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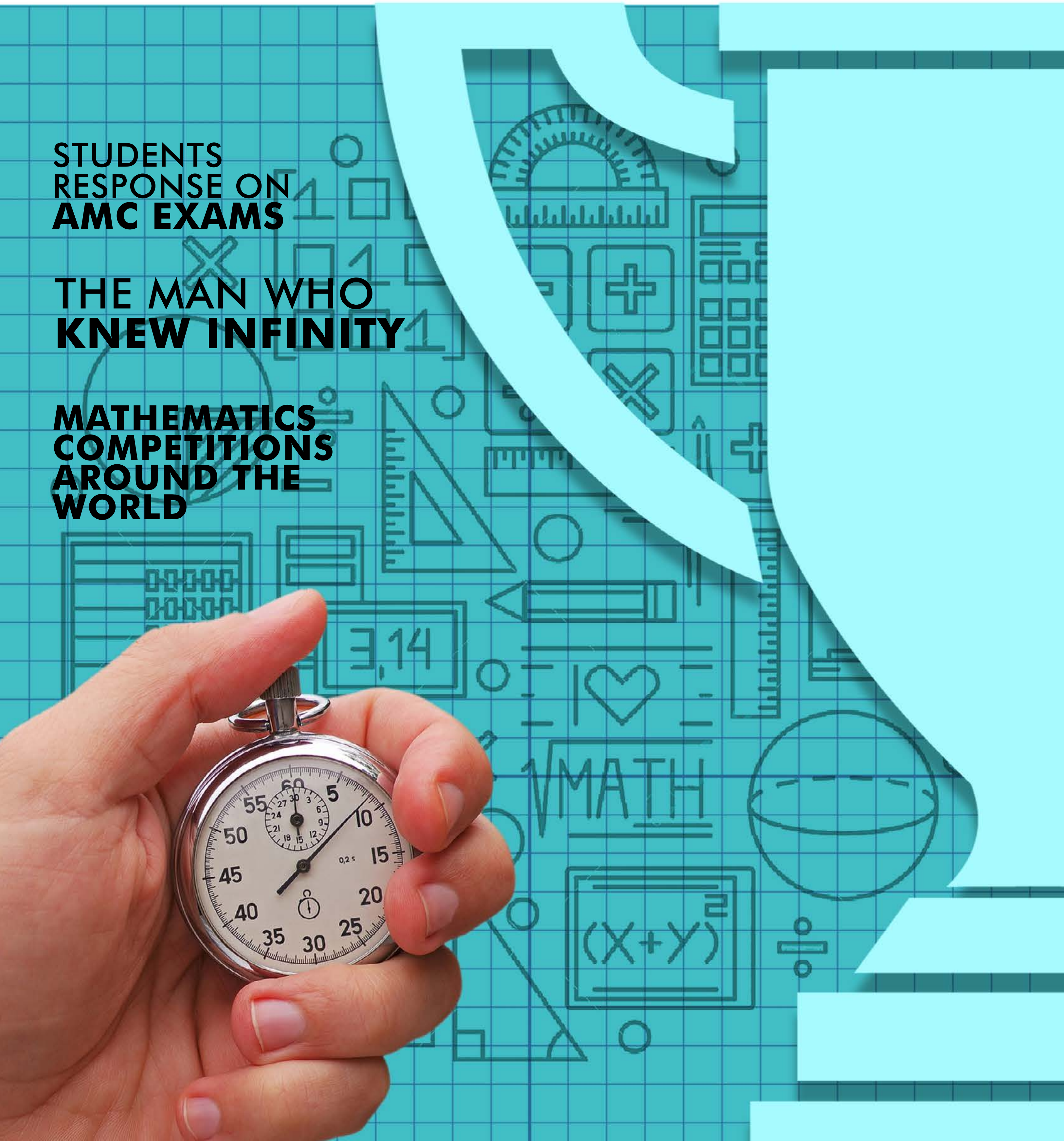

STUDENTS RESPONSE ON **AMC EXAMS**

THE MAN WHO **KNEW INFINITY**

MATHEMATICS COMPETITIONS AROUND THE WORLD

The Cedar Rapids Community School District Welcomes You!

A FEW OF OUR POINTS OF PRIDE

- District students consistently score above the state average on ACT College Readiness Indicators. Our five-year average composite score is 24.
- **We celebrate diversity! Over 30 languages are spoken in our schools and we provide English Language Learner programming for students at all levels.**
- Over 166 athletic programs and diverse activities are offered in the middle or high schools. From archery to zumba, there is an opportunity for every student to showcase their talents.
- **Students looking for the challenge of AP (Advanced Placement) courses, can choose from more than 28 AP courses.**
- Innovative learning environments include one-to-one initiatives and other student-centered, technology-enriched learning environments. All classrooms include access to digital resources and whiteboard technology.
- **Our outstanding fine arts programs are nationally recognized and celebrated.**
- Student teams have brought home some 20 state titles in Academic Decathlon, a competition matching intellect in Art, Economics, Essay, Interview, Language Arts, Mathematics, Music, Science, Social Science, and Speech.
- **The District recognizes nearly 1200 students annually for distinguished academic achievements.**
- We embrace world cultures, welcoming numerous foreign exchange students to our high school communities each year.

"I extend a heartfelt invitation to students, parents, and educators from around the world to visit our Cedar Rapids schools and city and to experience the programs offered here. I have been involved with the Student Enrichment Program from the start and I am thrilled about the possibilities and opportunities it provides students to learn and reflect; this is the core focus on any enrichment program. My team and I are committed to supporting the program and those involved with it."

-Dr. Brad Buck, Superintendent,
Cedar Rapids Community School District

"Participating students have the opportunity to study in one of the top high schools in Iowa as part of this experience. We're proud to have high schools named in the Washington Post's list of "America's Most Challenging High Schools." We also offer an innovative project-based learning opportunity – known as Iowa BIG – which provides students opportunities to engage in authentic business, entrepreneurial, and community projects to earn academic credit. Our teachers and administrators are some of the best in Iowa and nationally. "

-John Laverty, Board of Education President
Cedar Rapids Community School District

Cedar Rapids
Community School District
Excellence for All

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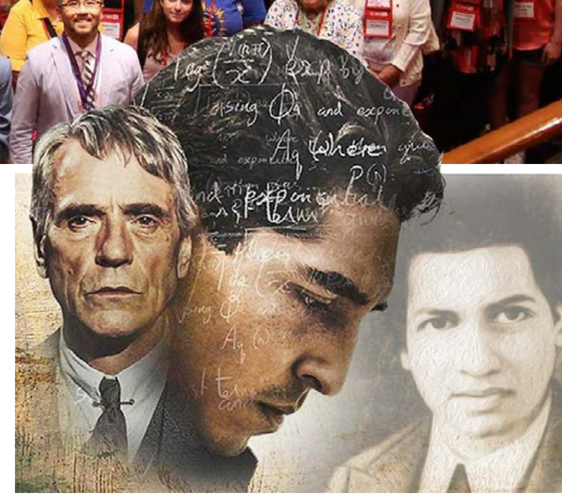
C O N T E N T S



FROM THE EDITORS DESK

We are back and we thank our readers who have been part with us since our first edition, who have continued to support us since our first edition. For this winter edition of TIGEs we are talking about Mathematics Competitions. We all have taken mathematics competition, either being forced by our parents or teachers or compete with your class mates, we all have been there. Some say competitions bring the best in oneself but sometimes it leads major stress problems and being an Indian, we have to deal with competition more than often.

The editors of Tiges decided we should focus in covering the competitions and how they impact a student psychology and their mental grit when it comes to preparing and competing in these competitions. We like always have taken perspectives from academicians, teachers, students, educators and we hope you enjoy this edition.

We have been getting letters from our readers and majority of the people want to read about sustainability and how this affects the students, teachers and how the education community should be prepare for it. If you want your thoughts to be shared with our readers, please email us at editor@tiges.ca.

If you want to share any feedback on this issue or write to editor, please email at editor@tiges.ca.

We look forward in hearing from you soon and hope you enjoy the winter edition of TIGES.

Editorial Team

MATH IN CAREER ENGINEERING AND ART OF PROBLEM SOLVING

When the project team of the Mathematical Association of America heard that I was going to be in Europe, the Middle East and Asia for a few weeks, they asked me to speak at several schools in between my various other meetings. My trip was initially intended to have been a fairly personal one, including a get-together in Dubai with my old college friends (some of whom I hadn't seen in nearly two decades!) and spending time with my father, but I promised I would do my best. I had in possession after all, a tried and true presentation on the very same subject that I had honed for years, and I was sure that I could make it through without much trouble.

I was wrong. I knew things were going poorly when, while at one of the first schools I was going to be speaking for, the International School in Amsterdam, one of the attending students stopped me three quarters of the way through my perfected pitch and demanded why on earth she should be studying math in the first place! At another school, in Dubai, a young man also seemed equally unconvinced about my talk of taking part in academic challenges . A 9th grader from Jaipur had her entire family drive her to Delhi to meet me, but her question encapsulated the general perspective of many of the young students that are confronted with the American Math Contest for

NNS CHANDRA

Chandra teaches grad students in United States and he leads Mathematical Association of America (MAA) efforts in South Asia and Middle East Asia. He works with high school students from around the world preparing them for university in his capacity as an accredited/certified counselor

the first time: what do these academic competitions actually do towards improving her academic and professional future?

I realized that my presentation was behind the times. Children today are more pragmatic than ever before, than even many adults I've met! They want to know exactly what they'll be getting for their time and effort, and even though I firmly believe in the practical use of the math contests, my lecture had failed to emphasize those aspects.

I decided to rework my entire presentation from the ground up, and try to bring an exact sense of what we do at Mathematical Association of America and how participating in AMC competitions will help a high schooler not only in preparing for university or securing an admission in a top school but also for a future in the field of mathematics. The following is a sneak peek of what I have to say to answer a few of those questioning voices from Amsterdam to Jaipur:

I was wrong. I knew things were going poorly when, while at one of the first schools I was going to be speaking for, the International School in Amsterdam, one of the attending students stopped me three quarters of the way through my perfected pitch and demanded why on earth she should be studying math in the first place! At another school, in Dubai, a young man also seemed equally unconvinced about my talk of taking part in academic challenges

Any mathematics student with a love for problem solving can look forward to a fulfilling and profitable career. The skills you develop while studying mathematics are in high demand, and there is no shortage of interesting jobs that will use your analytical, problem-solving, and logic skills.

For example, here are some of the careers a math student can consider:

1. Biostatisticians solve biological problems, particularly in healthcare. A biostatistician can study the effectiveness of new drugs, or identify the source of an outbreak using data and mathematical modelling. Biostatisticians can also work in ecology to predict how ecosystems

will change or in agriculture, helping farmers choose which crops to grow and which methods will be most effective.

Degree required:
Master's degree

2. Actuaries assess and minimize risk. They model outcomes for different scenarios, often for insurance companies. If you're not interested in working in insurance, large businesses and startups also hire actuaries to help executives determine what risks to take.

   Degree required:
   Bachelor's degree

3. Logisticians develop plans to maintain and repair equipment. They work to improve efficiency and reduce downtime by tracking the state of the equipment and planning preventative maintenance to avoid repairs.

   Degree required:
   Bachelor's degree

4 Data Scientists research problems and model solutions for everything from data security to the production of semiconductors. They often work with other scientists such as chemists and physicists to develop solutions.

   Degree required:
   Bachelor's degree

5. Financial Analysts study trends in financial markets. Most work for businesses and help them make economic choices. The Federal Reserve System also hires financial analysts to assist in making decisions about monetary policy.

   Degree required:
   Bachelor's degree

6 Market Research Analysts forecast sales trends and gather data on consumers. They develop and track marketing campaigns to find the most effective strategies to maximize sales.

   Degree required:
   Bachelor's degree

7. Technical Writers create technical documents like owner's manuals, detail technical procedures, and instructions on how to put together economical Swedish furniture using only a hex key. Technical writers can also write journal articles, grant proposals, and government reports.

   Degree required:
   Bachelor's degree

On top of these specific math related careers, the AMC prepares you for a stable future in a job market that is anything but. With the rise of artificial intelligence, we are experiencing a mass extinction of jobs that require nothing more than number crunching (complex or otherwise). However, the kind of careers that I believe AMC guides you toward can never be replaced; and that's because the experience of training for and completing the AMC gives you the most fundamentally human skill set of all: the ability to creatively solve problems. Do not mistake the American Math Contest for a high school math exam that, usually, asks you to memorize a set of formulae and then spit them out on command. After all, in the real world, a computer can do that, faster and more precisely than any human could dream to.

But creative problem solving? You can use that in any career under the sun, in any environment and at any time. And not just in the professional sphere, the skills the AMC trains can help students successfully make the difficult transition from high school to university and navigate the treacherous waters of academia.

This is the real reason why the American Math Contest is so highly regarded by admissions counselors around the world, and why its such a high distinction to score well on it. Because the fundamental skill that AMC tests for, is one that will be used again and again and again throughout your entire academic and professional life; regardless of the specific path you take.

I would love to hear your own responses to this. But for now, I hope I've successfully calmed down a few of those young voices I heard around the world!

THE WAY OF THE WARRIOR:

WHY COMPETITIVE SPIRIT IS VITAL AND HOW I FOUND IT

ACHYUTH CHANDRA

Achyuth is a former IB student who is now pursuing an honour major in Cognitive Science with a minor in Political Science at the University of McGill and planning on beginning a Master's degree in counseling psychology in the fall of 2015. He is actively involved in the McGill Debate Team, several creative writing organizations in McGill (including VP of the Paper's Edge), and plays tennis and boxes on his down time.

In the hours leading up to my first jiu-jitsu tournament, I was not surprised to find that the main emotion I carried with me at all times was anxiety and tension. Competition had never been my strong suit. I remember as a child, attending my first tennis tournament, and being filled with fear at the prospect of other people watching me play, watching me fail to serve or miss a volley, watching me lose. I competed a few more times throughout middle school and high school in a variety of things (debate, tennis, boxing), but win or lose, the fear never left me and I closed that chapter of my life when I graduated high school. In university, I focused more on my academics and allowed my extra curricular activities to be what they were intended to be: extra-curricular. But that isn't to suggest I didn't love those past times! Throughout my undergraduate and graduate careers, I played tennis weekly, I boxed multiple times a week, and I regularly attended my university's debate club. But for 6 years following my high school graduation, I had never felt that particular ball of stressful emotions in my gut that only materialized when I was about to participate in direct competition with another human being in front of an audience. And now, that familiar clump of stress was back.

Competition had never been my strong suit. I remember as a child, attending my first tennis tournament, and being filled with fear at the prospect of other people watching me play, watching me fail to serve or miss a volley, watching me lose.

THE RISE OF KANO

To understand more about how exactly I came to be attending this tournament, you have to go back 130 years. In May of 1882, a 22-year old man, freshly graduated in economics and political science from the University of Tokyo (the most prestigious school in Japan), set up a place to practice his own hobby more extensively. His name was Jigoro Kano, and his hobby was war.

More specifically, his hobby was a mock practice of unarmed warfare that the japanese called jujutsu (or jiu-jitsu or ju-jitsu). Ju - meaning gentle, flexible or yielding, and jitsu - meaning art or technique. The name implies the basic and fundamental mantra of the entire activity: maximum effect through minimum effort. Jigoro Kano studied under different masters of this unarmed martial art until he felt confident enough to open his own jujutsu dojo in 1882. Kano believed that jujitsu was a tool that could be used to teach vital lessons to the youth - lessons of humility, courage and perseverance. To that effect, he emphasized free sparring and physically demanding conditioning over formalized and coordinated rituals.

In the decades following the opening, a time period in which Kano continued to practice his main profession as a professor in an elite Japanese school even as his dojo exploded in popularity, Jigoro decided that his style of jujutsu had altered enough from its roots to deserve a new name altogether. He

decided that he would name it judo.

In the years to come, judo would travel around the world through warrior missionaries that spread from Japan to Russia (where it later became incorporated into an army combatives program known as SAMBO), Europe (where it mixed into the world of professional wrestling), and America (the 26th president of the United States, Theodore Roosevelt, received a brown belt in judo). The strongest influence it would have, however, was when a judoka by the name of Mitsuyo Maeda travelled to Brazil in 1914 and agreed to teach his martial art to two sons of a prominent business man by the name of Gracie.

THE GRACIE FAMILY

Helio and Carlos Gracie were those two sons, and with them, judo would be transformed again. Just as Kano had put his own flair and ideals onto a more ancient system of unarmed fighting, the Gracie family changed the basic assumptions of judo by asking - why should the fight end when one of the combatants has been thrown? Of course, this was how matches were scored in traditional judo. If you throw your opponent so that their back touches the ground, you score ippon, meaning you achieve victory. But the Gracies believed that this gave an unfair advantage to the larger fighter. They began to perfect and innovate on the ground techniques of judo (those techniques that take place once one or both fighters have been taken down), until, just like Kano had done before, they changed the name of their art to reflect the transformation they had effected on what they had learned. Now, they would call it Brazilian Jiu-Jitsu (BJJ).

The Gracies from the '30s onwards began to challenge anybody and everybody that dared dispute the superiority of their brand of judo and jujutsu; not only Helio and Carlos, but their many sons also eventually took up the mantle. Most famously, it was Royce Gracie (a son of Helio) that competed in the first Ultimate Fighting Championship (the largest mixed martial arts organization in the world today) and took home gold after submitting much heavier and stronger opponents.

My own experience with the art was humbling. In the beginning, I would get submitted without even knowing the mechanics of what was submitting me. All I knew was that I lacked air to breathe or my arm was extended precariously, and I would tap quickly and loudly. But I had never expected to be good, and the pleasure of every small victory sustained me.

A PERSONAL TALE

All this is meant to explain why, as I was walking down a small street in Montreal one cold day, my eye was instantly drawn to a neon sign that blinked 'Gracie Jiu-Jitsu'. On the power of that legendary name alone, I was able to muster up the courage to walk into the dojo that I would spend almost every free evening I had for the next two years.

