Homework 9: Program IV.1

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I have written two python files, one to derive an exact count and one to derive a probabilistic count. Instructions to use command-line arguments are included in the comments in the header.

The program `perm.py` takes as input n and outputs the exact number of permutations of length n without singleton or doubleton cycles.

The program `permprob.py` takes an input n and m, and returns the ratio of such permutations of length n in m randomly sampled permutations.

The output is summarized below.

	$n = 10$	$n = 20$
exact	0.223175	?
probabilistic ($m = 10^6$)	0.223215	0.222858

Note that the exact value for $n = 20$ takes too long to compute using a brute force approach. The performance could be improved by pruning (ending some branches early) or parallelizing, but it would take a long time to code. The transfer theorems give an asymptotic estimate of the ratio of $\frac{1}{e^{0.5}} = 0.223130$, which is very close to our numbers.