Problem 1. Let N and C be finite sets with $|N| = n$ and $|C| = c$. In this problem, a *card* (in the game of N-type, C-characteristic *Set*) will be a function $f : C \to N$.

(i) Explain the relationship between these cards and the cards in the game of *Set*.

(ii) Write down a precise definition of a set in the game of *Set*. (Make sure to underline the word "set" when talking about sets from the game so that they do not get confused with mathematical sets.)

Problem 2. How many cards are there in a deck of N-type, C-characteristic *Set*?

Problem 3. Calculate the number of sets in a deck of 4-type, 5-characteristic *Set*. A set may have any number between 0 and 4 characteristics in common. For each number between 0 and 4, determine how many sets there are with that many characteristics in common.

Solution.

$$4^5(\binom{5}{0} \times 0 + \binom{5}{1} \times 3! + \binom{5}{2} \times 3!^2 + \binom{5}{3} \times 3!^3 + \binom{5}{4} \times 3!^4 + \binom{5}{5} \times 3!^5)/4!$$

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