**List any extra-curricular mathematics activities in which you have participated (e.g., math clubs and camps).**

Since entering high school, I've been highly involved in the school mathematics club, which organizes all sorts of math activities and interesting competitions.

Last summer, I attended the Canada/USA Mathcamp, where I gained exposure to a series of college-level mathematics courses, where I was exposed to topics including but not limited to Cluster Algebra, Knot Theory, Non-Euclidean Geometry, Root System, Morse Theory…

Moreover, out of my interest and curiosity, I've participated in some mathematical research projects outside school. Listed as follows:
Collaborative project: proof on the unistructurality of quasi-cluster algebra; the number of triangulation on a Mobius stripe;
Individual projects: Tensor Calculus and Kaluza Theory; Mathematical Modeling of Local Climate Change.

**List all mathematics courses taken in the last two academic years, including the current term, and the grades you received in the courses completed.**

Since my schooling in UWC, Changshu China, I've kept an excellent performance in Pre-IB Mathematics (scoring 7/7 in all tests and final grade), which includes Statistics, Probability, and Number Theory.

Now, I'm attending the class of IB Further Math at a higher level with all IB second-years at Pearson College UWC. Course topics include Graph theory, Linear algebra, Group theory, Probability & Statistics, Calculus & differential equations, and Number theory. Since I've maintained a score of 7 in every examination and the final semester grade, I've been privileged to take the final IB Further Math exam in May this year.

Besides, most of my acquisition of mathematical knowledge comes from outside of my school curriculum. I still remember the first time I saw a video from 3Blue1Brown, where I ran into Linear Algebra and sensed the study of mathematics can not only be realized step by step following my school curriculum. After searching for mathematics courses from Coursera, edX, and Socratica Studios, as well as digital undergraduate textbooks, I've decided to self-study mathematics at different levels.

Recently, I've enrolled in an online course of algebraic geometry instructed by Visiting Professor Sheshmani at Harvard University. Studying with a group of undergraduates, I'm delving into some advanced fields I've never touched before.

**List all math contests and competitions in which you have participated, giving your score and/or**

**ranking if possible. Be sure to include your scores on the AMC10, AMC12, AIME, USAMO, or SAT 2 Math Subject Test, if you have taken any of these exams.**

1) Meritorious Award, 22nd Annual High School Mathematical Contest in Modeling (HiMCM), 02/2020;
2) Honor Roll in British Columbia, the Canadian Open Mathematics Challenge, qualified for attending Canadian Mathematical Olympiad (CMO), 11/2019;
3) Top 5%, Euclid Contest, The CENTER for EDUCATION in MATHEMATICS and COMPUTING, University of Waterloo, 05/2019;
4) First Prize (China), Math League, qualified for US Final (at Stanford) and its Math Camp (co-held by the Departments of Mathematics of Princeton University, Columbia University, and Williams College), 2018;
5) Second Prize, Jiangsu Junior High School Mathematics Competition, 2017;
6) Second Place (Global Final), The Berkeley Mini Math Tournament (BmMT), 2017;
7) SAT Subject Test - Math Level 2: 800, taken on 11/2019.

**What aspects of mathematics do you like the most?**

Mathematics is logical. Every answer requires valid proof, but with a couple of axioms and definitions, one can work through a problem to deduct an honest answer. At the same time, I can exercise my creativity when giving a conjecture, which isn't less important than giving a proof, and find ways to explore the unknown that may eventually be known. Mathematics can also present itself in a myriad of ways in our world: the similarity between the Fibonacci sequence and structure of pinecones, acceleration as the second derivative of distance when paddling in a kayak, and the differences in length-to-width ratios for various A paper sizes.

Nevertheless, mathematics can also be difficult. There are times when I will sit at my chair hunched over a problem for an afternoon only to find a fruitless outcome. But that doesn't make me like mathematics any less. With patience and an accumulation of information, I'll piece together the clues to find a solution. Working through problems in a logical and calm manner has encouraged me to face other situations in life in a similar way. Seeing the ways mathematics fits in our world also inspires me to discover new ways in which they can be incorporated into useful solutions.

