Dear parents of the Math 7 class parents,

My name is Niraj Aryal, and I am pleased to welcome you to this new semester at SchoolNova. I hope you had a great summer and are ready to go back to learning math.

Parents are welcome to join the class, but please remember to keep things quiet and avoid using your phones during class. Take a seat towards the back.

About me: I am a computational condensed matter physicist Brookhaven National Laboratory. My research involves understanding various interesting properties of crystalline materials at low temperature and at atomic scale by using quantum mechanics. In order to understand complex phenomena in nature, I use a wide range of computational and mathematical tools, most of which have foundations in middle and high school level math courses. I love teaching math and I do hope to convey the message to students that teaching math is indeed fun and rewarding.

Homework: Homework is assigned weekly and is super important—not optional! Try your best to tackle all the problems. It's okay if you can't complete them all; an incomplete solution is better than nothing and will give you partial points. Homework helps us see how well you're understanding the material. Encourage your child to do their homework independently, but if they get stuck, suggest taking a break and returning to it. Homework will cover topics from our lessons and concepts we're working on, so it's vital that students complete it. Write it neatly on quadrille paper with enough detail for us to understand your process. You can use math notations; a few words are fine, too, but no essays, please!

Supplies: Your child will need quadrille paper (for submitting homework), a folder, and a pencil case with essentials like pencils and erasers. You're free to organize in your preferred way, but at a minimum, bring paper, a pencil, and your completed homework if assigned.

What We'll cover: This year, we'll start by reviewing basic algebraic identities, factorization, irrational numbers, radicals etc. Then we will dive deeper into arithmetic and geometric sequences, basic combinatorics, and probability. We will then study quadratic equations and inequalities. After that, we will cover coordinate geometry and trigonometry. The details of syllabus for this year are included in the next page. The exact sequence of topics and the time spent on each section may vary depending on students' feedback and time constraints.

I am sure this year at SchoolNova will be very beneficial and fun for all of us. Please don't hesitate to email me at aryal@schoolnova.org about anything related to the course.

Syllabus

- **Algebra**: algebraic Identities and factorization, radicals, 30-60-90, 45-45-90 triangles, irrationality in the denominator, exponents (4 weeks)
    - o Goal: Be able to use main algebraic identities (square of sum/difference, difference of squares) to simplify and/or factor expressions, understand the need for algebraic transformations,
- **Arithmetic and geometric sequences**: advanced problems, including Infinite sums (2 weeks)
    - o Goal: Be able to solve advanced problems involving sequences, identify sequences given arbitrary terms, be able to derive formulas for sums, understand what infinite sum means and how to calculate it, see applications of sequences (music theory, etc.)
- **Basic combinatorics**: permutations, number of choices when order matters (nPk), simple combinations (order doesn't matter) such as number of handshakes. Formula for nCk (no proof!) (2-3 weeks)
    - o Goal: Understand the difference between combinations and permutations, identify when to use combinations and permutations.
- **Probability**: Review of basics, introduction to binomial distribution, introduction to conditional probability, Monty-Hall problem using conditional probability (2 weeks)
    - o Goal: Understand the concept of conditional probability, be able to solve Monty-Hall problems formally with conditional probability, use conditional probability notation.
- **Quadratic equations**: formula and derivation, Vieta formulas, symmetric functions (4 weeks)
    - o Goal: Understand the derivation of quadratic formula, be able to complete the square, analyze quadratic equations and the number of solutions, simple problems with parameter, understand the principle behind Vieta formulas and the meaning of Vieta formulas when there is one or no solutions.
- **equations with absolute values** (1-2 weeks) [If time permits]
- **Inequalities**: introduction, linear, quadratic inequalities, snake method (3-4 weeks)
    - o Goal: Understand what it means to solve inequalities, starting with quadratic inequalities, be able to solve already factored inequalities
- **Coordinate geometry**: Coordinate systems, graphs and graph transformations, parabolas and investigating general behavior of quadratic functions (5 weeks)
    - o Goal: Be able to fully analyze quadratic functions, draw their graphs using completion of the square, get the idea of sketching the graph approximately and identifying the general behavior of the quadratic function; being able to draw graphs of complex functions using step by step transformations; understand the idea of graph addition
- **Equations of circle, ellipse, hyperbola, parabola** (1-2 weeks)
- **Trigonometry**: introduction to trigonometry, definitions, basic identities, calculating elements of triangles using triangles (3 weeks)
    - o Goal: Learn the geometric definitions of basic trigonometric functions, be able to apply trigonometry to geometric calculations to find various elements of triangles, remember and be able to derive trigonometric functions of 30, 45, 60 degree angles, law of sines