Aryabhatta was one of the greatest astronomers and mathematicians in ancient India. His work had a tremendous impact on astronomy. Aryabhatta was a teacher, researcher and genius. His accomplishments are too many to even list a fraction of them in this article. In order to do so, one would need a book an inch thick! Aryabhatta founded a school and taught many other brilliant people, like Brahmagupta.

Aryabhatta was born in 476 AD in India. The place of his birth is disputed, the most common assertion is however that he was born in Kerala. We know his date of birth since he tells us that he was twenty-three years old when he wrote his book, *Aryabhatiya* which he finished in the year 499 AD. Aryabhatta studied in the Nalanda University, which is near the modern city of New Delhi in India.

Aryabhatta later became the head of the university. Aryabhatta lived during the Gupta Period, which is known as the golden age of Ancient India. Aryabhatta made many achievements in astronomy and mathematics.

One of these was his knowledge that the Earth rotated around the sun. This predated Copernicus by close to one thousand years. He also computed the orbits of the planets and showed that they were ellipses.

Another accomplishment was that he knew that the planets shine due to reflected sunlight. Later commentators did not believe this and changed the text to save him from silly mistakes! Aryabhatta also knew that the Earth was round and gave the excellent approximation of sixty two thousand eight hundred thirty two miles as the circumference of Earth.

Aryabhatta saw that the orbit of the moon was an ellipse and knew how long it would take for the planets to be aligned. He also knew that eclipses happened because the Earth cast a shadow on the moon and knew that days and nights were caused by the Earth rotating on its axis. He knew how to determine a
Aryabhata’s contributions to society include his work on Astronomy and his founding of a great school of Astronomy and Mathematics in Ancient India. His book, the *Aryabhatiya*, which encompasses most of his knowledge was translated into Latin in the thirteenth century and helped shape the development of western astronomy in the renaissance.

In Mathematics, Aryabhata’s is most significant accomplishment is the closest approximation for pi - his approximation was 3.1416 - and he was the first one to pronounce that it is an approximation. In his works, he preferred to use square root of 10 for pi, although he had a much closer decimal approximation! In his book, there are formulas and algorithms for finding square roots, cube roots and areas of polygons.  

Aryabhata is also famous for his sine tables.  

Something unique about Aryabhata is that even without a telescope, he performed almost perfect calculations.  

I find it inspiring that so much science can be discovered with no instruments and just abstract thinking.  

Aryabhata made numerous contributions to mathematics and did many great things for society. I hope you agree with me that Aryabhata was one of the most ingenious astronomers to ever walk the Earth.

---

### Pi Facts

- If the first billion decimal places of pi were typed in ordinary type, the line would stretch from New York to Kansas.
- Using computers, pi has been calculated to over six billion places of decimals.
- National Pi Day is March 14 (3.14). It is also Albert Einstein’s birthday.
- Truly, for many of us, pi = 3.141592653589793238462643383  
  2795028841976939937510582097  
  4944592307816406286289986280  
  348253421170679... is plenty good!
Bal Sabha Kudos 2003-2004

NCTE Writing Competition
This year, Anita Sadhu and Indu Chandrasekhar were two of five among the five students chosen to represent Hickman in the national NCTE competition.

National Language Exams
Vidya placed first in the State in Level I for Spanish. Arthi placed third in the State in Level IV for Spanish. Indu and Rajni both placed 11th in the State in Level V for French.

Music Competitions
Ajay was in a choir ensemble that achieved a superior rating at the MSHAA district competition, qualified for state, and achieved a superior rating at state. Meghna is one of six students who was selected from Hickman High for the 2004 MCDA Missouri Youth Honor Summer Choir, an All-State Youth Honor Choir.

Rajni and Indu both participated in the District and State Music Festivals for high school students with violin solos and a string quartet. Both received “Superior” ratings at Districts and “Excellent” ratings at State.