My own experience with the art was humbling. In the beginning, I would get submitted without even knowing the mechanics of what was submitting me. All I knew was that I lacked air to breathe or my arm was extended precariously, and I would tap quickly and loudly. But I had never expected to be good, and the pleasure of every small victory sustained me. I grew addicted within the first two months. For my lunch break at work, my coworkers grew used to the sight of me eating a meal as I watched analysis of a jiu jitsu match. I read every book I could find on the history of the art, and I would take pages and pages of notes so that I could remember key details of a technique. Most importantly though, I was in the dojo every chance I got.

Ultimately, what brought me back again and again, even after dislocating my shoulder or fracturing my nose or undergoing the stress

of final exams, was the competitive spirit that jiu-jitsu fanned in me.

LESSONS FROM COMPETITION

In the last two years, I learned several lessons through the medium of martial arts. The first was how important competition is. This is true for a variety of reasons; it was through competition for example, that the world was able to discover how effective judo and jiu-jitsu were. It's analagous to the invisible hand of Adam Smith; when everyone is allowed to compete freely and openly without artificial barriers, competition allows you to see what works and what doesn't. This is important, not only in martial arts, but in every single aspect of human life. In science for example, when researchers innovate to compete for awards and grants, or in politics, when the competition of platforms and viewpoints allow a population to decide who to elect. In a more personal sense, competition makes clear the areas in which you are strong and (more importantly), the areas where you are weak.

Another lesson I learned was how much of a teachable and trainable skill competitiveness is. For a long time, I had simply assumed that I lacked the spirit to compete and that was a lack I could never make up for. But talking to my team mates that regularly competed and suceeded in jiu jitsu, I realized how much they actively worked towards honing a succesful mentality. They read philosophy books, they meditated, they listened to motivational speeches; competitive spirit was a skill that the worked on and improved at.

But more important than realizing how vital competition is on a micro and macro level, or understanding that it's a skill to be trained and improved, was my comprehension of just how fulfilling competition is. Competing can become, if you allow it, a key part of a fully realized life. Outside the rigours of a 9 to 5 job or the daily challenges of academic life, competition can exist in a space where you want to win simply and only for yourself. Of course, most of us will never be in the top 1% of any given activity that we choose to actively compete in, but I believe the process can satisfy this vital part of the human condition that it is all too easy to ignore in modern life, where it's simpler to be dictated by the whims and wishes of your boss or your parents or any other outside influence.

All these lessons, I believe, are true independent of whatever it is you want to compete in. For me, it was martial arts, but for others, it could be debate or music or math tournaments. The crucial thing is to find an environment that forces you to assume responsibility for yourself and deal with the consequences thereof. This can be an incredibly frightening experience, but it can also alter the entire way you approach other aspects of your life.

THE END OF A BEGINNING

An hour after my first jiu-jitsu tournament, I sat alone on the bleachers of a local high school gym, still dressed in my kimono uniform. I didn't have any medals, I hadn't even won a single match. In the first fight, I had panicked and clumsily allowed myself to be thrown, and then had tired myself out in my desperate attempts to gain points. Ultimately, the time had run out, and I had to watch as my opponents arm was raised instead of mine.

I remembered seeing similar sights before, I had lost in other tournaments in other sports when I was much younger. Back then, all I could think was how disappointed my parents must have been or how uncool I looked to my friends. This time was different. I was angry, I was sad, I was disappointed; but I was also strangely, almost unbearably ecstatic. I had lost, but for maybe the first time in my long history of competing, I had lost completely and totally on my own terms. And it would be on my own terms that I learned how to improve and come back.

Two months later, I would compete again. And I don't think I'll ever stop.

MATHEMATICS COMPETITIONS AROUND THE WORLD

Mathematics competitions and olympiads are competitive tests which students all around the world are involved in testing their skills in the field of mathematics but also engage students in breaking barriers within their academic learnings in the field of mathematics. As this issue is being used to talk about Mathematics and the competitions, I have identified the most popular and challenging mathematics competitions around the world which give the students the opportunity to test their mathematical skill sets.

- Association of Computational and Mathematics Modeling Competition: Student from any countries under the age of 20 who can compete in teams up to four individuals. The team is given 14 days to research on two real world problems and will present its solution in the form of a research paper. This competition does not only test your

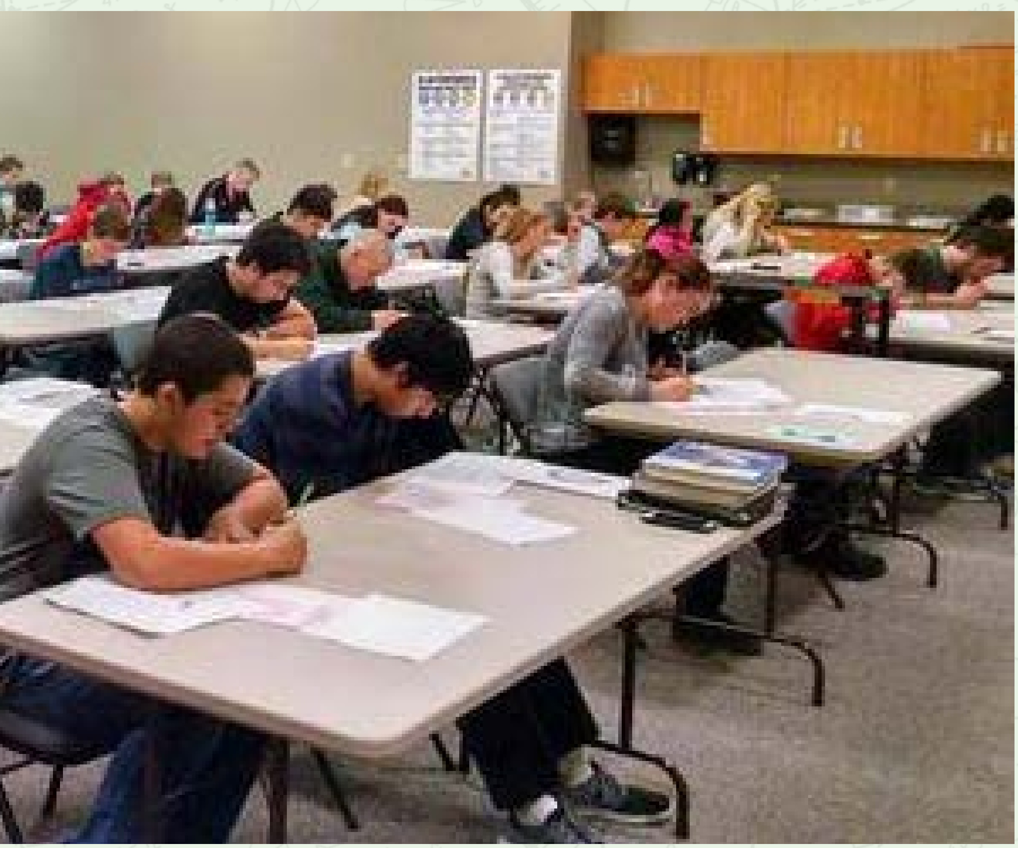
SOHOM BHOWMICK

Sohom is a University of Iowa alumni, graduated in Economics and Entrepreneurship.. A Transitions Labs alumni, well versed with all the programs. He is currently a consultant consulting various companies in social enterprise and non-governmental organizations and also an editor for Transitions in Global Education.

research skills but also helps students in developing the communication and teamwork skill sets with the students.

- International Math Olympiad-IMO is the one of the oldest held competitions of mathematics. The content of the competition is challenging which is revolving around the concepts of complex geometry, functional equations, and well grounded number theory. The selection process for the competition differs from country, but it often consists of series of tests which admit fewer students at each progressing test. Awards are given to approximately to the top scoring 50% of the individual contestants.
- Mathematical Kangaroo- Math Kangaroo is an international mathematical competition for students in grades 1 through 12. The competition consists of a single round that is taken on the same date (third Thursday of March) at a registered center. Awards are given to the top scoring students per grade at the national level. High scoring students in the US that are ranked high within their state will also be awarded as a state winner. The majority of the problem are algebra and geometry. Math Kangaroo has a special focus on three-dimensional geometry which are not usually seen in mathematics competition.

Its purpose is to simulate interest in mathematician and its applications to develop scientific thinking, communication skills and team work. Unlike other maths tournament, questions for the competition are shared before and contains parts with no known solution. The competition is somewhat similar like a research debate involving Reporter, Observer, Opponent and Reviewer



- Tournament of Towns - This high school math competition has been held since 1983 and it is an international recognized competition as each city hosts its own competition so participants do not have to travel. It has two rounds: Fall and Spring, both with two levels — O-level (basic) and A-level (advanced). The A-level is comparable in its difficulty with the All-Russian and International Mathematical Olympiads, the O-level is somewhat simpler. It is not obligatory to part¬icipate in al¬l rounds or levels. Each level is held se¬parately for (grades 8-9) and Senio¬rs (grades 10-11). Any sch¬ool stud¬ent of any grade can participate in the Tou¬rnament for his grade or hi¬gher. This tournament is organized by local committees in more than 100 cities of more than 25 countries in Europe, Asia, South and North America, Australia and New Zealand.
- International Tournament of Young Mathematician- IYTM is a team competition for high schools students all over the world. Its purpose is to simulate interest in mathematician and its applications to develop scientific thinking, communication skills and team work. Unlike other maths tournament, questions for the competition are shared before and contains parts with no known solution. The competition is somewhat similar like a research debate involving Reporter, Observer, Opponent and Reviewer.
- Singapore International Math Olympiad Challenge is an unique concept of mathematics competition which not only tests your ability to solve mathematical problems in a pen-paper format but also test one's ability to work as a team to play interactive mathematical games and solve

puzzles. SIMOC gives you an opportunity to compete with top mathematical talents around the world and learn from each other as a team. Students from almost 14 countries participate in this olympiad

- Harvard-MIT Mathematics Tournament - This is an annual high school tournament started in 1998 and this competition is staffed and written between the staff of Harvard and MIT and it has been considered as one of the most prestigious high school math competition in the world. HMMT February is attended by teams of eight students each. Teams can represent a single school, or a regional math team as large as a state. In recent years, teams have represented over 20 states, as well as Africa, Asia, Europe, and South America.HMMT February consists of three rounds: the Individual Round, the Team Round, and the Guts Round. No calculator or computational aids of any kind are allowed during the contest. HMMT February uses a unique scoring algorithm to score the competitors on the Individual Rounds. While the problems on these tests are weighted according to difficulty, they are done so after the testing has completed which has helped to create a fair method to weight problem according to difficulty.

- William Lowell Putnam Mathematics Competition - It is often called the Putnam competition, is an annual mathematics competition for undergraduate college students enrolled at the institutions of higher learning in the United States and Canada. They award a scholarship and cash prizes ranging from $250-$2,500 for the top students and $5,000-$25,000 for the top schools. The competition was founded in 1927 by Elizabeth Lowell Putnam in memory of her husband William Lowell Putnam, who was an advocate of intercollegiate intellectual competition. The exam has been offered annually since 1938 and is administered by the Mathematical Association of America.

Mathematics competition are just one of the ways where you can kinder competition between the students and students come together irrespective of nationality, gender or the age group. Competitions are a part of human nature and competitions sometimes brings the best in all of us.

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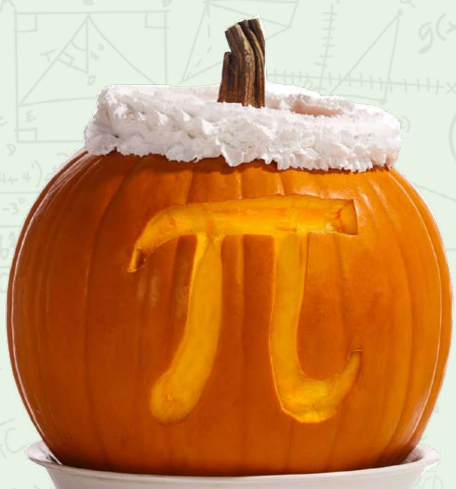


MATHEMATICS COMPETITIONS- THE FUTURE ON HOW STUDENTS ENGAGE IN ACADEMIC COMPETITIONS

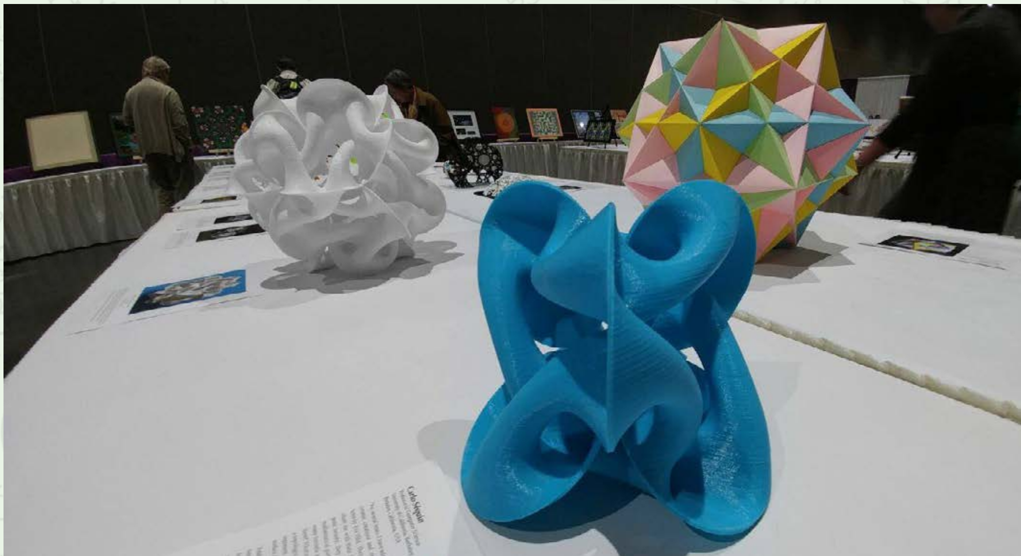
TIMOTHY KELLY

Timothy Kelley first had the idea for AreteLabs as a part-time, volunteer Rowing Coach at his high school alma mater. A fierce proponent of the erg (rowing machine), over time he realized that student athletes improved most, and dramatically so, when they were tested routinely (weekly) on the machine, as opposed to infrequently or randomly.

HISTORY

AreteLabs is a U.S. firm pioneering live, online academic competition. The idea for the platform came to the founder, Timothy Kelley, almost a decade ago during his time as a part-time, volunteer rowing coach at his high school alma mater. He had developed an expertise in coaching the rowing machine, also known as the erg. One year, instead of testing students on the erg randomly and infrequently, he decided to test them consistently and often. He required that all students test together and endeavored more generally to create an environment where only improvement and scoring a personal best mattered, not merely absolute achievement. The results changed dramatically, for the better. Focusing on personal bests made it possible for every student to shine in front of the group regardless of their natural gifts. Keeping the group together meant everyone was included, but also that everyone was accountable. And the high frequency of the testing made students very familiar with their scores over time. As students began to recognize objective signs of improvement, that compelled future improvement. As a result of these training modifications, a majority of students were improving every single test and on one rare occasion, every single student scored a personal best, over 30 students, a remarkable anomaly in endurance sports.

With this record of results, the



founder started to wonder whether this regimen might be replicated in the academic arena, online. His first step was to explore the idea at Harvard University where he took classes at the Graduate School of Education as part of a Masters in Public Policy he completed at Harvard Kennedy School. Very influential professors across the University demonstrated their support of his concept. Based on that feedback, he commenced development of the platform and the first prototype was released in 2013. That prototype eventually developed into Math Madness, an online math competition event held in the fall at three levels: elementary school, middle school, and high school. This event has grown to include over 600 participating schools nation-wide, and over 10,000 students. Recently, the firm has been awarded its second National Science Foundation Phase I grant ($225,000) to develop a platform that will be the most comprehensive, cutting-edge embodiment of both team-based and individual-based online academic competition throughout the world.

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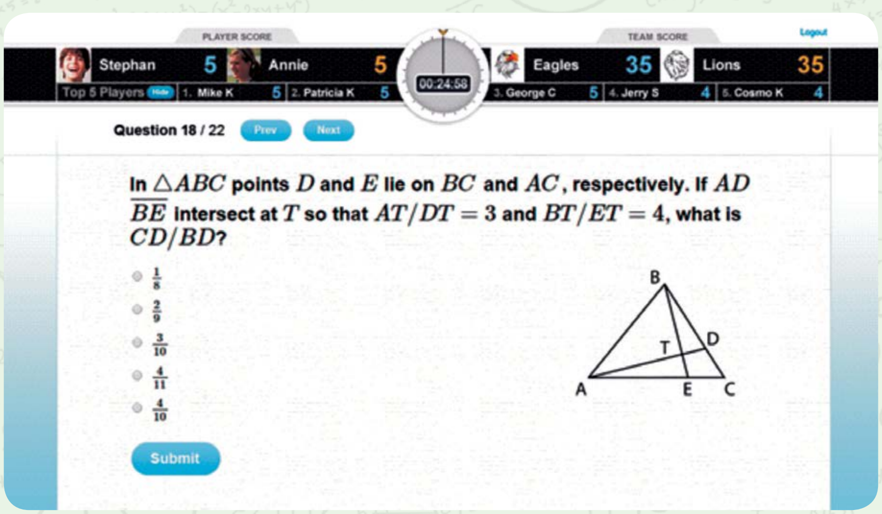
MATH MADNESS

In the U.S.,Math Madness takes place in the fall with one event held for high school teams (9th-12th), one for middle school teams (6th-8th), and one for elementary school teams (3rd-5th). In this event, the system arranges all matches for all rounds. Each match involves 2 teams and each round lasts 1 week. All rounds begin Sunday and end Saturday. A team can compete at any time during a given round and change its time to play during the round and from round to round, as well as the players it



fields. In addition, a team can opt out of any round that might conflict with its school schedule, keeping the commitment required to participate in the event to a minimum. In fact, the only 2 responsibilities of a teacher throughout the entire season are to add students to the team and choose the time to play each round. Thus, the event is remarkably flexible and simple for schools to participate in regardless of schedule.

