Educational Workshop Series

5-day Concentrated Basic Mathematics for Olympiads Preparatory Workshop

LEARN	High School level Mathematics targeted towards Mathematics Olympiad for 8^{th} -11^{th} Standard Kids. Particulary Algebra , Geometry , Combinatorics , Number Theory and Trigonometry.
FOR WHOM	• 8^{th} - 9^{th} Standard Students with keen interest in Mathematics • Outstanding 6^{th} - 7^{th} Standard students with background in algebra and geometry • 10^{th} - 11^{th} Standard Students appearing for Regional Maths Olympiad
WHEN	**Monday – Friday | 26 – 30 December 2016** **Time: 10 AM – 5 PM**
WHERE	E-Class Room, Venture Center 100, NCL Innovation Park, Dr Homi Bhabha Road/ Pashan Road, Pune -411008
CONTACT	Administrative queries: Ms. Lipika Biswas | Phone :020-25865877 Technical queries: Mr S Basu; Phone: +73500-39098 ; +91-9260462088 For more information, visit: http://www.venturecenter.co.in/workshops/
FEE	**Rs 2500/- per student** Limited seats. First-come-first-serve **Limited seats: 20** **Discounts:** 100% discount for students from LIG, with good academic record A few merit-cum-means scholarships (holders of which can attend this workshop free of cost) are available for students from LIG with strong academic record and /or outstanding performance in mathematics. To apply for this, please send the registration form duly filled in along with the recent mark-list. Maximum number of scholarships is 10.Please note that for the award of scholarship, the decision of Director, Venture Center is final.

Workshop description

Mathematics is the queen of sciences with applications in every field of Science. Although people view mathematics as full of formulas and symbols , few realize that core mathematics relies most importantly on power of deduction not memory. This workshop is targeted towards introducing school students to the wonderful world of mathematics made easy by the proper understanding of symbols and formulas. The workshop teaches absolute basics in mathematics of the topics mentioned below and also teaches problem solving techniques to attack any given problem. The Workshop focuses on :

- **Algebra:** Like Mathematics is the Queen of sciences, Algebra is the queen of mathematics. Almost every problem in mathematics requires the concepts of algebra to formulate and solve the problem . We start with definition of Algebra and extend the students knowlege to inequalities , identity , roots of polynomial , and classification and solution of equations.
- **Geometry:** We introduce students to theroems on Triangle , Quadrilateral and Circles and also teach effective construction techniques for problem solving.
- **Combinatorics:** We start with basic counting priciples based on set theory, then go on to introduce factorial concept and then go on to permutation and combinations.
- **Number Theory:** An advanced topic , we introduce students to basic notations in number theory and then subsequently cover residues**.**
- **Trigonometry:** An applied field of both algebra and geometry , trigonometry has numerous applications in engineering. We cover just enough definitions and formuales to enable the students to go ahead and attack problems independently.
- **Logic :** There are a class of problems which can be attacked by pure logic alone without requiring any formulae. We teach students basics of logical analysis and problem solving methods. This is the singlemost important topic in the entire workshop.

Synopsis

- Number Line and types of numbers
- Basic Logic and deduction principles
  - Basic induction
  - Proof by negation / contradiction
  - Elementary Counting
  - Coloring principle
  - Invariants
- Algebra
  - Definition
  - Properties of algebra
  - Identity
  - Equations
  - Arbitrary functions
  - Inequalities
  - Roots of Polynomials
  - System of Equations
- Geometry
  - Euclidean Geometry axioms
  - Axioms and Theorems and Conjectures
  - Basic line and Triangle theorems
  - Concept of locus
  - Construction techniques
  - Quadrilateral and Circle theorems
  - Corollaries
- Combinatorics
  - Set Theory
  - Counting principles ans factorials

    - Permutations and Combinations
- Number Theory
    - Notations and meaning
    - Divisibility conditions
    - Residues
    - Numerical Functions
    - Pells Equation
- Trigonometry
    - Notations
    - Relationship between trigonometric functions
    - Periodic solutions

Target audience

- 8^{th} - 9^{th} Standard Students with keen interest in Mathematics
- Outstanding 6^{th} - 7^{th} Standard students with background in algebra and geometry
- 10^{th} - 11^{th} Standard Students appearing for Regional Maths Olympiad
- The workshop assumes students have special mathematical aptitude

Faculty

The workshop shall be taught by Mr **S. Basu**.