**What aspects of mathematics do you like the least?**

Mathematics pays great attention to simple, elegant problems with logical, well-reasoned solutions. "There are N people who have to use the washroom, and there are M cubicles in the washroom. It is stipulated that there is at most one person in each cubicle. How many ways are there to use the washroom?" In such a case, I can understand what is happening, and I can tell a nice story.

Statistics, as a part of mathematics, on the other hand, works its magic on large, complex questions

where too many things are involved, and which are near impossible to make clear. How do video websites know the type of movies you like most? Which way will make you more likely to be a billionaire by buying welfare lottery tickets, gambling in casinos, or investing in stocks or futures? These questions are so complex that if not for statistics I could not make any prediction at all. In this regard, I find statistics extremely powerful; however, statistics cannot provide me with a nice, clean story. It will not give me an exact answer. It only tells me a measured "confidence interval", which is not very intellectually satisfying.

Statistics is also often counter-intuitive. Humans have a hard time understanding uncertainty, but statistics is based on uncertainty, which gives rise to my failure to fully appreciate its charm.

**Describe a positive experience that you have had with mathematics.**

"One, two, three, …" I was trying to draw out the complete exchange graph of Mobius stripe with marked points, wondering whether it was possible to calculate the number of all triangulations. Easy as I initially thought it would be, it turned out to be complicated and overwhelming. Frustrated, I turned to Cluster Algebra in the hope of viewing this intriguing problem from a different perspective. I drew their exchange graphs and cluster complexes and represented them in double cover, snake graph ...

I also tried to use brute force up to 4 marked points, but the result turned out to be not ideal. 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." I was suddenly enlightened. In every triangulation, each boundary edge is part of only one triangle. Inspired by this idea, we soon summarized three cases in which two arcs could divide the non-orientable surface. For the orientable part, the area without the crosscap, we directly apply the Catalan number to count the number of triangulations. For the non-orientable part, the area with the crosscap, we defined the number of triangulations recursively. By adding the three cases, we finally got a formula to solve our confusion.

However, the answer we got was recursively defined, and there was no simpler function to be found - even wolfram alpha cannot interpret a recursive formula with that complexity. I have to propose a new, simple formula, but its proof, either through the simplification of the recursive definition or by thinking from another angle, still awaits me to explore.

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.

**What do you hope to gain by participating in SUMaC?**

“Any student who wants to learn about Algebraic Topology can head to the small conference room on this floor. Professor Li will guide you to appreciate the charm of that subject.” Suddenly, it seems to be a gift that has been lost but regained. At the beginning of the Mathcamp, I was so disappointed to be told that Professor Li failed to hold any lectures on Algebraic Topology in this year because of a severe flu.

Although I listened to the symposium for only three hours, I seemed to have spent a century, and it was different from anything else I had learned before. With advanced mathematical tools, mathematicians were making progress on this relatively new-born area of math at an explosive speed. Algebraic topology opened for me a door to the mysterious and great world of modern math. Later in the summer of Mathcamp, I took all the topology and graph theory courses, and tried my best to understand more advanced areas in Topology, like fundamental groups and some basic Cohomology. As going to my present school, I began to ruminate those ideas by reading textbooks and searching online to decipher each confusion I met in these areas. Then, I come across SUMaC, where a course option directly centering on Algebraic topology is offered. I was so excited.

Therefore, I’m eager to systematically learn Algebraic Topology in SUMaC and desire to communicate directly with scholars and professors in this field for exploration of the confusion I’ve encountered in Fundamental groups, Poincare duality, and knot theory in my autonomous learning, as well as dive deeper into Lie Group or even Cohomology. I’m also looking forward to researching the relationship between topology and architectural design, especially some homeomorphic and non-homeomorphic changes of architectural form. I firmly believe I could get the inspiration in the coming summer at Stanford.