If a team chooses the same time to play as its opponent, the match is live with team score updating in real time. To add to the excitement, individuals from opposing teams are matched together evenly based on past performance, a second level of competition. If teams cannot find a common time to compete, then each team plays at a time convenient for it, with the winner decided after both teams have played. In this case, students square up against their personal best.

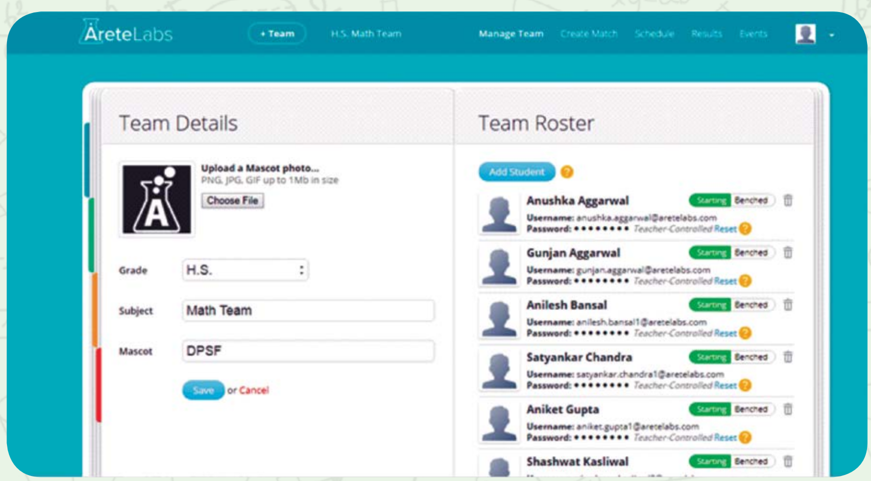
All matches are 30 minutes in length, although this variable can be changed, and all students from the same team play under the supervision of their teacher, simultaneously and individually. Thus, each student must have separate access to a computer/tablet and the internet. A team must field a minimum of 5 players per match but a maximum team size is not imposed. When the match starts, all team members logged into the AreteLabs website are automatically redirected to the Match Arena where a scoreboard is displayed as well as a question area. Each match includes 7-8 multiple choice and fill-in-the-blank questions. Content at the high school level is primarily aligned with AMC 10/12, at the middle school level with AMC 8, and at the elementary level with MOEMS, with a wide spread of difficulty to engage students of all abilities. A student receives 1 point for each question answered correctly. Team score is calculated by summing the top 5 individual scores of the given team. Students are not restricted to a specific time length for answering any given question. Once the match is over, questions and solutions are immediately furnished to each team to stimulate a unique teaching and learning opportunity.

As the season progresses, rankings of the top 50% of individuals and teams are published to highlight achievement and to help members of the greater community measure their own effort and progress. Teams are matched first by skill so that the competition is even and then by common time availability so that teams can play live where possible. Data from the 2 qualifying rounds are used to deter-

mine bracket assignments. The top 64 teams are assigned to the Title bracket. Remaining teams are then evenly placed in additional brackets based on team size, with all teams competing in a bracket. Within each bracket, teams are sorted by skill and seeded accordingly, following NCAA March Madness protocol.

There are two collaboration rounds included in the event. They are the only rounds where students do not play individually. Instead, teachers are asked to divide their team into mini-teams of no more than 3 students and no less than 2, assigning 1 student to log in and input answers on behalf of the mini-team. The members of each mini-team are free to discuss each question together. These are the most popular rounds, and potentially the most beneficial to students, of the entire event.

Those teams that are eliminated from a bracket can nonetheless extend their season by opting in to play against other similarly situated teams in weekly matches automatically arranged by the system. In



Students in these environments experience the potential downsides of competition without any of the likely benefits.

addition, a teacher can separately challenge another team to a match or divide his/her team into multiple teams that play against each other. Content from the present season and past seasons is made available to fuel such additional competition activity. Thus, all teams are guaranteed 10 rounds of play with the flexibility to opt out as needed.

A teacher can add as many students to the team as desired throughout the season, with each student assigned a separate account. Unique student ID information is not required nor does AreteLabs utilize student or teacher data in any way. Moreover, students are free to conceal their identity. Upon request Math Madness question sets from years prior can be pushed to a newly activated account so that a teacher can both review content appropriateness as well as create a live match for students to better determine potential interest in the core experience.

THEORY

While competition in its various manifestations is deeply rooted in the U.S. educational system, it does not always enhance motivation and subsequent performance. Inside the classroom, students often experience intense competitive pressure. Because failure following effort is often viewed as compelling evidence that one lacks ability, students may pursue a range of maladaptive self-protecting strategies when confronted with such

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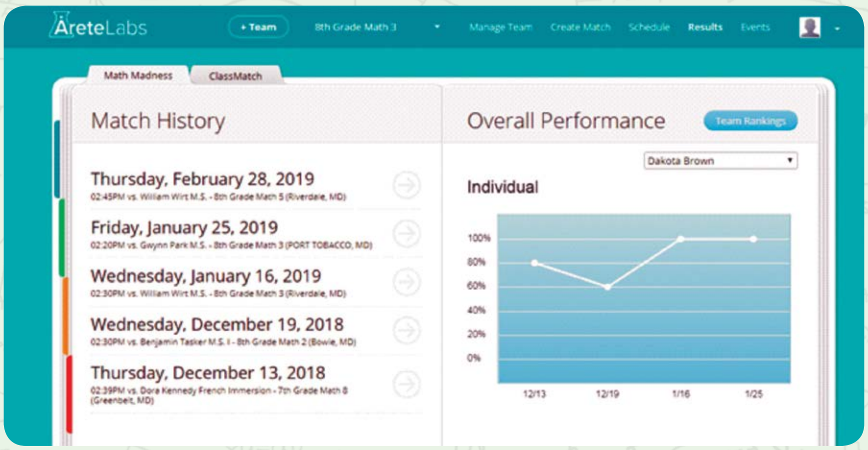

forces, including self-handicapping and disengagement (Byrne, D., De Castella, K., Covington, M. "Unmotivated or Motivated to Fail? A Cross-Cultural Study of Achievement Motivation, Fear of Failure, and Student Disengagement" Journal of Educational Psychology, Vol. 105, No. 3, 861– 880, 2013). Outside the classroom, while academic contests are not uncommon, they have historically failed to engage larger segments of the student population. This may be because they are often targeted strictly toward elite-level students, impose excessive costs in time and resources, or they lack those game mechanics that resonate with participants.

Theory of change: If a cost effective, logistically convenient, web/mobile platform is created that allows an unrestricted number of students to compete, individually or as part of a team, in a game-based environment closely modeled after successful, highly popular sports and sporting events, then students across the spectrum will be attracted to participate, peer norms will adjust to support academic success, motivation and effort will increase, and learning outcomes will improve.

Fifty years ago the eminent sociologist James Coleman published The Adolescent Society (1961) which would go on to achieve iconic status in the academic literature for its analysis of adolescent peer culture and value systems. His insights, excerpted below, illustrate the primary rationale for the theory of change:

The structure of competition in high schools – interpersonal competition in scholastic matters, interscholastic competition in athletics . . . undermines a student's efforts in scholastic directions (where he is working only for himself), and encourages his efforts in these other, tangential directions (where he is striving for team and school as well as himself) . . . One obvious solution is to substitute interscholastic competition in scholastic matters for the interpersonal competition for grades which presently exists.

The problem, as Coleman saw it, is that grades and most other academic performance metrics are relative indicators, ranking students against their classroom peers. Because an improvement in one student's achievement reduces the position of others, social norms emerge which discourage and even denigrate effort toward academic success. Students in these environments experience the potential downsides of competition without any of the likely benefits. In athletics, in contrast, the traditional inter-scholastic structure of competition ensures that individual and team success bring glory to the school as a whole. Effort and accomplishment become a source of honor, not ridicule. Coleman continues:

A change from interpersonal to intergroup competition would make it necessary to create, with consid-

A recent study found that 97% of teens aged 12-17 play digital games, 50% of these reporting daily or nearly daily play (Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., &Vitak, J.: "Teens, Video Games and Civics" Pew Internet & American Life Project, 2008). The momentum toward digital gaming is undeniable, and seemingly unstoppable.

erable inventiveness, the vehicles for competition . . . If there were systematically organized competitions, tournaments, and meets in all activities ranging from mathematics . . . through industrial arts . . . and if promotional skills were used, the resulting public interest and student interest in these activities would undoubtedly increase sharply . . . I suspect that the impact upon student motivation would be particularly great.

The AreteLabs platformhas the power to precipitate the shift Coleman envisioned by using the game mechanics that successfully motivate participants in the athletic and gaming worlds, e.g., real-time score, rankings, player statistics, leagues, tournaments, championships and so forth. Research since Coleman confirms that peer norms are not immutable, that they can be influenced by school policies such as whether tests are scored relative to one's peers or to an externally set standard (Bishop, J. "Drinking from the fountain of knowledge: Student incentive to study and learn–externalities, information problems and peer pressure" Handbook of the Economics of Education, Vol.2, 909-944, 2006).

Increased motivation on the part of individual students and encouragement from their peers should in turn lead to higher levels of student effort and, in turn, performance gains. Researchers have found that differentials in student effort appear to explain much of the differences between nations in academic achievement and, in particular, to contribute to the outstanding achievement levels of East Asian nations (Bishop, J. 2006). Moreover, an ongoing Stanford Research institute (SRI) meta-analysis of peer-reviewed journal research on digital games for learning finds that the use of digital games can enhance student learning relative to traditional instructional approaches (Clark, D., Tanner-Smith, E., Killingsworth, S. "Digital Games for Learning: A Systematic Review and Meta-Analysis" May 2013).

While some teachers may resist the competition's reliance on testing, recent research (Blunt, J., Karpicke, J. "Retrieval Practice Produces More Learning than Elaborative Studying with Concept Mapping" Science Vol. 331, No. 6018, February 2011) demonstrates that tests administered shortly after the introduction of material can lead to better long-term recall than other methods associated with retention such as concept mapping or re-reading. Thus, the experience of this online approach to academic competition can be both a motivational and a learning tool.

In the New York Times Bestseller Top Dog: The Science of Winning and Losing(2013), authors Bronson and Merryman report that in almost every study they reviewed of competition effects, most participants improve their effort level when subjected to competitive pressures. Therefore, they strongly advocate for competition, subject to one condition: that it be evenly arranged. For competition to drive performance gains, participants must feel like they have the ability to succeed. The AreteLabs platform is meticulously designed to match teams and students of similar ability together.

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USEFUL LINKS

https://www.youtube.com/watch?v=0UWryJgw034 (Cobb County School District pilot)

https://www.youtube.com/watch?v=FSwBGbXwSQw (Khan Academy pilot)

https://www.educationnext.org/using-technology-to-drive-competition-%E2%80%93-and-change-student-culture/ (Harvard University Article)

https://www.usatoday.com/story/news/nation/2013/03/24/math-march-madness-competition/2010875/ (USA Today article)

https://www.youtube.com/watch?v=yl-vDUI_HZAA&t=51s (AreteLabs tutorial)

THE ROLE OF COMPETITIONS IN A MATHEMATICS PROGRAMME

Brenda Bicknell, University of Waikato and Tracy Riley, Massey University

ABSTRACT

What role do competitions play in a mathematics programme for our students, especially our gifted and talented students? This question is examined from the perspectives of fifteen students (10-13 year olds) identified by their schools as mathematically gifted and talented, their teachers, and their parents. Students participated in variety of different types of mathematics competitions – local, national, and international. There was differential access to the competitions and differing perspectives; students and parents shared similar viewsabout the value of competitions, but there was a difference of opinion among the teachers.

INTRODUCTION

Competitions are viewed as an important part of the educational provisions for gifted and talented students (Renzulli, 1994; Riley & Karnes, 2007) and part of the recommended continuum of differentiated opportunities (Ministry of Education, 2000). In a national review conducted in 2004, 66.4% of schools (n=809) reported competitions as one of the school-based provisions for gifted and talented students across all areas of ability (Riley,Bevan-Brown, Bicknell, Carroll-Lind, & Kearney, 2004). The area in which competitions was most commonly utilised was in the domain of physical and sport abilities followed by the intellectual /academic domain.

Competitions can also be used as part of the multiple method identification process. Moreover, they offer students the opportunity to strive for personal achievement and to compare themselves with others. They are a means for "providing an encouraging environment in which gifted students compete, excel, and are honoured for their abilities" (Grassl & Mingus, 1999, p. 291). Karnes and Riley (1996) suggested that competitions also enhance students' self-directed learning skills and sense of autonomy.

The primary goals of mathematics competitions are to increase motivation, excitement and interest in mathematics, and to provide schools and parents with information about more able students. A competition result provides one measure of a student's mathematical ability and discriminates ability levels of individuals at the participant's level. Preparation for a competition in mathematics may demand targeted independent study as many competitions require rapid and accurate answers under pressure. Some competitions in mathematics, such as those organized by local mathematics teachers' associations, include group problem solving activities where team work and collaboration are important.

Bicknell, B., & Riley, T. (2012). The role of competitions in a mathematics programme. APEX: The New Zealand Journal of Gifted Education, 17 (1). Retrieved from www.giftedchildren.org.nz/apex

However, most competitions rely on independent problem solving abilities. Success in mathematics competitions, Ridge and Renzulli (1981) warned, is indicative of a particular type of mathematical talent and tells us little about the slower more logical formal type of mathematical talent.

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Motivation from competitions can also be extrinsic, resulting in certificates and awards, selection for other competitions, and recognized prestige. Udvari (2000) in a comprehensive analysis of the literature on competitions, concluded that "learning to deal with competition in a constructive manner is essential for gifted children, especially given the competitive nature of Western culture and the central role of competition in high-level achievement" (p. 215). This view was supported by Riley and Karnes (1998/99) who declared that "the opportunities to tap and showcase kiwi talent far outweigh the negative elements often associated with competitions" (p. 25). The negative outcomes, cited by Davis, Rimm, and Siegle (2011), were stress and feelings of failure from excessive competitiveness. It is important to note that not all competitions are designed well. Rusczyk (2012) provides a caution that if the competition emphasizes speed and memorisation they may encourage students to value such skills, instead of emphasizing the ability to think about and solve challenging problems. Students should also not be faced with problems that extend beyond their ability which could be discouraging. There is little research reporting the effectiveness of competitions in meeting the unique cognitive, social, and emotional needs of gifted and talented students. Campbell, Wagner, and Walberg (2000) acknowledged the need for such empirical research, but warn of the dilemma given the role of sponsorship that exists with many competitions. Research has focused more on Mathematics Olympiad students (see, for example, Campbell Wagner, & Walberg 2000), but not on younger students. Consequently this research-based article focuses on the role of competitions for younger students and is based on multiple perspectives: students', parents', and teachers'.

THE NEW ZEALAND SETTING

In New Zealand schools, we have a range of local, regional, national, and international opportunities for students to compete against their own and others' mathematical abilities in individual and team competitions, problem solving events, projects, and assessments. This range of challenges spans primary through to secondary-aged students, meeting the needs of many levels of ability, from developing expertise to exceptional, expert-like skills. In this section of the article, we highlight some details for the mathematical competitions in New Zealand, but encourage readers to visit their websites (included in the resources section at the end of this article).

At the local or regional level, we have competitions such as Canterbury's Cantamaths, Hawkes Bay's Mathletics, and Manawatu's Mathex. These mathematics competitions are designed for primary, intermediate, and junior secondary school students. Typically, these competitions provide opportunities for selected teams of students to answer mathematical questions in a timed environment. These mathematical questions include both computations and practical tasks, such as constructing three-dimensional models. Schools prepare students and sometimes host their own events for deciding which students will represent them. Some of these local events also have independent competitions; for example, Cantamaths offers students in years 6 to 10 independent project challenges, such as creating a computer generated design, publicity motif, mathematical poster, geometrical design, geometrical design, or mathematical model.

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The Otago Problem Challenge is a maths problem competition for children in years 7 and 8, but may be of interest to mathematically gifted children in year 6. This competition began in 1991 and reached its peak in 2002 when some 728 schools entered more than 42,000 children, of which 3,800 were in year 6. Children individually solve five questions in 30 minutes, but share their answers and strategies in small groups. The problems are aimed at more able children and all participants receive a certificate of participation and awards are given to the top one percent of participants.

Many New Zealand students in years 4 to 13 participate in the International Competitions and Assessments for Schools (ICAS, commonly referred to as the Australasian Schools Competitions) conducted by the University of New South Wales. This competition is comprised of a suite of assessments for primary and secondary students to provide diagnostic information about their abilities in core skills in areas such as science, mathematics, and English. It is expected that the assessments help identify students with particular talents.

The Mathematics Olympiads are intended for the crème de la crème of mathematically gifted and talented secondary school students and give opportunities for students to attend mathematics camps and to continue, if selected, to compete internationally. These Olympiads are now part of Science OlympiaNZ, along with the Olympiads in biology, chemistry, Future Problem Solving, geography, informatics or physics. This organisation tries to ensure that all gifted and talented students in mathematics have the opportunity to participate in an Olympiad or tournament and the secondary school students who compete in these international competitions are among the brightest and most technologically savvy in the country. New Zealand students excel internationally, winning, for example, 2 silver medals, 2 bronze medals and 2 honourable mentions, and maintaining their rank as 29th in the world, in 2011.

Another event for secondary students is the Senior Mathematics Competition, hosted by the New Zealand Association of Mathematics Teachers and currently sponsored by Eton Press and Casio. This competition is open to all year 12 and 13 students, with top competitors battling it out in Wellington for cash prizes, gifts, and certificates of recognition.

