6720, we can express the size of B as:
6720 = n!/(n-5)!, or 6720 = n(n-1)(n-2)(n-3)(n-4)

Solving this equation for x (or a bit of trial and error) tells us that B but be of size 8 because 8 * 7 * 6 * 5 * 4 = 6720.

3. We want to show that given a set (A) of 10 numbers from the range of 1 to 100, there exists two disjoint proper subsets (B and C) of A that have the same sum.

   To start, we know that the number of possible subsets from a set of length 10 is 2^{10}, because for each element we have the choice to either include it in the subset or not. This comes out to 1024 total subsets, and 1023 proper subsets (excluding the set of all 10 numbers).

   We will then look at the range of values we can achieve by adding together a proper subset of 10 numbers between 1 and 100. The empty set will have a sum of 0, and the set of 9 values of 100 will result in a sum of 900, giving 901 possible sums.

   The pigeonhole principle tells us that with 1023 proper subsets and 901 possible values, there exists at least two distinct proper subsets with the same sum.
   We are also told that B and C must be disjoint, which we can achieve by removing any shared elements. This will decrease the value of both sums by the same amount, guaranteeing that B and C still have the same sum.
   Therefore, for any set of 10 numbers from range 1 to 100, there exists two disjoint proper subsets with the same sum.
4. -
   a. (Choose 1 denomination from 13) * (choose 4 cards from 4) * (choose 1 card from the 48 remaining)
      Solution shown below
   b. (Choose 1 denomination from 13) * (choose 3 cards from 4) * (choose 2 denominations from the remaining 12) * (choose 1 card from 4) * (choose 1 card from 4)
      Solution shown below