ISSN : 2395-3071

RUBY 40 Years JUBILEE

BULLETIN

of the

Tripura Mathematical Society

tms ESTD 1979

Volume : XXXX : 2019-2020

BULLETIN

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Tripura Mathematical Society

Volume : XXXX
ISSN : 2396-3071

Published : October, 2020

EDITORIAL BOARD

Subscription :
Members - Free
Non-Members ₹ 50

Editorial

Our objectiveof publishing the “Bulletin” is to popularization of mathematical thoughts and views for the people of all categories to get the beauty, attractiveness and some depth of Mathematics.

The present ongoing hard scenario of the world due to the pandemic COVID-19, it was very hard to publish the present volume of the Bulletin of the TMS. In this period when work from home was the only possible way of completing our tasks, it is the person Dr. Jaydip Bhattacharya, GS, TMS whose utmost help make this possibility of publication of this present volume. So,in beginning I covey my sincere gratitude to him for this kindness.

This fortieth volume is comprised of some popular articles, question paper of RMO-2019 with solution, question paper of INMO-2020, results of different examinations conducted by TMS during the session 2019-2020. The annual report 2018-19 of the General Secretary, TMS and the audit report of the Treasurer, TMS of the period 2018-19 also included in this volume of the Bulletin.

We convey our special thanks to all those who come up with their innovative ideas and supporting attitude for publication of this current volume.

S. Bhowmik

On 40th Anniversary (Ruby Jubilee) of Tripura Mathematical Society.

ত্রিপুরা গণিত পরিষদ
ও
তার চল্লিশ বছর

ড. জয়দীপ ভট্টাচার্য্য
সহকারী অধ্যাপক
বীরবিক্রম মেমোরিয়াল কলেজ
সাধারণ সম্পাদক
ত্রিপুরা গণিত পরিষদ

৭ই জানুয়ারী ১৯৭৯। ত্রিপুরা গণিত পরিষদের পথচলা শুরু। দেখতে দেখতে চল্লিশটি বছর পার হয়ে গেল। সারা বছর ভর নানা কর্মকান্ডে সদা ব্যস্ত। আজ সারা রাজ্যে ছাত্রছাত্রী, শিক্ষক-শিক্ষিকা ও অভিভাবক অভিভাবিকাদের কাছে একটি পরিচিত নাম । রাজ্যের বাইরেও তার উজ্জ্বল উপস্থিতি।

শুনতে যতটা সহজ সরল মনে হচ্ছে, শুরুটা মোটেই ততটা কসুমাস্তীর্ণ ছিল না। অনেক বিশিষ্ট ব্যক্তিবর্গের দীর্ঘদিনের স্বপ্ন ও পরিশ্রমের একটি সার্থক অবয়ব গড়ে উঠেছিল আজ থেকে চল্লিশ বছর আগে। আজ গণিত পরিষদ ফুলে, ফলে ও ডালপালায় পরিপূর্ণ একটি মহীরুহ। একে রক্ষা করা, এগিয়ে নিয়ে চলাই বর্তমান ও ভবিষ্যৎ প্রজন্মের আশু কর্তব্য।

যে সকল লক্ষ্যকে সামনে রেখে মূলতঃ গণিত পরিষদের যাত্রা শুরু হয়েছিল সেগুলি হল ঃ-

১) গণিতকে জনপ্রিয় করে তোলা।

২) ছাত্র-ছাত্রীদের গণিতভীতি দূর করা।

৩) শিক্ষার্থীদের মধ্যে গণিতের প্রতি আগ্রহ জাগিয়ে তোলা।

৪) গণিতের মজা ও সৌন্দর্য সম্পর্কে সকলকে অবহিত করা।

৫) গণিত শিক্ষাদানের আনন্দ শিক্ষক-শিক্ষিকাদের মধ্যে ছড়িয়ে দেওয়া।

৬) গণিত বিষয়ক মেধা পরীক্ষাগুলিতে রাজ্যের প্রত্যন্ত অঞ্চলের ছাত্র-ছাত্রীদের অংশ গ্রহণে অনুপ্রেরণা দেওয়া।

৭) রাজ্যে গণিত গবেষণার পরিবেশ তৈরি করা।

গণিত পরিষদের বিভিন্ন কর্মকান্ডের অন্যতম হল বিভিন্ন শ্রেণির শিক্ষার্থীদের জন্য অনুষ্ঠিত নির্দিষ্ট পরীক্ষা সমূহ। এই পরীক্ষাগুলি কেবলমাত্র আগরতলাতেই সীমাবদ্ধ নয়। রাজ্যের সমস্ত ছাত্র-ছাত্রীদের

অংশ গ্রহণের সুবিধার্থে পরীক্ষাগুলি সারা রাজ্যে একযোগে অনুষ্ঠিত হয়। আর এই কাজে অন্যতম সহযোগী হল গণিত পরিষদের ইউনিটগুলি। এখন পর্যন্ত গণিত পরিষদের ১১টি ইউনিট রয়েছে। এগুলি হল - ১) অমরপুর, ২) বিলোনীয়া, ৩) উদয়পুর, ৪) বিশালগড়, ৫) সোনামুড়া, ৬) ধর্মনগর, ৭) কৈলাশহর, ৮) কমলপুর, ৯) খোয়াই, ১০) তেলিয়ামুড়া ও ১১) শান্তির বাজার।

প্রতিটি ইউনিটে একজন ইউনিট সেক্রেটারী রয়েছেন। পরিষদের বার্ষিক সাধারণ সভায় সর্বসম্মতিতে তাকে নির্বাচিত করা হয়। ইউনিটের অন্যান্য সদস্য-সদস্যারা সর্বদা তাকে সাহায্য করে থাকেন। বেশকিছু ইউনিটের কাজ সত্যিই প্রশংসনীয়। গণিত পরিষদের নির্ধারিত কর্মকাণ্ড ছাড়াও ইউনিটগুলি কেন্দ্রীয় কমিটির পরামর্শ অনুযায়ী কখনো কখনো এক দিবসীয় গণিত বিষয়ক সেমিনার, গণিত শিক্ষক-শিক্ষিকাদের জন্য কর্মশালা, শিক্ষার্থীদের জন্য স্পট কুইজের মতো আকর্ষণীয় অনুষ্ঠানেরও আয়োজন করে থাকে। এছাড়াও রয়েছে ইউনিট ভিত্তিক বার্ষিক পুরষ্কার বিতরণী অনুষ্ঠান ও গণিত দিবস উদ্‌যাপন।

অপরদিকে সম্প্রতি কয়েকটি ইউনিটের হতাশাজনক চিত্রও লক্ষ্য করা যাচ্ছে। সদস্য-সদস্যাদের অসহযোগিতার ফলে পুরো কাজের দায়ভার ইউনিট সেক্রেটারীর কাঁধে এসে পরে। একা সমস্ত কাজ নিখুঁতভাবে পরিচালনা করা যে যথেষ্ট কষ্ট সাপেক্ষ একথা বলাই বাহুল্য। এর থেকে উত্তরণের একমাত্র উপায় সকলের মিলিত প্রচেষ্টা ও সম্মিলিত সহযোগিতা। প্রত্যাশা রইল এই সমস্যা অচিরেই দূরীভূত হবে এবং ইউনিটগুলি আগের মতো প্রাণবন্ত ও কর্মতৎপর হয়ে উঠবে।

যে সকল কর্মসূচী বছরভর গণিত পরিষদ আয়োজন করে থাকে সেগুলি একে একে সংক্ষেপে বিবৃত করা হল।

ক) পঞ্চম শ্রেণিতে পাঠরত ছাত্র-ছাত্রীদের জন্য রয়েছে গণিত প্রবণতা পরীক্ষা (Apptitude test)। পরীক্ষাটি প্রথম চালু হয় ১৯৮৫ সালে বিলোনীয়া ইউনিটে। ১৯৮৭ সাল থেকে আগরতলা ও অন্যান্য ইউনিটগুলিতে পুরোদমে পরীক্ষাটি চালু হয়। আগরতলা সংলগ্ন রানীর বাজার সেন্টারেও এই পরীক্ষাটি প্রতিবছর হয়ে থাকে। প্রথম ২০ জন সফল ছাত্র-ছাত্রীদের পুরস্কার ও শংসাপত্র দেওয়া হয়। এই পরীক্ষায় প্রথম স্থানাধিকারীর জন্য রয়েছে মেডেল ও স্কলারশীপ। এছাড়াও দ্বিতীয় ও তৃতীয় স্থানাধিকারীর জন্য রয়েছে নগদ পুরস্কার। প্রতিটি ইউনিটের সফল পরীক্ষার্থীদের (ইউনিটের মোট পরীক্ষার্থীর উপর ভিত্তি করে সংখ্যাটা নির্ধারিত হয়) জন্য রয়েছে পুরস্কার ও শংসাপত্র।


On Initiative of
Tripura State Council for Science & Technology
JUNIOR MATHEMATICAL OLYMPIAD
FOR CLASS VIII SCHOOL STUDENTS
In collaboration with
Tripura Mathematical Society
Supported by
SECONDARY & ELEMENTARY EDUCATION, GOVT. OF TRIPURA
Schedule
Date of Olympiad : February 2, 2020
Last Date of Registration : January 20, 2020
Tripura State Council for Science & Technology

খ) ত্রিপুরা গণিত পরিষদ ও ত্রিপুরা বিজ্ঞান ও প্রযুক্তি পর্ষদের যৌথ প্রচেষ্টায় ২০০৭ সাল থেকে

ত্রিপুরা গণিত পরিষদ কর্তৃক আয়োজিত সেমিনার / কনফারেন্স / ওয়ার্কশপ এর তালিকা

ক্র.নং.	সেমিনার / কনফারেন্স / ওয়ার্কিশপ	তারিখ / বছর	সহযোগী সংগঠন
১.	সিম্পোজিয়াম অন ম্যাথামেটিক্স কারিকুল্যাম এট স্কুল লেভেল	৩-৪ জুন, ১৯৮০	--
২.	সেমিনার অন ম্যাথামেটিক্স ফর ডেভেলপমেন্ট অফ্ নর্থ ইস্ট রিজিয়ন	১০-১১ সেপ্টেম্বর, ১৯৮৩	--
৩.	সেমিনার অন কম্পিউটার সায়েন্স এন্ড স্কুল ম্যাথামেটিক্স	৫- ৬ ফেব্রুয়ারী, ১৯৮৬	--
৪.	সেমিনার অন লাইফ এন্ড ওয়ার্কস্ অফ রামানুজন	৫-৬ ডিসেম্বর, ১৯৮৭	--
৫.	ভেকেশনাল ম্যাথামেটিক্স কেম্প	৮ - ১৬ অক্টোবর, ১৯৯০	--
৬.	সেমিনার অন কম্পিউটার অ্যায়োরন্যাস	৬-৭ মে, ১৯৯৫	--
৭.	সেমিনার অন হিস্ট্রি এন্ড ফিলোসফি অফ সায়েন্সস্	২-৩ ডিসেম্বর, ১৯৯৫	ত্রিপুরা বিশ্ববিদ্যালয়
৮.	ন্যাশনাল সেমিনার অন ম্যাথামেটিকেল সায়েন্সস এন্ড ম্যাথামেটিক্স ফেয়ার	৩-৪ জানুয়ারী, ২০০৪	--
৯.	সেমিনার কাম ওয়ার্কশপ অন বৈদিক ম্যাথামেটিক্স	২২-২৩ এপ্রিল, ২০০৫	ত্রিপুরা বৈদিক ম্যাথ ফোরাম
১০.	ন্যাশনাল সেমিনার অন ফাজি ম্যাথামেটিক্স এন্ড ইটস্ এপ্লিকেশনস্	২৫-২৬ নভেম্বর, ২০০৬	ত্রিপুরা বিশ্ববিদ্যালয়
১১.	ন্যাশনাল কনফারেন্স অন অ্যান্সিয়ান্ট ইন্ডিয়ান ম্যাথামেটিক্স এন্ড কম্মেমোরেশান অফ ১৫০ বার্থ অ্যানিভারসারি অফ স্যার আশুতোষ মুখার্জ্জি	৮-৯ ফেব্রুয়ারী, ২০১৪	--
১২.	ডিসকাস্শান অন ম্যাথামেটিক্স উইথ স্টুডেন্টস, টিচার্স এন্ড গার্জিয়ানস্	১৪ ফেব্রুয়ারী, ২০১৫	বিদ্যালয় শিক্ষা দপ্তর
১৩.	ওয়ার্কশপ ফর টিচিং অফ ম্যাথামেটিক্স ইন ক্লাশেস IX টু XII ফর ম্যাথামেটিক্স টিচার্স	১১ এপ্রিল, ২০১৫	--
১৪.	ইন্টারনেশন্যাল কনফারেন্স অন রিসেন্ট ট্রেন্ডস্ ইন ম্যাথামেটিকেল সায়েন্সস	২৪-২৫ মার্চ, ২০১৮	এম.বি.বি. বিশ্ববিদ্যালয়
১৫.	ওয়ার্কশপ অন ম্যাথামেটিক্স ফর মাধ্যমিক লেভেল টিচার্স	১৪-১৫ ডিসেম্বর, ২০১৮	বিদ্যালয় শিক্ষাদপ্তর
১৬.	ন্যাশনাল কনফারেন্স অন বৈদিক ম্যাথামেটিক্স ইনক্লুডিং এনসিয়েন্ট ইন্ডিয়ান ম্যাথামেটিক্স (আপটু ১২০০ এ.ডি.)	২৮-২৯ ডিসেম্বর, ২০১৯	সি.এস.আই আর

৮ম শ্রেণির ছাত্র-ছাত্রীদের জন্য চালু হয় জুনিয়র ম্যাথামেটিক্যাল অলিম্পিয়াড (Junior Mathematical Olympiad) বা JMO। এই পরীক্ষাটি সদর মহকুমা সহ রাজ্যের প্রায় সবকয়টি মহকুমায় হয়ে থাকে। এই বছর (২০১৯) মোট ২৩ টি সেন্টারে পরীক্ষাটি হয়। খুব উৎসাহভরে প্রতিটি মহকুমায় গণিত দিবস উদ্‌যাপিত হয়। এই জন্য আর্থিক সাহায্য করে থাকে রাজ্য বিজ্ঞান ও প্রযুক্তি পর্ষৎ। এই অনুষ্ঠানে মহকুমা ভিত্তিক JMO পরীক্ষার প্রথম দশজনকে (সদর মহকুমায় প্রথম ১৫ জন) পুরস্কার ও শংসাপত্র দেওয়া হয়। এছাড়াও রাজ্য ভিত্তিক ফলাফলের ভিত্তিতে প্রথম ৩০ জনকে গণিত পরিষদ পুরস্কৃত করে থাকে। প্রথম স্থানাধিকারিকে দেওয়া হয় রাধারঞ্জন দেব চৌধুরী মেমোরিয়াল সিলভার মেডেল।

গ) নবম ও দশম শ্রেণির ম্যাথামেটিক্যাল অলিম্পিয়াড (MO) পরীক্ষা প্রথম চালু হয় ১৯৮১ সালে। গণিত প্রবণতা পরীক্ষার মতো এই পরীক্ষাতেও প্রতিটি ইউনিটের নির্দ্দিষ্ট সংখ্যক সফল পরীক্ষার্থীকে (ইউনিটের মোট পরীক্ষার্থীর উপর ভিত্তি করে সংখ্যাটা নির্ধারিত হয়) পুরস্কৃত করা হয়। রাজ্য ভিত্তিক প্রথম ২০জনকে আগরতলায় গণিত পরিষদের বার্ষিক পুরস্কার বিতরণী অনুষ্ঠানে পুরস্কার ও শংসাপত্র প্রদান করা হয়। এই পরীক্ষায় প্রথম, দ্বিতীয় ও তৃতীয় স্থানাধিকারীদের সত্যব্রত মহাপাত্র মেমোরিয়াল স্কলারশীপ প্রদান করা হয়ে থাকে।

ঘ) ১৯৮৭ সাল থেকে রিজিওনাল ম্যাথমেটিক্যাল অলিম্পয়াড (RMO) পরীক্ষা ত্রিপুরায় হয়ে আসছে। এই পরীক্ষায় কৃতকার্যদের পরবর্তী ধাপ হল যথাক্রমে INMO (Indian National Mathematical Olympiad এবং IMO (International Mathematical Olympiad)। ২০০৮ সাল থেকে INMO পরীক্ষার কো-অর্ডিনেটর হিসেবে ত্রিপুরা গণিত পরিষদ দায়িত্বপ্রাপ্ত। সমগ্র পরীক্ষাটির পরিচালনা ও নির্দেশনায় রয়েছে National Board of Higher Mathematics (NBHM) এর পক্ষে হোমি-ভাবা সেন্টার ফর সায়েন্স এডুকেশন (HBCSE)। মূলত ছয়টি স্টেজ রয়েছে পরীক্ষাটিতে।

১) PRMO বা Pre-Regional Mathematical Olympiad হল ১ম ধাপ।

২) দ্বিতীয় ধাপটি হল Regional Mathematical Olympiad (RMO)

৩) RMO পরীক্ষার উত্তীর্ণরা তৃতীয় ধাপে Indian National Mathematical Olympiad (INMO) পরীক্ষায় বসার সুযোগ পায়।

৪) চতুর্থ ধাপ হল INMO পরীক্ষায় উত্তীর্ণদের জন্য আয়োজিত International Mathematical Olympiad Training Camp (IMOTC) I সাধারণতঃ এপ্রিল মে মাসে HBCSE তে এই ক্যাম্পটি অনুষ্ঠিত হয়। প্রশিক্ষণ চলাকালীন বার কয়েক নির্বাচনি পরীক্ষা (Selection Test) হয়ে থাকে এবং অবশেষে ছয়জনকে পরবর্তী পর্যায়ের জন্য নির্বাচিত করা হয়।

৫) নির্বাচিত দলটির জন্য ৮-১০ দিনের কঠোর প্রশিক্ষনের ব্যবস্থা করা হয়।

৬) অবশেষে ষষ্ঠ ধাপে তারা International Mathematical Olympiad (IMO) তে বসার সুযোগ পায়।

অষ্টম শ্রেণি থেকে দ্বাদশ শ্রেণি পর্যন্ত ছাত্রছাত্রীরা এই পরীক্ষায় অংশগ্রহণ করতে পারে। RMO পরীক্ষায় ত্রিপুরা রিজিয়ন এর সফল ছাত্রছাত্রীদের গণিত পরিষদ পুরস্কার ও শংসাপত্র প্রদান করে থাকে। প্রথম স্থানাধিকারীকে ক্যাশ এওয়ার্ড দেওয়া হয়।

বিভিন্ন কার্যক্রমের জন্য নির্দ্দিষ্ট বিশেষ বিশেষ পুরস্কার সমূহ

কার্যক্রম	শ্রেণি	পুরস্কার সমূহ
১। গণিত প্রবণতা পরীক্ষা (Aptitude test)	V	ক) প্রথম স্থানাধিকারী- মাধবলাল চ্যাটার্জী মেমোরিয়াল মেডেল ও কুঞ্জবাসিনী মেমোরিয়াল স্কলারশীপ খ) দ্বিতীয় ও তৃতীয় স্থানাধিকারী- দীপক সরকার এনকারেজমেন্ট ক্যাশ এওয়ার্ড। গ) প্রথম ২০ টি স্থানাধিকারী—পুরস্কার ও শংসাপত্র। ঘ) প্রতিটি ইউনিট/সেন্টার এর নির্দ্দিষ্ট সংখ্যক টপার (মোট পরীক্ষার্থীর সংখ্যার উপর ভিত্তি করে নির্ধারিত) এর জন্য- পুরস্কার ও শংসাপত্র।
২। জুনিয়ার ম্যাথামেটিক্যাল অলিম্পিয়াড (JMO)	VIII	ক) প্রথম স্থানাধিকারী- রাধারঞ্জন দেব চৌধুরী মেমোরিয়াল সিলভার মেডেল। খ) প্রথম ত্রিশ স্থানাধিকারী (রাজ্য)—পুরস্কার ও শংসাপত্র। গ) প্রতিটি মহকুমা এর প্রথম দশজন— পুরস্কার ও শংসাপত্র।
৩। ম্যাথামেটিক্যাল অলিম্পিয়াড (MO)	IX - X	ক) প্রথম, দ্বিতীয় ও তৃতীয় স্থানাধিকারী— সত্যব্রত মহাপাত্র মেমোরিয়াল স্কলারশিপ। খ) প্রথম ২০ টি স্থানাধিকারী—পুরস্কার ও শংসাপত্র। গ) প্রতিটি ইউনিট এর নির্দ্দিষ্ট সংখ্যক টপার (মোট পরীক্ষার্থীর সংখ্যার উপর ভিত্তিকরে নির্ধারিত)— পুরস্কার ও শংসাপত্র।
৪। রিজিওনাল ম্যাথামেটিক্যাল অলিম্পিয়াড (RMO)	VIII - XII	(Pre-RMO পরীক্ষায় নির্বাচিতরা এই পরীক্ষায় অংশ গ্রহণ করে) ক) প্রথম স্থানাধিকারী— জয়দ্বীপ ভট্টাচার্য্য মেমোরিয়াল ক্যাশ এওয়ার্ড। খ) উত্তীর্ণরা — পুরস্কার ও শংসাপত্র।
৫। আন্তঃ বিদ্যালয় ক্যুইজ প্রতিযোগিতা (Inter School Quiz Contest)	IX - X	ক) চ্যাম্পিয়ন - চন্দ্রপ্রভা মেমোরিয়াল রানিং ট্রফি। খ) ফাইনালে উঠা প্রতিটি দল—পুরস্কার ও শংসাপত্র।
৬। গণিত দিবস - ২২শে ডিসেম্বর (অ) প্রশ্ন মঞ্চ (আ) বক্তৃতা প্রতিযোগিতা	 VI VII	 সফল প্রতিযোগী- পুরস্কার ও শংসাপত্র। প্রথম চারটি স্থানাধিকারী— পুরস্কার ও শংসাপত্র।
৭। গণিতে সর্বোচ্চ নম্বর অ) উচ্চ মাধ্যমিক পরীক্ষা	 XII	ক) বঙ্কিমচন্দ্র মেমোরিয়াল মেডেল। খ) প্রদীপ দত্ত মেমোরিয়াল ক্যাশ এওয়ার্ড। গ) গণিত পরিষদের পুরস্কার ও শংসাপত্র।

আ) মাধ্যমিক পরীক্ষা	X	ক) কেশব চন্দ্র সাহা সিলভার মেডেল, খ) কৃষ্ণ-সুষমা ক্যাশ এওয়ার্ড। গ) প্রদীপ দত্ত মেমোরিয়াল ক্যাশ এওয়ার্ড।।
৮। স্নাতকস্তরে সাম্মানিক গণিতে সর্বোচ্চ নম্বর	ফাইনাল সেমিস্টার (ত্রিপুরা বিশ্ববিদ্যালয়)	ক) রমেশ-যোগমায়া সিলভার মেডেল।

