Express Riddler

4 December 2020

Riddle:

Every year, CJ's family of five (including CJ) does a book exchange for Christmas. First, each person puts their name in a hat. The hat is shaken, and then each person draws a random name from the hat and gifts that person a book. However, if anyone draws their own name, they all put their names back into the hat and start over.

What is the probability that no one will draw their own name?

Solution:

The number of ways to choose the five names in any order is the permutation, denoted 5!, and is equal to 120. The number of ways to choose the five names with no one drawing his or her own name is the derangement, denoted !5, and is equal to 44. Therefore the solution is $^{!5}/_{5!} = {}^{44}/_{120}$, or $\boxed{\mathbf{{}^{11}/_{30}}}$.