Profile : Indian National Maths Olympiad awardee , 1998 .Design Engineer with experience in both Digital and Analog Design. Experienced in a multitude of EDA and simulation tools. Strong interests in Embedded systems design and multicore code design. Hobby Robotics fan and entrepreneur in related field. Puzzle solving enthusiast.

Education : B.Tech (H) '03 , M.Tech '04 (Indian Institute Of Technology , Kharagpur)

Experience: Component Design Engineer for Intel India's first Multicore project; Co-author of Enhanced Structural Tester Based Functional Test methodology for Intel Multicore processors; Mixed-Signal Design Consultant for National Semiconductor's Sponsored Project at IIT Kharagpur; Entrepreneur and Design Engineer

Research and previous Workshops: Behavioral Modelling for Mixed Signal Sytems using Verilog-AMS speeding up simulation times by 1000x; Analysis of spice simualtion engine for simulation speedup; Computer Architecture : Multi-core programming using Message Passing Interface and CUDA; Workshop on Behavioral Modelling at IIT Kharagpur;Workshop on SPICE at College of Engg, Pune; Workshop on Digital Design at Venture Center, Pune, Ongoing Workshop on Multi-Core computing at Venture Center , Pune.

Workshop includes

- Classroom and practical sessions
- Lunch and snacks at the Innovation Cafe
- List of Books for Maths Olympiad
- Joining a mailing list community of Mathematics enthusiasts
- Certificate of Participation from Venture Center based on homework performance

Workshop Schedule

Timings	Topic	Duration	Comments
Day 1 :			
10:00 - 11:00	Number line	60 mins	Introduction to Mathematics
	Basic Logic		
11:00 - 11:15	Break	15 mins	
11:15 - 13:00	Basics	105 mins	Algebra
	Properties		
	Quadriatic Equations		
	Square Inequality		
13:00 -14:00	Lunch	60 mins	
14:00 – 15:45	Identity	105 mins	
	General Equations		
15:45 -16:00	Break	15 mins	
16:00 – 17:00	Functions	60 mins	
Timings	**Topic**	**Duration**	**Comments**
Day 2 :			
10:00 - 11:00	Inequalities	60 mins	Algebra
11:00 - 11:15	Break	15 mins	
11:15 - 13:00	Roots of Polynomials	105 mins	
	System of Equations		
13:00 -14:00	Lunch	60 mins	
14:00 - 15:45	Set Theory	105 mins	Combinatorics
	Factorials		
15:45 -16:00	Break	15 mins	
16:00 – 17:00	Permutation and Combination	60 mins	
Timings	**Topic**	**Duration**	**Comments**
Day 3 :			
10:00 - 11:00	Axioms and Theorems	60 mins	Geometry
	Line and Triangle Theorems		
11:00 - 11:15	Break	15 mins	
11:15 - 13:00	Concept of locus	105 mins	
	Circle theorems		
13:00 -14:00	Lunch	60 mins	
14:00 - 15:45	Quadrilaterals	105 mins	
	Corollary		
15:45 -16:00	Break	15 mins	
16:00 – 17:00	Construction techniques	60 mins	

Timings	Topic	Duration	Comments
Day 4 :			
10:00 - 11:00	Notation and meaning	60 mins	Number Theory
	Divisibility conditions		
11:00 - 11:15	Break	30 mins	
10:30 - 13:00	Numerical Functions	105 mins	
	Residues		
13:00 -14:00	Lunch	60 mins	
14:00 - 15:45	Pells Equation	105 mins	
15:45 -16:00	Break	15 mins	
16:00 – 17:00	Problems	60 mins	

Timings	Topic	Duration	Comments
Day 5 :			
10:00- 11:00	Notations	60 mins	Trigonometry
	Basic relationship between functions		
11:00-11:15	Break	15 mins	
11:15-13:00	Continued	105 mins	
13:00-14:00	Lunch	60 mins	
14:00-15:45	Periodic Solutions	105 mins	
15:45-16:00	Break	15 mins	
16:00-17:00	Problem Solving techniques	60 mins	Closure
	Certificate Distribution		

About the organizer

Venture Center strives to nucleate and nurture technology and knowledge-based enterprises by leveraging the scientific and engineering competencies of the institutions in the "Pune region" in India. The Venture Center is a technology business incubator specializing in technology startups offering products and services exploiting scientific expertise in the areas of materials, chemicals and biological sciences & engineering. The Venture Center is the trademark of Entrepreneurship Development Center, a not-for-profit company hosted by the National Chemical Laboratory, Pune, India. More information is available at: http://www.venturecenter.co.in/