**What is an interesting mathematical problem you have worked on? Recall a problem that you spent some time thinking about. Carefully state the problem. Describe the work you have done on it.**

“One, two, three, …” I was trying to draw out the complete exchange graph of Mobius stripe and marked points on the boundary. But I was so frustrated that wondered whether it was possible to sum up the number of triangulations with all points I marked. And I turned to Cluster Algebra in the hope of viewing this intriguing problem from a different perspective. Drew their exchange graphs and cluster complexes, and represented them in double cover, snake graph...

I also tried brute force up to 4 marked points, but the result turned out to be so messy and overwhelmed. When I was nearly on the verge of emotional collapse, my mentor came up with an idea, “Maybe we can look at this from a combinatorics perspective, and it might have something to do with Catalan number.” Suddenly, I was enlightened. Since in each triangulation, each boundary edge is part of one and only one triangle, we soon sorted out the three cases in which two arcs could divide the non- orientable surface. For the orientable part, i.e. the area without the crosscap, we use Catalan number directly to count the number of triangulations. For the non-orientable part, i.e. the area with the crosscap, we defined the number of triangulations recursively. By adding the three cases, we got the final formula for the answer of the question.

Logic and rigor have always been the inherent charm of mathematics, but what is more attractive to me is the unexpectedness in mathematics. It seems to be waiting for me right around the corner, guiding me to link everything together but think out of the box at the same time.