ABMC Newsletter

September 2018

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Introduction to the First Newsletter

Hello everyone, welcome to the first ABMC bi-monthly newsletter! This will be a great opportunity for you to receive updates about ABMC, learn about local STEM opportunities, and work through a few fun math problems (drawn from the ABMC problem bank!).

The Successful ABMC 2018

On April 28, 2018, the second annual Acton-Boxborough Math Competition was held in Acton, Massachusetts at Acton-Boxborough Regional High School. The competition was a huge success. Over 80 students attended, representing over 20 schools across Massachusetts. Dozens of prizes were awarded at the contest, including trophies, medals, and gift cards.

For more photos and results from the contest, just visit our website's Archive page:

abmathcompetition.org/archive/

In addition, if you attended the contest in 2018 and have any feedback for us, please reach out to us at abmathcompetition@gmail.com. We try to improve our contest year by year and are happy to incorporate new changes in our contest in 2019.

What's new? Online contests!

This year, we are introducing a new element to ABMC: an online contest! The ABMC Online Contests consist of 3 rounds of tests (1 round per month), each containing 15 questions. Students will work individually and have a total of 50 hours before the submission deadline. Visit our website to learn more:

abmathcompetition.org/online-contest/

The contest dates follow:

- Saturday, October 20th – Sunday, October 21st
- Saturday, November 17th – Sunday, November 18th
- Saturday, December 15th – Sunday, December 16th

Local STEM Opportunities

Art of Problem Solving

Art of Problem Solving, abbreviated AoPS (pronounced "A-ops"), is an online platform dedicated to teaching students math and problem solving skills necessary for math contests, advanced courses, and other endeavors. The platform primary targets students who are interested in studying math outside of school.

AoPS offers a wide range of math textbooks, including books for Prealgebra, Algebra, Geometry, Counting and Probability, Number Theory, Pre-calculus, Calculus. These books are slightly more advanced than traditional math textbooks and often cover topics that are not taught in the math classroom. They are great for students who have a passion for math and would like to explore more on their own.

AoPS also offers a large number of online classes, many of which complement those textbooks. These classes consist of weekly classes on a virtual classroom and sets of homework problems, which are graded for correctness. For more information, visit their website at artofproblemsolving.com.

ABRHS Science Family Night

Are you interested in science and technology? Come to Science Family Night, which is annually held at Acton-Boxborough Regional High School each November. Organized by Acton-Boxborough high school students—members of Science Team, Envirothon, iGEM, and Resource Force—Science Family Night is a great opportunity for younger students to experience STEM through hands-on experiments and demonstrations. In past years, students have had the opportunity create their own catapults, extract DNA from cells, design their own circuits, control a home-made electric vehicle, and more.

Antonio, who helps organize the event each year, speaks fondly of Science Family Night. "It's amazing to see so many high schoolers who are passionate about science and technology share their interests with their younger peers." Antonio says that cannot wait to help out again this November.

What will Science Family Night offer this year? You will have to come and see!

Problems

Here are some fun problems for you and your teammates to ponder over! If you solve any of these problems or need a hint, tell us about it `abmathcompetition@gmail.com`. Additionally we can be reached as the user ABMC on Art of Problem Solving. If you submit a particularly elegant solution, perhaps your solution may be selected to be published in the solutions section of the next issue! Many of these problems are open ended and are intended to motivate larger and broader questions. Let us know if you find or compute anything interesting!

1. For how many positive integers x does $\frac{2018}{x}$ leaves remainder 1? What is the sum of the positive integers x such that $\frac{2018}{x}$ leaves remainder 1? What if 2018 and 1 were replaced by different integers?
2. Two standard six sided dice are rolled. The first shows the number a and the second shows the number b. What is the expected value of a? What is the expected value of b? What is the expected value of $a - b$? What is the expected value of $a + b$? What is the expected value of $\frac{a}{b}$?
3. A line segment AB is given with length 1. If two points C and D are randomly chosen within AB, what is the expected value of the distance between C and D? How does this relate to the problem above?
4. Consider a square $ABCD$, and let the center of this square be G. Let P be the set of points closer to G than any side of square $ABCD$. What can we say about the shape of P? What about the area of P? What happens if $ABCD$ is replaced by a triangle? A tetrahedron? An octahedron? Or even a 2018-dimensional hypercube? Google "hypercube" if you want to learn more about higher dimensional geometry!

Thanks to our sponsors!

Answers to the Problems

We hope you had fun with our problems! In the next issue, the solutions to the problems here will be posted along with names of students who have solved them. Additionally, we are accepting problem submissions for future newsletters. Just email us your name, grade, school, proposed problem, and solution in a PDF, scan, or Google Doc at abmathcompetition@gmail.com. Alternatively, you can send your problem directly through private messaging via Art of Problem Solving to the user ABMC. You will be credited if your problem ends up on our newsletter!