ঙ) গণিত পরিষদ আয়োজিত অন্যতম চিত্তাকর্ষক অনুষ্ঠান হল আন্তঃ বিদ্যালয় কুইজ প্রতিযোগিতা (Inter School Quiz Contest)। গণিত বিষয়ের উপর এই কুইজটি শুরু হয় ১৯৮৭ সালে। প্রথম রাউন্ড আগরতলা সহ প্রতিটি ইউনিটে একইদিনে একযোগে অনুষ্ঠিত হয়। প্রতি বছর ২১ শে ডিসেম্বর এই প্রতিযোগিতার দ্বিতীয় রাউন্ড ও সেমিফাইনাল অনুষ্ঠিত হয়। ফাইনালটি অনুষ্ঠিত হয় ২২শে ডিসেম্বর গণিত দিবসে। ফাইনালের চারটি দলকেই পুরস্কার ও শংসাপত্র দেওয়া হয়। চ্যাম্পিয়ন দলকে দেওয়া হয় চন্দ্রপ্রভা মেমোরিয়াল রানিং ট্রফি।

চ) ১৯৮৭ সালটি ছিল আধুনিক ভারতের মহান গণিতবিদ শ্রীনিবাস রামানুজনের শততম জন্মবর্ষ। তাঁর জন্মদিন ২২শে ডিসেম্বর বিশেষভাবে স্মরণীয় করে রাখার জন্য ত্রিপুরা গণিত পরিষদ ঐ বছর থেকে প্রতিবছর এই দিনটিকে বেশ ঘটা করে 'গণিত দিবস' হিসেবে পালন করে থাকে। এটা খুব গর্বের যে, ১৯৯০ সালে রাজ্যসরকার এই দিনটিকে 'গণিত দিবস' হিসেবে ঘোষণা করে। প্রসঙ্গত বলা যায় যে, রামানুজনের ১২৫ তম জন্মবর্ষ অর্থাৎ ২০১২ সালে ভারত সরকার ২২শে ডিসেম্বরকে 'জাতীয় গণিত দিবস' হিসেবে ঘোষণা করে এবং সেই থেকে প্রতি বছর সারা দেশে এই দিনটি খুব গুরুত্ব সহকারে পালিত হয়।

ত্রিপুরা গণিত পরিষদ এই দিনটি পালনের অঙ্গ হিসেবে দুইদিনব্যাপি বিভিন্ন প্রতিযোগিতার আয়োজন করে থাকে। আগের দিন অর্থাৎ ২১ শে ডিসেম্বর নবম ও দশম শ্রেণির আন্তঃবিদ্যালয় কুইজ প্রতিযোগিতার ২য় রাউন্ড ও সেমিফাইনাল অনুষ্ঠিত হয়। আগরতলা সহ প্রতিটি ইউনিটে অনুষ্ঠিত প্রথম রাউন্ডের প্রতিযোগিতার বাছাই করা দলগুলিই দ্বিতীয় রাউন্ডে অংশ গ্রহণ করে। এছাড়া সপ্তম শ্রেণির ছাত্রছাত্রীদের জন্য থাকে গণিতবিদ্‌দের জীবনীর উপর বক্তৃতা প্রতিযোগিতা।

মূল অনুষ্ঠানটি হয় ২২শে ডিসেম্বর। ঐদিন ষষ্ঠ শ্রেণির শিক্ষার্থীদের জন্য থাকে প্রশ্নমঞ্চ। তাছাড়া আন্তঃবিদ্যালয় কুইজ প্রতিযোগিতার ফাইনাল অনুষ্ঠিত হয়।

ছ) গণিত পরিষদের বুলেটিন হল পরিষদের দর্পণ। এর মাধ্যমে গণিত পরিষদের সারা বছরের কর্মকান্ডের

ছবিটি ভেসে ওঠে। যা প্রতিটি সদস্য-সদস্যাদের কাছেই একটি গুরুত্বপূর্ণ দলিল। এবছর ৪০ তম সংখ্যাটি প্রকাশিত হচ্ছে। বুলেটিনে প্রতি বছরের বিভিন্ন পরীক্ষার ফলাফল, RMO ও INMO পরীক্ষার প্রশ্নপত্র ও সমাধান, অডিট রিপোর্ট ও সাধারণ সম্পাদকের রিপোর্ট লিপিবদ্ধ থাকে। বিভিন্ন বিশিষ্ট লেখকের লেখা গণিত বিষয়ক প্রবন্ধগুলি এই বইটির মূল আকর্ষণ। গত চল্লিশ বছরে বেশকিছু অত্যন্ত মূল্যবান লেখার সাক্ষ্য বহন করে চলেছে বুলেটিন। এমনই বেশকিছু প্রবন্ধের উল্লেখ এখানে করা হল।

প্রবন্ধের শিরোনাম	লেখকের নাম	বুলেটিন সংখ্যা ও বছর	পৃষ্ঠা সংখ্যা
১। বাক্‌শালী পাণ্ডুলিপি	নলিনীকান্ত চক্রবর্তী	XVIII & XIX ১৯৯৭-৯৮ এবং ১৯৯৮-৯৯	১২ - ৪২
২। জ্যামিতি ও পদার্থবিদ্যা	মনীন্দ্র চন্দ্র চাকী	XIII & XIV ১৯৯১-৯২ এবং ১৯৯২-৯৩	২৪ - ২৭
৩। স্যার আশুতোষ মুখার্জ্জী- দি ম্যাথামেটিসিয়ান	রবিনন্দ ভৌমিক	XXXIV ২০১৩ - ১৪	৫ - ৮
৪। অসীমের ধারণা	প্রেমতোষ মজুমদার	XX ১৯৯৯-২০০০	২৬ - ৩০
৫। শূন্য রহস্য	সত্যবাচী সর	XIII & XIV ১৯৯১-৯২ এবং ১৯৯২-৯৩	২৪ - ২৭
৬। ইউজফুল টিপস ফর ইনট্রোডিউসিং কনসেপ্ট অফ ফাংশান	এম. পি. জসওয়াল	XXXVI ২০১৫-১৬	২১ - ২৪
৭। গণিত কণা	সুবোধ ভট্টাচার্য্য	X,XI & XII ১৯৮৯-৯০, ১৯৯০-৯১ এবং ১৯৯১-৯২	৫৪ - ৫৮
৮। বিশিষ্ট গণিতবিদ্ অধ্যাপক এ.সি. ব্যানার্জি	রবীন্দ্রনাথ সেন	XIII & XIV ১৯৯১-৯২ এবং ১৯৯২-৯৩	২৪ - ২৭

জ) আমাদের গণিত পরিষদের প্রকাশনার আর একটি উল্লেখযোগ্য সংযোজন হল গবেষনালব্ধ পত্রিকা বা জার্নাল যা পরিচিত Journal of Tripura Mathematical Society নামে। প্রতিটি সংখ্যায় দেশ ও বিদেশের গণিতজ্ঞদের লেখার পাশাপাশি আমাদের রাজ্যের নবিন গণিত গবেষকদের লেখা ও ছাপা হয়ে থাকে। ২০২০ এর মার্চ মাসে প্রকাশিত হল ২১তম সংখ্যাটি। প্রথমবারের মতো এই সংখ্যাটি অনলাইনে প্রকাশিত হল। চেষ্টা হচ্ছে এর ধারাবাহিকতা রক্ষা করার।

ঝ) ত্রিপুরা গণিত পরিষদ অন্যান্য আরও কর্মকাণ্ড নিয়ে সারাবছর ব্যস্ত থাকে।

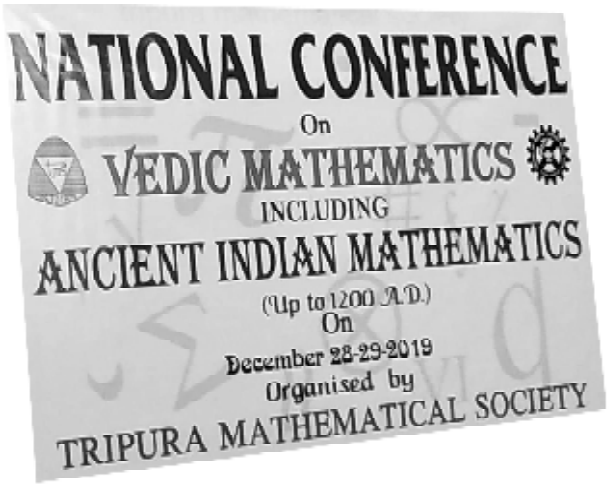
১। রাজ্যের বিভিন্ন স্কুলে গণিত বিষয়ক বক্তৃতা, ক্যুইজ বা প্রশ্নমঞ্চের মতো বিভিন্ন আকর্ষনীয় অনুষ্ঠান-এর মাধ্যমে শিক্ষার্থীদের অনুপ্রাণিত করার উদ্যোগ নেওয়া হয়।

২। গণিতের শিক্ষক ও শিক্ষার্থীদের নিয়ে আলোচনা মূলক অনুষ্ঠান 'গণিত মজলিশ' চালু হয়েছিল ২০০০ সালে। বর্তমানে অনুষ্ঠানটি বন্ধ রয়েছে।

৩। মহাবিদ্যালয় ও বিশ্ববিদ্যালয়ের শিক্ষক ও গবেষকদের নিয়ে প্রতি মাসের চতুর্থ শনিবার উচ্চগণিতের বিভিন্ন বিষয়ে বক্তৃতা বা লেকচার শুরু হয়েছিল ১৯৮১ সালে। বহিঃরাজ্যের অনেক প্রথিতযশা গণিত অধ্যাপকগণও ইহাতে অংশ নিতেন। এই অনুষ্ঠানটি কিছুদিন যাবৎ আর করা সম্ভব হচ্ছে না।

৪। বিজ্ঞানমেলা, গণিত প্রদর্শনী, ম্যাথকর্ণার প্রভৃতিতে ১৯৮৫ সাল থেকে নিয়মিত অংশ গ্রহণ করে আসছে ত্রিপুরা গণিত পরিষদ। বিভিন্ন সময় পুরস্কার ও সম্মাননায় ভূষিত হয়েছে। ত্রিপুরা রাজ্য বিজ্ঞান ও প্রযুক্তি পর্ষৎ ২০০৯ সালে 'মেঘনাদ সাহা এওয়ার্ড' এ ভূষিত করেছে গণিত পরিষদকে। এছাড়া বিজ্ঞান মেলায় ২০১১ ও ২০১৩ সালে প্রথম পুরস্কার এবং ২০০৯-২০১০ ও ২০১২ সালে দ্বিতীয় পুরস্কার পেয়েছে।

ঞ) ২০০৪ সালটি ছিল গণিত পরিষদের রৌপ্য জয়ন্তী বর্ষ। বছরটিকে স্মরণীয় করে রাখতে জাতীয় পর্যায়ের একটি গণিত সেমিনারের আয়োজন করা হয়। সেই সাথে গণিত-মেলারও আয়োজন করা হয়। দুই দিনের অনুষ্ঠানটি আয়োজিত হয়েছিল ২০০৪ সালের ৩-৪ জানুয়ারী, আগরতলার নেতাজী সুভাষ বিদ্যানিকেতনে। একটি স্মারক গ্রন্থ (Souvenir) বের হয়। বইটি যথার্থই গণিত পরিষদের একটি মূল্যবান দলিল।



ট) ২০১৯ সালটি অত্যন্ত গুরুত্বপূর্ণ ত্রিপুরা গণিত পরিষদের জন্য। এই বছর গণিতপরিষদ এর ৪০তম বার্ষিকী বা রুবী জয়ন্তী। পরিষদের সদস্য-সদস্যাদের ঐকান্তিক প্রচেষ্টায় ২০১৯ এর ২৮-২৯ ডিসেম্বর দুইদিনের জাতীয় আলোচনাচক্রের (National Conferance on Vedic Mathematics including Ancient Indian Mathematics upto 1200 AD) আয়োজন করা হয়। পরিষদের সদস্য-সদস্যা, বিভিন্ন বিশ্ববিদ্যালয়, মহাবিদ্যালয় ও বিদ্যালয়ের শিক্ষক-শিক্ষিকা ও ছাত্র-ছাত্রীরা অংশগ্রহণ করে। অংশগ্রহণকারীর মোট সংখ্যা ১৩০। মোট ২০ জন গবেষক-গবেষিকা ও ৫ জন বিদ্যালয়ের ছাত্রছাত্রী এই আলোচনাচক্রে বক্তব্য পেশ করেন। উপস্থাপিত গবেষণাপত্র সমূহ পুস্তকাকারে প্রকাশ করার কাজ চলছে।

কার্য্যনির্বাহী কমিটি (১৯৭৯ - ২০১৯)

বছর	সভাপতি	সহসভাপতি	সাধারণ সম্পাদক	কোষাধ্যক্ষ
১৯৭৯-৮০	বিশ্বনাথ চক্রবর্তী	মান কুমার চক্রবর্তী, সুকুমার বাসুলি	সরজু তিওয়ারি	মাতাপ্রসাদ জসওয়াল
১৯৮০-৮১	সুকুমার বাসুলি	মান কুমার চক্রবর্তী, সরজু তিওয়ারি	মাতাপ্রসাদ জসওয়াল	রবিনন্দ ভৌমিক
১৯৮১-৮২	সুকুমার বাসুলি	মান কুমার চক্রবর্তী, মনোরঞ্জন মাইতি	রবিনন্দ ভৌমিক	মাতাপ্রসাদ জসওয়াল
১৯৮২-৮৩	সুকুমার বাসুলি	মান কুমার চক্রবর্তী, মনোরঞ্জন মাইতি	রবিনন্দ ভৌমিক	মাতাপ্রসাদ জসওয়াল
১৯৮৩-৮৪	সুকুমার বাসুলি	মান কুমার চক্রবর্তী, মনোরঞ্জন মাইতি	রবিনন্দ ভৌমিক	মাতাপ্রসাদ জসওয়াল
১৯৮৪-৮৫	মান কুমার চক্রবর্তী	মনোরঞ্জন মাইতি, সুবোধ চন্দ্র সরকার	রবিনন্দ ভৌমিক	মাতাপ্রসাদ জসওয়াল
১৯৮৫-৮৬	মান কুমার চক্রবর্তী	মনোরঞ্জন মাইতি, নবকুমার ভট্টাচার্য	সত্যবাচী সর	সুবোধ চন্দ্র সরকার
১৯৮৬-৮৭	মান কুমার চক্রবর্তী	নবকুমার ভট্টাচার্য, সমীর লাহিরী	সত্যবাচী সর	সুবোধ ভট্টাচার্য
১৯৮৭-৮৮	মান কুমার চক্রবর্তী	নবকুমার ভট্টাচার্য, সমীর লাহিরী	সত্যবাচী সর	সুবোধ ভট্টাচার্য
১৯৮৮-৮৯	নবকুমার ভট্টাচার্য	সত্যবাচী সর, সমীর লাহিরী	রবিনন্দ ভৌমিক	মাতাপ্রসাদ জসওয়াল
১৯৮৯-৯০	বিদ্যুৎ কুমার দত্ত	সরজু তিওয়ারি, হরিপদ দত্ত	রবিনন্দ ভৌমিক	মাতাপ্রসাদ জসওয়াল
১৯৯০-৯১	বিদ্যুৎ কুমার দত্ত	সরজু তিওয়ারি, হরিপদ দত্ত	জগদীশ কুন্ডু	সুবোধ চন্দ্র সরকার
১৯৯১-৯২	সরজু তিওয়ারি	সুবোধ ভট্টাচার্য, হরিপদ দত্ত	সত্যবাচী সর	মাতাপ্রসাদ জসওয়াল
১৯৯২-৯৩	সরজু তিওয়ারি	জগদীশ কুন্ডু, হরিপদ দত্ত	সুবোধ ভট্টাচার্য	মাতাপ্রসাদ জসওয়াল
১৯৯৩-৯৪	বিদ্যুৎ কুমার দত্ত	রবিনন্দ ভৌমিক, হরিপদ দত্ত	জগদীশ কুন্ডু	মাতাপ্রসাদ জসওয়াল
১৯৯৪-৯৫	বিদ্যুৎ কুমার দত্ত	জগদীশ কুন্ডু, হরিপদ দত্ত	রবিনন্দ ভৌমিক,	মাতাপ্রসাদ জসওয়াল
১৯৯৫-৯৬	বিদ্যুৎ কুমার দত্ত	জগদীশ কুন্ডু, হরিপদ দত্ত	রবিনন্দ ভৌমিক,	মাতাপ্রসাদ জসওয়াল
১৯৯৬-৯৭	বিদ্যুৎ কুমার দত্ত	রবিনন্দ ভৌমিক, হরিপদ দত্ত	জগদীশ কুন্ডু	মাতাপ্রসাদ জসওয়াল
১৯৯৭-৯৮	নবকুমার ভট্টাচার্য	জগদীশ কুন্ডু, হরিপদ দত্ত	সত্যবাচী সর	মাতাপ্রসাদ জসওয়াল

১৯৯৮-৯৯	নবকুমার ভট্টাচার্য	সত্যবাচী সর, শুভব্রত মহাপাত্র	মাতাপ্রসাদ জসওয়াল	প্রেমতোষ মজুমদার
১৯৯৯-২০০০	নবকুমার ভট্টাচার্য	সত্যবাচী সর, হরিপদ দত্ত	মাতাপ্রসাদ জসওয়াল	সুবোধ চন্দ্র সরকার
২০০০-০১	প্রেমতোষ মজুমদার	সত্যবাচী সর, হরিপদ দত্ত	শুভব্রত মহাপাত্র	মাতাপ্রসাদ জসওয়াল
২০০১-০২	প্রেমতোষ মজুমদার	সত্যবাচী সর, শুভব্রত মহাপাত্র	হরিপদ দত্ত	অঞ্জন মুখার্জী
২০০২-০৩	জগদীশ কুন্ডু	শুভব্রত মহাপাত্র, হরিপদ দত্ত	সত্যবাচী সর	মাতাপ্রসাদ জসওয়াল
২০০৩-০৪	রবিনন্দ ভৌমিক	হরিপদ দত্ত, শিবপ্রসাদ ভট্টাচার্য	সত্যবাচী সর	মাতাপ্রসাদ জসওয়াল
২০০৪-০৫	রবিনন্দ ভৌমিক	হরিপদ দত্ত, নারায়ন রায়	দীপঙ্কর দে	মাতাপ্রসাদ জসওয়াল
২০০৫-০৬	রবিনন্দ ভৌমিক	হরিপদ দত্ত, নারায়ন রায়	দীপঙ্কর দে	শ্যামল বৈদ্য
২০০৬-০৭	রবিনন্দ ভৌমিক	হরিপদ দত্ত, নারায়ন রায়	দীপঙ্কর দে	শ্যামল বৈদ্য
২০০৭-০৮	প্রেমতোষ মজুমদার	হরিপদ দত্ত, দীপঙ্কর দে	মিহির লাল চ্যাটার্জী	দেবাশীষ ভট্টাচার্য
২০০৮-০৯	প্রেমতোষ মজুমদার	হরিপদ দত্ত, শুভব্রত মহাপাত্র	মিহির লাল চ্যাটার্জী	দেবাশীষ ভট্টাচার্য
২০০৯-১০	রবিনন্দ ভৌমিক	নারায়ন রায়, শুভব্রত মহাপাত্র	দেবাশীষ ভট্টাচার্য	সুবীর মজুমদার
২০১০-১১	রবিনন্দ ভৌমিক	নারায়ন রায়, শুভব্রত মহাপাত্র	শর্মিষ্ঠা ভট্টাচার্য হালদার	মধুমিতা চৌধুরী
২০১১-১২	প্রেমতোষ মজুমদার	নারায়ন রায়, নিলিমা চক্রবর্তী	প্রসেনজিৎ রায়	অঞ্জন বিশ্বাস
২০১২-১৩	প্রেমতোষ মজুমদার	দেবাশীষ ভট্টাচার্য, নিলিমা চক্রবর্তী	প্রসেনজিৎ রায়	শ্যামল দেবনাথ
২০১৩-১৪	রবিনন্দ ভৌমিক	শর্মিষ্ঠা ভট্টাচার্য হালদার, নিলিমা চক্রবর্তী	দেবাশীষ ভট্টাচার্য	সুবীর মজুমদার
২০১৪-১৫	রবিনন্দ ভৌমিক	স্বপ্না দাস, নিলিমা চক্রবর্তী	দেবাশীষ ভট্টাচার্য	জয়দীপ ভট্টাচার্য
২০১৫-১৬	রবিনন্দ ভৌমিক	স্বপ্না দাস, নিলিমা চক্রবর্তী	দেবাশীষ ভট্টাচার্য	জয়দীপ ভট্টাচার্য
২০১৬-১৭	রবিনন্দ ভৌমিক	শর্মিষ্ঠা ভট্টাচার্য হালদার, লিলিমা চক্রবর্তী	প্রসেনজিৎ রায়	জয়দীপ ভট্টাচার্য
২০১৭-১৮	রবিনন্দ ভৌমিক	শর্মিষ্ঠা ভট্টাচার্য হালদার, নিলিমা চক্রবর্তী	প্রসেনজিৎ রায়	জয়দীপ ভট্টাচার্য
২০১৮-১৯	প্রেমতোষ মজুমদার	শর্মিষ্ঠা ভট্টাচার্য হালদার, নিলিমা চক্রবর্তী	প্রসেনজিৎ রায়	জয়দীপ ভট্টাচার্য
২০১৯-২০২০	প্রেমতোষ মজুমদার	শর্মিষ্ঠা ভট্টাচার্য হালদার, নিলিমা চক্রবর্তী	জয়দীপ ভট্টাচার্য	রুনু ধর

এখন ২০২০ সালের মার্চ মাস। সামনের এপ্রিল মাসেই গণিত পরিষদের বার্ষিক পুরস্কার বিতরণী অনুষ্ঠান ও বার্ষিক সাধারণ সভা। আর সেজন্যই চলছে জোড় প্রস্তুতি। কিন্তু হঠাৎ করেই বাদ সাধল একটি অদৃশ্য জীবানু। সবকিছু যেন স্তব্ধ হয়ে গেল। সমগ্র বিশ্ব এক নিমেষে ঢুকে পড়ল চার দেওয়ালের মধ্যে। ছোট্ট একটি মারণ ভাইরাস, নাম করোনা। এর দাপটে কোভিড-১৯ অতিমারী দ্রুত ছড়িয়ে পড়তে লাগল। শুরু হল লকডাউন। চিকিৎসা বিজ্ঞানীদের কথায় এর থেকে রক্ষার উপায়গুলি হল— ১) সর্বদা মাস্ক ব্যবহার করা, ২) কিছুক্ষন পরপর সাবান দিয়ে হাত পরিস্কার রাখা ৩) হ্যান্ড স্যানিটাইজার ব্যবহার করা এবং ৪) সামাজিক দূরত্ব বজায় রাখা। এরকম পরিস্থিতিতে গণিত পরিষদের অনুষ্ঠান এপ্রিল মাসে হওয়া অসম্ভব। কবে হবে তাও অনিশ্চিত।

প্রত্যেক সংগঠনেরই কিছু কিছু সীমাবদ্ধতা থাকে। ত্রিপুরা গণিত পরিষদ ও তার ব্যতিক্রম নয়। গত চল্লিশ বছরে পরিষদের কোন স্থায়ী ঠিকানা বা অফিসঘর হয়নি। সমস্ত ধরণের কাজকর্ম, মিটিং, প্রভৃতি কারো না কারোর বাড়িতেই সারতে হয়। একটি লাইব্রেরী পর্যন্ত নেই। সমস্যাগুলির আশু সমাধান প্রয়োজন।

ত্রিপুরা গণিত পরিষদের ৪৮৪ জন আজীবন সদস্য-সদস্যা রয়েছেন (৩১ শে মার্চ ২০২০ পর্যন্ত)। সবাই যে এ রাজ্যের বাসিন্দা তা নয়। রাজ্যের বাইরে থেকেও অনেক সদস্য / সদস্যা সাধ্য মত যোগাযোগ রাখেন। সবার প্রচেষ্টা, উদ্যম ও আন্তরিক সহমর্মিতায় গণিত পরিষদ এগিয়ে চলেছে। কিন্তু আশংকার কথা নবীন প্রজন্মের সদস্যরা তেমনভাবে এগিয়ে আসছে না। ফলে কতিপয় সদস্যদের উপর কাজের চাপ বাড়ছে। বর্তমানে পরিষদের কার্যনির্বাহি কমিটি সহ অন্যান্য কাজকর্মে অল্পবয়সী, নবীন সদস্যদের এগিয়ে আসা খুব প্রয়োজন।

বিগত দিনগুলিতে ত্রিপুরা গণিত পরিষদের মুকুটে বেশ কিছু পালক যুক্ত হয়েছে। অনেক পুরস্কার ও সম্মানে ভূষিত হয়েছে যেমন, তেমনি বেশ কিছু কার্যকলাপের অগ্রগামি বা পথিকৃৎ ও বটে। অবসরকালীন ক্যাম্প, গণিত মেলা, গণিত ক্যুইজ, রামানুজনের জন্মদিনকে 'গণিত দিবস' হিসেবে পালন প্রভৃতি কর্মসূচি এদের অন্যতম। এহেন গণিত পরিষদের একজন আজীবন সদস্য ও সামান্যতম সৈনিক হিসেবে কাজ করতে পারার জন্য সকলের মতো আমিও অত্যন্ত আনন্দিত ও গর্বিত।

Report on the outcome of the
NATIONAL CONFERENCE ON VEDIC MATHEMATICS INCLUDING ANCIENT INDIAN MATHEMATICS (UP TO 1200 AD),

December 28-29, 2019

organized by the Tripura Mathematical society.