Sargam
The Sargam classical music and dance event was held in Whitmore Hall on March 14, 2004. Bal Sabha members who performed included Sumidha and Rijutha (Bharata Natyam), Ashok (piano), Sahana (Carnatic vocal) Meghna (Carnatic vocal and Bharata Natyam), and Indu and Rajni (violin and Bharata Natyam).

Mock Trial
Arthi, Indu, and Rajni were part of Hickman High School’s seven-member Mock Trial competition team that took first place in the Central Region Mock Trial (State qualifier).

Girls State
Arthi was one of four students selected from Hickman to participate in the Girls State Program, a one-week summer Government Leadership Academy sponsored by the American Legion. The simulation of local, county and state governments, including judicial, legislative and executive branch operations brings together girls from all parts of Missouri for leadership training.

National History Day
Meghna, along with two other group members, made an exhibit in the Senior Division of the competition. The title of their project was "Harlem Jazz: The Encounter and Exchange of People and Music." In the regional competition, Meghna’s group placed first, advancing to State. At the State level, their group got 1st place again. They will be going to Maryland in June for the National Competition. Out of the 2,000 students in Missouri who competed in regional competitions around the state, Meghna is one of 48 delegates going to the national competition.
If you are an aspiring lawyer, Mock Trial is for you. Even if you do not want to go into law, Mock Trial is a great experience for those that want to improve their arguing, acting, or public speaking skills. You can begin competing in Mock Trial in junior high.

Teams must have both lawyers and witnesses to participate. Each year, the St. Louis Bar Association publishes a "mock" case for Missouri teams to prepare. The case consists of various depositions from witnesses, pieces of evidence, and various court statements and regulations. Each team needs at least three lawyers and three witnesses to prepare both the defense and plaintiff sides of the case. The lawyers must prepare opening and closing statements, as well as direct and cross examinations of all of the witnesses. The witnesses must memorize their statements and take on the role of their character.

Most mock trial competitions take place in a real courtroom, and each team plays the role of both the defense and plaintiff sides of the case. The lawyers must prepare opening and closing statements, as well as direct and cross examinations of all of the witnesses. The witnesses must memorize their statements and take on the role of their character.

Most mock trial competitions take place in a real courtroom, and each team plays the role of both the defense and the plaintiff on different days. In the high school division, the best teams in the region go on to compete at the state level. The top state level team goes on to the national competition.

Overall, mock trial is a genuinely fun and challenging experience. If you are seriously interested in competing well, there are many law professors at the University who are willing to help you. With the right connections and a strong, supportive team, you will go far.
Mathcounts and MCTM are two very good math competitions open to students in Missouri. Mathcounts is for students in grades six to eight. MCTM is for students in grades four to eight. Both have regional and state levels, although Mathcounts also goes on to national.

Mathcounts has two rounds, the sprint and target. The sprint round gives you forty minutes to complete thirty problems without the use of a calculator. Target round questions are given in sets of two, with six minutes to complete each set, and calculators are allowed. There are four total sets in the target round.

Mathcounts questions are in general a little more difficult that MCTM. In Mathcounts, in order to advance to state from regional, the scores from Columbia and Kirksville are combined, and the top ten out of that list go. At state, the top four people advance to the nationals. There is also a team round in Mathcounts. This round gives a team of four people a limited amount of time to do ten questions, with the use of a calculator. The top three teams from Kirksville and Columbia combined go to state. The top four individual finishers at state make the national team. The coach from the top team in state is the national team’s coach. There is also one other round in Mathcounts; the countdown round. Only the top ten individuals compete in this round. Two people go head to head in a race to finish a problem. Three problems are given, one at a time. The person who gets two out of three right wins. If there is a tie (meaning that at least one question was missed by both people), problems are given until someone gets one right. The person who wins stays and goes against the next person. In Mathcounts, there is no differentiation between grades and all students compete on equal footing regardless of the grade.