**What aspect of SUMaC appeals to you the most?**

I woke up with the howling of sea animals. It took a while before I realized being in an ecological reserve. It was still dark outside. I opened the door. The peculiar smell of coastal creatures hit me. Then, I walked out. Living on Race Rocks Islands for a week, I’d been used to a lot of things: no shower, frozen food, limited electricity… I only looked forward to the sunrise and sunset every day. “The demands of mankind are unlimited,” I started to reflect on what my economics teacher said in class. I’d like to get lost on the island, where I have little but lack nothing. Self-sufficiency is all I need, just like how it was since the dawn of mankind.

This time, I am greatly appealed to the “pure mathematical enrichment” emphasized by SUMaC.

I’m excited about plunging myself in the sea of mathematics. Working on a math problem for an hour or two at night has become a daily routine for me. There are times when I’m so fixated on a problem that I’ll think about it for most of the evening, even when I’m brushing my teeth or lying on my bed before falling asleep. However, with patience and accumulation of information, I’ll piece together the clues to find a solution. I am expecting to have one period of time when I can totally focus myself on mathematics to gain momentum, to enjoy the process, and to fully research and delve into this topic.

Therefore, SUMaC is such a wonderful opportunity for me to enjoy the purity of mathematics. I will study with young math talents from all over the world, exchange thoughts with teaching assistants and professors of strong math backgrounds, and work on piles of problem sets and intriguing research projects for the whole day without worrying about any external distraction.

**Tell us about some of your non-academic interests, or a fun fact about yourself. What do you do when you aren't in school?**

In my leisure time, I would collect omnifarious flavors of instant noodles from all over the world to build up my food reserves. Though I have eaten plenty, I constantly save more than I consume. In the hope of making instant noodles more delicious, I started to try various kinds of cooking styles to test and find out my preferences. I firstly watched videos on YouTube and then attempted my culinary creations. *Practice makes perfect.* After being enough, I came up with my own fresh ideas - instant noodle soaked in hot whole-fat milk, instant noodle cakes, and fried noodles with marshmallow sauce. In terms of the fried flavor, I've also thought of different tricks. Boil the noodles, drain the water to make cold noodles, and stir-fry them with ingredients; or stir-fry the toppings first and then pour them on the cold fried noodles. I've mastered dozens of creative cooking methods of instant noodles.

As an amateur and 24/7 hungry gourmet, I see my pursuit of delicious cuisine as an indispensable part of my personality. When I encountered a Yunnan cuisine, which is called scrambled eggs with jasmine, I would purchase the raw materials and tried to revive the dish myself. Moreover, I am fond of studying to make toast in eight different ways, cook scrambled eggs with tomato in five flavors. I love inventing new recipes, especially the ones that combine East Asian and exotic food together. Steamed meat of litchi soaked with Korean chili sauce, ice cream topped with fermented bean curd, or Thai rice fried in squid ink are my specials. The exploration of uncertainty always excites me. Reinvigorating a traditional dish also satisfies my curiosity. Tasty? Unpleasant? Or mediocre? It doesn't matter. On the long, long list of crossed-out experiments, I did find a unique delicacy. I just can't stand that routines render our lives dull. Special recipes stimulate our taste buds and evoke our thoughts.

I have created and recorded many innovative ideas, and I would like to put them into practice. This is also a little fun in my ordinary life. At SUMaC, I look forward to coming up with more brilliant ideas in a truly diverse environment. I hope to make the transient summer community a more creative and fun place.

**Please list all other summer programs including other Stanford Pre-Collegiate Studies programs to which you have applied or plan on applying to for this upcoming summer.**

1) Leadership Seminars at the University of Notre Dame
2) Architecture Summer Programs at Penn

3) Yale Summer Program at Astrophysics