University of Northern Iowa

UNI ScholarWorks

2007

Counting Pill Combinations

David R. Duncan
University of Northern Iowa

Bonnie H. Litwiller
University of Northern Iowa

Let us know how access to this document benefits you

Recommended Citation

Duncan, David R. and Litwiller, Bonnie H., "Counting Pill Combinations" (2007). *Faculty Publications*. 2.
https://scholarworks.uni.edu/mat_facpub/2

COUNTING PILL COMBINATIONS

David R. Duncan and Bonnie H. Litwiller

Teachers are always on the lookout for problems which combine simple computation and related analyses. We shall present a medication setting which involves these elements.

A patient with vein blockage is prescribed a regimen of Warfarin, an anti-coagulant. This medication is typically available in pills of two active ingredient concentrations, 5mg and 2mg, each "scored" in the middle for easy "bisection." The dosage for an individual patient is usually precisely prescribed in half-milligram increments, and then frequently adjusted as the coagulation reading for the patient's blood changes. Are 2 and 5 mg pills sufficient to achieve any desired dosage? Table 1 displays answers to this question for several smaller dosages.

Table 1:

Dosage	Number of 2mg Pills	Number of 5mg Pills
½	Cannot be done	
1	½	
1½	Cannot be done	
2	1	
2½		½
3	1½	0
3½	½	½
4	2	0
4½	1	½
5	0	1
5½	1½	½
6	3	0

This table need not be continued. Any higher dosage can be achieved by adding half of a 2mg pill to the dosage one milligram smaller. In fact, the table need not be continued beyond a 2½ mg dosage, since any dosage beyond that point can be attained by adding achievable increments to either the 2mg or the 2½mg doses.

Let us also address an additional question: What is the smallest dosage which can be composed in two distinct non-trivial ways (eliminating the distinctions between one 2mg and two half-2mg pills, and between one 5mg and two half-5mg pills)? Simple inspection reveals that a 5mg dose can be achieved by either of one 5mg pill or two-and-a-half 2mg pills.

What is the smallest dosage which can be composed in three distinct non-trivial ways?

Again, inspection of consecutive dosages reveals that 10mg can be constructed using two 5's, five 2's, or two-and-a-half 2's and one 5.

Challenges for readers and their students:

1. Continue the preceding sequence of questions to find the smallest dosage which can be composed in four, five, six, … non-trivial ways.

2. Substitute other concentrations for the 2mg and 5mg sizes and repeat the exercises of the article.

David R. Duncan (david.duncan@uni.edu) and Bonnie H. Litwiller (bonnie.litwiller@uni.edu) are regular contributors to the ICTM Journal.
Both David and Bonnie have recently retired from the mathematics department at UNI.