Mathematics Achievement Challenge is designed to extend and enrich students in mathematics at Levels 3 and 4 of the New Zealand Curriculum (Ministry of Education, 2007). The objective is that students complete in-depth mathematical investigations that are challenging and relate to everyday life. The students are encouraged to complete the challenges at school or at home. These challenges do not really fit the category of competitions as such, but are used by teachers to provide enriching, extra challenges for the more able students in mathematics.

THE RESEARCH SAMPLE AND METHODS

This study examined, from multiple perspectives, and over a two-year period, the education of a group of fifteen Year 6 and Year 8 students who had been identified by their teachers as mathematically gifted and talented. The group consisted of ten Year 6 students (2 girls, 8 Bicknell, B., & Riley, T. (2012). The role of competitions in a mathematics programme. APEX: The

New Zealand Journal of Gifted Education, 17 (1). Retrieved from www.giftedchildren.org.nz/apex. boys) who transferred from primary school to a new school for Year 7, and five Year 8 students (2 girls, 3 boys) who moved to secondary schools for Year 9. In the first phase of the research three schools were involved but after the students made a transition in the following year, eight schools were included in the study.

One purpose of the study was to seek understandings about the educational provisions for mathematically gifted and talented students, including competitions. The students' mathematical experiences, both past and present were examined using evidence from school policy documents; student, teacher, and parent interviews; questionnaires; and classroom observations. The gifted and talented policy documents from each school were examined to see what provisions were documented and if these provisions specifically included competitions.

Thirteen teachers from both phases of the study (pre and post transition) were interviewed about the key features of their mathematics programme and if they used competitions as part of the programme. If competitions were included as part of the provisions, they were asked to elaborate. Students were asked to talk about their mathematics programme, including the role of competitions. The parents (one for each child including 13 mothers and two fathers) were given an opportunity to talk in individual interviews (pre and post transition) about any opportunities for their child to take part in

MATHEMATICS COMPETITIONS.

What opportunities were the students given? Six of the eleven schools (two primary, three intermediate, and one secondary) stated in their policies that gifted and talented students should be given opportunities to participate in competitions. This opportunity in practice relied on factors such as school and teacher organization. All of the teachers in the study valued the use of competitions (for certain students) as part of their mathematics programme. The range of competitions included the Otago Problem Challenge, Mathematics Achievement Challenge, the New South Wales Competition (International Competitions and Assessments for Schools), the Australian Mathematics Trust Competitions, National Bank Competition (from 3 March 2011 known as The Junior Mathematics Competition), and team competitions run by local mathematics teachers' associations.

The Otago Problem Challenge was valued by some of the teachers and students for its emphasis on problem solving skills. The Achievement Challenge was not so favourably received by students, although the two teachers using the competition felt it was useful as a voluntary enriching activity and to encourage independent work. Students from seven of the schools participated in The Australian Mathematics Competition. There was an expectation that the students in each of the special classes (represented in this study) would compete in the Australian competition each year, although one teacher confessed that in that particular year their entry form had been mislaid. Some students missed out because the teacher or school were late with their entries, or they just did not get around to organizing it in that particular year, and in some schools the opportunity was restricted to only those in the designated 'gifted' class. This was the case for one student; he was initially not allowed to participate in the Australian Mathematics Competition because he was not in Bicknell, B., & Riley, T. (2012). The role of competitions in a mathematics programme. APEX: The New Zealand Journal of Gifted Education, 17 (1). Retrieved from www.giftedchildren.org.nz/apex. the gifted class and at the last minute was allowed to participate, only because of his mother's perseverance.

The students were very aware of what competitions they had or had not been able to participate in. Most of the students were in favour of being able to participate in competitions and had participated in previous years. If their school failed to send in entries or did not participate in competitions that they had previously competed in, the students were not impressed and the parents expressed disappointment. In two cases, the parents intervened because they knew about the competitions (their children had participated in previous years) and they were annoyed when it became apparent their children had not been registered to participate. The parents felt their children enjoyed the competitions (especially the New South Wales competition) as it gave them a chance to compare themselves with not only others in their group at school, but also with a wider set of students. The students who competed in the Australian competition talked about wanting to obtain distinction1. The Australian Competition results, according to the intermediate school teacher, were used as a way of monitoring students' achievement levels and checking that "there was no slippage".There was one case of a student being entered in a mathematics competition that varied to the competitions she had usually competed in. Nina (Year 9) was not impressed with this particular competition. She explained:

We did do this other one which I didn't like, the questioning was so different, it asked pointless questions which didn't test your true academic ability in maths, it asked you strange things ... I got distinction, I didn't like it; I'm not doing it again. They were just pointless questions like how many acute angles can you have in a polygon with 2001 sides, it was harsh, no calculators. First questions were real easy Year 6 and last ones were ridiculous. I prefer … [when] it actually asks what you know and what you should know rather than random ones. (Nina-Year 9 student)

All of the schools in the study entered teams in their local competitions. The team competitions were very favourably received by students, parents, and teachers. The students talked about the value of "working together", the preparation, and how when you have been doing it for a few years "you kinda know what to expect". It was an opportunity to represent the school. In some cases, the schools held internal preliminary competitions, so even the process of being selected was viewed with a sense of challenge and excitement. In two of the primary schools, the principals with interest and expertise in mathematics took responsibility for the training of the teams for this competition. In most cases, there was deliberate coaching and preparation. It was also viewed as an opportunity for the students to work as members of a team; this feature was acknowledged by students, teachers, and parents.

It's good because they have to work within a team and quite often they might be gifted mathematicians who just like to focus on their own and not to problem solve in a Bicknell, B., & Riley, T. (2012). The role of competitions in a mathematics programme. APEX: The New Zealand Journal of Gifted Education, 17 (1). Retrieved from www.giftedchildren.org.nz/apex. group. I think it's good for them as they may not be used to problem solving in a group. (Year 6 teacher)

WHY PARTICIPATE: MULTIPLE PERSPECTIVES

There was a variety of different competitions referred to by the students, teachers, and parents. Most of the students had experienced the local team mathematics competitions and most had participated at some time in individual national and/or international mathematics competitions. These competitions were viewed favourably by the students and parents.

The students appreciated the opportunity to participate in competitions and recognised the differences between the international ones and the team approach in the local competitions. The most common reason for the individual competitions was the chance to prove themselves among their peers, nationally and in Australasia. Two of the students wanted to make sure they maintained their record of obtaining 'distinction'. Nearly all of the students had represented their schools in local team competitions and were prepared to practise solving problems as a team. They also recognised the differing types of mathematical abilities within the group. For example, they recognised who was the speediest "number cruncher', who tackled geometric problems the best, and who was the most confident in solving fractional reasoning problems. The students talked about the strategies they employed in working as a team under the pressure of time and the delegation of problems.

The parents liked to use competitions as an additional way of monitoring their children's learning through participation and results in competitions. The parents strongly supported competitions and when the opportunity was not given, they usually took some form of action such as contacting the school to make inquiries about the competitions. The parents supported their children's participation in competitions in monetary terms; the costs were not high and some schools subsidized this expense.

Although the students and parents shared similar views about the value of competitions, there was a difference of opinion among the teachers. Although most of the teachers recognized the benefits of competitions, two teachers expressed some reservations. One teacher explained:

Not all of the students thrive on competition, so I have to be very careful about how I use them. Probably 60 to 70% of this class are more extroverts and like competitions. They have to feel safe and comfortable so I don't use them at the start when they are sorting each other out and they are afraid to make mistakes. Now they are really comfortable with each other so I can use competitions more. (Year 9 teacher, coeducational secondary school)

The schools that enrolled students each year in the competitions used the results as a form of tracking student progress. Interestingly, both teachers in the boys' schools associated competitions with gender. One teacher commented; "that determination to get it right. I've Bicknell, B., & Riley, T. (2012). The role of competitions in a mathematics programme. APEX: The New Zealand Journal of Gifted Education, 17 (1). Retrieved from www.giftedchildren.org.nz/apex. noticed that with boys, they thrive on competition". Similarly, another teacher explained that "competition is part of the programme. A lot of this school is about competition; boys like competition….We foster competition".

One of the teachers from a co-educational secondary school was ambivalent about competitions. He explained:Personally, I sit on the fence on it, in some ways I think that it's good because there are some students who thrive on the challenge and like to compare themselves against others in the world and they find that absolutely inspiring whereas there are others that find it a chore….I don't force them, it's upsetting; some just don't enjoy competition at all. (Head of Mathematics Department)

CONCLUSION AND IMPLICATIONS

Competitions were recognized as an integral part of the mathematics programme. Some, but not all, competitions were well received by the students. It depended on the particular competition, with the preference for most of the students being an Australian competition and the local mathematics teachers' associations' team competitions. The students liked to be compared with other students outside of New Zealand, yet also enjoyed the opportunity to compete as part of a team in their local setting. The students found competitions motivating; students and parents appreciated the comparative component. These positive attributes are supported in the literature and they should form part of the continuum of provisions (Renzulli, 1994). However, issues were raised about access to the competitions and continued opportunities after a student makes a transition in the school system (such as the move from primary to intermediate school, or intermediate to secondary school). There were not always the same opportunities as experienced in the students' previous schools.

Competitions should be acknowledged in school policy as part of the mathematics programme. Equitable opportunities should be provided for students to participate in mathematics competitions and ideally a promising student should not be denied opportunities because of the cost factor. Schools could invite students to provide feedback on their experiences so that their participation is taken seriously and not viewed as a separate part of the programme. Competitions can serve as a way of bringing students of 'like minds' together so that they find friendship, inspiration, and encouragement from working with others. This may be in preparation for the competition, working on problems from previous competitions, or sharing after a competition.

This study affirms the importance of competitions for gifted and talented students and argues that both individual (national and international) and group mathematics competitions are an important component of any programme for the mathematically gifted and talented. As with other provisions, they should not be utilized in isolation or without careful consideration as to who might benefit and should be planned in advance. However, opportunities to participate in competitions must also be seen as an open and equitable

process. Bicknell, B., & Riley, T. (2012). The role of competitions in a mathematics programme. APEX: The New Zealand Journal of Gifted Education, 17 (1). Retrieved from www.giftedchildren.org.nz/apex.

COMPETITIONS RESOURCES

Otago Problem Challenge	http://www.maths.otago.ac.nz/pc/
Mathematics Achievement Challenge	http://www.maths.org.nz/
International Competitions and Assessments for Schools	http://www.eaa.unsw.edu.au/about_icas/newzealand
The Junior Mathematics Competition	http://www.maths.otago.ac.nz/jmc/JMChome.php
Australian Mathematics Competition	http://www.amt.edu.au/
OlympiaNZ	http://www.scienceolympianz.org.nz/index.php
Gifted and Talented Online Competitions Page	http://gifted.tki.org.nz/For-students/Competitions

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MATHEMATICS PREMIER LEAGUE

INTER SCHOOL AND INTRA SCHOOL COMPETITIONS WITH
HEAVY CASH AWARDS
TO WIN IN FALL

MPL 2019

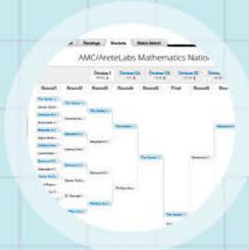
MATHEMATICS PREMIER LEAGUE

PAD UP FOR NETS APRIL 15

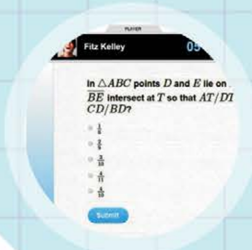
Math Premier League has been conceived from the successful American Math Madness competition powered by Aretel Labs USA.

The main objective of this competition is to get the different school teams participate and popularize Mathematics by Play and Learn Method. This will Inculcate a team spirit in the Coming generation along with some creative thinking.

The Model of the Competition will be in two phases Spring 2019 and Fall 2019 . Spring tournament is expected to kick off during the mid April and Fall tournament in August.



Tournament with a real time Progress Monitored By Competing TeamMembers Parents and Cheer Groups. Friends Families and promoting sponsors also can watch the matches



The Questions are specially designed for the students to trigger their Creative Thinking . This Tournament also indents to develop the communicative partnership capability to work as a team thus molding them into true professionals.

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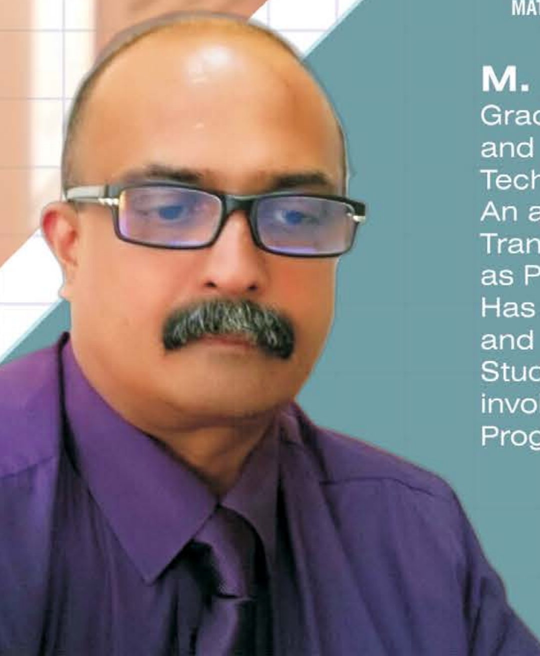

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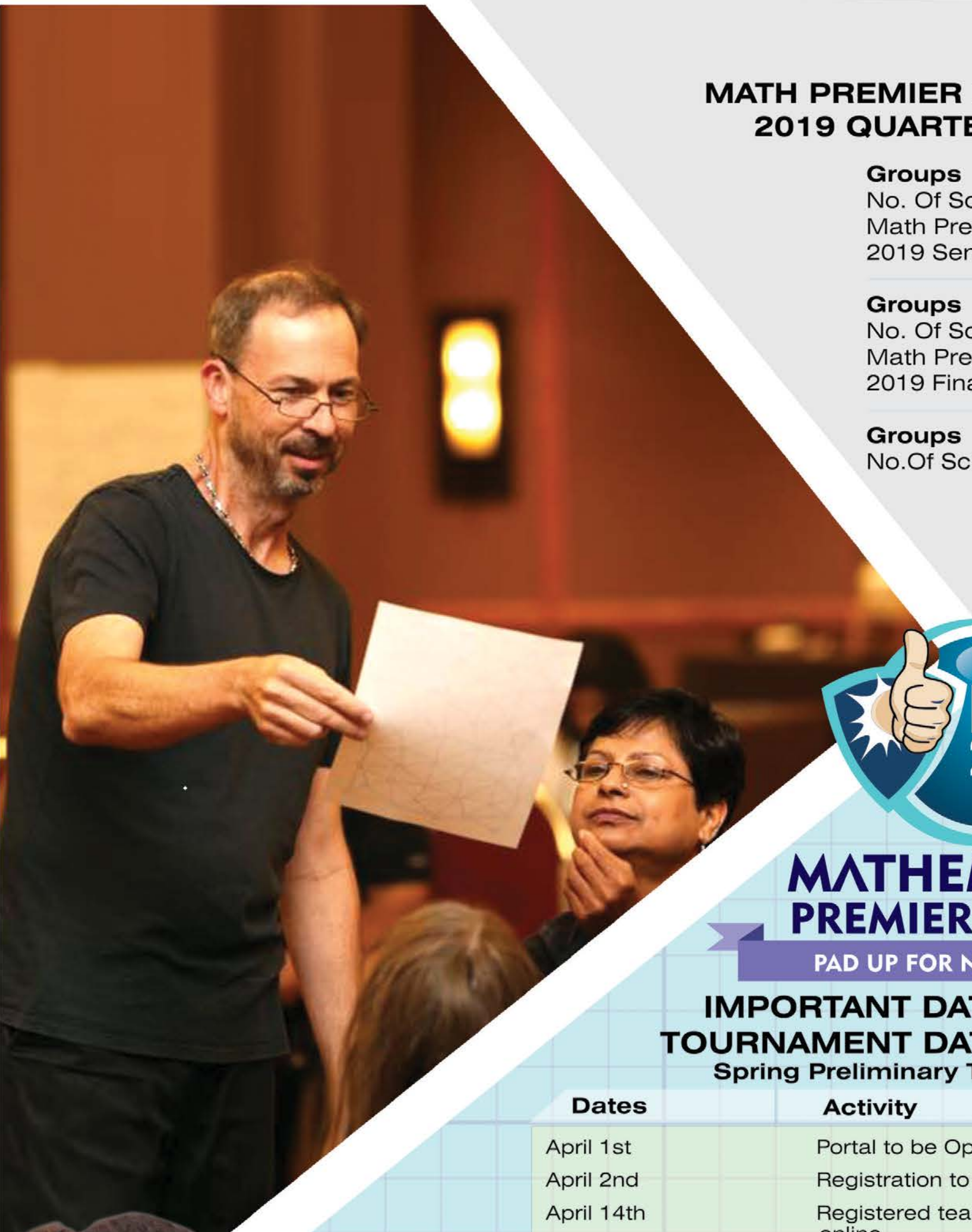


MATH PREMIER LEAGUE SPRING 2019 QUARTER FINAL ROUND

Groups	A	B	C	D
No. Of Schools	8	8	8	8

Math Premier League Spring 2019 Semi Final Round

Groups	A	B
No. Of Schools	4	4

Math Premier League Spring 2019 Final Round

Groups	A	B
No.Of Schools	1	1

MPL 2019

MATHEMATICS PREMIER LEAGUE

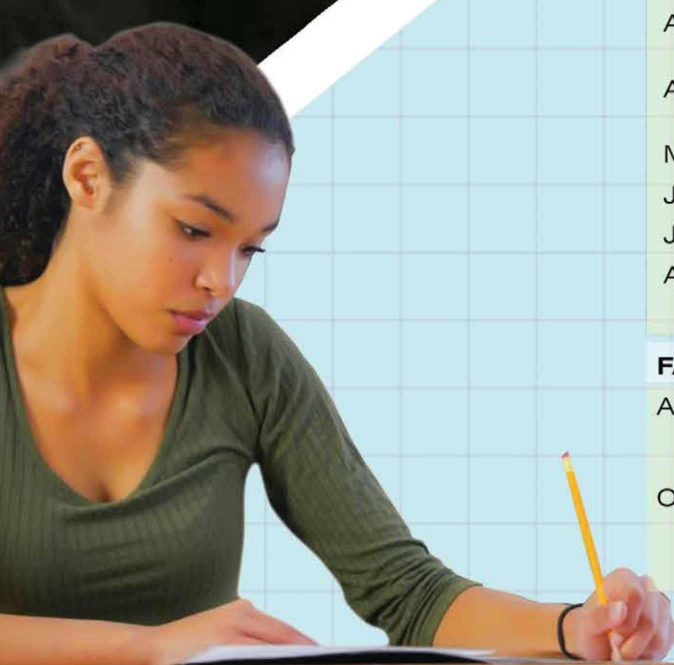
PAD UP FOR NETS APRIL 15

IMPORTANT DATES FOR THE TOURNAMENT DATES ACTIVITY

Spring Preliminary Tournament 2019

Dates	Activity
April 1st	Portal to be Open
April 2nd	Registration to Start
April 14th	Registered teams to start practicin online.
April 30th	32 or more Teams will be given Fixtures - in Four Groups
May 1st until 30th	Quarter Final Starts
June 1stth to June	30th Semi Final Match will Start
July 1st to July 31st	Preliminary round Finals
August 1st	Preliminary Spring Tournament results will be announced.

