

Directions: Solve the following problems. All written work must be your own. See the course syllabus for detailed rules.

1. [4.1.3] A standard deck of playing cards has one card for each suit/rank pair, where the 4 suits are spades, hearts, diamonds, and clubs and the 13 ranks are ace, 2 through 10, jack, queen, king. How many ways are there to order a deck of cards so that all cards with the same suit are next to each other? (The cards within each suit need not be in order.)
2. [4.1.10] You order 10 different books online, 3 of which are for your sister. The books arrive randomly, one by one. What is the probability that the books for your sister arrive consecutively?
3. How many circular arrangements of $\{1, \dots, 2n\}$ do not place an even number next to an odd number?
4. [4.2.7] You want to write down a 3×4 matrix whose entries are either 0 or 1. You want the matrix to have 2 or 3 ones (and the rest zeros). How many such matrices are there?
5. [4.2.10] A class of 32 students is asked to split into lab groups. If there are 10 groups of 3 students and one group of 2 students, how many ways can the groups be formed?
6. [4.2.22] In a letter dated Nov 22, 1693, Samuel Pepys asked Isaac Newton a probability question. He posed three scenarios and wanted to know which one had the greatest chance of success. The scenarios were: throwing six dice in hopes of obtaining at least one 6; throwing 12 dice in hopes of obtaining at least two 6's; and throwing 18 dice in hopes of obtaining at least three 6's. Calculate the probability of success in each of these cases.