The proposal for organizing the "National conferenceon vedic mathematics including ancient indian mathematics (up to1200 AD)during December 28 - 29, 2019" was approved by the "the Extended Executive Committee Meeting of Tripura Mathematical Society" held on 19.07.2019.

The objective of the Tripura Mathematical Society(TMS) is follows:

1. Eradication of Mathematics phobia, if any, among learners.
2. To create interest about Mathematics among the learners
3. To inspire students to have joy of learning Mathematics.
4. To unfold beauties, excitement and fun in Mathematics.
5. Promotion and creation of awareness of Mathematics & Mathematical studies amongthe learners & teachers.
6. To identify a group of talents in mathematics.
7. To motivate teachers to have pleasure of teaching Mathematics.
8. Creation of research environment in Mathematics in Tripura.
9. To highlight rich Indian heritage and culture of Mathematical Sciences.

Tripura Mathematical Society, performed periodically the objective 9, to highlight rich Indian heritage and culture of mathematical sciences along with other objectives.

1. Seminar on History & Philosophy of Science — December 2-3, 1995
2. Seminar-cum-Workshop on Vedic Mathematics — April 22- 23, 2005
3. National Conference on Ancient Indian Mathematics — February 8-9, 2014

In December 2019 we have also organized thefollowing conference with partial support from CSIR.

4. National Conference On Vedic Mathematics Including Ancient Indian Mathematics (up to 1200 AD) — December 28-29, 2019

PLAN OF WORK

The organizer have planned to invite few renowned mathematicians from different parts of India and will bear their travel expenditure inside India to Agartala. Some renowned mathematicians from the country will also be invited and for the retired persons, travel cost will be included in the budget.

The main invited lectures of the conference will be common in the different topics of Vedic Mathematics and the Ancient Indian Mathematics, so that each and every participant can listen to their lectures.

The organizer have planned to have a session in the evening in which the participants, mainly students will get a chance to interact with the reputed mathematicians and will know about various prospects is the field of Vedic mathematics and its applications and scope for working with mathematicians from abroad.

There were 119 registered participants (along with some non-registered)which includes contributory participants talks and 20 Invited speakers from the country which includes the following reputed persons outside of Tripura:

1. Prof. Soma Basu, Rabindra Bharati University, Kolkata, West Bengal
2. Sri Ullash Narayan Behara, DRDO,Chandigarh, Punjab
3. Dr. Mata PrasadJaiswal, Uttar Pradesh
4. Dr. Satyabachi Sar, Kolkata, West Bengal.

There were several student speakers from different colleges and schools form Agartala also in the conference.

We invited moreInvited speakers from the reputed organizations from different parts of India, but they could not come due to lack of travel support.

The Conference was inaugurated by Prof. A. Saha, Ex VC, Tripura Central University and Vice-Chairman, Higher Education, Govt. of Tripura.

There were Prof. M.K.Sing, VC(acting) of Tripura University (Central) and Prof. S. Poddar, VC, MBBUniversity, Tripura graced the occasionas Guest of Honor.

In the inaugural address byHonorable Prof. A. Saha, Ex VC, of Tripura University, who talked about the importance of the Vedic Mathematics in every aspect of daily life and urged that its promotion is necessary for the benefit of the society. This conference is a step ahead in this direction and wished that there will be fruitful discussions and suggestion in the two days among the participants.

ACHIEVEMENTS OF THE SOCIETY

Since its inception, the members of the Tripura Mathematical Society motivated young talents of the North-East region, inparticularfrom Tripura, for perusing different activities in mathematics and its applications. We invited also reputed and renowned Mathematicians from the country and abroad as speakers in several occasion.

THE BENEFICIARIES

This National Conference invited reputed and renowned Mathematicians from the country for participation. As a result of which the students, young and enthusiastic researchers from the North-East region, in particular Tripura will get an exposure from them. During the conference they will get chance to interact with them, so that they will know not only about the thrust area of research but also about the scope and future prospect of mathematical science research in our country and abroad. This will help in motivating the young minds to build their future. They can avail the opportunities available in foreign Universities and Institutions.

EXPECTED OUT PUT

It is expected that the exposure to the national community will have greater impact in the future of the young of the North East region and the country as a whole. After the conference, when they return back to their respectiveplaces, they will be in regular touch with each other. Some of them will get a chance to have collaborate research work.

It is planned to bring out the talks and the papers presented in the conference in the form of a Proceeding. One of the school student participants asked, “Why Vedic Mathematics has not been included in the school syllabus?” In an answer to this question, it was replied that Government at the National level is thinking about such provision in future.This tells about the interest and impact about the theme of the Conference among the young generation of our country.

RECOMMENDATIONS.

The Valedictory function was organized on December 29, 2019 at 4.00 PM.In the valedictory function, the participants expressed their great satisfaction by attending such conference. At the end in the organizing committee meeting including the Invited speakers, it was decided that at frequent interval such type of Conferences (National or International) should be organized by the Tripura Mathematical Society. This will bring the mathematicians of Tripura,particularly the younger generation to the international and national level. They will get

exposure to the national/international community also.In this all participants were received Certificates from organizers.

Some of the photographs are attached here:

Part of the Participants

At the Dias on Inaugural Session

Group Photo of the Participants

DIFFERENT COMMITTEES OF THE NATIONAL CONFERENCE ON VEDIC MATHEMATICS including ANCIENT INDIAN MATHEMATICS (upto1200 AD)

December 28 - 29, 2019

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ARTICLES OF MATHEMATICAL INTEREST

THE GREAT BERNOULLI FAMILY

Dr. Premtosh Majumder
President
Tripura Mathematical Society
Ex. Controller of Examinations,
Tripura University

The first known member of the Bernoulli family was Leon Bernoulli. He was a doctor in Antwerp which at that time was a part of Spanish Netherlands in the early part of sixteenth century. His son Jacob migrated to Frankfurt, Germany in 1570 to escape from the Spanish persecution of the protestants. Jeacob's grandson, a spice trader also named Jacob moved to the free city of Basel, Switzerland in 1620 and was granted citizenship in 1622. Their family till now is not mathematics oriented, rather engaged in spice business. His son Nikolaus (or Nicolaus 1623-1708). Leon's great-great-grand son had four sons among of which Johann and Hieronymus became the progenitors of the greater and lesser branches of the family respectively. Two of them became the most influential mathematics experts in the academic community but hostile to each other. It is to be mentioned that many members of the Bernoulli family were bearing the same name.

Sons of Nikolaus were as follows :

1. The first son Jacob Bernoulli, also known as James (or Jacques) was born on Dec. 17, 1654. He was a great mathematician after whom Bernoulli numbers are named. He was the author of a text book named Ars Conjectandi on early probability theory. He was one of the earliest to realize how powerful as an instrument of analysis was the infinitesimal calculus and he applied it to several problems in his works.

Jacob Bernoulli's book "The Art of Conjecture" was published posthumously in 1713, consolidated existing knowledge on probability theory and expected values as well as adding personal contributions such as his theory of permutations and combinations, Bernoulli trials, Bernoulli distribution and some important elements of number theory, such as Bernoulli numbers sequence. He also published papers on transcendental curves and became the first person to develop techniques for solving separable differential equations – the set of non linear not solvable differential equations now named after him. He discovered polar co-ordinates – a method of describing the location of points in space using angles and distances. He was the first to use the word 'integral' to refer to the area under a curve.

Jacob Bernoulli also calculated the approximate value of the irrational number 'e' while exploring the compound interest on loans. If compounded at 100% interest annually, I dollar becomes 2 dollars after one year; when compounded semiannually it produces 2.25 dollars, compounded quarterly 2.44 dollars, monthly 2.61 dollars, weekly 2.69 dollars, daily 2.71 dollars etc. If it were to be compounded continuously then One dollar would tend towards a value 2.7182818…. dollars after a year, a value which become known as 'e'. Algebraically it is the value of the series …

$$\left(1+\frac{1}{1}\right)^1\left(1+\frac{1}{2}\right)^2\left(1+\frac{1}{3}\right)^3\left(1+\frac{1}{4}\right)^4\ldots$$

In 1655 John Wallis (1616-1703) used the symbol '∞' to represent infinity in his Arithmetica Infiniforum. But this was not used further until 1713 when James Bernoulli used it in his Ars Conjectandi. This sign was sometimes used by the Romans to denote the number 1000 and it has been conjectured that in later period led to its being applied to represent any large number.

2. The second son Nicolaus Bernoulli (1662 – 1716) was a painter and a municipal councillor of special dignity of Basel. He did not study mathematics like his other two brothers Jacob and Johann.

3. Johann Bernoulli was born at Bale on August 7, 1767 and died there on January 1, 1748. He is also known as Jean. He was a mathematician who adopted infinite simal calculus at its early stage. He did not do very well in the spice business. At the age of sixteen he entered the university of Bale and studied medicine. He requested his elder brother Jacob to teach him mathematics. After two years under the successful guidance and tutelage Johann become his equal. At first Jacob had no problem in teaching his younger brother Johann. As time went on, the Bernoulli blood began to boil. Johann's ego was getting larger for which he began to boast of his works and at the same time he belittled his elder brother Jacob. As a result the elder brother was so anger he made crude comments about Johann's abilities. Jacob referred to him as a student repeating what the teacher taught him in other words a parrot. Jacob and Johann went back and forth with comments in the academic community which developed a notorious reputation of their family togetherness.

Despite family problems, Johann was an excellent mathematician. He was however the most successful teacher of his age and had the faculty of inspiring his pupils with almost as passionate to zeal for mathematics as he felt himself. The general adoption on the continent of the differential rather than the fluxional notation was largely due to his influence. He used calculus to solve problems on the laws of gravitation which Newton failed to solve. By using different techniques he made many discoveries in calculus.

In 1695 Jacob was on the chair of mathematics in the university of Bale. Johann wanted that chair for himself but he was offered a chair in Holland. He promised not to come back to Bale. About 1705 Johann's father-in-law was in the dying condition. He expressed his last desire to see his daughter and grand children for the last time. So Johann decided to return to Bale. While travelling towards Bale Johann did not know that his elder brother Jacob died of tuberculosis. Once he realized of his brothers death, Johann took the chair of his elder brother.

Johann received a taste of his own medicine though when his student Guillaume de l'Hospital published a book in his own name consisting almost entirely of Johann's lectures, including his now famous rule about $0 \div 0$, a problem which had dogged mathematicians since Brahmagupta's (598-670) initial work on the rules for dealing with zero back in the seventh century. This showed that $0 \div 0$ does not equal zero, does not equal 1, does not equal infinity and is not even undefined but is indeterminate, meaning it could be equal to any number. The rule is still usually known as l'Hospital's rule and not Bernoulli's rule.

Despite their competitive and combating personal relationship both the brothers Jacob and Johann had a clear aptitude for mathematics at a very high level and constantly challenged and inspired each other. They established an early correspondence with Gottfried Wilhelm Leibnitz (June 21, 1646 – Nov. 14, 1716) and were among the first mathematicians to not only study and understand infinitesimal calculus but to apply it to various problems. They became instrumental in disseminating the newly discovered knowledge of calculus and helping to make it the cornerstones of mathematics it has become to-day.

But they were more than just disciples of Leibnitz and they made their own important contributions also. One well known and typical problem of the day to which they applied themselves was that of designing a sloping ramp which would allow a ball to roll from the top to the bottom in the fastest possible time. Johann Bernoulli demonstrated through calculus that neither a straight line nor a curved ramp with a very steep curved ramp known as brachistochrone curve, a kind of upsidedown cycloid, similar to the path followed by a point on a moving bicycle is the curve of quickest descent. This application was an example of calculus of variations, a gerneralisation of infinitesimal calculus that the Bernoulli brothers developed together and has since proved useful in fields as diverse as engineering, financial investment, architecture and construction and even space travel.Johann also derived the equation of catenary curve such as that formed by a chain hanging between two posts, a problem presented to him by his elder brother Jacob.

In the interval between 1677 and 1704, the Leibnitzian calculus had been developed into an instrument of real power and easy applicability on the continent

largely through the efforts of Jacob and Johann Bernoulli's while in England owing to Newton's reluctance to share his mathematical discoveries freely the calculus was still a relatively untried curiosity.

4. Hieronymus Bernoulli (1669 – 1760) : Much is not known about him. It is speculated that he was engaged in looking after the spice business of the family instead of practicing mathematics.

In addition to Jacob and Johann the Bernoulli family of mathematicians is generally taken to include (i) Nicolaus I Bernoulli (1687 – 1759), son of Nicolaus was a Mathematician who worked on curves, differential equation and probability theory. He was the originator of St. Petersburg Paradox.

(ii) Nicolaus II Bernoulli (1695 – 1726) was the son of Johann. He lived for a very short period. He could not show his brillince. (iii) Daniel Bernoulli, son of Johann was born on 7th Feb., 1700 and died on 17th March, 1787 in Bale. Johann was determined to make Daniel a merchant. He tried to Convince Daniel that there is no money in mathematics. Daniel was a natural philosopher who applied mathematics in his works. Like a Bernoulli, Daniel did not want to study business of course Johann's stubbornness made Daniel to study medicine and he applied mathematical physics to it for which he received a medical doctorate. He also developed the theory of hydrodynamies. He analysed the flow of water from a hole in a container. He developed Bernoulli equation which defines a relation between pressure and density of a fluid at a point. He was the first person to realize the concept of expected utility of resolving the St. Petersburg paradox. Daniel travelled to Danzig, Humburg, Holland and Paris. He worked mostly in venice and St. Petersburg. He requested his father Johann to come home. But his father denied. Instead he sent his best student Leonhard Euler (1707-1783) to work with him. Euler was contemporary to Daniel and became a very good friend. Euler is regarded as one of the best mathematicians of all times. Daniel and Eular worked together in St. Petersburg on the vibration and frequency of sounds by using musical instruments. In 1734 Daniel returned to Bale and entered a contest in Paris Academy for his ideas on astronomy. His father, Johann also entered at the same time and they jointly won the Grand Prize. Johann's ego could not stand being pronounced as an equal to his son. So he banned Daniel from his house. Johann went still further. He stole one of Daniel's papers and submitted the same in his name. At one point Johann published a book, based on Daniel's work even changing the date to make it look as though his book had been published before his son's. Daniel's earliest mathematical work was the "Exercitations" published in 1724 which contains the solution of the differential equations proposed by Riccali. Two years later, he pointed out for the first time the frequent desirability of resolving a compound motion into motions of translation and

motions of rotation. His chief work is his "Hydrodynamica" published in 1738; it resembles Lagranges' Macanique Analytique in being arranged so that all the results are consequences of energy. This was followed by the memoirs of Euler and Maclaurin, a prize was awarded by the French Academy; these three memoirs contain all that was done, on this subject between the publication of Newton's principia and the investigations of Laplace. Danial also wrote a large number of papers on various mechanical questions especially on problems connected with vibrating strings and the solution given by Taylor and D'Alembert. He is the earliest writer who attempted to formulate a kinetic theory of gases and he applied the idea to explain the law associated with names of Boyle and Mariotte.

Several more later prominent scholars from Bernoulli family are also descendent from the family include the following :

1. Johann Jacob Bernoulli (1831 – 1913) was an art historian and archaelolgist. He was noted for his Romische Ikonographic 1882 onwards on Roman imperial portraits.
2. Elisabeth Bernoulli (1873 – 1935) was a strong supporter of women's voting right. She was a campaigner against alcoholism.
3. Hans Bernoulli (1876 – 1959) was an architect and designer of the Bernoulli hauser in Zurich.

The surname survives in Switzerland with ten entries in the whitepages for the city of Basel as of 2018.

Probably the most striking case history is that of the Bernoulli family which is three generation produced eight mathematicians, several of them outstanding who inturn produced a swarm of descendents about half of whom were gifted above the average and nearly all of whom, down to the present day, have been superior human beings. No fewer than 120 of the descendants of the mathematical Bernoulli's have been traced geneologically and of this considerable posterity the majority achieved distinction - sometimes amounting to eminence in the law, scholarship, science, literature, the learned professions, administration and the arts. None were failures. The most significant thing about a majority of the mathematical numbers of this family in the second and third generations, is that they did not deliberately choose mathematics as a profession but drifted to it out of very strong attraction. As the Bernoulli family played a leading part in developing the calculus and its applications in the seventeenth and eighteenth centuries, they must be given more than a passing mention in even the briefest amount of the evolution of modern mathematics. The Bernoulli family is unique of its kind. The world of mathematics will be emensly benefited and developed by the emergence of such families.

On St. Petersburg Paradox :

A statement which is apparently self contradictory but is at bottom true is called a parax. Some examples of paradoxes are D'Alembert paradox in hydrodynamics, Russell, cantor, Burali-forti Paradoxe, in set theory.

Since its inception probability theory has provided key insight for those interested in quantifying risk. It has allowed statisticians, actuaries and others to collect statistics in the real world and then make useful inferences regarding the underlying distribution being sampled. The St. Petersburg Paradox in a famous probability paradox discussed in a series of letters in 1713 by Nicolaus Bernoulli. It is related to the game of gambling. In it the gambler flips a coin until he receives his first tail or head as the case may be. The distribution of how many flips it will take follows a geometric distribution with probability one half. The paradox is created due to the fact that the person offering this game to the gambler will have to pay out two dollars for the first flip and then twice as much for each successive flip required. By multiplying every outcome by its corresponding probability the expected value is

$$2\left(\frac{1}{2}\right)+4\left(\frac{1}{2}\right)^2+8\left(\frac{1}{2}\right)^3+\ldots\ldots+2^n\left(\frac{1}{2}\right)^n+\ldots\ldots$$

$$= 1 + 1 + 1 + \ldots\ldots = \infty$$

The paradox arises from the discrepency between the expected value often thought of as the fair value for a game in probability theory and the one experienced in practice. Clearly this game is not worth an infinite amount to the gambler since he is unlikely to receive more than a modest gain and certainly a finite one. Many researchers modelled the sample distribution of St. Petersburg Paradox mean. The researchers are dealing with the problem from different angles of view.

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THREE WOMEN CREATE HISTORY IN MATHEMATICS

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INTRODUCTION

We know that there is no Nobel Prize in mathematics. But for decades, the most prestigious awards in mathematicsare the **Fields Medals**, and **Abel Prize.**

John Charles Fields of Canada, proceeded with the planningthe award of medal in Mathematics, but died in 1932. Just before his death, he made a will funding an amount for the medal.First the medal was awarded in 1936, it was reintroduced in 1950 for those who are 40 or younger and has been awarded every four years. ***Maryam Mirzakhani*** was the only woman to receive a **FIELDS MEDAL in 2014**.

The **ABEL PRIZE** recognizes contributions to the field of mathematics that are of extraordinary depth and influence. It is presented annually in Oslo by the Norwegian Academy of Science and Letters. **Karen Keskulla Uhlenbeck** is the first woman awarded the **Abel prize in 2019**.

The **SHANTI SWARUP BHATNAGAR PRIZE** is announced every year on 26 September to celebrate the Council of Scientific and Industrial Research's Foundation Day. This prize is given out to recognize a handful of scientists and researchers across many disciplines for having made outstanding contributions to science and technology in India. **Dr. Neena Gupta** of ISI, Kolkata, has createdhistory by becoming youngest recipient of the **Shanti Swarup Bhatnagar Award** in Mathematical Sciences, the **Highest Honour in Indiain 2019.**.

1. K. K. Uhlenbeck, First woman to win the Abel Prize in 2019

His Majesty King Harald V awarded the **Abel Prize** for 2019 to **Karen Keskulla Uhlenbeck**, the laureate at the award ceremony in Oslo on the 21st of May 2019, for her pioneering achievements in geometric partial differential

The woman behind the numbers

Karen Keskulla Uhlenbeck at Princeton University as

equations, gauge theory and integrable systems, and for the fundamental impact of her work on analysis, geometry and mathematical physics.

The recognition of Uhlenbeck's achievements should have been far greater, for her work has led to some of the most important advances in mathematics in the last 40 years."

Today, Uhlenbeckis Senior Research Scholar well as Visiting Associate at the Institute for Advanced Study (IAS). She is one of the founders of the Park City Mathematics Institute at IAS, which aims to train young researchers and promote mutual understanding of the interests and challenges in mathematics.

> ***"The recognition of Uhlenbeck' sachievements should have been far greater, for her work has led to some of the most important advances in mathematics in the last 40 years." – Jim Al-Khalili, Royal Society Fellow.***

As a child, she loved reading and dreamed of becoming a scientist.She is alsothe co-founder of the Institute's Women and Mathematics program (WAM), created in 1993 to recruit and empower women to lead in mathematics research at all stages of their academic careers.

"Karen Uhlenbeck receives the Abel Prize 2019 for her fundamental work in geometric analysis and gauge theory, which has dramatically changed the mathematical landscape. Her theories have revolutionized our understanding of minimal surfaces, suchas those formed by soap bubbles, and more general minimization problems in higher dimensions." – *Hans Munthe-Kaas, Chair of the Abel Committee.*

She is also the co-founder of the Institute's Women and Mathematics program (WAM), created in **1993** to recruit and empower women to lead in mathematics research at all stages of their academic careers.As Dr. Uhlenbeck, she was a role model for women who followed her in mathematics.

