(w)$. For any given permutation there exists a skip sequence, though it might be hard for a magician to incorporate.

The logological question is to find pairs of words u and w , and a well-motivated skip sequence relating them, that a magician could use with suitable patter. I am not a magician, however, so in this article I will just give pairs of common words. (Pairs using an uncommon word were found but are not reported.)

The story of Josephus Flavius is well-known in recreational mathematics. Forty men stood in a circle and every third man, still standing, was killed. (The puzzle is to find where Josephus should stand to survive to the end.) In our terminology we would say $k_i = 2$ for all i . However k_1 might be different depending on where you want to start. Let J_a^b be the skip sequence where $k_1 = a$ and $k_i = b$ for $i > 1$. Choosing $a = 0$ or $a = b$ would be natural in a trick.

We first looked at six letter words. For J_1^1 there is teaset/estate, and veined/endive. For J_2^2 there is mimosa/Maosim. For J_3^3 there is neuter/tenure, settee/testee, and opuses/spouse. For J_4^4 there is ginned/ending, and parsec/escarp. For J_5^5 affair/raffia. Letting $a = 0$ we have begird/bridge, and preset/pester for J_0^3 . Also we have Bosnia/bonsai, and stored/strode for J_0^5 . There are also some fixed points for J_0^4 (addend, attest, eggnog, beetle, needle among many others) and for J_0^5 (coffee, yippee, halloo, etc.). The word tattoo is a fixed point for both J_0^3 and J_0^5 !

There are fewer seven letter examples. For J_4^4 there is striate/artiest. For J_0^3 there is Devries/diverse and obtrude/outbred. For J_0^5 there is perusal/pleuras. We found none for eight letter words.

We could also define other skip sequences. An obvious idea is to choose longer and longer skips, which we call “rhopalic”. Let R_a be the skip sequence with $k_1 = a$ and $k_i = k_{i-1} + 1$ for $i > 1$. A six letter example, for R_0 is starer/Sartre. For seven letter words R_0 has piastre/parties and R_1 has the fixed points eeriest and oospore. The skip sequence R_0 for eight letter words yields a large number of fixed points including addendum, announce, assassin and innuendo.

There remains many more skip sequences to explore.