MCTM stands for Missouri Council of Teachers of Mathematics. The contestants take a test, which is scored and the placing is determined by the scores. The contest for grades four to six has two divisions: Concepts and Problem Solving. The Concepts test requires contestants to utilize mathematical theory, while problem solving is based on executing correct calculations. Placing is given for each individual division. The top three in each division in regional level are advanced to the state, where they compete in only those divisions that they qualified in. For seventh and eighth grades, the contestants are split into two groups; the group that has not had algebra and the group that has. Each group is given a different test, and placing is found for each group, with the top three in regional going on to state. In seventh and eighth grade there is also a team test. In this contest, there is no differentiation between seventh grade, eighth grade, algebra or non-algebra. Teams have up to four people.

Questions are given one at a time, and each question has its own time limit. The team with the most correct answers wins. Only the first place team in the region goes to state. For the last 4 years, the state finals were in Columbia, Missouri which is very convenient for our parents.

To prepare for these contests a very good thing to do is to work the sample tests that may be found on the internet. In MCTM it is a good idea to do the tests from your grade and even some of the ones for higher grades. Make sure you are comfortable with whatever calculator you are going to use. It is important that you understand how to do the problems. While these steps may not guarantee victory in the contest, the knowledge gained from them will stay with you.


On the national level one other round in Mathcounts; the countdown round. The top four individuals compete in this round. Two people go head to head in a race to finish a problem. Three problems are given, one at a time. The person who gets two out of three right wins. If there is a tie (meaning that at least one question was missed by both people), problems are given until someone gets one right. The person who wins stays and goes against the next person. In Mathcounts, there is no differentiation between grades and all students compete on equal footing regardless of the grade.

MCTM stands for Missouri Council of Teachers of Mathematics. The contestants take a test, which is scored and the placing is determined by the scores. The contest for grade four to six has two divisions: Concepts and Problem Solving. The Concepts test requires contestants to utilize mathematical theory, while problem solving is based on executing correct calculations. Placing is given for each individual division. The top three in each division in regional level are advanced to the state, where they compete in only those divisions that they qualified in. For seventh and eighth grades, the contestants are split into two groups; the group that has not had algebra and the group that has. Each group is given a different test, and placing is found for each group, with the top three in regional going on to state. In seventh and eighth grade there is also a team test. In this contest, there is no differentiation between seventh grade, eighth grade, algebra or non-algebra. Teams have up to four people.

Questions are given one at a time, and each question has its own time limit. The team with the most correct answers wins. Only the first place team in the region goes to state. For the last 4 years, the state finals were in Columbia, Missouri which is very convenient for our parents.

To prepare for these contests a very good thing to do is to work the sample tests that may be found on the internet. In MCTM it is a good idea to do the tests from your grade and even some of the ones for higher grades. Make sure you are comfortable with whatever calculator you are going to use. It is important that you understand how to do the problems. While these steps may not guarantee victory in the contest, the knowledge gained from them will stay with you.

Bal Puja literally means "Youth Prayer". Youth and parents in the Columbia area have been regularly meeting bimonthly at Panda Pals (graciously provided by Dr. and Mrs. Shukla) to educate/inform Hindu youth in the community of their cultural and religious heritage. Bal Puja was founded in September 1998. The first meeting focused on Ganesh Chaturthi with Dr. Nagar leading the prayers; interestingly, it is auspicious to initiate all activities with a prayer to Lord Ganesh.