Filling the analyst's toolbox : Uhlenbeck developed tools and methods in global analysis, which are now in the toolbox of every geometer and analyst. Her work also lays the foundation for contemporary geometric models in mathematics and physics.

Karen Keskulla Uhlenbeck has become the first woman to be awarded the Abel Prize, one of the world's most prestigious international mathematics awards.The jury cited Keskulla Uhlenbeck's 'fundamental work in geometric analysis and gauge theory which has dramatically changed the mathematical landscape'. Dr. Uhlenbeck helped pioneer geometric analysis, developing techniques now commonly used by many mathematicians.

Karen Uhlenbeck published many of her major papers in her late 30s and ***received a MacArthur Fellowship in 1983.*** In 1983, at 41, she received broader recognition with a MacArthur Fellowship, which comes with a bundle of money- $204,000

ABEL PRIZE

The Abel Prize, named after the Norwegian mathematician Niels Hendrik Abel, is set up in 2003. Since 2003, it has been given out annually to highlight important advances in mathematics. The previous 19 laureates — in three years, the prize was split between two mathematicians.

In spite of his short life (aged 26 years), he made significant contributions to a variety of mathematical fields.The prize,seen by many *as the Nobel Prize in mathematics*, was first awarded in 2003 to honor the 19th-century Norwegian mathematician Niels Henrik Abel.It has been awarded to 19 laureates till now.

The Abel Prize recognizes contributions to the field of mathematics that are of extraordinary depth and influence. It is presented annually in Oslo by His Majesty King Harald V, and is administered by the Norwegian Academy of Science and Letters on behalf of the Norwegian Ministry of Education and Research.

The prize award was worth 6 illionm Norwegian kroner ($704,000).

Some of Abel's Work

Niels Henrik Abel

(5.8.1802–6.4.1829)

Abel equation, Abel function, Abel's identity, Abel's inequa -lity; Abel's test, Abel's theorem, Abel transform, Abel trans- formation, Abel's binomial theorem, Abelian category ,Abel- ian variety, Abelian extension, Abelian group, Abel's irreducibility theorem, Abel–Jacobi map, Abel–Plana formula, Abel–Ruffini theorem, Abelian means,Abel's summation formula, Abelian and tauberian theorems' Abelian variety, Dual abelian variety.

The Norwegian Academy of Science and Letters announced it has awarded this year's Abel Prize — to Karen Uhlenbeck, an emeritus professor at the University of Texas at Austin. The award cites "the fundamental impact of her work on analysis, geometry and mathematical physics."

"She did things nobody thought about doing,and after she laid the foundations of a branch of mathematics" said Sun-Yung Alice Chang, a five-member prize committee.

Dr. Uhlenbeck described the complex shapes of soap films not in a bubble bath but in abstract, high-dimensional curved spaces. In later work, she helped put a rigorous mathematical underpinning to techniques widely used by physicists in quantum field theory to describe fundamental interactions between particles and forces.

In her early work, Dr. Uhlenbeck essentially figured out the shape of soap films in higher-dimensional curved spaces. This is an example of what mathematicians call optimization problems, which are often very difficult and can have zero solutions, one solution or many solutions.

"You can ask a question of when you have a soap bubble in this *n*-dimensional space," she said. "You don't know ahead of time what the shapes of those minimal soap bubbles are going to be."

With soap films and bubbles - two-dimensional surfaces in a three-dimensional space - the problem starts to get more complicated.

To minimize the forces of surface tension, a bubble forms in the shape with the least amount of area to wrap around a given volume-a sphere. When two or more bubbles touch each other or when a soap film forms inside of a twisted metal loop, the shapes become more complicated but still contort to take up the smallest amount of area.Inhigher dimensions, the theory becomes dramatically harder, and standard techniques just don't work.

2. Maryam Mirzakhani, only woman to receive a FIELDS MEDAL in 2014.

Maryam Mirzakhani,an Iranian Mathematics professor at Stanford University in California, was named the first female winner of the Fields Medal. A woman has won the world's most prestigious mathematics prize for the first time since the award was established nearly 80 years.

Maryam Mirzakhani

(12.05.1977-14.7.2017)

Most of the problems Mirzakhani works on involve geometric structures on surfaces and their deformations. She has a particular interest in hyperbolic planes, which can look like the edges of curly kale leaves, but may be easier to crochet than explain. According to a citation released by the International Mathematical Union, Mirzakhani won the prize for her "outstanding contributions to the dynamics and geometry of Riemann surfaces and their moduli spaces".

The following fourMathematicians(one Indian origin) were awardedFIELDS MEDAL in 2004

1. Maryam Mirzakhani

2.Hairer won for his "outstanding contributions to the theory of stochastic partial differential equations".

3. Avila was honoured for his "profound contributions to dynamical systems".

4. **Manjul Bhargava** won for "developing powerful new methods in the geometry of numbers", including elliptic curves used in cryptography.

Born and raised in Iran, Mirzakhani completed a PhD at Harvard in 2004. Her path into mathematics was not a given, though. As a child, her passion was not for numbers, but literature. Her school in Tehran was near a street full of bookshops and because browsing was not allowed, she ended up buying a lot of random books. "I dreamed of becoming a writer," she said in an interview for the Clay Mathematics Institute (CMI) in 2008."I never thought I would pursue mathematics before my last year in high school."

It was Mirzakhani's brother who first piqued her interest in science. He used to come home from school and talk over what he had learned. He told her the story of the German mathematician, Carl Friedrich Gauss, who displayed his precocious skills as a schoolboy when he worked out in seconds how to sum all the numbers from 1 to 100. (The answer is 5,050 and the trick is to look at pairs that add up to 101.) "That was the first time I enjoyed a beautiful solution, though I couldn't find it myself," **she said.**

The seed that had been sown began to germinate, with help from her school principal, a strong-willed woman who made every effort to ensure her students had the same opportunities as the boys. As a teenager, Mirzakhani took part in international Mathematical Olympiads and won gold medals in 1994 and in 1995. In the first, in Hong Kong, she dropped a single point. At the latter, in Toronto, she finished with a perfect score.

FIELDS MEDAL

Fields Medal

John Charles Fields,of Canada, proceeded with the planningthe award of medal in Mathematics, but fell ill in May of 1932 and died in August. Just before his death, he made his will funding an amount of $47,000 for the medal.First awarded in 1936, the **medal** was reintroduced in 1950 and has been awarded every four years since.

John Charles Fields

14.05.1863 -9.8.1932

The prize, worth 15,000 Canadian dollars (£8,000), is awarded to exceptional talents under the age of 40 once every four years by the International Mathematical Union. Between two and four prizes are announced each time.

There have been 55 Fields medallists since the prize was first awarded in 1936, including this year's winners.

To the Mathematical community of qualified minds, she has a breathtaking scope, is technically superb and boldly ambitious. She describes the language of Mathematics as full of "beauty and elegance".

Mirzhakhani, 37, was among a number of women tipped for the prize in recent years and her success won immediate praise from fellow mathematicians.

Later, as a student at Sharif University, she befriended inspiring mathematicians and found that the more time she spent on the subject, the more excited she became. Then, at Harvard, she began to work with another Fields medalist, Curt McMullen, and became fascinated with how he made mathematics so simple and elegant.

Most of the problems Mirzakhani works on involve geometric structures on surfaces and their deformations. She has a particular interest in hyperbolic planes, which can look like the edges of curly kale leaves, but may be easier to crochet than explain. According to a citation released by the International Mathematical Union, Mirzakhani won the prize for her "outstanding contributions to the dynamics and geometry of Riemann surfaces and their moduli spaces".

"I can see that without being excited, mathematics can look pointless and cold. The beauty of mathematics only shows itself to more patient followers,"- she said.

"I hope that this award will inspire lots more girls and young women, in this country and around the world, to believe in their own abilities and aim to be the Fields medalists of the future."

Fields medallist, who will surely be the first of many, will put to bed many myths about women and mathematics, and encourage more young women to think of mathematical research as a possible career".

Although women have contributed to mathematics at the highest level for a long time, this fact has not been visible to the general public.

3. Neena Gupta,Youngest Women Mathematician Creates History in India

Dr Neena Gupta ,of ISI, Kolkata has createdhistoryby becomingyoungest recipient of **the prestigious SHANTI SWARUP BHATNAGAR AWARD** in Mathematical Sciences, the **Highest Honour in India**, at the age of 35 for having solved a 70-year-old mathematics puzzle called the **Zariski Cancellation Problem**.

She is **the third womanin Mathematics to win** the honour till date.

Neena Gupta

*"Maths is for somebody who can solve the problems on their own. The pleasure which I get in solving problems in mathematics is much more than*any award,"

– Dr. Neena Gupta.

She expressed gratitude to her mother Gyanlata Gupta who taught her Mathematics till Class X. Dr. Gupta said that she never secured full marks but she loved mathematics and to spend hours solving problems. Dr. Gupta did her schooling from Khalsa Model Senior Secondary School, Dunlop, Kolkata. She graduated with honours in Mathematics from Bethune College, Kolkata, in 2006.

She did her P.G. in Mathematics from ISI in 2008 and subsequently did her Ph.D. degree in 2011 with algebraic geometry as her specialization, under the guidance of Prof. Amartya Kumar Datta, ISI, Kolkata. She also thanked her husband who is from IISc., Bangalore, for understanding her relationships with Mathematics.

Dr. Neena Gupta also received the following prizes:

1. Birla Science Prize in Mathematics (2017),

2. The Ramanujan Prize from the University of Madras (2014)

3. Saraswathi Cowsik Medal in 2013, awarded by TIFR Alumini Association

4. Indian National Science Academy–Young Scientist Award in 2014 for her

work on the Zariski Cancellation Problem, soon after she first published her research paper on it in 2014.

The **Zariski Cancellation Problem** is a 70-year-old algebraic problem. In recent years, Dr Gupta has provided solutions to two open problems in mathematics – one, posed by Oscar Zariski (1899-1986), one of the founders of modern Algebraic Geometry. Gupta describes these open mathematical conjectures as problems which can be easily explained to mathematicians but are very difficult to solve. The 'Zariski Cancellation Problem', which has earned

Gupta the SSB AWARD, has intrigued mathematicians around the globe ever since a version of it was proposed by O Zariski in 1949.

Dr. Gupta's field of research is Commutative Algebra and Affine Algebraic Geometry. Commutative algebra, apart from being a beautiful subject, provides a base over which a vast body of pure mathematics develops, Algebraic Geometry being one of the primary ones.

SHANTI SWARUP BHATNAGAR AWARD

This particular problem had remained open for about 70 years, before Dr. Gupta finally provided a complete solution to it in positive characteristic, in 2014.

The Shanti Swarup Bhatnagar Prize is announced every year on 26 September to celebrate the Council of **Scientific and Industrial Researc**h's(**CSIR**) Foundation Day. This prize is given out to recognize a handful of scientists and researchers across many disciplines for having made outstanding contributions to science and technology in India. The awards are given out across seven categories, and include a citation, a commemorative plaque, a cash prize of Rs 5 lakh, and additionally, an endowment of ₹ 15,000 per month up to the age of 65 years.

Who is Shanti Swarup Bhatnagar?

Dr Shanti Swarup Bhatnagar **was the Founder Director and the first Director-General of CSIR** and is considered to be **"**the Father of research laboratories**in India.** He gotthis moniker for having established twelve nationally-recognized laboratories over the course of his lifetime.

The Shanti Swarup Bhatnagar Award for Science and Technology is an award in India for the following seven disciplines, namely:

1. Biological Sciences
2. Chemical Sciences
3. Earth, AtmosphereOcean and Planetary Sciences
4. Engineering Sciences
5. Mathematical Sciences
6. Medical Sciences
7. Physical Sciences.

Each discipline may have multiple winners (maximum 2 individuals if required).

The prize recognizes outstanding Indian work in science and technology. It is the most coveted award in multidisciplinary science in India. The award is named after the founder Director of the CSIR, Shanti Swarup Bhatnagar. It is awarded since 1958. Any citizen of India engaged in research in any field of science and technology up to the age of 45 years is eligible for the prize.

Names of candidates are proposed by a member of the governing body of CSIR, Vice-Chancellors of universities or institutes of national importance, and deans of different faculties of science and former awardees. Selection is made by the Advisory Committee constituted each year and necessarily consists of at least six experts including at least one former Bhatnagar Awardee in the respective discipline. If two nominees are unanimously recommended in the same field because of equal merit, both are awarded.

Till 2019, there have been 547 Bhatnagar awardees, out of which, only 17 are women. "There needs to be social awareness so that people start sending their girl child for higher education,"

References : Different News papers and websites.

KERALA SCHOOL OF MATHEMATICS, JYESTHADEVA AND YUKTI-BHASA

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I. India has a glorious past and great heritage in the field of mathematics. It is one of a few civilizations where mathematics flourished even in very early stage of civilization. The whole world owes to India for its invaluable works in mathematics in many fields at different periods of time. Indian mathematics as a whole may roughly be divided into a few periods such as

(i) Pre-Vedic period	(before 1900 B. C.)
(ii) Vedic period	(1900 B. C. – 800 B. C.),
(iii) Period of Sulva sutras	(800 B. C. – 200 B. C.)
(iv) Period of Jaina Mathematics	(500B.C.–400 A. D.)
(v) Classical period	(400 A.D.–1200A.D.).
(vi) Medieval period	(1200 A.D. – 1800 A.D.)
(vii) Modern period	(1800 A.D. and onward)

We are concerned here with Kerala School of Mathematics which belonged to medieval period. Jyesthadeva was an eminent mathematician in this period and Yukti-bhasa was his immortal work.

It is a matter of great regret that some Western historians of mathematics are reluctant to give proper credit to the mathematicians belonging to Kerala School of Mathematics and to their splendid discovery, especially in the field of infinitesimal calculus. Boyer writes in the book 'A History of Mathematics', 'Bhaskara is the last significant medieval mathematician from India'. Eves, Kline, Kaye, Arka Somayaji, too, made similar remark stating that no progress was virtually made in India after Bhaskara II (1115 – 1185). On the contrary, G. G. Joseph believes that the mathematics produced by Kerala School was neither

trivial nor elementary in any sense. He further says, 'The beginning of modern mathematics is usually seen as a European achievement but discoveries in medieval India between fourteen century and sixteen century have been ignored or forgotten'. Indeed, 'From early times there had been in Kerala, substantial academic activities, as evidenced by centres of learning, reference to scholars, and profuse writing produced and preserved in the form of manuscripts. It is worth noting that apart from the religious and scholarly outlook of the elite society, the factors which additionally facilitated scholars to pursue their studies in peace and tranquility included the geographical situation of the narrow strip of land that formed Kerala, as sequestered between the Arabian Sea and the Sahya range of mountains, at the extreme south of India, unaffected by foreign invasions and political turmoil that disturbed other parts of India'.

Also, D.T. Whiteside of Cambridge, the editor of sixth volume of mathematical papers of Sir Isaac Newton (1642–1727) (in Vol. II, p.237, footnote 122) admits the priority of works of the Kerala School to works of Newton. J. Hofmann of Germany and A.P. Yushkewitch of the then USSR are also two historians of mathematics who have acknowledged the credit of works of the Kerala School. M.S. Rangachari rightly remarked, 'The seeds of modern mathematical analysis were sown in our soil at least two to three centuries earlier to the ideas of the subject in the Western world'. According to C. S. Seshadri , 'It is remarkable that the work of Kerala School of mathematics during 14^{th}–16^{th} centuries already anticipates the development of infinitesimal calculus, achieved independently by Leibniz and Newton in 17^{th} century'.

The Kerala School of mathematics flourished from fourteen century to eighteenth century. But it has been an unwritten story of achievement without the effort of C.M. Whish. Only of late, it has come to light that the Kerala School of Mathematics discovered some very important results in calculus much earlier than the discoveries as credited in the names of the Western mathematicians. In 1832, a British civil servant C.M. Whish read a paper to a joint meeting of Madras Literary Society and the Royal Asiatic Society. This paper appeared in 1834 in Transaction of Royal Asiatic Society of Great Britain and Ireland under the heading 'On the Hindu Quadrature of the Circle, and the infinite Series of the proportion of the circumference to the diameters exhibited in the four sastras, the Tantra Sangraham, Yucti Bhasa, Canara Padhati, and Sadratnamala'. [Interested readers can go through the full content of Whish's memoir, which is

available in 'Appendix' of Ref. [2] (pp. 195 – 211)]. Whish pointed out that Hindus had known ideas attributed to Newton and other European mathematicians much earlier. According to him the Kerala mathematicians had 'laid the foundation for a complete system of fluxions' and these works abounded 'with fluxional forms and series to be found in no work of foreign countries'. About a century later his article came to the notice of C.T. Rajagopal and his associates. In a series of articles they highlighted the works of mathematicians of the Kerala School. This encouraged scholars and researchers for further investigation and helped people to know about wonderful discoveries of scholars of Kerala School of Mathematics.

Kerala School of Mathematics was pioneered by Madhava of Sangamagrama (c. 1340–1425**)**. He was considered to be the founder of Kerala School of Mathematics. Other notable scholars were Narayana Pandit (c.1340 – 1400); Paramesvara (c.1370–1460) , Damodara (c.1400 – 1500) , Nilakantha Somayaji (c.1444–1545) , Jyesthadeva (c. 1500–1600), Chitrabhanu (c.1475– 1550) , Sankara Variar (c. 1500–1560 **)**, Achyuta Pisarati (c.1550 – 1621) , Narayana Bhattathiri **(**c.1559 – 1645), Putumana Somayaji (c.1660-1740) and Sankara Barman(1774–1839).

The mathematical works of importance of the Kerala School includes 'Golavada','Madhyamanayanapra-kara', 'Lagnaprakarana', 'Venvaroh', 'Sphutacandrapti', 'Aganitagrahachara' of Madhava , 'Tantra Sangraha' (c.1500) and 'Aryabhateeya bhasya' of Nilakantha, 'Yukti-bhasa' (c. 1530) of Jyesthadeva, 'Kriyakramakari', (c.1535), which is a commentary on Lilavati of Bhaskara II ,and 'Yuktidipika', which is a commentary of Tantra Ssangraha of Sankara Variar, 'Karana Paddhati' of Putuman Somayaji, and 'Sadratnamala' of Sankara Barman.

The significant discoveries of the Kerala School include the power series for $\tan^{-1}x$, power series for ð, a number of rational approximations to ð, power series for sine and cosine, approximation of sine and cosine functions, besides extension of earlier works, especially of Aryabhata (476–550) and Bhaskara II (1114–1185). It is worthy to mention here the celebrated remark of G.G. Joseph: 'In Kerala the period between fourteenth and sixteenth centuries marked a high point in the indigenous development of astronomy and mathematics'.

II. Jyethadeva was a pupil of Damodara. He was a younger contemporary of Nilakantha Somayaji. Achyuta Pisharati was a pupil of

Jyecmhadeva. He was a Nambuthri belonging to the Parangngottu family. Parangngottu, the family house of Jyecmhadeva, still exists in the vicinity of Trikkandiyur and Alathiyur. The Y*ukti-bhasa* is a major treaties written by Jyesthadeva. It is composed in the Malayalam, the spoken language of Kerala. This is in contrast to the centuries-old Indian tradition of composing scholarly works in the Sanskrit . Moreover, the work is not in verse but is in prose, again in contrast to the prevailing style of writing. It is self-contained and provides reasons and justifications for all results cited.

The power series of $\tan^{-1} x$ is given by

$$\tan^{-1}x = x - x^3/3 + x^5/5 - x^7/7 + \ldots\ldots\ldots\ldots \quad (1)$$

One may note that this series is called as 'Gregory series' after the name of James Gregory (1638–1675) who derived it in 1667. But it should have been termed 'Madhava series', as the original discoverer is Madhava. It is to be further noted that Jyesthadeva stated that the relevant series was discovered by Madhava. It is equivalent to (1). In Yukti-bhasa his description is 'a remarkable passage describing it'. When the relevant verse given by Madhava, as described by Jyesthadeva, is translated into English, it may be stated as follows:

'The product of given sine and radius divided by the cosine is the first result. From the first (and then the second, third, …. etc.) results, obtain (successively) a sequence of results by taking the square of the sine as the multiplier and square of the cosine as the divisor. Divide (the above results) in order by the odd numbers 1, 3, 5, ….. etc. to get the (full sequence of) terms. From the sum of the odd terms, subtract the sum of the even terms. (The result) becomes the arc. In this connection, it is laid down that the (sine) of the arc of (that of) its compliment, whichever is smaller, should be taken here (as the 'given sine'); otherwise, the terms obtained by the (above) repeated process will not tend to a vanishing magnitude.'

When it is expressed in mathematical notation, we get

$$r\theta = r(r\sin\theta)/1.(r\cos\theta) - r(r\sin\theta)^3/3.(r\cos\theta)^3 + r(r\sin\theta)^5/5.(r\cos\theta)^5 - \ldots. \quad (2)$$

which on simplification reduces to

$$\theta = \tan\theta - \tan^3\theta + \tan^5\theta - \tan^7\theta + \ldots\ldots\ldots\ldots\ldots \quad (3)$$

and writing $\tan\theta = x$ in (3) we get (1).

III. Ganita – Yukti –Bhasa (Rationales in Mathematical Astronomy), popularly known as Yukti-bhasa, was composed intentionally as a manual of proofs. The very purpose of writing the book was to record in full detail the rationale of the various results of mathematics and astronomy discovered by the scholars of Kerala School of Mathematics, especially by Madhava and Nilakantha. An

English translation of Yukti-bhasa by late K.V. Sarma has been published in two volumes. Each volume contains English translation along with explanatory notes of each chapter. The first volume contains mathematics, consisting of seven chapters and the second volume contains astronomy, consisting of eight chapters.

It is a highly instructive treatise which elucidates lucidly the rationale of mathematics and astronomy as it was understood and explained in South India during the middle ages. Its author Jyesthadeva has couched the work in Malayalam, the language of Kerala and which of importance that the work has been popular in the land for four hundred years. There are at least two unique aspects of Yukti-bhasa. 'First unlike the usual texts in mathematics and astronomy which are written in Sanskrit, Yukti-bhasa is written in the local language Malayalam, besides, it is in the form of an expository text which includes detailed explanations and proofs of various results'.

In Astronomy Kerala School followed the school of Aryabhata (476 – 550) and in Astrology the school of Varahamihira (c. early sixth century). From seventh century onwards, Kerala has remained the follower of Aryabhatan school of Astronomy. The discipline flourished under royal patronage and assiduously followed by the Namputiri Brahmins of Kerala.

Among the texts of Kerala Yukti- bhasa is certainly an important work. Its main aim is to present the rationale of the theories involved in the constants and computations occurring in Tantra Sangraha. And we know that Tantra Sangraha is an important work of Nilakantha Somayaji.