FALL MEGA TOURNAMENT 2019	
August 7th	Actual Fall Season Tournament Will Start until October
October 15th	Finalists and Semi Finalists will be announced and End of Tournament.



COMPETITIONS AND MATHEMATICS EDUCATION

PETAR S. KENDEROV

Petar S. Kenderov is a distinguished Bulgarian scholar with an outstanding contribution to the development of Mathematics, to the establishment of a system for early identification and development of young talents in Bulgaria in the field of Mathematics and Informatics, to the improvement of school education in Mathematics, and to the development of civil society in Bulgaria. Kenderov was born on April 5, 1943, in the town of Pazardzhik, Bulgaria. He graduated from secondary school in his hometown and, in 1960, became a student in mathematics at the Faculty of Physics and Mathematics, Sofia University, after passing a special exam aimed at selecting students (among the best performers in the national Mathematics Olympiad).

ABSTRACT

Mathematics competitions, together with the people and organizations engaged with them, form an immense and vibrant global network today. This network has many roles. Competitions help identify students with higher abilities in mathematics. They motivate these students to develop their talents and to seek professional realization in science. Competitions have positive impact on education and on educational institutions. Last but not least, a significant part of the classical mathematical heritage known as "Elementary Mathematics" is preserved, keptalive and developed through the network of competitions and competition-related activities. Nevertheless, competitions need to evolve in order to meet the demands of the new century. These and many other items are outlined and discussed in the paper.

INTRODUCTION

Competition is essential and intrinsic to life. Every day, living things in nature and economic subjects in society compete for resources, for better living conditions, and for higher efficiency. The desire to compete in overcoming a challenge is deeply rooted in human nature and has been employed for centuries to help people sharpen their skills and improve their performance in various activities.

Competitions, however hotly debated, praised, or condemned, remain central and inherent in education. Both the traditional marking (grading) of students in school and the more innovative measuring of their basic scholastic abilities (implemented by methods such as PISA, TIMSS, or SAT) inevitably create, directly or indirectly, competition among students, among teachers, among schools, and even among whole countries. Heated debates aside, few would deny the positive influence such competitions bring to the process of teaching and learning, and to the overall performance of the educational system.

The interaction between competition and education is more complex, however. It is not only that competitions enhance education. Education itself can be viewed as preparation of individuals (or groups of individuals, even whole nations) for future competitions. In what follows, we give a brief history of contemporary math competitions and present the state of the art in this area. Then we outline how competitions help identify, motivate, and develop higher-ability and talented students.

Next we focus on the impact of competitions on education, on educational institutions and on mathematics as a science. Finally, we pose challenges and identify venues for improvement.

BRIEF HISTORY OF MATHEMATICS COMPETITIONS

It is difficult to trace precisely the origins of mathematics competitions for school students; after all, in-class testing (which often resembles small-scale competitions) has accompanied the school system from its very beginning. In fact, the archetype of some competitions can be found outside school, in the society. Newspapers and recreational journals frequently offer prizes for solving crosswords, puzzles, and problems of a deeper mathematical nature. This practice is widely used today by many mathematical journals that publish problems and give awards to school students who provide good solutions.

V. Berinde [2] reports that a primary school math competition with 70 participants was held in Bucharest, Romania, as early as 1885. There were eleven prizes awarded to 2 girls and 9 boys. It cannot be excluded that other competitions were held elsewhere before or after that date too. Nevertheless, the 1894 Eötvös competition in Hungary is widely credited as the forerunner of contemporary mathematics (and physics) competitions for secondary school students. The competitors were given four hours to solve three problems individually (no interaction with other students or teachers was allowed). The problems in the Eötvös competition were specially designed to challenge and check creativity and mathematical thinking, not just acquired technical skills; the students were often asked to prove a statement.

As an illustration, here are the three problems given in the very first Eötvös competition in 1894 (the entire collection of problems and their solutions is maintained by John Scholes at www.kalva.demon.co.uk/eotvos.html):

P1. Show that {(m, n) : 17 divides 2m + 3n} = {(m, n) : 17 divides 9m + 5n}. P2. Given a circle C, and two points A, B inside it, construct a right-angled triangle PQR with vertices on C and hypotenuse QR such that A lies on the side PQ and B lies on the side PR. For which A, B is this not possible?

P3. A triangle has sides length a, a + d, a + 2d and area S. Find its sides and angles in terms of d and S. Give numerical answers for d = 1, S = 6.

The Eötvös competition model still dominates the competition scene. The year 1894 is notable also for the birth of the famous mathematics journal KöMaL (an acronym of the Hungarian name of the journal, which translates to High School Mathematics and Physics Journal). Founded by Dániel Arany, a high school teacher in Györ, Hungary, the journal was essential to the preparation of students and teachers for competitions (about one third of each issue was devoted to problems and problem solving and readers were asked to send solutions). As noted by G. Berzsenyi in the preface of [3], about 120–150 problems were published in KöMaL each year; about 2500–3000 solutions were received. The best solutions and the names of their authors were published in following issues. This type of year-round competition helped many young people discover and develop their mathematical abilities; many of them later became world-famous scientists. (For more information, see the journal web site, komal.elte.hu.)

> **The interaction between competition and education is more complex, however. It is not only that competitions enhance education. Education itself can be viewed as preparation of individuals (or groups of individuals, even whole nations) for future competitions. In what follows, we give a brief history of contemporary math competitions and present the state of the art in this area. Then we outline how competitions help identify, motivate, and develop higher-ability and talented students.**

About the same time, similar development occurred in Hungary's neighbor, Romania. The first issue of the monthly Gazeta Matematicˇa, an important journal for Romanian mathematics, was published in September 1895. The journal organized a competition for school students, which improved in format over the years and eventually gave birth to The National Mathematical Olympiad in Romania. For legal reasons, the journal was transformed to Society Gazeta Matematicˇa in August 1909. The following year, the Romanian Parliament approved the legal status of the new society and this is considered to be the birthday of the Romanian Mathematical Society [2].

What happened in Hungary and Romania in the late 1800's was not something isolated and special to these two countries only; most likely, it reflected a much broader trend. Indeed, international collaboration and solidarity were rising steadily and many national math societies were founded around the same time. The Olympic Games were revived in 1896. The First International Congress of Mathematicians took place in Zürich in 1897. Within several decades, other countries started to organize mathematics competitions. In 1934, a Mathematical Olympiad was organized in Leningrad, USSR (now St. Petersburg, Russia).

3. Mathematics competitions today Today the world of mathematics competitions encompasses millions of students, teachers, research mathematicians, educational authorities, and parents, who organize and take part in hundreds of competitions and competition-like events with national, regional, and international importance every year. Even greater is the number of books, journals, and other printed and electronic resources that help students and their mentors prepare

for the various types of competitions.

3.1. International Mathematical Olympiad (IMO). Of course, the most important and most prestigious math competition is the International Mathematical Olympiad (IMO) – an annual competition for high school students. Directly or indirectly, all other competition activities in mathematics and sciences are related to the IMO.The idea to organize an international mathematics competition crystallized during the Fourth Congress of Romanian Mathematicians in 1956. Paul Jainta [4] points out that "IMO, the pinnacle of competitions among individuals, was the brainchild of Romania's Tiberiu Roman, an educator of monumental vision." The first IMO took place in Romania (1959) with participants from seven countries: Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Poland, Romania, and the Soviet Union (USSR). The second IMO (1960) was organized by Romania as well, but since then

it is hosted by a different country every year (except 1980, when no IMO was held). Over the years, the participation grewdramatically: the 2005 IMO inMexico gathered 513 competitors from 93 countries!

Strict formalized rules govern every aspect of the IMO, such as participation, problem selection, assessment of solutions, and distribution of medals (for a description of the IMO, browse erdos.fciencias.unam.mx). Each country sends a team of up to eight (four in 1982; since 1983, six) high-school

students, chaperoned by a team leader and a deputy team leader. The competition itself is held on two consecutive days; each day, the students have four and a half hours to solve three problems. Each year, just before the competition, the six problems are selected by an international jury formed by the national team leaders and representatives of the host country. Even though confined to secondary school mathematics, the problems are rather difficult and solving them requires a significant degree of inventive ingenuity and creativity. Each problem is worth seven points, so the perfect score is 42 points. Formally, like the Olympic Games, the IMO is a competition for individuals; participants are ranked according to their score and (multiple) individual medals are awarded. Nevertheless, again as in the Olympic Games, the medals and points obtained by the participants from each country are totaled and the countries are unofficially ranked, providing grounds for comparison between countries.

The two days of heavy problem-solving are followed by a social program for all the participants. Students get to know each other, discuss alternative solutions to the competition problems, and make plans for their future, while the team leaders share their experiences and best practices in creating new problems and preparing their students for the competition. With its high standards, the IMO prompts the participating countries to constantly improve their educational systems and their methods for selecting and preparing the students. This yielded a great variety of competitions and mathematical enrichment activities around the world which resists any classification. There are "Inclusive" (open for all) competitions which are intended for students of average abilities, while "exclusive" (by invitation only) events target talented students (a prime example of the second type is the IMO and the national olympiad rounds beyond the first). There are "Multiple-choice" competitions where each problem is supplied with several answers, from which the competitor has to find (or guess, as no justification is required) the correct one. In contrast, "classical style" competitions (like the IMO) require the students to present arguments (proofs) in written form. In "correspondence" competitions, such as those organized by KöMaL and Gazeta Matematics , the students do not necessarily meet each other, while in "presence" competitions (which form the majority of math competitions) the participants are gathered together, which is believed to provide "equal rights" to all students. There are even mixed-style competitions, with a presence-style first stage and correspondence-style subsequent stages. (We will present some newer styles in more detail later.)

Another indication of the importance of the IMO is the fact that other sciences, such as physics, chemistry, and biology, soon followed suit and started international olympiads of their own. Bulgaria organized the first international olympiads in informatics/ computer science (1989) and in mathematical linguistics (2003).

4. Why are the competitions needed?

Here is a short and incomplete list of reasons on which we expand later on:

1. higher abilities and talent are identified, motivated and developed;

2. what happens before and after the competition is good for education;

3. talented students are steered to careers in science;

4. competitions raise the reputation of an educational institution.

4.1. Finding higher abilities and talent. The educational systems in most countries target mainly students of average mathematical abilities (who form the majority in schools). Additional care is often provided for lower-ability students, so that they could cover the educational standards. The standard curriculum and syllabus requirements pose no significant challenge however to students with higher abilities. They do not feel the need to work hard and, as a result, their mathematical abilities and talent remain undiscovered and undeveloped.

This is a pity, of course, since these higher-ability youngsters are a very important resource for the development of society, provided they are properly educated, motivated, and supported. Unlike other natural resources, such as mineral deposits, which remain preserved for the future generations, if undiscovered and unused, the talent of a young person is lost forever, if it is not identified, cultivated, and employed properly. Competitions and other enrichment activities are obvious remedies for this shortcoming, as they allow students to exhibit their abilities and talent. Moreover, competitions motivate the participants to work hard while preparing for them and, as a result, further develop their abilities and talent.

4.2. Before and after competitions. Some opponents to competitions complain that there is no apparent direct connection between the competitions and the mathematics as taught in the classroom. This, in our mind, is a rather narrow approach to the issue.

Classroom is only one of the many homes of the educational process. One should take into account the integral impact of competitions and competition-related activities on education. What frequently escapes public attention, which often focuses on a rather small group of happy winners, is the fact that the other, "non-winner" participants, also gain a lot. While preparing for the competition, and trying to solve the problems during the competition itself, all participants increase their knowledge significantly.

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Taking into account that in some competitions hundreds of thousands of students are taking part, the integral impact on the learning of mathematics becomes significant for the overall development of the contemporary society. From this point of view the contribution of the International Competition "European Kangaroo" with more than 3 millions of participants is difficult to overestimate.

We should not neglect also what happens in the corridors of the school (or outside the school) after the competition is over. The students are sharing their experiences (successes, failures, new ideas generated, etc.). This has a tremendous educational effect which however is not always given proper attention. The competitions and mathematics enrichment activities can be viewed as events that provide impetus for subsequent discussions among the students (as well as among their friends, parents, etc.). From the viewpoint of acquiring new mathematical knowledge (facts and techniques) these after competition discussions might be as important as the preparation for and the competition itself. Many of us owe a significant part of our knowledge to just such "corridor mathematics". From this point of view the social program after IMO gains additional importance. All this could (and should) have some practical implications for theways the competitions and other enrichment activities are planned and organized. One should deliberately incorporate possibilities (the more the better) for "after event" discussions, reflections and interactions. There is an unexhausted potential for introduction and sharing new practices in this area.

Finally, while preparing their students for competitions the teachers gain experience how to teach mathematical topics that are currently not in the curriculum. This may become important at later stages, if some of these topics become a part of theschool program.

4.3 Steering talented students to careers in science. The health and longevity of any social sector depends on how many talented young people are attracted to it. The role of math competitions in identifying talented young people and in attracting them to science should be obvious. Indeed, the fact that a significant number of successful participants in math competitions later become famous scientists was recognized rather early.

4.4. Raising the reputation of an educational institution. The academic reputation of a university depends primarily on the merit of the intellectual achievements of its academic staff. "The higher the reputation of the professors, the higher the reputation of the university" is the essence of this widely accepted belief. What is often overlooked, though, is that the level of the students also has a significant impact on the outcome of the educational process and, in the long run, on the reputation of the institution. While higher-ability students still have the chance of becoming good professionals if trained by ordinary professors, even outstanding professors can fail to produce high-level specialists from mediocre and unmotivated students.

Teachers know well that a few good students in class not only motivate the other students and make them work harder, but also place higher demands on the preparation of the teachers themselves. This two-way challenge influences positively the educational process and improves, directly or indirectly, the reputation of the entire educational institution.

It is no wonder that many universities try hard to attract good students. One of the bestways to achieve this is to organize competitions for secondary school students and to offer incentives, such as stipends or entrance exam waivers, to the winners. Such policies usually yield the expected results, as a special type of relationship develops between organizers and the winners during the preparation for the competition, the competition itself, and the post-competition period, which encourages the winners to consider seriously (sometimes as the first option) enrolling in the university where the competition (and/or the preparation for it) takes place.

In addition to the obvious advantages, enrolling competition winners has a delayed "value-added" effect to the reputation of a university. After graduation, math competition winners, as people with good problem-solving skills, are more likely to get rapid professional recognition, because they are likely to find solutions to difficult and complex real-life problems easier and faster than others. Once their success is noticed and registered by the working environment, the recognition of the problem-solvers' alma mater increases immediately and almost automatically.

As a success story, consider the University ofWaterloo, Canada, and the breathtaking rise of its reputation during the seventies and eighties of the last century. Alongside other plausible explanations, such as good management and excellent academic staff, its success can also be attributed to the fact that the University of Waterloo was the host of the Canadian Mathematics Competition [www.cemc.uwaterloo.ca], which attracted a good portion of the best young minds in Canada.

TheWilliam Lowell Putnam Competition, widely known as the "Putnam Exam" and administered by the Mathematical Association of America, is the flagship of annual competitions for university students in North America. While enrolled at the University of Waterloo, the former winners in school competitions performed consistently well in the Putnam Exam, securing a prominent presence of Waterloo in the top five teams in North America. This also was contributing to the reputation of the institution. It is no wonder that, within less than 20 years, the University of Waterloo became one of the leading centers for mathematics and computer sciences in the world. There is another success story related to the University ofWaterloo and the Canadian Mathematics Competition, which shows how a new implementation of an inspiring idea at a new place can yield fantastic results.

It is an appropriate place here to pay tribute to Peter O'Halloran, who had the vision for the future of mathematics competitions and knew the strategies how to achieve the goals. He understood the role of international collaboration in this field and was the major force behind the inception of WFNMC and its association with ICMI as an Affiliated Study Group.

The Australian mathematician Peter O'Halloran (1931–1994) spent a part of his 1972–73 sabbatical leave from the Canberra College of Advanced Education (now University of Canberra) at the University of Waterloo. There he gained, as Peter Taylor (Executive Director of the Australian Mathematics Trust) recalls ([6]), ... the idea of a broadly based mathematics competition for high school students.

On his return he often enthused to his colleagues about the potential value of such a competition in Australia. In 1976, while President of the Canberra Mathematical Association, he established a committee to run a mathematics competition in Canberra. This was so successful that the competition became national by 1978 as the Australian Mathematics Competition, sponsored by the Bank of New South-Wales (nowWestpac Banking Corporation).

