**Solutions:**

**S1)**  = 9979200

**S2)**

**S3)**

The only possible *n* here is 20.

**S4)**  Notice that the sum of all of the least elements in all subsets can be discussed by calculating the number of cases for each least element *m* to appear. The sum will then be:

We can expand every following term into the sum of multiple s:

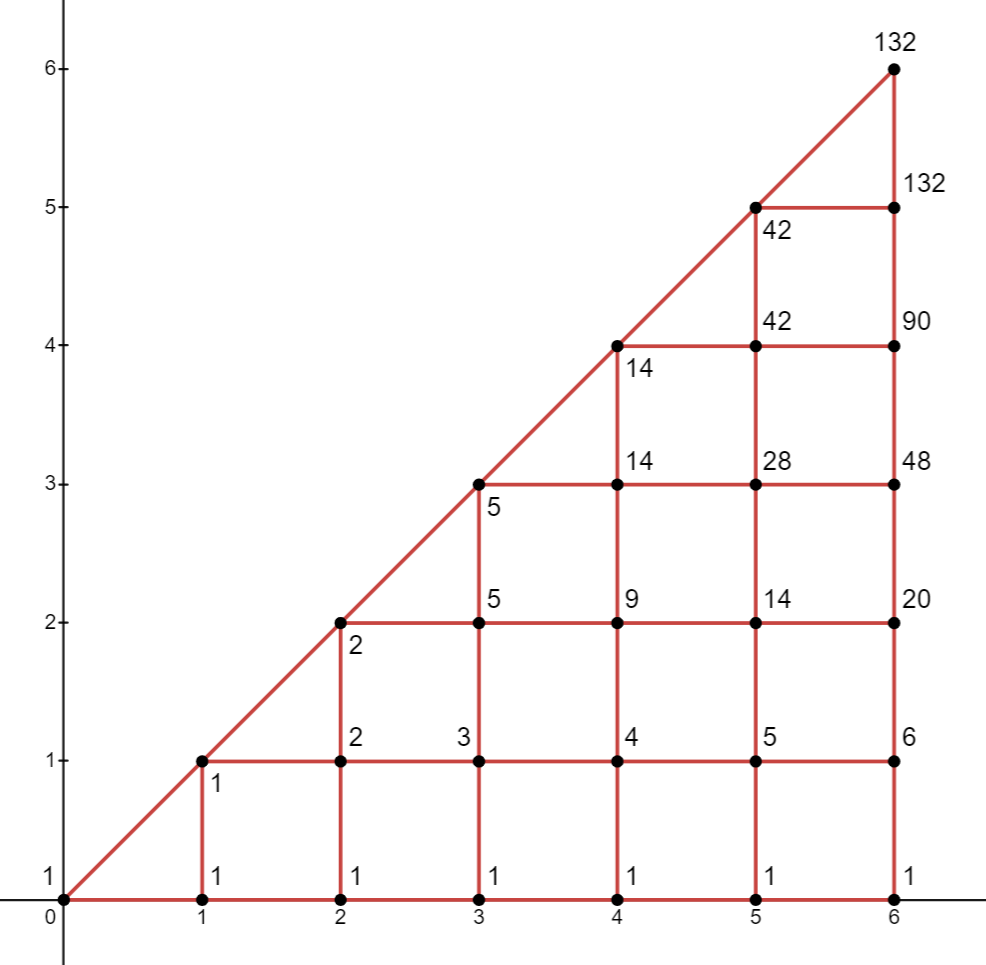
Using the Hockey-stick property inside of each parenthesis, the expression becomes another summation:

Observe that we can use the hockey-stick property again:

Since there are a total of subsets, the arithmetic mean will be

Therefore, the final answer is .

**S5)**  We can simplify this problem into ordering 6 “wash”s and 6 “place”s, where when reading from left to right, there is no point when the number of “place”s is greater than the number of “wash”s. We can graph this using a triangular-counting method:



Where the x-axis is the number of dishes washed, and the y-axis is the number of dishes placed in the cabinet. The triangular graph gives a total of 132 possible arrangements, which will be the final answer for the question.