It has been mentioned earlier that Yukti- bhasa consists of two parts: Mathematics and Astronomy. Let us now first see what are the main subjects of Part I (Mathematics). These are as follows:

I. Parikarma (Logistics)
II. Dasaprasna (Ten problems involving logistics)
III. Bhinnaganita (Fractions)
IV. Trirasika (Rue of three)
V. Kuttakara (Pulverisation)
VI. Paridhi-vyasa (Relation between circumference and diameter)
VII. Jyanayana (derivation of R sine)

To understand the importance and impact of Yukti-bhasa we are going to add only a few words about one chapter (Chapter VI) of the above mentioned subjects. In this chapter we find several formulas for determining the circumference of a circle of a given diameter. Here we find different summations of the series and demonstration of the derivation of those series. It is of great interest that C. T. Rajagopal and his associates have worked out , in terms of modern mathematics, the series and different formulae enunciated in Yukti-bhasa and shown that 'these are much prior to the discoveries made more than a century later by the Western scientists, James Gregory (1671), G. W. Leibnitz (1673) and Isaac Newton (1670)'.

Further to have some flavour of mathematical part of Yukti-bhasa we reproduce some portion from chapter II (ten problems involving logistics) below:

Let a and b be two numbers, and, for convenience, let us assume that $a \geq b$.

Let $p = a + b$, $q = a - b$, $r = a.b$, $s = a^2 + b^2$, $t = a^2 - b^2$. Given any two of the five quantities p, q, r, s, t how to find a and b?

Problem 1: If p, q are given, find a, b.

[Ans. $a = (p + q) / 2$, $b = (p - q) / 2$]

Problem 2: If p, s are given, find a, b.

[Ans. First we find q as $\sqrt{(p^2 - 4r)}$, since

$p^2 - 4r = (a + b)^2 - 4 ab = (a - b)^2$. Then result follows from the answer of Problem 1.]

Problem 7: If q, t are given find a, b.

[Ans. We find p in terms of q, t as follows and find a, b in terms of p, q then;

$t / q = (a^2 - b^2)/ (a - b) = (a + b) = p$]

Problem 8: If r, s are given find a, b.

[Ans. We first calculate q in terms of r and s and then find p in terms of q and r by proceeding as before. We note that

$(s - 2r) = a - b = q$ and $(q^2 + 2r) = a + b = p$]

Now let us state the subjects as given in Part II (Astronomy).These are as follows:

VIII. Grahagati (Planetary motion), Bhagola (Sphere of zodiac), Madhyagraha (Mean Planets),Surjasputa (True Sun), Grahasputa (True Planets)

IX. Bhu- Vayu-Bhagola (spheres of Earth, Atmosphere and Asterisms), Ayanacalana (Precission of the equinoxes)

X. Pancadasaprasna (Fifteen problems relating to spherical triangles)

XI. Dig-jnana(Orientation), Chayaganita (Shadow computations), Lagna (Rising point of Ecliptic),Nati-Lambana (Parallaxes of Latitude and Longitude)
XII. Grahana (Eclipse)
XIII. Vyatipata
XIV. Visible correction of Planets
XV. Moon's cusp and Phases of the Moon

It is to be remembered that the mathematical and astronomical rationale presented in Yukti-bhasa relate to several aspects, to wit, concepts, theories, constants, computations, demonstration by diagrammatic representation and like. 'The treatment is logical, going step by step, first presenting the fundamental and gradually building up argument. It is, if one might say so, 'intimate' in that it inculcates the steps as a teacher does to a student. The work aims at understanding and conviction by the reader'.

The author in Yukti-bhasa (YB), though admits in the opening sentence that he follows Tantra Sangraha (TS), YB is a quite a different type of work. 'Rather than being a commentary (vyakhya or bhasya) it is a stand-alone exposition of the material covered in TS, segregating (unlike TS itself) the mathematics in the first part and its use in the construction of an accurate planetary model in the second'. YB is distinctive in other ways too. ' At a time when all scientific texts were composed in Sanskrit, often in terse verse, it is written in Malayalam prose which is anything but terse, it is self-contained, and it provides reasoned justifications for all results cited'.

P. P. Divakaran's remark about YB is quite noteworthy. He says, Jyesthadeva wrote what can accurately be called the first textbook of Calculus, Yukti-bhasa. 'It is a comprehensive accounts, in its last two chapters, of the fundamental principles of integral and differential calculus (in that natural order in the Kerala approach to calculus), as well as the relationship between them, and their study of trigonometric functions'.

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CONTRIBUTIONS OF S. RAMANUJAN AND D.R. KARPREKAR TO NUMBER THEORY

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In this article in brief we give contributions of Srinivas Ramanujan and D.R. Karprekar of India towards number theory.

Srinivas Ramanujan: He was born on Dec. 22, 1987 at Eurode and died April 26, 1920 at Chetpot in Madras Presidency in Tamil Nadu, He was FRS at the age of 31 years (2nd in India).

Ramanujan Number: Once Prof. G.H. HARDY came to see Ramanujan in a taxi which had the number 1729. On hearing of that number Ramanujan said , it is the smallest number expressible as the sum of two cubes in two different ways: $1729 = 1^3 + 12^3 = 9^3 + 10^3$.

His notebooks contain examples of three fourth powers in two different ways 9 ex. $2^4 + 4^4 + 7^4 = 3^4 + 6^4 + 6^4 = 2673$; $1^4 + 8^4 + 12^4 + 32^4 + 64^4 = 2^4 + 39^4 + 44^4 + 46^4 + 52^4 = 65^4$; $158^4 + 59^4 = 134^4 + 133^4 = 635318657$.

Highly composite numbers: A prime number has only two divisors viz. itself and unity. For examples: 2, 3, 5, 7, 11, …..are prime numbers. A natural number n, which has at least one divisor between 1 and n, is called a composite number. For example 4, 6, 8, 9, 10, …… A highly composite (h.c.) number N is a natural number which has more divisors than any number less than N. For example :

2,4,6, 12, 24, 36, 48, 60, 120 , 180, 240, 360, 720, 840, 1260….are h.c. numbers.

1920, the year in which Ramanujan breathed his last, is not a h.c. number. Thus h.c. numbers escaped the blame of the creation becoming the death-trap to the creater.

1920 is known as associated number.

The 103rd highly composite number given by Ramanujan, is 6, 746, 328, 388, 800. This number has 13 digits and its prime factorization is $2^6.3^4.5^2.7^2.11.13.17.19.23$

Theorem: If $N= 2^{a_1}.3^{a_2}.5^{a_3} \dots \dots \dots \dots \dots .p^{a_p}$ is a highly composite number then $a_1 \geq a_2 \geq \dots\dots\dots\dots \geq a_p$. and $a_p = 1$ except for N = 4 and 36. It is to be noted that $4 = 2^2$ and $36 = 2^2.3^2$.

Theorem: There are an infinite number of highly composite numbers.

The distributions of both prime numbers and highly composite numbers are highly erratic.

Partition of integers: A partition of integer n is a division of n into any number of positive integral parts. P(n) is the number of partitions of n, where n is an integer, P(n) is called the partition function of n.For examples: 4 = 3 + 1= 2 + 2= 2 + 1+ 1= 1+ 1+ 1+ 1. So, p(4) = 5.

The following table provides the value of p(n), for n = 1, 2,3, ….., 20.

n	1	2	3	4	5	6	7	8	9	10
P(n)	1	2	3	5	7	11	15	22	30	42
n	11	12	13	14	15	16	17	18	19	20
P(n)	56	77	101	135	176	231	297	385	490	627

Remark: He could write values of $\sqrt{2}$, π to any number of decimal places. He was also interested in magic squares. He gave the formula to prepare 3 x 3, 4 x 4, 5 x 5 ,…….magic squares. The numbers should be in arithmetic progression. In the magic square, each row sum = each column sum = each diagonal sum.

Dattatreya Ramchandra Kaprekar (1905–1986) was an Indian recreational mathematician who described several classes of natural numbers including the Kaprekar, Harshad and Self numbers and discovered the Kaprekar constant, named after him. Despite having no formal postgraduate training and working as a schoolteacher, he published extensively and became well known in recreational mathematics circles

Kaprekar constant [: In 1949, Kaprekar discovered an interesting property of the number 6174, which was subsequently named the Kaprekar constant. He showed that 6174 is reached in the limit as one repeatedly subtracts the highest and lowest numbers that can be constructed from a set of four digits that are not all identical. Thus, starting with 1234, we have: 4321 " 1234 = 3087, then 8730 " 0378 = 8352, and 8532 " 2358 = 6174.

Repeating from this point onward leaves the same number (7641 " 1467 = 6174). In general, when the operation converges it does so in at most seven iterations. A similar constant for 3 digits is 495. However, in base 10 a single such constant only exists for numbers of 3 or 4 digits; for other digit lengths or bases other than 10, the Kaprekar's routine algorithm described above may in general terminate in multiple different constants or repeated cycles, depending on the starting value.

Kaprekar number[: A Kaprekar number is a positive integer with the property that if it is squared, then its representation can be partitioned into two positive integer

parts whose sum is equal to the original number (e.g. 45, since 45^2=2025, and 20+25=45,) However, note the restriction that the two numbers are positive; for example, 100 is not a Kaprekar number even though 100^2=10000, and 100+00 = 100. This operation, of taking the rightmost digits of a square, and adding it to the integer formed by the leftmost digits, is known as the Kaprekar operation.

Some examples of Kaprekar numbers:

Number	Square	Decomposition
703	703^2 = 494209	494+ 209= 703
2728	2728^2 = 7441984	744+1984 = 2728 etc.

Devlali or Self number : In 1963, Kaprekar defined the property which has come to be known as self numbers, which are integers that cannot be generated by taking some other number and adding its own digits to it. For example, 21 is not a self number, since it can be generated from 15: 15 + 1 + 5 = 21. But 20 is a self number, since it cannot be generated from any other integer. He also gave a test for verifying this property in any number. These are sometimes referred to as Devlali numbers (after the town where he lived); though this appears to have been his preferred designation, the term self number is more widespread. Sometimes these are also designated *Colombian number*s after a later designation.

Harshad number : Kaprekar also described the Harshad numbers which he named harshad, meaning "giving joy" (Sanskrit *harsha*, joy +*da* taddhita pratyaya, causative); these are defined by the property that they are divisible by the sum of their digits. Thus 12, which is divisible by 1 + 2 = 3, is a Harshad number. These were later also called *Niven numbers* after 1977 lecture on these by the Canadian mathematician Ivan M. Niven. Numbers which are Harshad in all bases (only 1, 2, 4, and 6) are called *all-Harshad numbers*. Much work has been done on Harshad numbers, and their distribution, frequency, etc. are a matter of considerable interest in number theory today.

Demlo number : Kaprekar also studied the Demlo numbers, named after a train station 30 miles from Bombay on the then G. I. P. Railway where he had the idea of studying them.. The best known of these are the Wonderful Demlo numbers 1, 121, 12321, 1234321…, which are the squares of the repunits 1, 11, 111,1111 ….

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News of Tripura Mathematical Society

RESULT OF APTITUDE TEST - 2019 (FOR CLASS V)

Examination Held : 05.01.2020 **Publication of Result 12.03.2020**

AGARTALA

Rank	Roll No.	Name	Father's Name	School
1st	AG/A/1201	Sri Anubhab Debnath	Sri Apansu Debnathh	R.K.Mission Vidyalaya
2nd	AG/A/1277	Ms. Sampriti Barman	Sri Sujit Barman	Shishu Bihar H.S.School
2nd	AG/A/1720	Ms. Indrani Bhownik	Sri Binoy Krishna Bhownik	Ramakrishna Shishu Tirtha
4th	AG/A/1203	Sri Adityaraj Das	Sri Rameshwar Das	R.K.Mission Vidyalaya
5th	AG/A/1219	Sri Shibraj Debnath	Sri Ratan Debnath	R.K.Mission Vidyalaya
5th	AG/A/1202	Sri Soushubhra Das	Sri Prasenjit Das	R.K.Mission Vidyalaya
7th	AG/A/1198	Sri Hrishikesh Das	Sri Mrinal Das	R.K.Mission Vidyalaya
8th	AG/A/1289	Ms. Trisha Shil Sharma	Sri Sanjit Shil Sharma	Shishu Bihar H.S.School
8th	AG/A/1218	Sri Rognik Chakraborty	Sri Biswajit Chakraborty	R.K.Mission Vidyalaya
10th	AG/A/1200	Sri Shuvam Ghosh	Sri Subrata Ghosh	R.K.Mission Vidyalaya
11th	AG/A/1036	Sri Tanavya Barua	Sri Papu Barua	Holy Cross School
12th	AG/A/1190	Sri Soumyadip Dutta	Sri Biswanath Dutta	R.K.Mission Vidyalaya
12th	AG/A/1708	Ms. Rasni Debnath	Sri Goutam Debnath	Ramakrishna Shishu Tirtha
14th	AG/A/1212	Sri Sandeepan Das	Sri Subrata Das	R.K.Mission Vidyalaya
15th	AG/A/1210	Sri Ashmit Datta	Sri Bapi Datta	R.K.Mission Vidyalaya
16th	AG/A/1161	Ms. Joyasmita Saha	Sri Jishu Saha	Pranavananda Vidyamandir
16th	AG/A/1719	Ms. Nikita Podder	Sri Nirmal Ch. Podder	Ramakrishna Shishu Tirtha
16th	AG/A/1694	Sri Nabajyoti Ghosh	Sri Jagadish Ghosh	Ramakrishna Shishu Tirtha
19th	AG/A/1245	Ms. Madhurima Das	Sri Manik Lal Das	Shishu Bihar H.S.School
20th	AG/A/1208	Sri Abhinaba Banik	Sri Anjan Banik	R.K.Mission Vidyalaya
21st	AG/A/1237	Ms. Prithvija Chakraborty	Sri Partha Chakraborty	Ma Anandamayee Vidyapeeth

AMARPUR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	AMP/A/019	Sri Chiranjit Paul	Sri Govinda Paul	Charu Bharati Shiksha Sadan
2nd	AMP/A/003	Ms. Sujannita Saha	Sri Manik Lal Saha	DAT H.S. School

BELONIA UNIT

Rank	Roll No.	Name	Father's Name	School
1st	BN/APT/009	Sri Ayoush Debnath	Sri Sibu Debnath	Belonia Govt. Eng. Med.
2nd	BN/APT/006	Sri Dipanjan Bardhan	Sri Debasish Bardhan	Belonia Govt. Eng. Med.

DHARMANAGAR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	DN/A/19132	Sri Somaditya Pal	Sri Subrata Pal	Golden Valley H.S. School
2nd	DN/A/19039	Ms. Prachi Debnath	Sri Sibabrata Debnath	New Shishu Bihar Madyamik Vidyalaya
3rd	DN/A/19167	Sri Bibek De	Sri Bidyut Bhusan De	North Point School
4th	DN/A/19073	Sri Amartya Das	Sri Kalpataru Das	Tripureswari Sishu Tirtha
4th	DN/A/19168	Ms. Dipshikha Chowdhury	Sri Dipal Chowdhury	North Point School
6th	DN/A/19081	Sri Ashmit Aditya	Sri Alokesh Aditya	New Shishu Bihar Madyamik Vidyalaya
7th	DN/A/19025	Sri Santanu Nath	Sri Sanjay Nath	Tripureswari Sishu Mandir
8th	DN/A/19079	Ms. Sneha Nath	Sri Ashu Ranjan Debnath	New Shishu Bihar Madyamik Vidyalaya
8th	DN/A/19080	Sri Tirthankar Acharjee	Sri Haradhan Acharjee	New Shishu Bihar Madyamik Vidyalaya
10th	DN/A/19038	Ms. Debasmita Nath	Sri Biswajit Nath	New Shishu Bihar Madyamik Vidyalaya
11th	DN/A/19169	Ms. Garima Pal	Sri Gautam Pal	North Point School
12th	DN/A/19041	Tasnina Begam	Md. Ajmat Ali	New Shishu Bihar Madyamik Vidyalaya

KAILASHAHAR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	KLS/ 10006	Sri Mayukh Sarma	Sri Kajal Kanti Sarma	Children Blossom School
2nd	KLS/ 10011	Sri Baibhab Das	Sri Bibhas Das	Children's Garden School
3rd	KLS/ 10076	Sri Arghadeep Saha	Sri Arindam Saha	Holy Cross School, Kumarghat
4th	KLS/ 10059	Ms. Ankita Pal	Sri Arabinda Pal	Nivedita Children's School
5th	KLS/ 10005	Ms. Raktima Dhar	Sri Mukul Dhar	Children Blossom School
6th	KLS/ 10068	Sri Soumen Debnath	Sri Birendra Debnath	Nivedita Children's School
7th	KLS/ 10063	Sri Tirthankar Das	Sri Sankar Das	Nivedita Children's School

KAMALPUR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	KMP/26	Sri Manas Deb	Sri Malay Kanta Deb	Baralutma Class XII School
2nd	KMP/24	Sri Swarnabha Deb	Sri Sumukh Deb	Ananda Marga Pry. School
3rd	KMP/23	Sri Shubhankar Ghosh	Sri Nitya Gopal Ghosh	Ananda Marga Pry. School
4th	KMP/29	Sri Subhajit Ghosh	Sri Nepal Chandra Ghosh	Ananda Marga Pry. School
5th	KMP/30	Sri Ritesh Kairi	Sri Ranjit Kairi	Ananda Marga Pry. School

KHOWAI UNIT

Rank	Roll No.	Name	Father's Name	School
1st	KHW/001	Sri Dipayan Das	Sri Ranjan Das	Khowai Govt. Eng. Med. H.S School

TELIAMURA UNIT

Rank	Roll No.	Name	Father's Name	School
1st	TLM/AT/G/003	Ms. Ratri Modak	Sri Sanjoy Modak	Ananda Marga High School
2nd	TLM/AT/G/002	Ms. Shubhasmita Roy	Sri Santosh Chandra Roy	Ananda Marga High School
3rd	TLM/AT/B/014	Sri Aniketh Saha	Sri Sanjit Saha	Ananda Marga High School
4th	TLM/AT/B/005	Sri Rajdeep Sarkar	Sri Bipad Bandhu Sarkar	Ananda Marga High School
5th	TLM/AT/B/007	Sri Debarpan Majumder	Sri Debabrata Majumder	Ananda Marga High School
6th	TLM/AT/B/019	Sri Naman Das	Sri Samir Das	Ananda Marga Pry. School
7th	TLM/AT/B/008	Sri Ayush Roy	Sri Nitai Roy	Ananda Marga High School
8th	TLM/AT/G/004	Ms. Anantika Deb	Sri Amalendu Deb	Ananda Marga High School
9th	TLM/AT/B/002	Sri Ratnadeep Das	Sri Dipak Das	Ananda Marga High School
10th	TLM/AT/B/003	Sri Garbit Banik	Sri Gobinda Banik	Ananda Marga High School
11th	TLM/AT/B/004	Sri Amit Das	Sri Mithun Das	Ananda Marga High School
11th	TLM/AT/B/022	Sri Chirantan Paul	Sri Chayan Kumar Paul	Kendriya Vidyalaya B.S.F

UDAIPUR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	U/APT/09	Sajid Ahamed	Jakir Hossain	Vivekananda Vidyapith H.S.
2nd	U/APT/44	Mausam Nur	Rustam Ahamed	Brilliant Stars School
3rd	U/APT/11	Ms. Hridhy Chakraborty	Sri ChandanChakraborty	Vivekananda Vidyapith H.S.
4th	U/APT/07	Sri Bishal Saha	Sri Biswajit Saha	Vivekananda Vidyapith H.S.
5th	U/APT/38	Ms. Manisha Das	Sri Dulal Das	Brilliant Stars School

SANTIRBAZAR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	STB/AT/024	Sri Suraj Basu	Sri Shyamal Basu	SunflowerEng.Med.Academy
2nd	STB/AT/023	Sri hritabrata Lodh	Sri Joy Krishna Lodh	SunflowerEng.Med.Academy
3rd	STB/AT/025	Sri Saumyadip Bhaumik	Sri Saugata Bhaumik	SunflowerEng.Med.Academy

RANIRBAZAR CENTRE

Rank	Roll No.	Name	Father's Name	School
1st	RNB/A/29	Sri Ayush Debnath	Sri Uttam Debnath	Vivekananda Shishu Niketan high School
2nd	RNB/A/02	Sri Subal Adhikari	Sri Nirmal Adhikari	KV NIT, Agartala
3rd	RNB/A/41	Ms. Deepshikha Karmakar	Sri Milan Karmakar	Shishu Niketan H.S School
4th	RNB/A/42	Ms. Trisha Debnath	Sri Tapan Debnath	Shishu Niketan H.S School
5th	RNB/A/43	Ms. Disha Biswas	Sri Anil Chandra Biswas	Shishu Niketan H.S School
6th	RNB/A/30	Sri Gourav Das	Sri Kaushik Das	Vivekananda Shishu Niketan high School
7th	RNB/A/67	Sri Satyajit Debnath	Sri Mintu Debnath	Shishu Niketan H.S School

RESULT OF APTITUDE TEST - 2019 (FOR CLASS V)

Examination Held : 05.01.2020 **Publication of Result 12.03.2020**

STATE LEVEL

Rank	Roll No.	Name	Father's Name	School
1st	DN/A/ 19132	Sri Somaditya Pal	Sri Subrata Pal	Golden Valley H.S. School
2nd	AG/A/1201	Sri Anubhab Debnath	Sri Apansu Debnathh	R.K.Mission Vidyaluya
3rd	AG/A/1277	Ms. Sampriti Barman	Sri Sujit Barman	Shishu Bihar H.S.School
3rd	AG/A/1720	Ms. Indrani Bhowmik	Sri Binoy Krishna Bhowmik	Ramakrishna Shishu Tirtha
3rd	DN/A/ 19039	Ms. Prachi Debnath	Sri Sibabrata Debnath	New Shishu Bihar Madyamik Vidyalaya
6th	DN/A/ 19167	Sri Bibek De	Sri Bidyut Bhusan De	North Point School
7th	DN/A/ 19073	Sri Amartya Das	Sri Kalpataru Das	Tripureswari Sishu Tirtha
7th	DN/A/ 19168	Ms. Dipshikha Chowdhury	Sri Dipal Chowdhury	North Point School
9th	AG/A/1203	Sri Adityaraj Das	Sri Rameshwar Das	R.K.Mission Vidyalaya
9th	TLM/AT/G/003	Ms. Ratri Modak	Sri Sanjoy Modak	Ananda Marga High School
11th	AG/A/1219	Sri Shibraj Debnath	Sri Ratan Debnath	R.K.Mission Vidyaluya
11th	AG/A/1202	Sri Soushubhra Das	Sri Prasenjit Das	R.K.Mission Vidyaluya
13th	AG/A/1198	Sri Hrishikesh Das	Sri Mrinal Das	R.K.Mission Vidyaluya
14th	AG/A/1289	Ms. Trisha Shil Sharma	Sri Sanjit Shil Sharma	Shishu Bihar H.S.School
14th	AG/A/1218	Sri Rugnik Chakraborty	Sri Biswajit Chakraborty	R.K.Mission Vidyalaya
14th	U/APT/09	Sajid Ahamed	Jakir Hossain	Vivekananda Vidyapith H.S.
17th	AG/A/1200	Sri Shuvam Ghosh	Sri Subrata Ghosh	R.K.Mission Vidyalaya
17th	KLS/ 10006	Sri Mayukh Sarma	Sri Kajal Kanti Sarma	Children Blossom School
19th	DN/A/ 19081	Sri Ashmit Aditya	Sri Alokesh Aditya	New Shishu Bihar Madyamik Vidyalaya
19th	U/APT/44	Mausam Nur	Rustam Ahamed	Brilliant Stars School

