

Show all work for full or partial credit. Put a box around your final answer in each part. Try the problem on your own before helping each other understand it.

1. How many distinct ways are there to put 15 identical donuts into 5 distinctly labeled bags? The order in which you fill the bags does not matter—just the result.

2. How many integral solutions are there to  $x_1 + x_2 + x_3 = 32$ , if  $0 \leq x_1 \leq 7$ ,  $x_2 \geq 0$ , and  $x_3 \geq 2$ ?

3. Craig Venter has constructed 16 distinct RNA strands (like 16 books). He has prepared three different codon pairs between each of which he plans to attach an ordered sequence of his RNA strands (think 16 books on 3 shelves). He'll use each of 16 strands once, putting from 0 to 16 of them in order between each codon pair. The result is a collection of three new genes.

- How many distinct sets of three genes can he make?

- Say one of the genes he creates is denoted AUGCGCCGCCAGUGA. The first AUG and the last UGA are the start-stop codon pair. If we leave the codon pair in place and rearrange only the letters of the middle portion CGCCGCCAG, how many genes can we make? (Think anagrams of just those 9 letters.) Don't worry about whether the results are real genes.