At each meeting we have different kids perform puja and bhajans, produce short presentations and enactments about festivals, epics, and gods of Hinduism. These are followed by stories from Hindu epics by adults. Drs. Hema Srinivasan and H.R. Chandrasekhar have been regularly regaling the group with their stories and insightful morals since the inception of Bal Puja. Dr. Chandrasekhar has published a book entitled *Tales from Indian Epics*, which contains several of his Bal Puja stories. Dr. Inder Khurana also had children perform episodes from the Ramayana, a Hindu holy book, since September 1998. The enactment of the book was completed via about 30 episodes over a five-year period. These short skits were performed by the children themselves, and they learned and enjoyed the epic by direct participation. The finale of the Ramayana was celebrated in a grand manner at Dr. Shukla's residence. Dr. Khurana now conducts skits from the Krishna Leela. We now hold Bal Puja meetings in the Rock Quarry House off of Grindstone Parkway. The entire community participates and contributes in many ways to Bal Puja including providing delicious food. Summaries of all meetings have been documented and distributed to the groups by Drs. Nair and Khurana. Families interested in joining the group can email me at aj_ay_nair@hotmail.com.

Science Olympiad is a team-based science competition. Each school building has its own team. In Columbia, each team is allowed to have 15 members. Columbia schools compete at two different levels: Division B for Middle and Junior High Schools, and Division C for the High Schools. In some schools there is a shortage of students who want to be on the team. In other schools, such as Hickman, a pre-screening is held to choose school members.

Teams compete in several events (see the listing at the end of this article). Students do events in pairs or as a trio. Each event lasts 50 minutes. Individual students can do 2 to 5 events. Students get individual rankings; first–fifth place are recognized with medals or ribbons. These rankings are combined to determine a team's overall ranking in the competition. It is the team's overall ranking that determines whether the team as a whole proceeds to the next level of competition.

Events at Science Olympiad are varied. Some involve knowing a lot of content that one learns in school – for example, Physics Lab or Qualitative Analysis. Others involve knowing content one might not learn in school, for example, Astronomy or Disease Detectives. Yet others involve unusual combinations of skills, like Write It, Do It, where one member of a team examines a weird gadget made of a variety of materials and write a description. The other team member then must construct the gadget from the description. Still other events involve building a gadget in advance following given guidelines. Examples include a bottle rocket, a catapult, or a battery buggy. Other building events require building a robot that performs particular tasks or a Rube-Goldberg-like machine for Mission Possible that does certain specific tasks within guidelines. This year’s Mission Possible for the C division consisted of a machine where a maximum of 15 energy transfers were allowed to take place (3 each of mechanical, chemical, electromagnetic spectrum, thermal and electrical). The ma-
Science Olympiad Events
(Divisions B and C)

Bottle Rocket (B/C): Participants will design, construct and test rockets made of plastic pop bottles, which will remain aloft for a maximum period of time.

Bridge Building (B): Given certain parameters of length, width, height, and material, each team is to design, build and test the lightest bridge to carry a maximum standard load.

Can’t Judge a Powder by Its Color (B): Various powders’ characteristics will be identified.

Cell Biology (C): Contestants will answer questions on cell structures and functions.

Chemistry Lab (C): Teams will demonstrate chemistry laboratory skills related to selected topics.

Designer Genes (C): Students will solve problems using their knowledge of genetics.

Disease Detective (C): This event requires students to apply principles of epidemiology to a published report of a real-life health situation or problem.

Dynamic Planet (B/C): Teams will work at stations that display a variety of earth science materials and related earth science questions.

Naked Egg Drop/Eng. Design (B): Teams construct a package on-site to catch and protect an egg from breaking.

Experimental Design (B/C): Given a set of unknown objects, teams will design, conduct, analyze and write-up an experiment.

Forestry (B/C): Students will demonstrate knowledge of taxonomic keys, habitats, life history and geographic distribution.

Fossils (B/C): Students will identify, describe, and classify various fossil specimens.

Meteorology (B): This event involves the use of process skills as applied to the science of meteorology.

Metric Estimation (B): Students will demonstrate an intuitive feeling for estimating and later for measuring different events/objects using S.I. metric units.

Mission Possible (B/C): Participants will design and build a Rube Goldberg like device, which demonstrates a series of energy transfers to accomplish a specific task.

Physics Lab (C): Teams will demonstrate physics laboratory skills related to selected topics.

Picture This (B): A team member draws a representation of a particular scientific term or concept for team members who must guess the term while watching it being drawn.