RESULT OF PRASHNA MANCHA - 2019 (FOR CLASS VI)
Held on 22.12.2019

Sl. No	Name	Father's Name	Name of School
1.	Sri Aadrish Deb	Sri Jayanta Deb	R.K.Mission Vidyalaya
2.	Sri Baibhab Roy	Sri Biswanath Roy	R.K.Mission Vidyalaya
3.	Sri Sounak Roy	Sri MantuLal Roy	R.K.Mission Vidyalaya
4.	Sri Rajjeet Singha	Sri Binod Singha	R.K.Mission Vidyalaya
5.	Sri Shubham Roy Choudhury	Sri Biswanath Roy Choudhury	Sri Krishna Mission School
6.	Sri Ayan Debnath	Sri Shibajyoti Debnath	Umakanta Academy
7.	Ms. Hrishita Bhattacharjee	Sri Ashish Bhattacharjee	Shishu Bihar H.S. School
8.	Sri Anik Roy	Sri Bichitra Kumar Roy	R.K.Mission Vidyalaya
9.	Sri Mayank Saha	Sri Madan Gopal Saha	Holy Cross School
10.	Sri Shubranil Saha	Sri Nepal Saha	Shiksha Niketan H.S. School
11.	Ms. Rajoishi Biswas	Sri Rajib Biswas	Shishu Bihar H.S. School

SPEECH COMPETITIO (FOR CLASS - VII) - 2019
Held on 22.12.2019

Rank	Name	Father's Name	Name of School
1st	Ms. Sreeja Lodh	Sri Chhotan Lodh	Siksha Niketan H.S School
2nd	Ms. Debaleena Acharjee	Sri Mihir Acharjee	Bhaban's Tripura Vidyamandir
2nd	Sri Debarghya Chowdhury	Sri Sabya Sachi Chowdhury	Shishu Bihar H.S School
3rd	Ms. Shatakshi Basu	Sri Sanjit Basu	Holy Cross School

INTER SCHOOL QUIZ COMPETITION - 2019
Held on 22.12.2019

Rank	Name	Father's Name	Name of School
1st	Sri Sagnik Purkayastha Sri Pratik Chandra Nath Sri GranthikChakraborty	Sri Subhrajyoti Purkayastha Sri Prabir Chandra Nath Sri Goutam Chakraborty	Bir Bikram Institution
2nd	Sri Soumyaditya Chakraborty Sri Soham Chakraborty Sri Baibhab Bhaumik	Sri Swapan Chakraborty Sri Sujit Chakraborty Sri Uttam Kumar Bhaumik	K V Kunjaban
3rd	Sri Saptarshi Sarkar Sri Debamallya Ghosh Sri Arnab Das	Sri Pulak Kumar Sarkar Sri Goutam Ghosh Sri Khokan Chandra Das	R K Mission Vidyalaya
4th	Sri Ruptanay Pal Sri Dyuti Ballav Paul Sri Supratim Modak	Sri Rupam Pal Sri Debabrata Paul Sri Ratan Modak	PranavanandaVidyamandir

Sadar Sub-Divisional Level Result of JUNIOR MATHEMATICAL OLYMPIAD - 2019 (for Class VIII)

Held on 02.02.2020 **Result Published on 17.02.2020**

Rank	Roll No. Ag/J	Name	Father's Name	School
1st	3390	Sri Kamalkorak Adhikari	Dr. Kalipada Adhikari	Holy Cross School
2nd	3314	Sri Sinjan Debnath	Sri Nikunja Debnath	Shishu Bihar H.S. School
3rd	3257	Sri Sayan Bhadra	Sri Samir Chandra Bhadra	R.K.Mission Vidyalaya
4th	3078	Sri Antareep Ray	Sri Chiranjan Ray	U.K.Academy Eng. Med. School
5th	3332	Sri Dedipyaman Pal	Sri Jayanta Narayan Pal	Kshudiram Basu Eng. Med. School
5th	3245	Sri Saswata Roy Choudhury	Sri Bapi Roy Choudhury	R.K.Mission Vidyalaya
7th	3417	Sri Shibajyoti Saha	Sri Kishore Kumar Saha	Holy Cross School
7th	3244	Sri Manarshi Debnath	Sri Mrinal Debnath	R.K.Mission Vidyalaya
9th	3384	Sri Mannat Debnath	Sri Manoj Kumar Debnath	Holy Cross School
10th	3239	Sri Aditya Deb Roy	Sri Asish Deb Roy	R.K.Mission Vidyalaya
10th	3382	Ms. Lopamudra Deb	Dr. Maloy Kumar Deb	Holy Cross School
12th	3246	Sri Shoubhik Acharjee	Sri Rajib Acharjee	R.K.Mission Vidyalaya
13th	3392	Sri Anubhab Debnath	Sri Pritilal Debnath	Holy Cross School
14th	3240	Sri Jasim Debbarma	Sri Sidhartha Debbarma	R.K.Mission Vidyalaya
14th	3261	Sri Hrituraj Debbarma	Sri Mrinal Debbarma	R.K.Mission Vidyalaya
14th	3402	Sri Anilava Bhaumik	Sri Apan Bhaumik	Holy Cross School

State Level Result of
JUNIOR MATHEMATICAL OLYMPIAD - 2019
(for Class VIII)

Held on 02.02.2020 **Result Published on 12.02.2020**

TOP THIRTY POSITION HOLDERS IN TRIPURA STATE

Rank	*Roll No.*	*Name*	*Father's Name*	*School*
1st	AG/J/ 3390	Sri Kamalkorak Adhikari	Dr. Kalipada Adhikari	Holy Cross School
2nd	AG/J/ 3314	Sri Sinjan Debnath	Sri Nikunja Debnath	Shishu Bihar H.S. School
3rd	AG/J/ 3257	Sri Sayan Bhadra	Sri Samir Chandra Bhadra	R.K.Mission Vidyalaya
4th	AG/J/ 3078	Sri Antareep Ray	Sri Chiranjan Ray	U.K.Academy Eng. Med. School
5th	AG/J/ 3332	Sri Dedipyaman Pal	Sri Jayanta Narayan Pal	Kshudiram Basu Eng. Med. School
5th	AG/J/ 3245	Sri Saswata Roy Choudhury	Sri Bapi Roy Choudhury	R.K.Mission Vidyalaya
7th	AG/J/ 3417	Sri Shibajyoti Saha	Sri Kishore Kumar Saha	Holy Cross School
7th	AG/J/ 3244	Sri Manarshi Debnath	Sri Mrinal Debnath	R.K.Mission Vidyalaya
9th	AG/J/ 3384	Sri Mannat Debnath	Sri Manoj Kumar Debnath	Holy Cross School
10th	AG/J/ 3239	Sri Aditya Deb Roy	Sri Asish Deb Roy	R.K.Mission Vidyalaya
10th	AG/J/ 3382	Ms. Lopamudra Deb	Dr. Maloy Kumar Deb	Holy Cross School
10th	STB/19/ 094	Sri Sandipan Biswas	Sri Sankar Biswas	Brintak Siksha Niketan
13th	AG/J/ 3246	Sri Shoubhik Acharjee	Sri Rajib Acharjee	R.K.Mission Vidyalaya
13th	KLS/20/ 053	Ms. Anwesha Pal	Sri Amarjit Pal	Nataji Vidyapith Eng. Med. H.S. School
13th	DMN/F/062	Ms. Briti Chanda	Sri Benu Gopal Chanda	Golden Valley H.S School
13th	KMP/ 76	Ms. Rajashree Ghosh	Sri Rupak Ghosh	Kamalpur Govt. Eng. Med. School
17th	AG/J/ 3392	Sri Anubhab Debnath	Sri Pritilal Debnath	Holy Cross School
18th	U/JMO/ 71	Sri Souvik Shome	Sri Subhankar Shome	Udaipur Eng. Med. H.S School
19th	AG/J/ 3240	Sri Jasim Debbarma	Sri Sidhartha Debbarma	R.K.Mission Vidyalaya
19th	AG/J/ 3261	Sri Hrituraj Debbarma	Sri Mrinal Debbarma	R.K.Mission Vidyalaya
19th	AG/J/ 3402	Sri Anilava Bhaumik	Sri Apan Bhaumik	Holy Cross School
22nd	AG/J/ 3331	Ms. Anurupa Baidya	Sri Anil Ranjan Baidya	Kshudiram Basu Eng. Med. School
23rd	AG/J/ 3067	Sri Rupayan De	Sri Rajib De	Sri Krishna Mission School
23rd	AG/J/ 3094	Sri Saikat Das	Sri Rakhal Chandra Das	U.K.Academy Eng. Med. School
25th	AG/J/ 3273	Sri Anurag Datta	Sri Ajoy Kishore Datta	R.K.Mission Vidyalaya
25th	AG/J/ 3258	Sri Soumyatritwa Roy	Sri Santanu Roy	R.K.Mission Vidyalaya
25th	AG/J/ 3009	Ms. Sayambrita Mitra	Sri Swapan Mitra	Sri Krishna Mission School
25th	DMN/F/ 022	Ms. Rajashree Nath	Sri Dipak Kumar Nath	Dharmanagar Govt. Girls H.S School
29th	AG/J/ 3688	Ms. Sudipta Debnath	Sri Milan Debnath	Maharani Tulsibati Girl's H.S School
29th	JMP/M/ 018	Ms. Sara Debbarma	Sri Budharai Debbarma	Madhya Ghaniamara S.B School
29th	KMP/72	Sri Subhasish Deb	Sri Shyamal Deb	Kamalpur Govt. Eng. Med. School

RESULT OF MATHEMATICAL OLYMPIAD - 2019
(For Class IX & X)

Examination Held on 05.01.2020 **Published on Result :12.03.2020**

STATE LEVEL

Rank	Roll No.	Name	Father's Name	School
1st	AG/M/2318	Shri Soham Chakraborty	Shri Sujit Chakraborty	Kendriya Vidyalaya, Kunjaban
2nd	DN/M/ 19081	Sri Granthik Chakraborty	Goutam Chakraborty	Bir Bikram Institution
2nd	AG/M/2093	Shri Aryan Saha	Shri Dipak Saha	Holy Cross School
4th	AG/M/2319	Shri Soumyaditya Chakraborty	Shri Swapan Chakraborty	Kendriya Vidyalaya, Kunjaban
5th	DN/M/ 19080	Shri Prabal Singha	Purna Chandra Singha	Bir Bikram Institution
5th	AG/M/2725	Shri Dipayan Deb	Shri Narayan Deb	Netaji Subhas Vidyaniketan
7th	DN/M/ 19028	Sri Soumik Pal	Subrata Pal	Golden Valley H.S. School
8th	DN/M/ 19079	Sri Sagnik Purkayastha	Subhrajyoti Purkayastha	Bir Bikram Institution
9th	AG/M/2157	Shri Arnab Das	Shri Khokan Chandra Das	R.K.Mission Vidyalaya
10th	TLM/MO/2019/B/007	Shri Tushar Singha Roy	Binay Singha Roy	Ananda Marga High School
10th	U/MO/51	Shri Soumyadipta Das	Tapan Das	Udaipur Eng. Med. H.S. School
12th	DN/M/ 19103	Sri Subhabrato Deb	Debashish Deb	Holy Cross High School, Panisagar
13th	U/MO/33	Shri Udit Sarkar	Uttam Kumar Sarkar	Brilliant Stars School
14th	BN/MO/001	Shri Shamik Saha	Subhasis Saha	Belonia Govt. Eng. Med. HS School
14th	AG/M/2327	Swaralipi Datta		Auxilium Girls' School
16th	AMP/M/04	Smt. Atabi Debnath	Chittaranjan Debnath	Charu Bharati Shiksha Sadan
16th	DN/M/ 19082	Shri Pratik Chandra Nath	Prabir Chandra Nath	Bir Bikram Institution
16th	AG/M/2180	Shri Utsab Das	Shri Swapan Das	Shishu Bihar H.S.School
19th	KLS-10577	Smt. Nirjita Choudhury	Nilothpal Choudhury	Netaji Vidyapith Eng. Med. HS School
19th	U/MO/50	Shri Tridip Baksi	Tapan Kumar Baksi	Udaipur Eng. Med. H.S. School
19th	DN/M/ 19102	Shri Souradeep Deb Nath	Rangalal Deb Nath	Holy Cross High School, Panisagar

RESULT OF MATHEMATICAL OLYMPIAD - 2019
(For Class IX & X)

Examination Held on 05.01.2020 **Published on Result :12.03.2020**

AGARTALA

Rank	Roll No.	Name	Father's Name	School
1st	AG/M/2318	Shri Soham Chakraborty	Shri Sujit Chakraborty	Kendriya Vidyalaya, Kunjaban
2nd	AG/M/2093	Shri Aryan Saha	Shri Dipak Saha	Holy Cross School
3rd	AG/M/2319	Shri Soumyaditya Chakraborty	Shri Swapan Chakraborty	Kendriya Vidyalaya, Kunjaban
4th	AG/M/2725	Shri Dipayan Deb	Shri Narayan Deb	Netaji Subhas Vidyaniketan
5th	AG/M/2157	Shri Arnab Das	Shri Khokan Chandra Das	R.K.Mission Vidyalaya
6th	AG/M/2327	Swaralipi Datta		Auxilium Girls' School
7th	AG/M/2180	Shri Utsab Das	Shri Swapan Das	Shishu Bihar H.S.School
8th	AG/M/2133	Shri Tapajyoti Chakraborty	Shri Amitabha Chakraborty	R.K.Mission Vidyalaya
8th	AG/M/2132	Shri Sourasish Das	Shri Surjya Kumar Das	R.K.Mission Vidyalaya
10th	AG/M/2053	Shri Sandipan Saha	Shri Sudip Saha	Sri Krishna Mission School
10th	AG/M/2006	Shri Swarnab Saha	Shri Biswajit Saha	U.K.Academy Eng. Med.
12th	AG/M/2106	Shri Rajdeep Saha	Shri Rajib Saha	Holy Cross School
12th	AG/M/2143	Shri Arkadeep Bhowmik	Shri Prasenjit Bhowmik	R.K.Mission Vidyalaya
14th	AG/M/2189	Smt. Sirsha Ghosh	Shri Sandip Ghosh	Shishu Bihar H.S.School
14th	AG/M/2082	Shri Parthib Roy	Shri Partha Roy	Holy Cross School
16th	AG/M/2005	Shri Prantik Saha	Shri Pankaj Saha	U.K.Academy Eng. Med.
17th	AG/M/2007	Shri Ratnadip Sen	Shri Narayan Sen	U.K.Academy Eng. Med.
17th	AG/M/2203	Shri Nisar Uddin	Shri Mostafa Kamal	Shishu Bihar H.S.School

AMARPUR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	AMP/M/04	Smt. Atabi Debnath	Chittaranjan Debnath	Charu Bharati Shiksha Sadan

BELONIA UNIT

Rank	Roll No.	Name	Father's Name	School
1st	BN/MO/001	Shri Shamik Saha	Subhasis Saha	Belonia Govt. Eng. Med. HS School
2nd	BN/MO/076	Smt. Arunima Pal	Manna Pal	Belonia Vidyapith H.S. School
3rd	BN/MO/002	Shri Ratnadip Das	Ranjit Kumar Das	Belonia Govt. Eng. Med. HS School
4th	BN/MO/008	Shri Chayan Debnath	Arjun Debnath	Belonia Govt. Eng. Med. HS School
4th	BN/MO/003	Shri Mainak Das	Kalu Das	Belonia Govt. Eng. Med. HS School
6th	BN/MO/067	Shri Ayan Roy Barman	Bikash Roy Barman	Belonia Vidyapith H.S. School
7th	BN/MO/004	Smt. Srijita Mallik	Biplab Mallik	Belonia Govt. Eng. Med. HS School

DHARMANAGAR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	DN/M/ 19081	Sri Granthik Chakraborty	Goutam Chakraborty	Bir Bikram Institution
2nd	DN/M/ 19080	Shri Prabal Singha	Purna Chandra Singha	Bir Bikram Institution
3rd	DN/M/ 19028	Sri Soumik Pal	Subrata Pal	Golden Valley H.S. School
4th	DN/M/ 19079	Sri Sagnik Purkayastha	Subhrajyoti Purkayastha	Bir Bikram Institution
5th	DN/M/ 19103	Sri Subhabrato Deb	Debashish Deb	Holy Cross High School, Panisagar
6th	DN/M/ 19082	Shri Pratik Chandra Nath	Prabir Chandra Nath	Bir Bikram Institution
7th	DN/M/ 19102	Shri Souradeep Deb Nath	Rangalal Deb Nath	Holy Cross High School, Panisagar
8th	DN/M/ 19059	Shri Arka Deep Pal	Asim Kumar Paul	North Point School

KAILASHAHAR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	KLS-10577	Smt. Nirjita Choudhury	Nilothpal Choudhury	Netaji Vidyapith Eng. Med. HS School
2nd	KLS-10572	Shri Dibakar Roy	Dipankar Roy	Netaji Vidyapith Eng. Med. HS School
3rd	KLS-10570	Smt. Anusree De	Jahar Lal De	Netaji Vidyapith Eng. Med. HS School
4th	KLS-10617	Shri Soumyadeep Paul	Biswajit Paul	Kendriya Vidyalaya, Kailashahar
5th	KLS-10578	Shri Rajdip Paul	Kamalaksha Paul	Netaji Vidyapith Eng. Med. HS School
6th	KLS-10571	Smt. Aishee Choudhury	Biswajit Choudhury	Netaji Vidyapith Eng. Med. HS School

7th	KLS-10573	Shri Parthib Kilikdar	Prasanta Kilikdar	Netaji Vidyapith Eng. Med. HS School
8th	KLS-10601	Shri Dinesh Shah	Lalan Kumar Shah	Netaji Vidyapith Eng. Med. HS School
9th	KLS-10575	Shri Yubaraj Bhattacharjee	Jayanta Bhattacharjee	Netaji Vidyapith Eng. Med. HS School
10th	KLS-10569	Shri Anurag Paul	Subhendu Bikash Paul	Netaji Vidyapith Eng. Med. HS School
10th	KLS-10625	Shri Sankarsan Das	Mohit Lal Das	Nivedita Children's School, Kumarghat
12th	KLS-10633	Shri Soumyadeep Pal	Mrinal Kanti Pal	Nivedita Children's School, Kumarghat

KAMALPUR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	KMP/08	Sri Pritam Nath	Partha Pratim Nath	Kamalpur Govt. Eng. Med. Class XII School
2nd	KMP/26	Shri Atanu De	Apurba Kumar De	Kamalpur Govt. Eng. Med. Class XII School

KHOWAI UNIT

Rank	Roll No.	Name	Father's Name	School
1st	KHW/005	Sri Abir Dasgupta	Rajat Dasgupta	Khowai Govt. Eng. Med. Class XII School
1st	KHW/007	Sri Dhritiman Roy	Dhiman Roy	Khowai Govt. Eng. Med. Class XII School

TELIAMURA UNIT

Rank	Roll No.	Name	Father's Name	School
1st	TLM/MO/2019/B/007	Shri Tushar Singha Roy	Binay Singha Roy	Ananda Marga High School
2nd	TLM/MO/2019/B/024	Shri Anuvabh Sutradhar	Pintu Sutradhar	Ananda Marga High School
3rd	TLM/MO/2019/B/004	Shri Dwipayan Debnath	Shyamal Debnath	Ananda Marga High School
4th	TLM/MO/2019/B/038	Shri Shibasis Chakraborty	Sekhar Chakraborty	Teliamura Higher Secondary School
5th	TLM/MO/2019/B/008	Shri Subhrajeet Paul	Subrata paul	Ananda Marga High School
6th	TLM/MO/2019/B/012	Shri Souvik Das	Shri Santosh Das	Ananda Marga High School
7th	TLM/MO/2019/B/030	Shri Debajyoti Karmakar	Dulal Karmakar	Ananda Marga High School
8th	TLM/MO/2019/B/029	Shri Tohin Majumder	Uttam Kumar Majumder	Ananda Marga High School
9th	TLM/MO/2019/B/025	Shri Swarup Nama	Pramatosh Nama	Ananda Marga High School
10th	TLM/MO/2019/B/002	Shri Gourab Paul	Pradip Chandra Paul	Ananda Marga High School
11th	TLM/MO/2019/B/013	Shri Sauradip Deb	Sajal Kumar Deb	Ananda Marga High School
12th	TLM/MO/2019/B/026	Shri Subhasish Saha	Debasish Saha	Ananda Marga High School

UDAIPUR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	U/MO/51	Shri Soumyadipta Das	Tapan Das	Udaipur Eng. Med. H.S. School
2nd	U/MO/33	Shri Udit Sarkar	Uttam Kumar Sarkar	Brilliant Stars School
3rd	U/MO/50	Shri Tridip Baksi	Tapan Kumar Baksi	Udaipur Eng. Med. H.S. School
4th	U/MO/16	Shri Sanchan Pal	Siba Prasad Pal	Vivekananda Vidyapith H.S. School

SANTIRBAZAR UNIT

Rank	Roll No.	Name	Father's Name	School
1st	STB/MO-19/065	Shri Souharda Sinha	Sajal Kanti Sinha	Sunflower Eng. Med. Academy
2nd	STB/MO-19/071	Shri Subhadeep Sil	Dulal Sil	Muhuripur H.S. School
2nd	STB/MO-19/026	Smt. Asmita Biswas	Dulal Biswas	Brintak Siksha Niketan
4th	STB/MO-19/017	Smt. Shayanika Barman	Swapan Kumar Barman	Santir Bazar Girls' HS School
5th	STB/MO-19/036	Shri Samiran Chakraborty	Nidhan Chakraborty	Brintak Siksha Niketan
5th	STB/MO-19/037	Shri Joydeep Mallik	Sankar Mallik	Brintak Siksha Niketan
5th	STB/MO-19/064	Smt. Hrittisha Baidya	Arun Chandra Baidya	Sunflower Eng. Med. Academy
8th	STB/MO-19/024	Smt. Dipanwita De	Dipak De	Brintak Siksha Niketan
9th	STB/MO-19/027	Smt. Moumita Mahajan	Biswajit Mahajan	Brintak Siksha Niketan

REGIONAL MATHEMATICAL OLYMPIAD - 2019
Region - Tripura
RESULTS
(30 students (Class 8-11 any) + 5 Girls' quota + 6 class XII Students)