It is now well known that this competition has grown to over 500,000 entries annually, and is probably the biggest mass-participation event in the country. The success of Peter O'Halloran was encouraging for others. André Deledicq started in 1991 the Kangaroo Competition in France (the name reveals the Australian influence). The Kangaroo Competition is now truly international (albeit with focus on Europe), enjoying more than 3 million participants each year.

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SUMMARY

Competitions have influenced positively mathematics education and its institutions in different ways for more than a century. Engaging millions of students and educators, math competitions have a distinguished way to identify, motivate, and develop young talent, steering it to careers in science. Mathematics competitions have matured and formed an immense and vibrant global network which contributes significantly to the preservation and the maintenance of mathematical heritage.

The flagship IMO not only serves as the "golden standard" for numerous other competitions in mathematics and the sciences (especially with its often-overlooked social program), but it also provides a constant stimulus for improvement of school systems around the world.

Traditional competitions are complemented by more inclusive and less known events that emulate more closely real research and engage even broader student audience. Nevertheless, stronger consolidation and collaboration of teachers, schools, universities, and educational authorities is needed in order to meet the challenges of the new century.

MATHEMETICS IN PERESPECTIVE OF MAHATMA GANDHI

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Mathematics in Perspective of Mahatma Gandhi

Mathematics is the abstract study of subjects. Its resolve the truth or falsity of conjectures. The research required to solve mathematical problems can take years or even centuries of sustained inquiry. Mathematical structures are good models of real phenomena, and then mathematical reasoning can provide insight or predictions about nature. Mahatma Gandhi knew it's important in life of human being. So he encouraged always to his sons for study of Mathematics. He encouraged his associates also. He wrote it's important in his letters. He spoke in number of meetings about its important. Mahatma Gandhi wrote, "I know that Manilal is weak in his arithmetic. Please give him adequate attention."1

Mathematics is the systematic study of the shape and motion of any physical objects. Practical mathematics has a record of human activities.

Mahatma Gandhi wrote, "Also, be regular with the exercises in Arithmetic."2 Mahatma Gandhi suggested, "The morning hours should be devoted to the most important activities. It will do if you make it a rule to do a large number of sums in arithmetic."3 Mahatma Gandhi told, "Boys will be taught their own language that is, Gujarati or Hindi and, if possible, Tamil, as also English, arithmetic, history, geography, botany and zoology."4

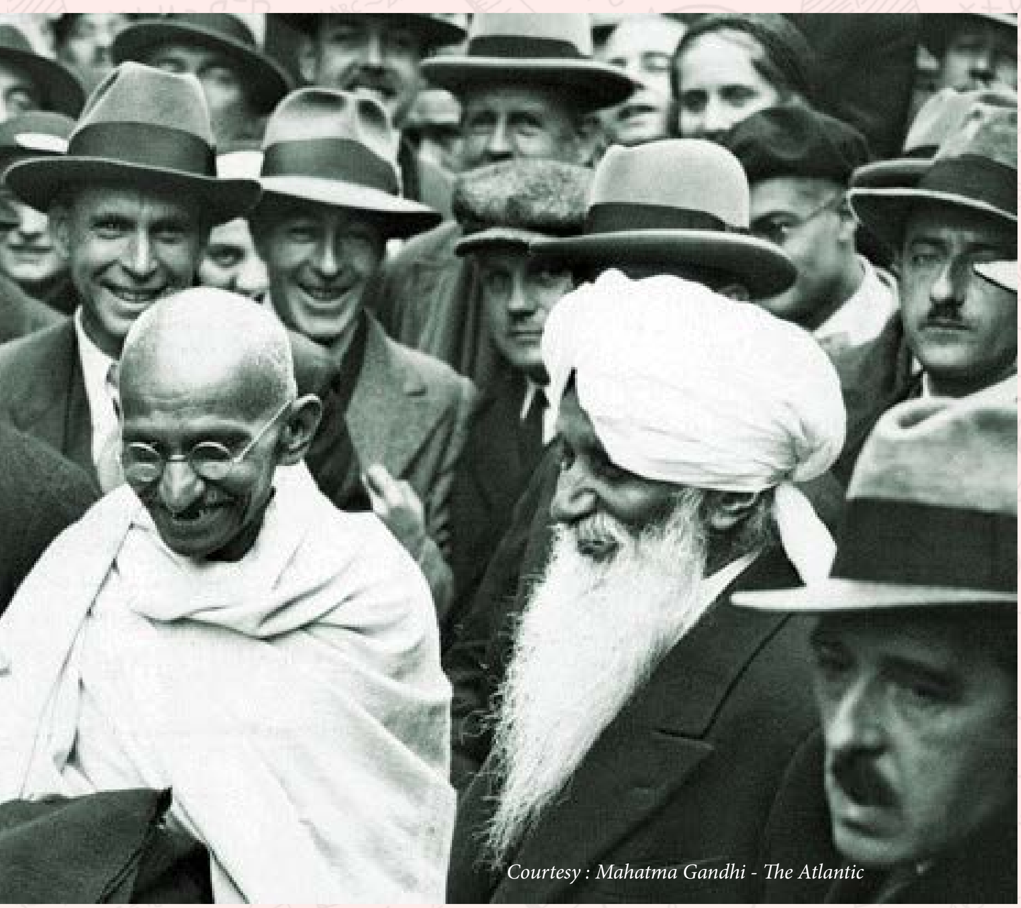
The famous Mathematician Galileo said that the universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Mahatma Gandhi said, "The ordinary meaning of education is a knowledge of letters. To teach boys reading, writing and arithmetic is called primary education."5 Mahatma Gandhi described, "Mental

training is given for three and a half hours at least, consisting of the vernaculars of the respective scholars, English, Arithmetic, and so much of history and geography as may arise from the lessons in English or in the vernacular."6 Mahatma Gandhi wrote, "Arithmetic will certainly include oral sums and Indian accountancy.'7

Mathematics is used throughout the world as an essential tool in many fields. The branch of mathematics concerned with application of mathematical knowledge to other fields inspires and makes use of new mathematical discoveries, which has led to the development of entirely new mathematical disciplines. There is no clear line separating pure and applied mathematics without having application in mind. Mahatma Gandhi told, "Our boys can solve intricate mathematical problems but are ignorant of simple arithmetic useful in business. They have very little knowledge of the indigenous tables."8 Mahatma Gandhi told, "If a boy attends the school with his nails grown and filled with dirt, the teacher can ask him, even during the period for arithmetic, why his nails are dirty and what he had been taught on this point."9

Mathematics is used throughout the world as an essential tool in many fields. The branch of mathematics concerned with application of mathematical knowledge to other fields inspires and makes use of new mathematical discoveries, which has led to the development of entirely new mathematical disciplines. There is no clear line separating pure and applied mathematics without having application in mind.

Indian mathematics emerged in the end of the 18th century. In the classical period of Indian mathematics (400 AD to 1200 AD), important contributions were made by scholars like Arybhatta, Bhaskar-II. The decimal number system is given to world by India. Indian mathematicians made early contributions to the study of the concept of zero as a number. Mahatma Gandhi wrote, "In teaching Arithmetic and other allied subjects, too, the traditional method hardly finds any place. It is almost completely abandoned. With the disappearance of the indigenous method of learning tables, we have lost the capacity for making speedy calculations which our elders possessed."10 Mahatma Gandhi wrote, "Mathematics will include Arithmetic, Algebra, Geometry and Trigonometry. In other words, the pupils will be brought up to the level of the present First Year of the College."11



Courtesy : Mahatma Gandhi - The Atlantic

Mahatma Gandhi told, "Everyone doing a sum in arithmetic has to start again from the point where he might have gone wrong. We also should do the same."12 Mahatma Gandhi said, "A good teacher can make even a dry subject like Arithmetic interesting.'13 Mahatma Gandhi told, "We may deduce by a simple rule of arithmetic that it must be equally possible for millions of Hindus and millions of Mussalmans if only they will it."14 Mahatma Gandhi wrote, "Those who have not made preliminary preparations are quite unfit to breathe the rarefied atmosphere in high altitudes, or those who have no preliminary training in simple mathematics are unfit to understand or assimilate higher geometry or algebra."15

Mahatma Gandhi wrote, "My time has been much occupied in preparing a re-arrangement of the text-books in both mathematics and physics for my pupils, such as will conform to their experience. All English text-books, and even the Indian ones, are apparently written for city-bred children and presuppose familiarity with machinery and manufactured apparatus of all kinds. These children here have never seen automobiles, steam engines, electric lights, pumps, water-pipes, or even bullock-carts. So the assumptions, pictures, technical terms and arrangement of the text-books of physics, and even of much of mathematics can have no reality and therefore no interest or educational value for them. Gradually, therefore, I am putting together what will be in effect a text-book on science and mathematics for Indian village children. Since most of the children of India are in the villages, I hope it will be useful."16 Mahatma suggested, "We do a sum in mathematics with the help of our reasoning faculty. It does not matter whether or not we have faith in mathematics. But, for spiritual knowledge, faith is essential."17

Mahatma Gandhi described, "In our institution, everything will be taught in a way opposite to that in a Government school. Our teacher will solve mathematical problems in a different way. Gregg is composing a novel science of mathematics for the Indian children whom he teaches. Our teacher should not teach with the help of the distance between Manchester and Liverpool. He should frame his examples from conditions here, so that our history and geography too maybe learnt from this. We have to reconstruct everything, mathematics, history, economics, geography. If you students do not help in this, what can the teachers do? And if the teachers themselves are immature it is obvious that the principles will crumble. My language need not be considered mathematical just because I use mathematical terms. But if it is as exact as mathematics, that is, if its successive steps in reasoning are logical and exact, it may be described as mathematical. If my language has that quality, it is because of my worship of truth."18

Ancient and medieval Indian mathematical works all composed in ancient languages. Which a set of rules or problems were stated with great economy in verse in order to aid memorization by a student. Mahatma Gandhi told, "The teacher must ask himself why the disc has that particular diameter, no more and no less. When he has solved these questions satisfactorily and has gone into the mathematics of the thing, your pupil becomes a good engineer."19 Mahatma Gandhi said, "With the help of mathematics he can explain the mechanism of the charkha in great detail."20

Mahatma Gandhi suggested, "I have never claimed to present the complete science of nonviolence. It does not lend itself to such treatment. So far as I know no single physical science does, not even the very precise science of mathematics. I am but a seeker, and I have fellow-seekers like the questioner whom I invite to accompany me in the very difficult but equally fascinating search."21 Mahatma Gandhi did a lot. But he had no sufficient time for it.

ncient and medieval Indian mathematical works all composed in ancient languages. Which a set of rules or problems were stated with great economy in verse in order to aid memorization by a student. Mahatma Gandhi told, "The teacher must ask himself why the disc has that particular diameter, no more and no less. When he has solved these questions satisfactorily and has gone into the mathematics of the thing, your pupil becomes a good engineer.

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THE FUTURE OF ARTIFICIAL INTELLIGENCE (AI)

ARUNDHATI

Arundhati is a senior at Kerala Technological University pursuing her Bachelor's in Computer Science and Engineering. As a student researcher, she works at the intersection of Data Science, Interactive Intelligence and Computer Vision. She has previously worked as a Research Assistant in Embedded Vision at Nanyang Technological University, Singapore. Arundhati is a recipient of various awards and scholarships from IEEE Computer Society, Computer Society of India, Qualcomm and Anita Borg Institute. She is passionate about developing solutions and policy frameworks to channelize the growth of emerging technologies.

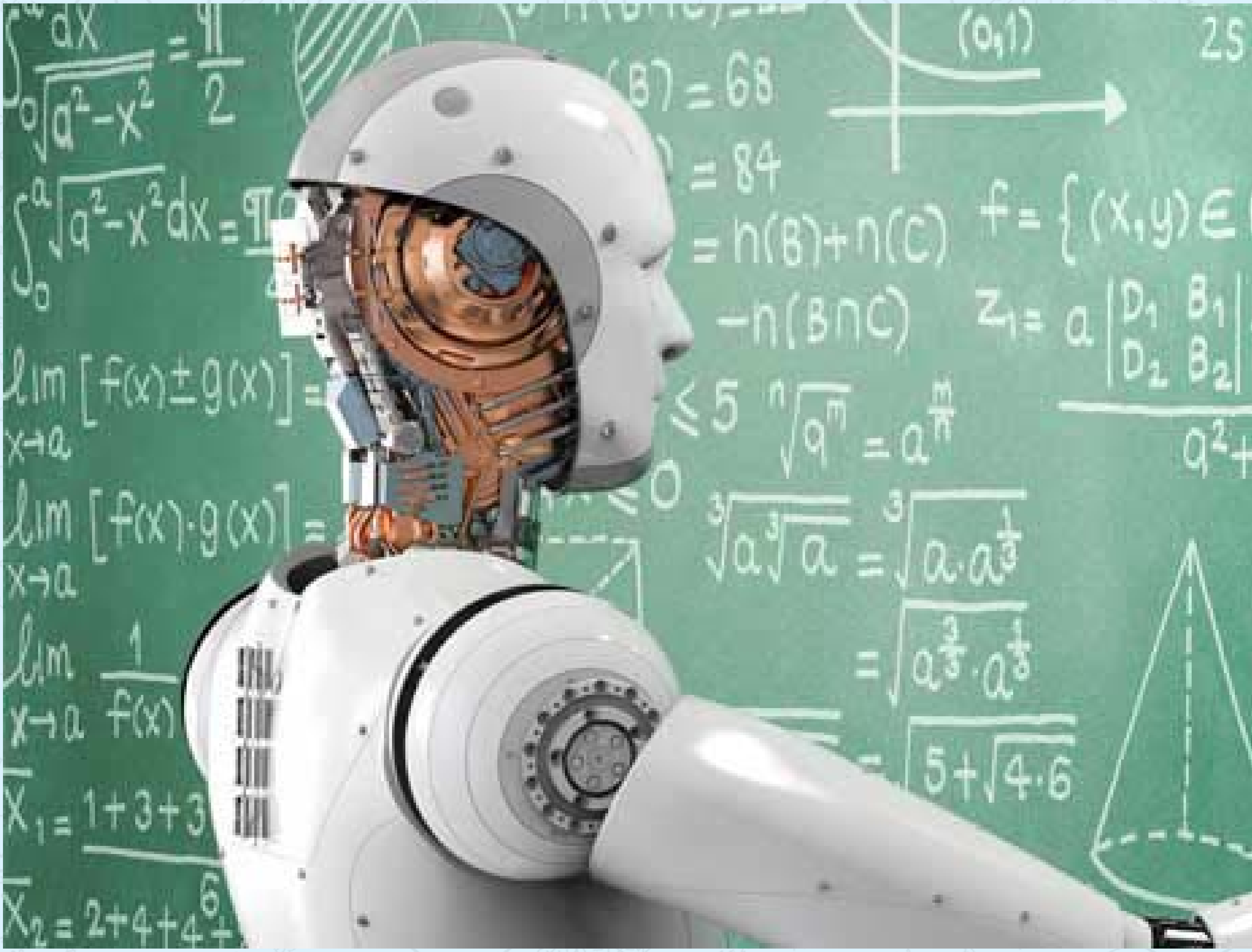
The rain is blowing through the sea/ A bird in the sky/ A night of light and calm/ Sunlight/ Now in the sky/ Cool heart/ The savage north wind/ When I found a new world.

This piece of poetry is from the first-ever poetry collection written by Artificial Intelligence.

We hear about how AI is changing the work of doctors and lawyers but now we see AI adorning the cap of poets and musicians. Apart from near perfect predictions and analysis, AI is creating art, music and poetry. It's challenging humans in games that require both cognition and creativity.

Artificial Intelligence (AI) is a field that has a long history but is still actively growing and changing. The world's first computer programmer, Lady Ada Lovelace,had mentioned the possibility of Artificial intelligence in her notes for Charles Babbage's Analytical Engine.

Lovelace's dismissal of artificial intelligenceis significant. She wrote that " The Analytical Engine has no pretensions whatever to originate anything. It can do whatever we know how to order it to perform. It can follow analysis; but it has no



power of anticipating any analytical relations or truths''.

Ada was a pioneer in Mathematics, Arts and Computers. In fact, her vision was so far ahead of time that it almost took a century of technology to catch up to her.

In 1950, a young Englishman in his seminal paper "Computing Machinery and Intelligence", proposed a test to examine a machine's ability to exhibit intelligent behavior equivalent to, or indistinguishable from, that of a human. It opens with the words: 'I propose to consider the question, Can machines think?'. Alan Turing, theinventor of this test went on to become the father of theoretical computer science and artificial intelligence. Only time will tell when Turing's vision will be achieved. But civilization will never be the same once it is.

The early sign that Turing's vision was getting realized happened on 11th May 1997 when IBM's Deep Blue became the first computer system to defeat a reigning world chess champion, Garry Kasparov, in a match under standard chess

tournament time controls. The next milestone in the history of AI happened on the sets of the popular quiz show, Jeopardy! when IBM's question-answering system, Watson, defeated the two greatest Jeopardy champions, Brad Rutter and Ken Jennings, by a significant margin.

Today, all of us carry intelligent personal assistants in our pockets which obediently responds to us with 'Hi ! How can I help you ?'. AI algorithms are increasingly used for predicting disasters and other natural calamities. It is assisting doctors and technicians to monitor health data. It is providing farmers with advanced agricultural inputs. Millions of kids around the world are benefiting from Intelligent teaching and learning tools.

The interplay of powerful technologies like AI, Blockchain, Virtual and Augmented Reality, Internet of Things, Big Data and 3D printers render human capacities limitless. As innate wanderers and explorers, humans could finally unravel the mysteries surrounding our inner and outer universes. The quest to achieve artificial general intelligence has just begun. Our extremely capable intelligent machines could still loose to a 6-year-old child in tasks such as comprehending aesthetics, handwritng recognition and object recognition .

AI research is growing by leaps and bounds. Fuzzy logic, Neural Networks, Swarm Intelligence, Expert Systems, Cognitive science and Machine Learning are integral components that aid this spectacular growth. Innumerous possibilities in the field of AI can expand human capabilities beyond our imagination. AI offers an extraordinary possibility to accelerate solutions for solving problems like poverty, hunger, climate-change and epidemics.

