Problem Set 7 - Math

Question 1

Set Difference was surprisingly quite a tough one. I was under the impression that Question A's were easy, but I think Math as a topic caught me off guard.

The initial naive way of thinking about it would have been trying to directly answer the question, get the max and min of each subset, and then subtract them. However, with 2^n subsets, this would take way too long.

I only later had a thought while writing out the expanded form of the summation that I could rearrange the formula into the sum of all max's of subsets, minus the sum of all minimums of subsets. And with some basic combinatorics, I could calculate the sum of all max's/mins. For the max's I first sorted (in reverse order) the array, and, for every element from left to right, the number of subsets the element at index belongs in is the 2^(number of remaining numbers), representing the number of ways to arrange the remaining elements.

I also had some issues with the modular arithmetic in getting the powers of 2, (modexp) as I was only initially learning about modular arithmetic for this question. I ultimately solved this - with suggestions from my friend - by precomputing the powers of 2 rather than writing a modexp function… yeah pretty bad for my learning but it worked :)