TOP 30 students | class VIII to XI |				
Sr. No	Roll No	Name	Class	School
1	MTM301872	DRIPTANIL BHOWMIK	XI	KAMALPUR GOVT ENGLISH MEDIUM HIGHER SECONDARY SCHOOL
2	TRK208069	DWIJA DAS	IX	SRI SRI RAVISHANKAR VIDYAMANDIR
3	TRK208086	RAJARSHEE DAS	X	SRI KRISHNA MISSION SCHOOL
4	TRK208135	ARNAB DAS	X	RAMA KRISHNA MISSION VIDYALAYA
5	TRK208065	SUSMIT NEOGI	X	BHAVAN'S TRIPURA VIDYAMANDIR
6	TRK208119	SINJAN DEBNATH	VIII	SHISHU BIHAR H.S. SCHOOL
7	TRK208121	SAUMYADIP DEB	X	HOLY CROSS SCHOOL
8	TRK208124	BIBHABASU DEBNATH	X	SRI KRISHNA MISSION SCHOOL
9	TRK208177	BIJAYASHREE PAL	XI	SRI KRISHNA MISSION SCHOOL
10	TRK208110	SHUBHRANIL BASAK	IX	BHAVAN'S TRIPURA VIDYAMANDIR
11	TRK208125	ARYAN ACHARJEE	X	RAMA KRISHNA MISSION VIDYALAYA
12	TRK208063	ANURAG DAS	XI	RAMA KRISHNA MISSION VIDYALAYA
13	TRK208142	DEBADRITA SAHA	XI	HINDI GOVERNMENT HIGHER SECONDARY SCHOOL
14	TRK208143	WRIDDHIRAAJ DEV	XI	SRI KRISHNA MISSION SCHOOL
15	TRK208174	SOUMIK PAL	IX	GOLDEN VALLEY H.S. SCHOOL
16	MTM301013	ANTAREEP RAY	VIII	UMAKANTA ACADEMY (ENGLISH MEDIUM)
17	TRK208064	JOYJEET DEB	IX	SHISHU BIHAR H.S. SCHOOL
18	TRK208083	SREEJITA DAS	VIII	HOLY CROSS SCHOOL
19	TRK208126	SHASHIDHAR ROY	X	HOLY CROSS SCHOOL
20	MTM306036	SOUHARDYA NATH	XI	RAMA KRISHNA MISSION VIDYALAYA
21	TRK208059	SHUBHRAJYOTI DAS	IX	UMAKANTA ACADEMY (ENGLISH MEDIUM)
22	TRK208080	PURNASREE DEB	X	PRANAVANANDA VIDYA MANDIR
23	TRK208160	UTSAB DAS	IX	SHISHU BIHAR H.S. SCHOOL
24	TRK208138	ARYAN SAHA	X	HOLY CROSS SCHOOL
25	MTM306814	PARAMITA DEBBARMA	X	SWAMI DHANAJOY DAS KATHIA BABA MISSION SCHOOL
26	TRK208017	SOUMYAJIT DAS	XI	HINDI HIGHER SECONDARY SCHOOL
27	TRK208061	SNEHA DAS	X	AUXILIUM GIRL'S SCHOOL
28	TRK208093	HRIDDHI CHAKRABORTY	XI	HOLY CROSS SCHOOL
29	TRK208101	SWARNAB SAHA	X	UMAKANTA ACADEMY (ENGLISH MEDIUM)
30	TRK208134	KUSHAL DEB	X	RAMA KRISHNA MISSION VIDYALAYA

5 Girls Quota | class VIII to XI |				
Sr. No	Roll No	Name	Class	School
1	TRK208130	TANISHA RAY	X	HOLY CROSS SCHOOL
2	TRK208133	SAHELI DEB	X	HOLY CROSS SCHOOL
3	TRK208100	NABASREE DEBNATH	X	HOLY CROSS SCHOOL
4	TRK208112	RAJDIPA SUTRADHAR	IX	HOLY CROSS SCHOOL
5	TRK208081	SHRABANI SINGHA	X	SRI KRISHNA MISSION SCHOOL

6 students | class XII |				
Sr. No	Roll No.	Name	Class	School
1	MTM300857	ARIJIT DEY	XII	Netaji Vidyapith English Medium H.S. School
2	MTM301375	NIKITA GHOSH	XII	NETAJI SUBHAS VIDYANIKETAN
3	TRK208109	SAKJIT DAS	XII	HINDI GOVERNMENT HIGHER SECONDARY SCHOOL
4	TRK208140	SOUMYA PRASAD SHARMA	XII	RAMA KRISHNA MISSION VIDYALAYA
5	TRK208086	RITAVASH DEBNATH	XII	UMAKANTA ACADEMY (ENGLISH MEDIUM)
6	TRK208146	DIPTANU BISWAS	XII	UMAKANTA ACADEMY (ENGLISH MEDIUM)

LIST OF LIFE MEMBERS 2019-2020

Sl. No.	I.M. No.	Name	M/email	Address
1.	480/2019	Sri Suman Das	9862534158 sumandas18842@gmail.com	Research Scholar Tripura Univ.
2.	481/2019	Smt. K.Renubebeta Devi	7629007141 renu.ksh11@gmail.com	Research Scholar Tripura Univ.
3.	482/2019	Prof. Soma Basu	9051118213 somabasu01@gmail.com	RabindraBharati University
4.	483/2019	Sri H.N.Behera	9815889183 hullash334@gmail.com	Scientist, DRDO Chandigarh
5.	484/2019	SmtSonali Roy Barman	8794898041 roybarmansonali@gmail.com	Student, Women's College

REGIONAL MATHEMATICAL OLYMPIAD - 2019
Problems and Solutions

1. Suppose x is a nonzero real number such that both x^3 and $20x + \frac{19}{x}$ are rational numbers. Prove that x is a rational number.

Solution: Since x^3 is rational, we see that $(20x)^3$ and $(x/19)^3$ are rational numbers. But

$$(20x)^3 - \left(\frac{19}{x}\right)^3 = \left(20x - \frac{19}{x}\right)\left((20x)^2 - (20^2 \cdot 19) + 20^2 \cdot 19^2 + (20 \cdot 19^2)\frac{1}{x^2} + \frac{19^3}{x^4}\right).$$

Consider

$$T = \left((20x)^2 - (20^2 \cdot 19) + 20^2 \cdot 19^2 + (20 \cdot 19^2)\frac{1}{x^2} + \frac{19^3}{x^4}\right)$$
$$\left((20x)^3 - \frac{19^3}{x^3}\right) - 20 \cdot 19\left((20x)^2 + \frac{19^2}{x^2}\right) - (20^3 \cdot 19^3).$$

Using $20x + (19)/x$ is rational, we get

$$(20x)^3 + \frac{19^3}{x^3} - \left(20x + \frac{19}{x}\right)^3 - 3 \cdot 20 \cdot 19$$

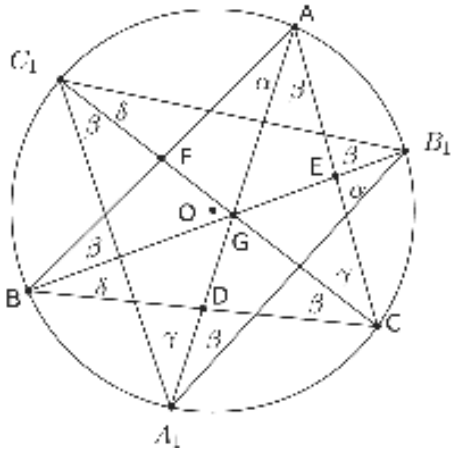
is rational. This leads to

$$(20x)^4 + \frac{19^4}{x^4} = \left((20x)^2 - \frac{19^2}{x^2}\right)^2 + 2 \cdot 20^2 \cdot 19^2$$

is also rational. Thus T is a rational number and $T \neq 0$. We conclude that $20x - (19/x)$ is a rational number. This combined with the given condition that $20x + (19/x)$ is rational shows $2 \cdot 20 \cdot x$ is rational. Therefore x is rational.

2. Let ABC be a triangle with circumcircle Ω and let G be the centroid of triangle ABC. Extend AG, BG and CG to meet the circle Ω again in A_1, B_1 and C_1, respectively. Suppose $\angle BAC = \angle A_1B_1C_1$, $\angle ABC = \angle A_1C_1B_1$ and $\angle ACB = \angle B_1A_1C_1$. Prove that ABC and $A_1B_1C_1$ are equilateral triangles.

Solution:



Let $\angle BAA_1 = \alpha$ and $\angle A_1AC = \beta$. Then $\angle BB_1A_1 = \alpha$. Using that angles at A and B_1 are same, we get $\angle BB_1C_1 = \beta$. Then $\angle C_1CB = \beta$. If $\angle ACC_1 = \gamma$, we see that $\angle C_1A_1A = \gamma$. Therefore $\angle AA_1B_1 = \beta$. Similarly, we see that $\angle B_1BA = \angle A_1C_1C = \beta$ and $\angle B_1BC = \angle B_1C_1C = \delta$.

Since $\angle FBC = \angle BCC = \beta$, it follows that FB is tangent to the circumcircle of $\triangle BCC$ at B. Therefore $FB^2 = FG \cdot FC$. Since $FA = FB$, we get $FA^2 = FG \cdot FC$. This implies that FA is tangent to the circumcircle of of $\triangle AGC$ at A. Therefore $\alpha = \angle GAF = \angle GCA = \gamma$. A similar analysis gives $\alpha = \delta$.

It follows that all the angles of $\triangle ABC$ are equal and all the angles of $\triangle A_1B_1C_1$ are equal. Hence ABC and $A_1B_1C_1$ are equilateral triangles.

3. Let a, b, c be positive real numbers such that $a + b - c - 1$. Prove that

$$\frac{a}{a^2 + b^3 + c^3} + \frac{b}{b^2 + c^3 - a^3} + \frac{c}{c^2 + a^3 + b^3} \leq \frac{1}{5abc}.$$

Solution: Observe that

$$a^2 \mid b^3 \mid c^3 = a^2(a \quad b \mid c) \quad b^3 \mid c^3 = (a^3 \mid b^3 \mid c^3) \mid a^2(b \mid c) > 3abc \mid a^2b \mid a^2c.$$

Hence

$$\frac{a}{a^2 + b^3 + c^3} \leq \frac{1}{3bc + ab + ac}.$$

Using AM-HM inequality, we also have

$$\frac{3}{bc} + \frac{1}{ca} + \frac{1}{ab} \geq \frac{25}{3bc + ca + ab}.$$

Thus we get

$$\frac{a}{a^2 + b^3 + c^3} \leq \frac{1}{3bc + ab + ac} \leq \frac{1}{25}\left(\frac{3}{bc} + \frac{1}{ca} - \frac{1}{ab}\right).$$

Similarly, we get

$$\frac{b}{b^2 + c^3 + a^3} \leq \frac{1}{25}\left(\frac{3}{ca} + \frac{1}{ab} - \frac{1}{bc}\right)$$

and

$$\frac{c}{c^2 + a^3 - b^3} \leq \frac{1}{25}\left(\frac{3}{ab} + \frac{1}{bc} + \frac{1}{ca}\right)$$

Adding, we get

$$\frac{a}{a^2 + b^3 + c^3} + \frac{b}{b^2 + c^3 + a^3} + \frac{c}{c^2 + a^3 + b^3} \leq \frac{5}{25}\left(\frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca}\right) - \frac{1}{5abc}.$$

4. Consider the following 3×2 array formed by using the numbers $1, 2, 3, 4, 5, 6$:

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{pmatrix} - \begin{pmatrix} 1 & 6 \\ 2 & 5 \\ 3 & 4 \end{pmatrix}.$$

Observe that all row sums are equal, but the sum of the squares is not the same for each row. Extend the above array to a $3 \times k$ array $(a_{ij})_{3\times k}$ for a suitable k, adding more columns, using the numbers $7, 8, 9, \ldots, 3k$ such that

$$\sum_{j=1}^{k} a_{1j} = \sum_{j=1}^{k} a_{2j} = \sum_{j=1}^{k} a_{3j} \quad \textbf{and} \quad \sum_{j=1}^{k} (a_{1j})^2 = \sum_{j=1}^{k} (a_{2j})^2 = \sum_{j=1}^{k} (a_{3j})^2.$$

Solution: Consider the following extension:

$$\begin{pmatrix} 1 & 6 & 3+6 & 4+6 & 2-(2\cdot 6) & 5+(2\cdot 6) \\ 2 & 5 & 1+6 & 6+6 & 3-(2\cdot 6) & 4+(2\cdot 6) \\ 3 & 4 & 2+6 & 5+6 & 1 \quad (2\cdot 6) & 6+(2\cdot 6) \end{pmatrix}$$

of

$$\begin{pmatrix} 1 & 6 \\ 2 & 5 \\ 3 & 4 \end{pmatrix}.$$

This reduces to

$$\begin{pmatrix} 1 & 6 & 9 & 10 & 14 & 17 \\ 2 & 5 & 7 & 12 & 15 & 16 \\ 3 & 4 & 8 & 11 & 13 & 18 \end{pmatrix}.$$

Observe

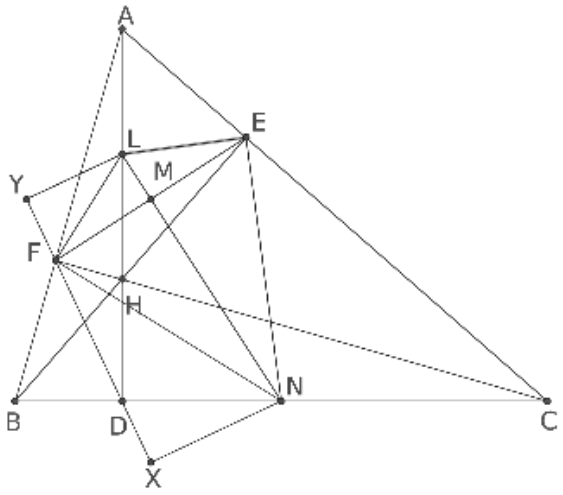
$$\begin{aligned} 1-6+9+10+14+17 &= 57; \quad 1^2-6^2+9^2+10^2+14^2-17^2 = 703; \\ 2-5+7+12+15+16 &= 57; \quad 2^2-5^2+7^2+12^2+15^2-16^2 = 703; \\ 3-4+8+11+13+18 &= 57; \quad 3^2+4^2+8^2+11^2+13^2+18^2-703. \end{aligned}$$

Thus, in the new array, all row sums are equal and the sum of the squares of entries in each row are the same. Here $k-6$ and we have added numbers from 7 to 18.

5. In a triangle ABC, let H be the orthocenter, and let D, E, F be the feet of altitudes from A, B, C to the opposite sides, respectively. Let L, M, N be midpoints of segments AH, EF, BC, respectively. Let X, Y be feet of altitudes from L, N on to the line DF. Prove that XM is perpendicular to MY.

Solution: Observe that AFH and HEA are right-angled triangles and L is the mid-point of AH. Hence $LF = LA = LE$. Similarly, considering the right triangles BFC and BEC, we get $NF = NE$. Since M is the mid-point of FE it follows that $\angle LMF = \angle NMF = 90^\circ$ and L, M, N are collinear. Since LY and NX are perpendiculars to XY, we conclude that $YFML$ and $FXNM$ are cyclic quadrilaterals. Thus

$$\angle FLM = \angle FYM, \quad \text{and} \quad \angle FXM = \angle FNM.$$



We also observe that CFB is a right triangle and N is the mid-point of BC. Hence $NF = NC$. We get

$$\angle NFC - \angle NCF - 90^\circ - \angle B.$$

Similarly, $LF = LA$ gives

$$\angle LFA = \angle LAF = 90^\circ - \angle B.$$

We obtain

$$\angle LFN = \angle LFC + \angle NFC = \angle LFC + 90 - \angle B = \angle LFC - \angle LFA = \angle AFC = 90^\circ.$$

In triangles YMX and LFN, we have

$$\angle XYM = \angle FYM = \angle FLM = \angle FLN,$$

and

$$\angle YXM = \angle FXM = \angle FNM = \angle FNL.$$

It follows that $\angle YMX = \angle LFN = 90^\circ$. Therefore $YM \perp MX$.

6. Suppose 91 distinct positive integers greater than 1 are given such that there are at least 456 pairs among them which are relatively prime. Show that one can find four integers a, b, c, d among them such that $\gcd(a, b) = \gcd(b, c) = \gcd(c, d) = \gcd(d, a) = 1$.

Solution: Let the given integers be $a_1, a_2, \ldots, a_{91}$. Take a 91×91 grid and color the cell at (i, j) black if $\gcd(a_i, a_j) = 1$. Then at least $2 \times 456 = 912$ cells are colored black. If d_i is the number of

black cells in the ith column, then $\sum d_i \geq 912$. Now,

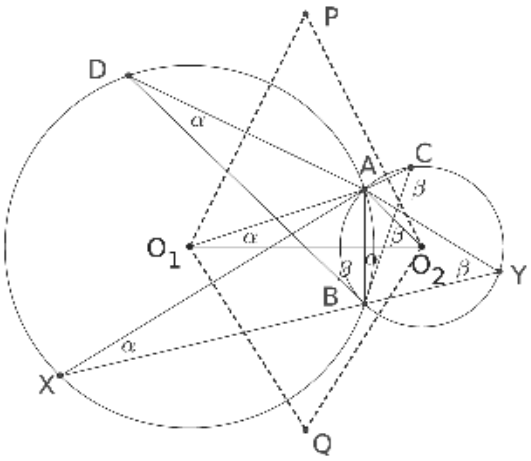
$$\begin{aligned}\sum_{1}^{91}\binom{d_i}{2} &\geq \frac{1}{2}\left[\frac{1}{91}\left(\sum_{i=1}^{91} d_i\right)^2 - \sum_{i=1}^{91} d_i\right] \\ &= \frac{1}{2\times 91}\left(\sum_{i=1}^{91} d_i\right)\left(\sum_{i=1}^{91} d_i \quad 91\right) \\ &\geq \frac{1}{2\times 91}\times 2\times 456\times(2\times 456-91) \\ &> \binom{91}{2}\end{aligned}$$

Since there are only $\binom{91}{2}$ distinct pairs of columns, there must be at least one pair of rows (u, v) that occur with two distinct columns s, t. Thus $(u, s), (u, t), (v, s)$ and (v, t) are all black. Thus if the integers corresponding to the columns u, v, s, t are a, c, b, d respectively, then $\gcd(a, b) - \gcd(b, c) - \gcd(c, d) - \gcd(d, a) - 1$.

SOLUTIONS TO INMO - 2020 PROBLEMS

1. Let Γ_1 and Γ_2 be two circles of unequal radii, with centres O_1 and O_2 respectively, in the plane intersecting in two distinct points A and B. Assume that the centre of each of the circles Γ_1 and Γ_2 is outside the other. The tangent to Γ_1 at B intersects Γ_2 again in C, different from B; the tangent to Γ_2 at B intersects Γ_1 again in D, different from B. The bisectors of $\angle DAB$ and $\angle CAB$ meet Γ_1 and Γ_2 again in X and Y, respectively, different from A. Let P and Q be the circumcentres of triangles ACD and XAY, respectively. Prove that PQ is the perpendicular bisector of the line segment O_1O_2.

Solution:



Let $\angle CBA = \alpha$ and $\angle DBA = \beta$. Then $\angle BDA = \alpha$ and $\angle BCA = \beta$. We also observe that $\angle AO_1O_2 - (\angle AO_1B/2) - \alpha$ and, simiarly, $\angle AO_2O_1 - \beta$. Hence

$$\angle O_1AO_2 = 180^\circ - (\alpha + \beta).$$

We also have

$$\angle PO_1A = \frac{\angle DO_1A}{2} = \frac{2\angle DBA}{2} = \angle DBA = \beta.$$

Hence $\angle PO_1O_2 - \angle PO_1A + \angle AO_1O_2 - \beta + \alpha$. Similarly, we can get $\angle PO_2O_1 - \alpha + \beta$. It follows that P lies on the perpendicular bisector of O_1O_2.

Now we observe that

$$\angle XQY - 360^\circ - 2\angle XAY - 360^\circ - 2(180^\circ - \alpha - \beta) - 2(\alpha + \beta).$$

This gives

$$\angle O_1QO_2 = \frac{1}{2}(\angle XQA + \angle YQA) = \frac{\angle XQY}{2} = \alpha + \beta.$$

This shows that A, O_1, O_2, Q are concyclic. We also have

$$\begin{aligned} \angle ABX &= \angle ABD + \angle DBX - \beta + \angle DAX - \beta - \frac{\angle DAB}{2}; \\ \angle ABY &= \angle ABC + \angle CBY - \alpha + \angle CAY - \alpha - \frac{\angle BAC}{2}. \end{aligned}$$

Adding we obtain

$$\angle ABX + \angle ABY - \alpha + \beta + \frac{1}{2}(\angle DAB + \angle BAC) - \alpha + \beta + (180^\circ - \alpha - \beta) - 180^\circ.$$

Hence X, B, Y are collinear. Now

$$\angle QAX = \frac{1}{2}(180^\circ \quad \angle AQX) = 90^\circ \quad \beta;$$

$$\angle XAO_1 = \frac{1}{2}(180^\circ - \angle XO_1A) = 90^\circ - \frac{1}{2}(360^\circ - 2\angle ABX) = \angle ABX - 90^\circ.$$

Hence

$$\angle QAO_1 = 90^\circ - \beta + \angle ABX - 90^\circ = \angle ABX - \beta = \frac{\angle DAB}{2} = \frac{\angle O_1AO_2}{2}.$$

This shows that AQ bisects $\angle O_1AO_2$ and therefore the chords QO_1 and QO_2 subtend equal angles on the circumference of the circle passing through QO_2AO_1. Hence $QO_2 - QO_1$. This means Q lies on the perpendicular bisector of O_1O_2.

Combining, we get that PQ is the perpendicular bisector of O_1O_2.

2. Suppose $P(x)$ is a polynomial with real coefficients satisfying the condition $P(\cos\theta + \sin\theta) = P(\cos\theta - \sin\theta)$, for every real θ. Prove that $P(x)$ can be expressed in the form

$$P(x) = a_0 \mid a_1(1 \quad x^2)^2 \quad a_2(1 \quad x^2)^4 \mid \cdots \mid a_n(1 \quad x^2)^{2n},$$

for some real numbers $a_0, a_1, a_2, \ldots, a_n$ and nonnegative integer n.

Solution: Changing θ to $\theta - \pi/2$, we see that

$$P(\sin\theta + \cos\theta) - P(\sin\theta - \cos\theta)$$

This shows that $P(x) - P(-x)$ for all $x \in [-\sqrt{2}, \sqrt{2}]$ and as P is a polynomial, in fact,

$$P(x) = P(-x)$$

for all $x \subset \mathbb{R}$. Hence $P(x)$ is an even polynomial; $P(x) = Q(x^2)$ for some polynomial $Q(x)$. This gives

$$Q(1 + \sin(2\theta)) = P(\cos\theta - \sin\theta) = P(\cos\theta - \sin\theta) = Q(1 - \sin(2\theta)).$$

Taking $t - \sin(2\theta)$, we see that $Q(1 + t) - Q(1 - t)$. Hence $Q(0) - Q(2)$

Consider $Q(t) - Q(0)$. This vanishes both at $t = 0$ and $t = 2$. Hence $t(2 - t)$ is a factor of $Q(t) - Q(0)$. We obtain

$$Q(t) - Q(0) = t(2 - t)h(t)$$

for some polynomial $h(t)$. Using $Q(1 + t) = Q(1 - t)$, it follows that $h(1 + t) = h(1 - t)$. Hence by induction we get

$$Q(t) - \sum_{k \quad 0}^{n} b_k t^k (2 - t)^k.$$

Hence

$$P(x) = Q(x^2) = \sum_{k=0}^{n} b_k (x^2(2 - x^2))^k = \sum_{k=0}^{n} b_k \left(1 - (1 - x^2)^2\right)^k.$$

Using binomial theorem, we can write this as

$$P(x) = \sum_{k=0}^{n} a_k (1 - x^2)^{2k},$$

for some coefficients a_k, $0 \le k \le n$.