Polymer Detective (C): Students will separate and demonstrate an understanding of polymers.

Practical Data Gathering (C): Students will solve practical science problems.

Process Skills for Life Science (B): Students will answer a series of questions designed to test life science lab skills such as measurement, observation and interpretation.

Qualitative Analysis (C): Teams will identify eight solutes on the basis of their reactions with each other and able to answer questions about qualitative analysis concepts.

Reach for the Stars/Astronomy (B/C): Teams identify constellations and solve astronomy problems.

Remote Sensing (C): Teams use maps and remote sensing technology to explain human land use patterns and the relationship of a region’s physical environment to the cultural landscape.

Road Scholar/Map Reading (B): Requires the accurate interpretation and understanding of various map features using a variety of road and topographic maps.

Robo-Billiards (B): Teams will design and build a robot capable of placing billiard balls into containers.

Robot Ramble (C): Students will design and build a robot capable of performing certain tasks.

Science Crime Busters (B): A forensics event where students will correctly identify liquids, solids and other materials in a crime scenario.

Science of Fitness (B/C): Students will be tested on their knowledge of fitness concepts.

Sounds of Music (C): A team will build musical instruments, describe the scientific principles behind their operation and perform a musical selection on them.

Storm the Castle (B/C): Teams will design, construct, calibrate and operate a device capable of launching a projectile as far and as accurately as possible using only the energy of a falling counterweight.

Tower Building (C): Teams will design, build & test the lightest tower to carry a maximum load.

Water Quality (B): Students will demonstrate an appreciation and understanding of aquatic ecology, water resource management, water treatment practices and aquatic chemical processes.

Wheeled Vehicle (B): The contestants will construct and bring a “vehicle” to the event that uses some sort of non-metallic elastic means of propulsion.

Wright Stuff (B/C): Students will design and build a propeller propelled aerodynamic device for greatest time aloft.

Write It/Do It (B/C): A technical writing exercise where students write a description of a contraption and other students will attempt to recreate it using only the written description.
This past academic year has been tremendously successful for the newly created Desi Club at Hickman High School.

Over the school year, Desi Club has sponsored many events, such as film screenings, Gandhi Day, and a guest lecture by Dr. Paul Wallace on terrorism in India. Our various meetings have showcased South Asian food, music, dance, and tradition. One of our most successful events this year took place in January. Desi Club sponsored an overnight lock-in for our members that featured dance lessons, Indian food, a lecture on South Asian religions, mehendi, and other group activities.

In May, Desi Club hosted the most popular booth at Hickman’s World Fair event, presenting classical Indian dance, music, and henna. The final event of the year was a Holi celebration, where many members and non-members came to Cosmo Park for a spring celebration that included water balloons and colored powder.

Over the year, Desi Club has cemented itself into Hickman tradition, becoming widely known to all for its diversity and enthusiasm. Our future plans include more widespread events where both Hickman and Rock Bridge High Schools will be jointly involved in Desi Club activities.

On behalf of all of the current Desi Club officers, I would like to personally thank the Bal-Sabha community for their support and financial contributions to our club. We would greatly appreciate your continuing support as our club grows. With your support, Desi Club will be strong enough to prosper into the future when perhaps today’s elementary school children will become leaders in their high schools.

Next year’s Desi Club officers will be:
President: Rajni Chandrasekhar
Social Chair: Amy Trae
Educational Chair: Indu Chandrasekhar
Treasurer: Arthi Vellore
Secretary: Anita Sadhu

Bal Sandesh welcomes the new team!

Bal Sandesh needs your help!
We welcome submissions of all types (reports, poetry, short stories, artwork, puzzles, jokes etc.). Work can be submitted to the Editors or Parent Advisors, preferably in electronic format (e-mail or diskette). Artwork can be submitted on paper. Older students interested in serving on the editorial/production team should contact the Editorial Staff or the Parent Advisors.