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Industry 4.0 is commonly referred to as the fourth industrial revolution. It is the name given to the current trend of automation and data exchange in manufacturing technologies. AI could probably eliminate a few redundant jobs, It could possibly bring new jobs with it. Reskilling our workforce in either scenarios would be an absolute necessity. Adaptability is the key to thrive in this new era. Let's be open and daring to learn new things.

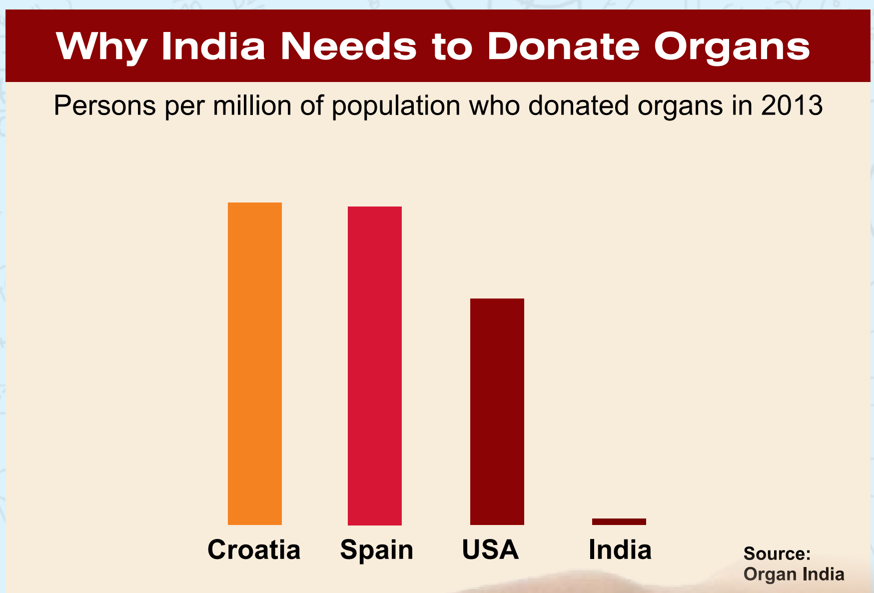
AI could either make all our dreams come true, or destroy society and the world as we know it. Let's not think of waging wars between humans and machines because we are increasingly becoming a tightly-coupled cognitive unit. We need to value each other first and foremost. We must learn to thrive on the beauty of this symbiotic relationship where humans could passionately create, express and imagine and our mechanical counterparts could relentlessly perform, act and execute.

ORGAN DONATION IN INDIA -

WHY I WANT TO TARGET YOUNG INDIA VIA SOCIAL MEDIA!

Introduction:-

Finding a donor is very tough in India, and is further complicated by bureaucratic red tapism, and also due to lack of awareness and apathy among my fellow Indians



NIRAVANNEY

10th Grade,
Oberoi International
School, Mumbai
India

WHO CAN BE A DONOR IN INDIA?

1. Cadaver as donor

Here organs used in transplants are donated from people who are brain dead, known as Cadaver Transplant, and an approval of donor's next of kin is mandatory.

2. Related Donor

Close relative as organ donor (especially for liver and kidney transplants) to a family member.

3. Non related donor

Here the transplant needs to be approved by a state level committee or by a hospital committee that includes government officials.

CHALLENGES IN INDIA

1. The Cadaver donors are typically on a life support system, and a person appears to be sleeping and warm to touch. This rather makes it difficult to convince family members (especially a large section of illiterate society) to donate organs of their relative who is brain dead.

2. Religious and Superstitious beliefs
Many families culturally refuse to donate an organ on a new moon day (Amavasya) as it is considered inauspicious. Waiting for the next day, the organ in question can become medically useless.

3. Incentivizing the donors is not allowed by Indian law.

4. Ethical issues in India
Many prospective organ donors in India might do it out of poverty, which in turn can put their lives at risk in a "not so medically fit" donor.

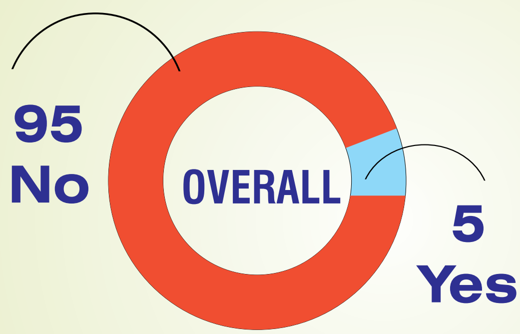
5. Difficulty in obtaining donors leads to desperation amongst patients and their families, which in turn can lead to illegal trading of organs. This unfortunately is alarmingly common in India.

6. In India, there are too few transplant surgeons and hospitals equipped for transplants. Also, ventilators for preserving the organs of a brain dead person and trained critical care personnel to manage such situations are prerequisites for a successful transplant program. Though the private sector is fairly well equipped, the government funded hospitals are not well geared.

7. Miscellaneous:-

- Apathy amongst the masses towards organ donation
- Shy/afraid to discuss organ donation
- Professional ignorance
- Fear of litigation
- Poor communication

Have you signed up for organ donation?



BARELY 5% FINALLY TOOK THE STEP TO REGISTER AS ORGAN DONORS

	Male	Female	18-30 yrs	31-45 yrs
No	94	95	96	94
Yes	6	5	4	6

Times Of India Survey: August 1st, 2016

Do you know which organs can be dontated

	Male	Female	18-30 yrs	31-45 yrs	Overall
Eye	89	94	93	90	91
Kidney	85	89	88	85	87
Heart	61	65	64	63	63
Liver	40	37	41	36	38
Lungs	18	19	18	19	19
Intestine	11	10	11	10	11
Pancreas	7	8	8	7	8
All	9	5	5	9	7

THER'S LESS AWARENESS THE HEART, LIVER, LUNGS ETC CAN ALSO BE DONATED. MOST KNOW ABOUT ONLY EYE & KIDNEY DONATIONS

Times Of India Survey: August 1st, 2016

How can the challenges of organ donation be addressed?

1. Due to a tremendous lack of awareness and myths related to organ donation, an aggressive awareness campaigning should be done. More than 65% of India's population is below 35 years of age and this population is hooked to social media. Hence, my objective is to target this population via social media for whom I have developed a Youtube channel (Click here to view my Youtube Channel)

2. Government should look at amending some laws like laying down specific criteria for payment to donors (fixed amount). For example, Singapore is a country where paying donors for their organs is legal and government facilitates these donors by long term follow up by setting up a national registry of all donors and also incentivise with some health insurance. However, this is a distant dream for India where only 1.3% of GDP is invested in health care and this won't be sufficient to allocate money for organ donation.

CURRENT SITUATION IN INDIA

- Annually, over 1,50,000 people die in India due to road traffic accidents.
- 67% brain stem death.
- Almost 100,000 potential organ donors per year.
- Unfortunately, only 0.08% donate their organs to the needy.
- Rate of organ donation is highest in Spain (35 per 100,000 population).
- In India, Tamil Nadu ranks first among all states while awareness is very poor in North and North-East India.

What awareness should be made on Social Media?

1. Over 1 million people in India suffer from end-stage organ disease and need donated organs to survive. Someday you or your own family member might need one. This can create empathy among my fellow Indians.

2. Each day, 250 precious lives are lost due to lack of donors.

3. One organ donor can typically save 8 lives. The same donor can also save and improve lives of upto 50 people by donating tissues and eyes.

4. If everyday, dead people donate their eyes in India, within 11 days, all blind will be able to see in this nation having an estimated 0.7 million blind people.

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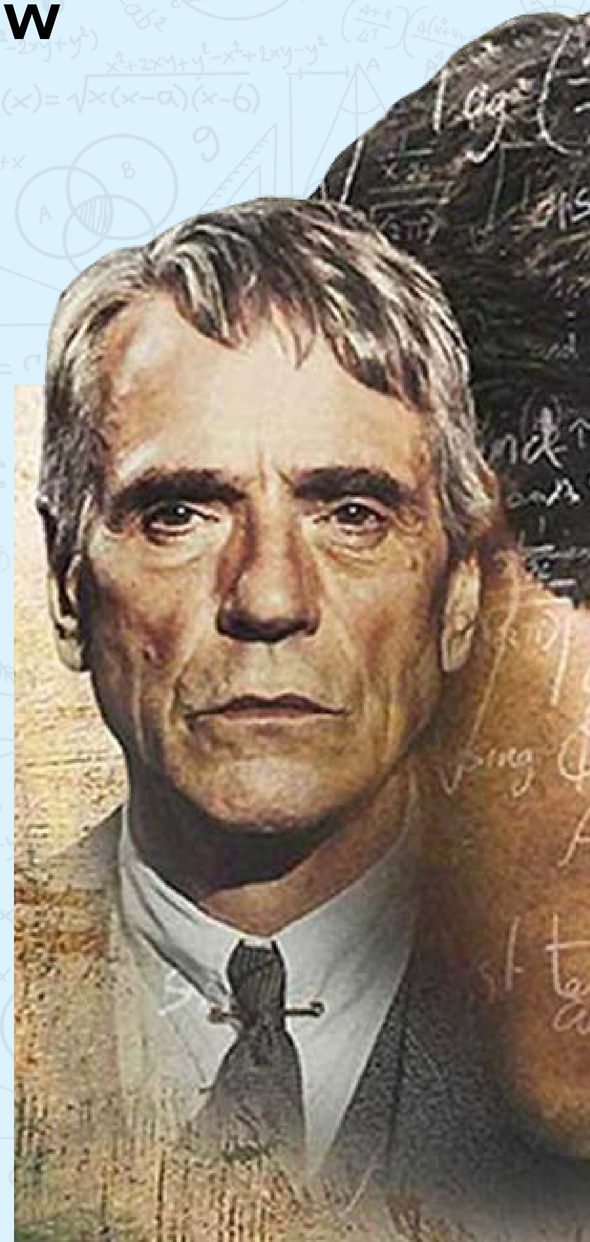
A MAN WHO KNEW INFINITY
MOVIE REVIEW

ARUNDHATI

Arundhati is a senior at Kerala Technological University pursuing her Bachelor's in Computer Science and Engineering. As a student researcher, she works at the intersection of Data Science, Interactive Intelligence and Computer Vision. She has previously worked as a Research Assistant in Embedded Vision at Nanyang Technological University, Singapore. Arundhati is a recipient of various awards and scholarships from IEEE Computer Society, Computer Society of India, Qualcomm and Anita Borg Institute. She is passionate about developing solutions and policy frameworks to channelize the growth of emerging technologies.

The year was 1897. In the small temple town of Kumbakonam,India, Komalatammal was teaching her son, Ramanujan, ancient scriptures . She taught him to sing religious songs, attend pujas and maintain particular eating habits as per Brahmin culture. At the age of 10, the boy had his first encounter with formal mathematics. By the age of 13, he was discovering complex theorems all by himself. After graduating from Town Higher Secondary School, he secured a scholarship to attend local college where he displayed exemplary performance in Mathematics but could not focus on other subjects, thereby losing his scholarship. He left college but continued pursuing independent research in Mathematics.

The young researcher was living in conditions of extreme poverty. Due to his growing acceptance within the mathematics circle of Madras, he was able to secure a small job as an accounting clerk with the Madras Port Trust which enabled him to support his mother and young wife, Janaki. At his office, Ramanujan would quickly complete his work and devote spare time to carefully record mathematical findings in his notebooks. The local mathematicians were captivated by his brilliance and urged Ramanujan to write letters to British mathematicians for professional advice.



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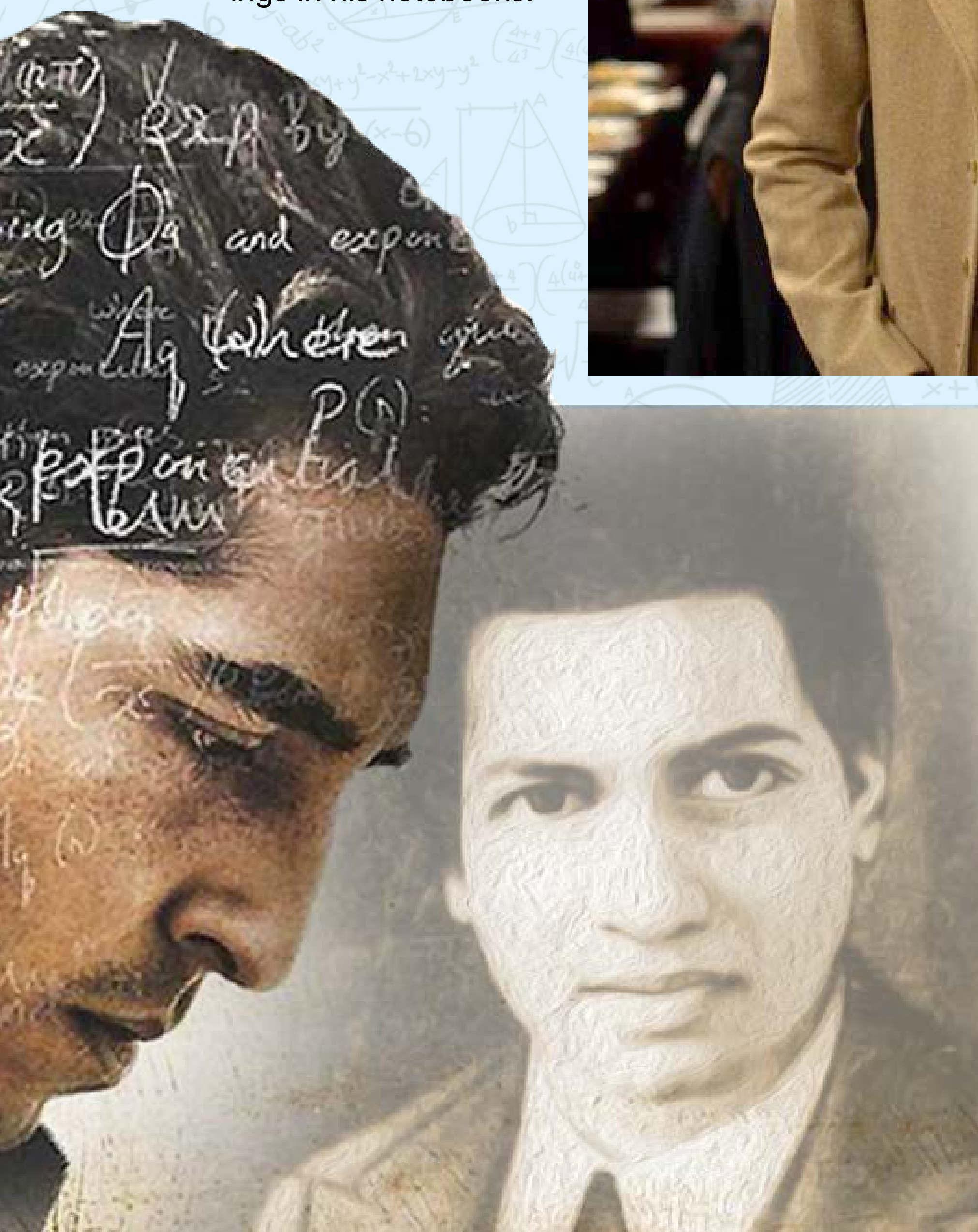


Some 4600 miles away, in Trinity College - Cambridge, England, British Mathematician, G.H. Hardy receives a letter. That letter was probably the starting point of one of the best scientific partnerships in the history of the world. Hardy was initially caught by surprise because how often would he receive a letter from someone as good as Euler or Jacobi . A look at the letter's enclosed papers convinced Hardy of Ramanujan's untutored brilliance. The mathematical landscape in England was dominated by Hardy and his colleague J.E. Littlewood.

Hardy and Littlewood tried to validate the assertions made by Ramanujan in his letter. After a few days, Hardy concluded : "The formulas defeated me completely. I had never seen anything in the least like this before. A single look at them is enough to show they could be written down by a mathematician of the highest class. They must be true because no one would have the imagination to invent them". Hardy was not the only mathematician to whom Ra-

manujan had sent his result. Other mathematicians turned him down due to his lack of formal mathematical education. Hardy was eager to nurture Ramanujan's talent. Hardy was not only a great mathematician but also a great teacher and a mentor. Hardy sent an encouraging response to the 23-year-old Ramanujan expressing his desire to see proofs for some of Ramanujan's assertions. Meanwhile, Hardy started making arrangements for Ramanujan to come to Cambridge.

Ramanujan was caught in an unforeseen dilemma. In those days, Brahmins were forbidden to cross the ocean and venture into foreign lands. But the young researcher's ambition to pursue mathematics overcame the tremendous pressure to conform to societal norms . In early 1914, he set sail for England and arrived in Cambridge. Hardy taught Ramanujan basic mathematical tools and tamed his creativity.

Hardy also supported Ramanujan's approach of fearlessly attacking complex mathematical problems. In 1916, Ramanujan earned his BA from Cambridge and went on to publish excellent papers. Ramanujan remained a strict vegetarian and would often write to his friend in Madras to send him Tamarind and Cocunut Oil. He prepared his own meals and would cook at odd times when he is not occupied with Mathematics.

amanujan and Hardy considered themselves to be explorers in the exotic landscape of mathematical patterns and harmony. They collaborated on several areas spanning across mathematical analysis, number theory, infinite series and continued fraction.

Ramanujan would tell Hardy that his theorems were revealed to him in sleep by Goddess Namagiri. Hardy said that they were "arrived at by a process of mingled argument, intuition, and induction, of which he was entirely unable to give any coherent account." Littlewood would go on to say that 'Every positive number is one of Ramanujan's personal friends'.

In 1917, Ramanujan fell ill. When he recovered sufficiently, he decided to return back to India. On his return in early 1919, Ramanujan was hailed for his terrific feats in mathematics. But his natural simplicity and modesty remained unaffected. Back in India, he was pre-occupied with illness and mathematics. He would often consider his body as though it were some mathematical object. Such was the intensity of his love for mathematics.

In a fateful last letter to Hardy, Ramanujan shared hints of some very interesting functions. Ramanujan's wife Janaki would remember his last days : "He was only skin and bones. He often complained of severe pain. In spite of it he was always busy doing his mathematics...Four days before he died, he was scribbling ". On April 26 1920, Ramanujan succumbed to illness. At the time of his death, he was aged just 32.

The movie 'The Man Who Knew Infinity ' captures brilliantly the journey of a young man from a small temple town in Madras to the upper echelons of mathematics. Srinivasa Ramanujan will forever be remembered as the man who knew infinity. His inspirational life and astounding work stand testimony to his passion, dedication and intellectual vitality. Only time will tell if a mathematician of Ramanujan's caliber would walk on this earth ever again.

OVERSEAS SCHOOL OF COLOMBO MAA/AMC-2019

I am Mrs. C.H.Ratnaweera, a Sri Lankan Mathematics teacher who works in Overseas School of Colombo for the past nine years.

The Overseas School of Colombo participated in the AMC for the second year in succession. We participated in all the categories AMC8, AMC10 & AMC12. It was a new experience for us in the previous year and we had difficulties in figuring out the nature of the competition. However, having had this experience, it went far more smoothly this year. The students who had participated last year demonstrated high enthusiasm with their involvement in this competition this year. We hope to continue with AMC along with more students participating. We feel that the nature of the questions in this competition offer good challenges to our mathematically able students.

Mrs. Chamila Ratnaweera

Teacher of Mathematics/teacher in charge of AMC
The Overseas School of Colombo

DPS FARIDABAD STUDENTS TOP AMERICAN MATH CONTEST PROBLEM SOLVERS IN ACTION

Thirteen year old Shashwat Kasliwal and twelve years old Satyankar Chandra of DPS Faridabad school were presented certificates from the Mathematical Association of America (MAA), USA for finishing in the top two exam takers in South Asia that appeared for the 2017 -18 American Math Contest (AMC 8). They were a part of 80 plus students who participated and 58 of them scored above international average. The AMC exam is a prize exam that is run by the MAA and this year had 102,051 participants from 1864 schools, worldwide.

Sasankar is an enthusiastic and focused child who is looking forward to joining an Ivy League school in the coming years for

Topers on AMC from DPS F with Principal Mr. Anil Kumar, MAA IPG head Chandra and teachers her undergraduate degree. "Everyone tells me I am being proactive" beams Jaism, "but in order to get into the school of my ambition, I believe of the need to walk that extra mile in this competitive world". Jasih is taking part of the CBSE program, . However, Jaish has already started working towards building her resume to apply to a prestigious university. "I am fortunate to be guided by a team of committed teachers of DPS F. Jyothi Ma'am, Ruchira ma'am, Ms Kaur etc" stated Sasank "One of them, Mr. Chandra, International Group Manager responsible for MAA operations South Asia, introduced me and other students enrolled to MAA/AMC and helped me prepare for that."

"Mr. Chandra encourages us to think beyond Statement of Purposes (SOPs) and university application essays, and even traditional schooling itself.", says Mr. Anil Kumar. He is the principal of DPS Faridabad, and a math teacher himself, he continues "These kind of international competitions make students understand math from a different perspective. MAA-AMC introduced them to the world of problem solving approach in math rather than the equation solving approach teaching method followed in India". AMC is one important completion top universities around the world encourages secondary students to take. For example Universities MIT, CALTEH, Stanford, CMU etc do have supplemental application form to fill in AMC score.

"The mission of the MAA's American Mathematics Competitions is to increase interest in mathematics and to develop problem solving through a fun competition" beamed Ruchira Sarkar, DPS F teacher and she leads and coordinates these efforts. Ms Kaur added "Teachers and schools benefit from the chance to challenge students with interesting mathematical questions that are aligned with curriculum standards at all levels of difficulty. In addition, students gain the opportunity to learn and achieve through competition with students in their school and around the world".

One can wonder aloud if the ultimate goal of this was just to get into a school in the 'west' Ruchira Sarkar reply came quickly and passionately: "The focus is on learning and growth and on becoming globally connected citizens, and of course these factors would look good on a US university candidates profile". " Our school committed resources, we had 2 students from 5th and 2 form 6th scored high in this contest almost double that of international average. Our school is on the merit roll of MAA, and once all contests are over we expect our ranking, internationally, be around 300th best performing school in the world. We are proud. Our goal is to jump 200 points in next year to become one of the top 100 schools around the world."

I asked how well MAA and their local partners manage to guide their students from North America, and I found that both the youngsters were unanimous in their praise, Santhosh Kumar the PMO who head and work closely with MAA here in Delhi "One counselor or coach from MAA team visits us every 45 to 60 days and we are constantly in touch with them on the phone, weekly for sure if not more. Together we developed a plan for next several months and we review the implementation of the plan in our sessions. It is a good feeling to know that a team of professionals are always available and happy to guide us!"

A note on MAA and its international program, A note on AMC

You can check them out online at www.transitionslab.com, Email: amc@tlups.com

MATHEMATICAL ASSOCIATION OF AMERICA

100 CELEBRATING A CENTURY OF ADVANCING MATHEMATICS

MAA – IPG

Boston, MA, USA

Programs in South Asia, South East & Middle East Asia

The Program

Figure 1 MAA office 1921 & now

MAA - The Mathematical Association of America is the world's largest community of mathematicians, students, and enthusiasts. We further the understanding of our world through mathematics because mathematics drives society and shapes our lives. The mission of the MAA is to advance the understanding of mathematics and its impact on our world. Our members include university, college, and high school teachers; graduate and undergraduate students; pure and applied mathematicians; computer scientists; statisticians; STEM professionals, and many others in academia, government, business, and industry. We welcome all who are interested in the mathematical sciences. Our board is chaired by Deanna B Haunsperger. Our South Asia programs are led by Prof Chandra who manages MAA – IPG based out of Boston. Beyond advocacy at international, federal and local level for STEM/MATH MAA brings out premier publications like: The American Mathematical Monthly, The College Mathematics Journal, Mathematics Magazine, organizes several academic events like Math Fest, joint math meetings, regional meetings.

The Contest

66	6,000	350,000	6
Years	Schools	Participants	IMO Gold Medals

Figure 2 Top AMC performers in a school with our Director & Principal

The MAA's American Mathematics Competitions (MAA AMC) program leads the world in strengthening the mathematical capabilities of the next generation of problem-solvers. Through classroom resources and friendly competition, the MAA AMC program helps educators identify talent and foster a love of mathematics. The MAA AMC program positively impacts the analytical skills needed for future careers in an innovative society.

The American Mathematics Competitions are a series of examinations and curriculum materials that build problem-solving skills and mathematical knowledge in middle and high school students.

- American Mathematics Competition 8 (AMC 8): AMC's middle school level competition
- American Mathematics Competition 10/12 (AMC 10/12): AMC's high school level competition
- American Invitational Mathematics Examination (AIME): AMC's invitational competition for high scoring AMC 10/12 participants
- United States of America Mathematical Olympiad (USAMO) and United States of America Junior Mathematical Olympiad (USAJMO): AMC's top invitational competition for high scoring AIME participants
- The Putnam Competition: An annual mathematics competition for undergraduate college students

The Scholarships and Awards given by MAA -IPG

- **Awards**
  - Certificates and awards recognizing participants, guiding teachers and principals
  - Top 1% of AMC 10 and 2.5 % of AMC 12 receive invitation for AIME
  - All participants receive digital copies of journal

- **Educators scholarships**
  - For Professional development scholarships worth 2350 $ available for guiding teachers. Special application required.
  - For research, trainings – separate proposal required
  - Registration fees are mostly get waived for educators associated with our programs with most math conference

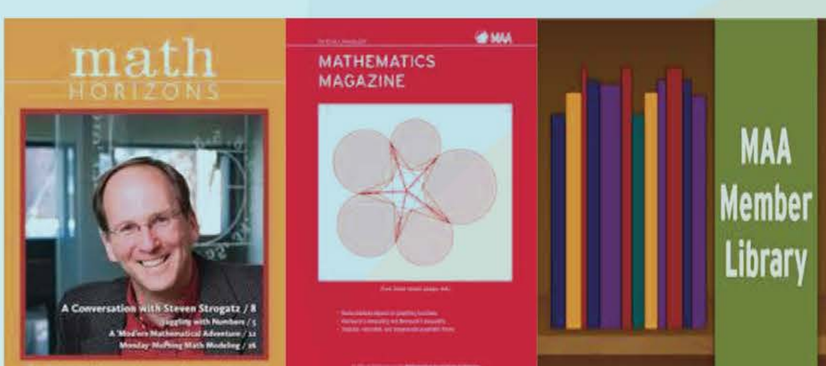
- **Student scholarships**
  - Up to 1550 $ available for eligible students to participate in our programs in USA
  - 25 $ for applying for math club recognition for Ch Mu Alpha math club and an additional 250 $ for club program per active math club/participating school
  - For other programs (American Red Cross First Aid and CPR training, U Waterloo programs etc) AMC contestants receive scholarships. For Red Cross programs participants only pay 18 $/certification training in place of the normal fees of 129 $.

- **Educators travel grants**
  - Up to 5000 $ available for educators to travel to attend our programs in Iowa and New York
  - Limited funds are available for educators who are travelling to attend conferences

- **Funds for special projects**
  - Up to 1000 $ available for expanding library, working on translations
  - We receive and approve several custom projects

- **Conference registrations** are mostly waived for top performers and additional 500 $ is available for travel to Math Fest Conf. Opportunity to get published, speaking opportunities at international levels

THE AMERICAN MATHEMATICAL MONTHLY MAA



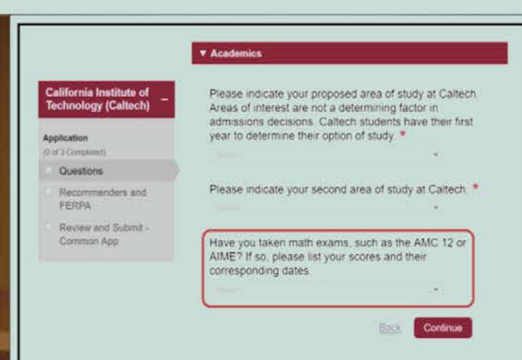


Figure 4 College application question on AMC - CALTECH

This note is prepared by Maria Sabi, Executive Assistant to MAA – IPG Director, Boston, MA, USA

#6 Top City for Living the **American Dream**
-Smartasset.com

Top 50 Overall **Best Run Cities in America**
-Wallethub.com

Best Run City in Iowa
-Wallethub.com

14th **Best City Services**
-Wallethub.com

#1 Best Place in America to Raise a Child
-Smartasset.com

5th Best City in America for **Young Adults to Get Rich**
-Moneyunder30.com

All-America City
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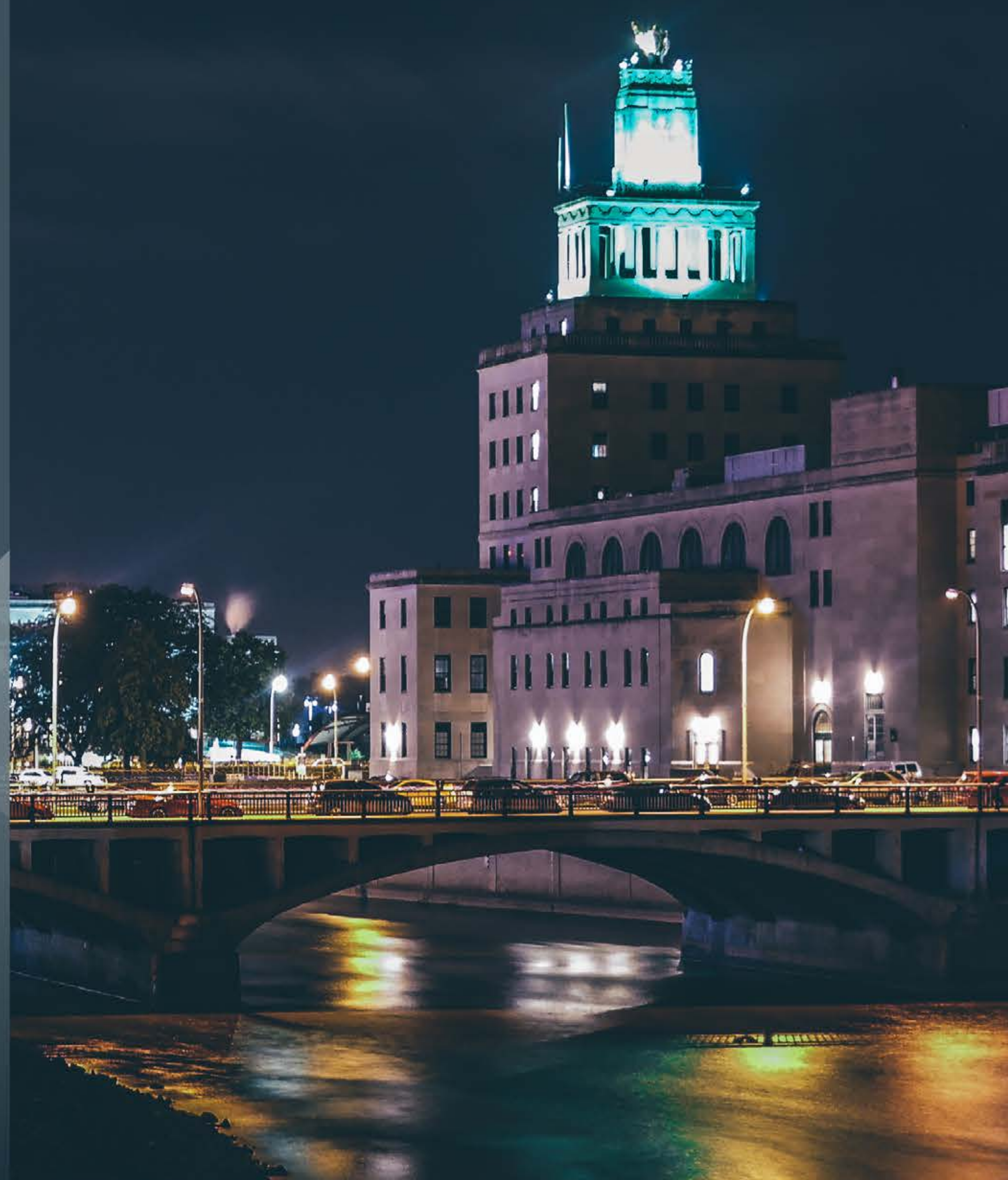
CEDAR RAPIDS
City of Five Seasons®

CEDAR RAPIDS

"Cedar Rapids is proud to support student enrichment programs. We welcome all to experience the culture, arts, fun and diversity in the City of Cedar Rapids."

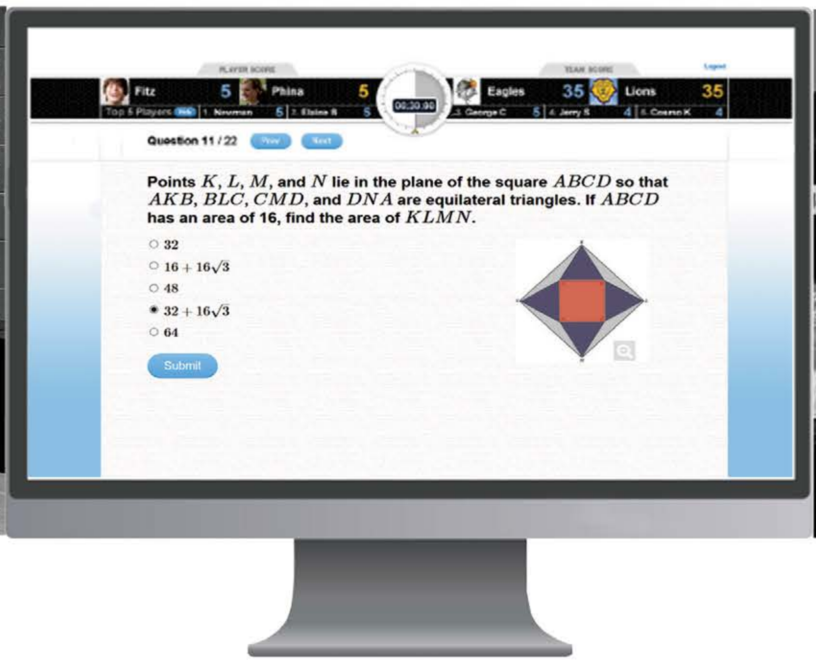
– Cedar Rapids Mayor Ron Corbett



AreteLabs

Live Online Academic Competition

·Exploring Online Math Competition·
AreteLabs and its mission to bring the most popular features of athletic sports into the classroom



PRODUCTS

Math Madness - *Signature event*

Fixed structure featuring 4 weeks of scrimmaging including two collaboration rounds and two qualifying rounds followed by a single elimination bracket tournament. One 30-minute match per week, 7-10 AMC-style questions per match. Ideal for math classes or clubs seeking modernized problem-solving activity.

Premier Math Series - *Customizable event*

From simple scrimmaging to full tournament and championships, the length, question content, timing, scoring and other variables of the event all tailorable to satisfy specific scheduling and pedagogical preferences. Ideal for school districts or networks intent on leveraging competition systematically and affordably.

BENEFITS

Team-based approach: any number of students play independently or collaboratively but always together as a team and all without having to leave the classroom!

Flexibility of play: each team can play its match any day/time of the week and can change that time during each round and from round to round.

Superior content: expertly developed and curated by a team of remarkable U.S. educators including the former head of AMC.

Actionable data: all player statistics and solutions post immediately after a match creating a unique teaching and learning opportunity.

Thrilling competition: a student earns a point for each question answered correctly while the patented online scoreboard displays both individual and team score in real time!

Tim Kelley
CEO, *Founder*

EDUCATIONnext

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