3. Let $X = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Let $S \subseteq X$ be such that any nonnegative integer n can be written as $p - q$ where the nonnegative integers p, q have all their digits in S. Find the smallest possible number of elements in S.

Solution: We show that 5 numbers will suffice. Take $S = \{0, 1, 3, 4, 6\}$. Observe the following splitting:

n	a	b
0	0	0
1	0	1
2	1	1
3	0	3
4	1	3
5	1	4
6	3	3
7	3	4
8	4	4
9	3	6

Thus each digit in a given nonnegative integer is split according to the above and can be written as a sum of two numbers each having digits in S.

We show that $|S > 4$. Suppose $|S| < 4$. We may take $|S| = 4$ as adding extra numbers to S does not alter our argument. Let $S = \{a, b, c, d\}$. Since the last digit can be any one of the numbers $0, 1, 2, \ldots, 9$, we must be able to write this as a sum of digits from S, modulo 10. Thus the collection

$$A - \{x + y \pmod{10} | x, y \in S\}$$

must contain $\{0, 1, 2, \ldots, 9\}$ as a subset. But A has at most 10 elements ($\binom{4}{2} - 4$). Thus each element of the form $x + y \pmod{10}$, as x, y vary over S, must give different numbers from $\{0, 1, 2, \ldots, 9\}$.

Consider $a-a, b+b, c+c, d+d$ modulo 10. They must give 4 even numbers. Hence the remaining even number must be from the remaining 6 elements obtained by adding two distinct members of S. We may assume that even number is $a + b \pmod{10}$. Then a, b must have same parity. If any one of c, d has same parity as that of a, then its sum with a gives an even number, which is impossible. Hence c, d must have same parity, in which case $c \quad d \pmod{10}$ is even, which leads to a contradiction. We conclude that $S| \geq 5$.

4. Let $n \geq 3$ be an integer and let $1 < a_1 \leq a_2 \leq a_3 \leq \cdots \leq a_n$ be n real numbers such that $a_1 + a_2 + a_3 + \cdots + a_n = 2n$. Prove that

$$a_1 a_2 \cdots a_{n-1} - a_1 a_2 \cdots a_{n-2} + \cdots + a_1 a_2 + a_1 + 2 \leq a_1 a_2 \cdots a_n.$$

Solution: We use Chebyshev's inequality. Observe

$$\begin{aligned} & n(a_1 a_2 \cdots a_{n \ 1} + a_1 a_2 \cdots a_{n \ 2} + \cdots + a_1 + 1) \\ & \quad = (a_1 a_2 \cdots a_{n-1} + a_1 a_2 \cdots a_{n-2} + \cdots + a_1 + 1)((a_n - 1) + (a_{n-1} - 1) + \cdots + (a_1 - 1)) \\ & \quad \leq n(a_1 a_2 \cdots a_{n-1}(a_n - 1) + \cdots + a_1(a_2 - 1) + 1(a_1 - 1)) \\ & \quad \leq n(a_1 a_2 \cdots a_n \quad 1). \end{aligned}$$

It follows that

$$a_1 a_2 \cdots a_{n \ 1} \quad a_1 a_2 \cdots a_{n \ 2} \mid \cdots \mid a_1 \mid 1 < a_1 a_2 \cdots a_n \quad 1.$$

This gives the required inequality.

5. Infinitely many equidistant parallel lines are drawn in the plane. A positive integer $n \geq 3$ is called *framcable* if it is possible to draw a regular polygon with n sides all whose vertices lie on these lines and no line contains more than one vertex of the polygon.

   (a) Show that $3, 4, 6$ are *framcable*.

   (b) Show that any integer $n \geq 7$ is not framcable.

(c) Determine whether 5 is *framable*.

Solution: For $n = 3, 4, 6$ it is possible to draw regular polygons with vertices on the parallel lines (note that when we show a regular hexagon is a framed polygon, it includes the equilateral triangle case).

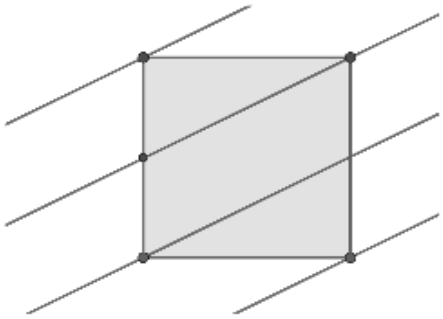


Figure 1:

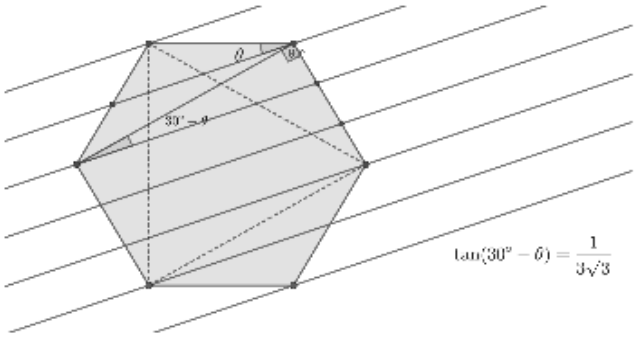


Figure 2:

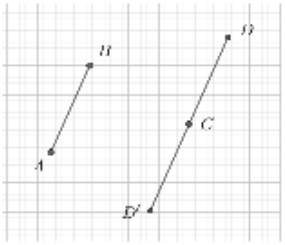


Figure 3:

We will prove that it is not possible for $n \geq 7$. In fact, we prove a stronger statement that we can not draw other polygons with vertices on the lines (even if we allow more than one vertex to lie on the same line).

First observe that if A, B are points on the lines and C is another point on a line, if we locate

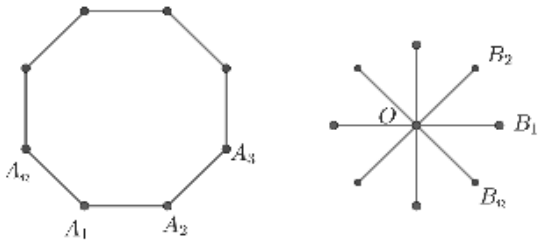


Figure 4:

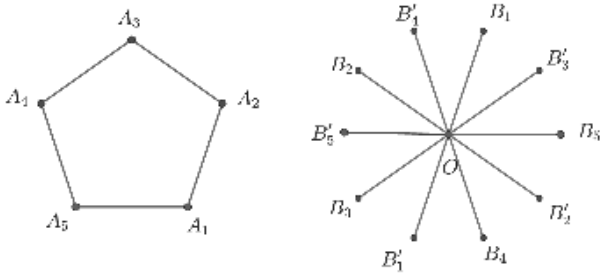


Figure 5:

point D such that CD is parallel and equal to AB, then D also lies on a line. Suppose that we have a regular polygon $A_1A_2 \ldots A_n$, where $n \geq 6$, with all the vertices on the grid lines. Choose a point O on a grid line and draw segments OB_i equal and parallel to A_iA_{i-1}, for $i = 1, 2, \ldots, n-1$ and OB_n parallel and equal to A_nA_1. The points B_i also lie on the grid lines and form a regular polygon with n sides. Consider the ratio $k = \dfrac{B_1B_2}{A_1A_2}$. Since $n > 6$, the $\angle B_1OB_2 < 360°/6$ and hence is the smallest angle in the triangle B_1OB_2 (note that the triangle B_1OB_2 is isosceles). Thus $k < 1$. Hence starting with a polygon with vertices on grid lines, we obtain another polygon with ratio of side lengths $k < 1$. Repeating this process, we obtain a polygon with vertices on grid lines with ratio of sides k^m for any m. This is a contradiction since the length of the side of a polygon with vertices on grid lines can not be less than the distance between the parallel lines. Thus for $n > 6$, we can not draw a polygon with vertices on the grid lines.

The above proof fails for $n = 5$. In this case, draw OB_1, OB_1' parallel and equal to A_1A_2, in opposite directions (see Figure 5), and similarly for other sides. Then we obtain a regular decagon with vertices on the grid lines and we have proved that this is impossible.

6. A *stromino* is a 3×1 rectangle. Show that a 5×5 board divided into twenty-five 1×1 squares

cannot be covered by 16 *strominos* such that each *stromino* covers exactly three unit squares of the board and every unit square is covered by either one or two *strominos*. (A *stromino* can be placed either horizontally or vertically on the board.)

Solution: Suppose on the contrary that it is possible to cover the board with 16 strominos such that each unit square is covered by either one or two strominos. If there are k squares that are covered by exactly one stromino then $2(25 \quad k) \mid k = 163 = 18$ and hence $k = 2$. Thus there are exactly two squares which are covered by only one stromino. We colour the board with three colours red, blue, green as follows. The square corresponding to the i-th row and the j-th column is coloured red if $i + j \equiv 0 \pmod 3$, green if $i + j \equiv 1 \pmod 3$ and blue otherwise. Then there are 9 red squares, 8 green squares and 8 blue squares. Note that each stromino covers exactly one square of each colour. Therefore the two squares that are covered by only one stromino are both red. For each such square $i + j \equiv 0 \pmod 3$ where i and j are its row and column number.

We now colour the board with a different scheme. We colour the square corresponding to the i-th row and the j-th column red if $i - j = \pmod 3$, green if $i - j = 1 \pmod 3$ and blue otherwise. Again, there are 9 red squares and hence the two squares covered by only one stromino are both red. For each such square $i - j \equiv 0 \pmod 3$ where i and j are its row and columne number Thus, each of the two squares covered by only one stromino satisfies $i + j \equiv 0 \pmod 3$ and $i - j \equiv 0 \pmod 3$ where i and j are its row and column number. This implies that $i - j - 3$. This is a contradiction because there is only one such square.

ANNUAL REPORT : SESSION 2018-2019

[To be presented at the 40th Annual General Meeting of Tripura Mathematical Society on 2nd June, 2019 at the auditorium of Sukanta Academy, Agartala, Tripura.]

Hon'ble President, Vice President and Members of TMS, I extend my hearty and pleasant welcome to all who are present in the business session of AGM 2019 and wish Subha Naba Barsha to all our members. At this auspicious occasion I also remember the dignitaries whose endless effort and contribution in the field of Mathematics as well as in the proliferation and achievements of TMS demands special mention.

Before detailing the activities of the Executive Committee 2018-2019, I would like to mention the salient features of the proceedings of the 39th Annual General Meeting.

39th General Body Meeting: The 39th AGM was held on 29th April 2018 at the Matangini Pritilata Sabhagriha of Women's College, Agartala , Tripura.

In the prize distribution ceremony of morning session, Prof Arunoday Saha, Ex Vice-Chancellor, Tripura University (A Central University), Suryamaninagar, Sri Bhabatosh Datta, Senior Scientific Officer, TSCST and Mrs Manidipa Debbarma, Principal, Women's College were present respectively as the chief Guest, Special Guest and Guest of Honour . Dr. Sharmistha Bhattacharya Halder, Vice President, Acting President of TMS, chaired the Session. The details of activities of TMS during the session 2017-2018 have been furnished in the Bulletin of Tripura Mathematical Society Vol No 38.

The Business session of AGM 2018 was started with the discussion on the Agenda points duly announced by Dr Sharmistha Bhattacharya Halder, Vice President, Acting President of TMS, who graced the Chair in the Business Session where all the Unit Secretaries , Treasurer and General Secretary placed their reports and were all accepted . After announcement of the dissolution of the Executive Committee of TMS of the session 2017-2018 by the President of TMS, a *new Executive committee of TMS was formed* and Unit secretaries were elected by the members present in the Business session of AGM 2018. Names of the Executive Committee members and Unit Secretaries for the year 2018-19 are published in the Bulletin of TMS, Vol 39.

Now I am presenting before the house, the activities of the TMS under the Executive Committee for 2018-2019.

1. Meeting of the Executive Committee: During the session 2018-2019, 12 (twelve) meetings of the Executive Committee/Extended Executive Committee were held.

2. Organization of Examinations/ Quiz Contests: The Society organized Mathematical Olympiad and Aptitude Test both on 9th September 2018. Inter School Quiz Contest on Mathematics 2018 was also conducted successfully. Preliminary round at sub divisional level was held on 11th August 2018 and then the State level 2nd (Semi final) Round was held on 21st December 2018. The final was held on 22nd December 2018. Satisfactory number of candidates for those examinations was noticed. The details of the results regarding these examinations conducted and quiz contests organized have been furnished in the Bulletin TMS Vol 39. So repetitions of those things have been avoided here for the paucity of time.

3. Mathematics Day Celebration: Like every year TMS observed the Birth Anniversary of Srinivas Ramanujan as Mathematics Day in collaboration with the Tripura State Council for Science and Technology, Govt of Tripura on 22nd December 2018. The Programme was organized at the Campus Hall of N. S. Vidyaniketan, Agartala, Tripura. Details of the Programme and the results of Prasna Mancha organized on that occasion are given in the ***Bulletin (Vol 39***) of TMS. It may be mentioned that the top Fifteen Rank holders (Agartala Municipal Area) of the JMO conducted by TMS and TSCST were presented prizes on that occasion.

4. Organization of Regional Mathematical Olympiad (RMO) and Indian National Mathematical Olympiad (INMO): These two Examinations were conducted on 07th Oct, 2018 and 20th January 2019 respectively. Dr S Bhattacharya (Halder) was the convener of the organizing committee of the said examination. The detail result of the RMO may be seen in the ***Bulletin (Vol 39***).

5. Organization of the Junior Mathematical Olympiad (JMO) for the Students of Class VIII: Junior Mathematical Olympiad (JMO) was jointly organized by TMS and TSCST on 11th Nov, 2018 in all sub-divisions, Nagar Panchayets, AMC Area. The sub-divisional results were declared on 10th December 2018 and the State level results on 5th Jan, 2019. The details of the results are available in the Bulletin, TMS Vol 39.

6. Awards: Apart from the awards of TMS, successful students are also able to get the following awards:

i) Madhab Lal Chatterjee Memorial Silver Medal and Kunjabasini Memorial Scholarship (for the highest scorer in the Aptitude Test) and Dipak Sarkar Memorial Encouragement Scholarship (for 2nd & 3rd position in the Aptitude Test).

ii) Radha Ranjan Deb Choudhury Memorial Silver Medal (for JMO topper)

iii) Satyabrata Memorial Scholarship (for 1st, 2nd and 3rd position in MO)

iv) Jaydeep Bhattacharjee Memorial Scholarship (for 1st position in RMO)

v) Chandraprava Memorial Running Trophy (for the Champion Team of Inter School Quiz Contest at Madhyamik level)

vi) Keshab Chandra Saha Memorial Silver Medal and Pradip Datta Memorial & Krishna Sushama Scholarship (for the highest marks in Mathematics in Madhyamik under TBSE)

vii) Bankim Chandra Memorial and Pradip Datta memorial Scholarship (for the highest marks in mathematics in H.S (+2) Exam under TBSE).

viii) Ramesh Chandra Das Memorial Silver Medal (for the highest scorer in B.Sc Mathematics Honours).

7. Membership: TMS has enrolled 16 new Life Members in this session, totalling to 479 Life Members.

8. Acheivements:

Organisation of Seminar: (i) Tripura Mathematical Society organised a one day Seminar on Methods of Teaching Mathematics for Elementary to Madhyamik level Teachers and Students in Amarpur Sub-division at Amarpur Class-XII School on 2nd August, 2018. Dr. Premtosh Majumder, President, TMS and Member Haridhan Debnath & Pabitra Roy were present there. TMS also organised one day program on the topic of Development of Geometry in Birendranagar H. S. School, Jirania, West Tripura. Dr. Premtosh Majumder, President, TMS and Member Haridhan Debnath & Lipika Saha were present in that programme.

(ii) Tripura Mathematical Society with the help of Directorate of School Education organized a Two Day workshop on Mathematics at Chandrai para Class XII School BRC Hall under Dhalai District for Madhyamik Level Teachers on 14.12.2018 & 15.12.2018. Dr Premtosh Majumder, president, TMS; Mr Prasenjit Roy, General secretary, TMS; Dr Manimoy Pal, Member TMS; Prof B. C. Tripathy, Editor in Chief of Journal, TMS & Dr Subrata Bhowmik, Editor of Bulletin, TMS delivered lectures in that workshop.

(iii) TMS also organised a one day programme at Kamalpur Class XII School on the topic of Teaching of Mathematics on 23rd Feb, 2019. Dr. Premtosh Majumder, President, TMS was present in that programme.

9. Publication: I am happy to announce that the **39th *volume of the Bulletin of TMS*** of the session 2018 – 2019 & **20th Volume of Journal** of 2018 is released today the 2nd June (Morning Session), 2019.

10. Donation: (a) Dr S Bhattacharya (Halder) donated Rs 12,000.00 , Dr Souvik Bhattacharya donated Rs 10,000.00, Mr Prasenjit Roy donated Rs 2000.00 and Mr Krishnendu Das donated Rs 2000.00.

(b) I like to remember that like every year First 15 prizes for Aptitude test is given by courtesy of M/S Parul Prakashani.

11. Grants: (a) TSCST-Rs 47, 000.00 [JMO (State) –Rs 40,000; JMO (Sadar) & Math Day -Rs 7000.]

(b) Dept of Atomic Energy & NBHM: Rs 70,000.00 for conducting INMO, RMO.

Thanks:

On behalf of TMS, I convey my sincerest and heartiest thanks to all those who have come forward with their helping hands to give impetus to the activities of TMS in any way or other to fulfil our ultimate mission. I must mention here modestly and gratefully that many Governmental and Non-Governmental organizations, different Institutions, different Print and Electronic media and many individuals have come forward whole-heartedly and spontaneously to help the TMS in all of our occasions.

My special and sincere thanks go to all the members of the Executive Committee, all Sub Committee members, all Unit Secretaries and other members of the Society who have generously and successfully shouldered different responsibilities showered on them. Without their collective and sincere effort it would not have been possible on my part to make such diversified programs of the society materialized.

Finally, I express my heartiest gratitude to all the members of TMS for their intense dedication, thrust, conviction and faith conferred on me towards performing the duty as General Secretary of TMS in a homely and successful manner.

I am grateful to the entire respected guardians and my beloved students who have co-operated a lot with us.

I am sure the unintentional lapses and unwanted inconveniences if any, caused by me in my tenure shall be overlooked and forgotten by your generosity in the mighty spirit of Team TMS.

Thanking all of you once again.

Prasenjit Roy
02/06/2018
General Secreatary,
TMS

T.K.SAHA & CO.
(Chartered Accountants)
Sakuntala Road,
Agartala : 799001
0381-232-6798 (O)
0381-230-7684 (R)

AUDIT REPORT

We have audited the attached Receipts & Payments Account of ***TRIPURA MATHEMATICAL SOCIETY, P.O. : Agartala College, Agartala, Tripura (W), Regd. No. 662/79 as at 31-03-2019 (Fin Year 2018-2019)*** *which are in agreement with the books of accounts as maintained and produced before us for the purpose of our audit.*

We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.

In our opinion and to the best of our information and according to explanations given to us, the said Receipts & Payments Account give a true and fair view of the actual receipts & payments that have taken place during the period from 01-04-2018 to 31-03-2019.

Place : Agartala
Date : 20-04-2019

T.K. SAHA & CO. CHARTERED ACCOUNTANTS TAPAN KUMAR SAHA CHARTERED ACCOUNTANT MEMBERSHIP NO. 052007 AGARTALA

20/04/2019

For T.K.Saha & Co.
Chartered Accountants

TRIPURA MATHEMATICAL SOCIETY

P.O. : Agartala College, Agartala, Tripura (W)

Regd. No. 662/79

Receipts & Payments Account for the Fin. Year 2018-2019.(Period from 01.04.2018 to 31.03.2019)

RECEIPTS			PAYMENTS		
To ***Opening Balance*** :			By ***Expenses inconnection with***		
1. Cash in hand		67,020.00	***Popularisation of Mathematics*** :		
2. Cash at Bank :			a) Aptitude Test	17,280.00	
S.B.I., MBBC Branch			b) M.O Test	18,700.00	
(A/c No. 10333227328)		1,24,714.82	c) Inter School Quiz Contest	3,267.00	
3. Fixed Deposit :			d) Conference (ICRTMS'18)	30,000.00	
B.C Bardhan Memorial Fund	20,000.00		e) Bulletin (Vol- XXXVIII)	17,896.00	
Kali Krishna Bama Sundari			f) Journal JTMS (Vol- 19)	12,000.00	
Memorial Fund	25,000.00		g) Expenses Relating to		
Madhablal Chatterjee			AGM (2017-18)	13,889.00	1,13,032.00
Memorial Medal Fund	25,000.00				
Kunjabasini Scholarship					
Fund	10,000.00				
Krishna Sushoma Award			" ***Expenses for TSCST Fund*** :		
Fund	6,000.00		a) JMO Test (Sadar)	4,474.00	
Pradip Datta Scholarship			b) JMO Test (State)	41,929.00	
Fund	10,000.00		c) Mathematics Day	3,168.00	49,571.00
Dipak Sarkar Encouragement					
Fund for Aptitude Test	10,000.00				
Joydeep Bhattacharjee					
Memorial Fund	7,000.00		" ***Expenses for NBHM Fund***		
Satyabrata Mahapatra			R.M.O/I.N.M.O Exam		70,761.00
Memorial Scholarship Fund	50,000.00				
Radha Ranjan Deb Choudhury					
Memorial Silver Medal/Cash			" ***Expenses for Unit*** :		
Award Fund	1,00,000.00		1. Amarpur	2,452.00	
Ramesh-Jogamaya Silver			2. Belonia	4,096.00	
Medal Fund	1,00,000.00		3. Bishalgarh	4,260.00	
Prizes by M/s. Parul			4. Dharmanagar	11,980.00	
Prakashani Fund	40,000.00		5. Kamalpur	3,032.00	
Mr. A.Datta Fund	5,000.00	4,08,000.00	6. Kailashahar	8,696.00	
2. Life Membership Fund		1,42,720.00	7. Khowai	1,600.00	
3. General Deposit		11,63,712.00	8. Teliamura	8,576.00	
4. Books & Periodicals		37,770.00	9. Udaipur	3,130.00	
5. Mr. Amlan Bhowmik		7,590.00	10. Santirbazar	5,920.00	53,742.00
" ***Life Membership Fee***		8,000.00			
" ***Donation*** :			" ***Other Expenses***		
1. Mr. Partha Saha	80,000.00		1. Bank Charges	50.00	
2. Mrs. Madhumita Choudhury	5,000.00		2. Audit Fee	2,360.00	2,410.00
3. Dr. Sarmistha Bhattacharya (Halder)	12,000.00				
4. Dr. Shouvik Bhattacharya	10,000.00				
5. Mr. Krishnendu Das	2,000.00				
6. Mr. Prasenjit Roy	2,000.00	1,11,000.00			
C/O		20,70,526.82	*C/O*		2,89,516.00

Cont. to Page No. (02)

B/F		20,70,526.82	B/F		2,89,516.00
To *Printing Charges of JTMS*			By ***Closing Balance :***		
1) Volume - 19	4,800.00		**1. Fixed Deposit :**		
2) Volume - 20	22,000.00	26,800.00	B.C Bardhan Memorial Fund	20,000.00	
			Keshab Chandra Saha Memorial Fund	1,00,000.00	
" ***Grants-in-aid :***			Madhabial Chatterjee Memorial Medal Fund	25,000.00	
1. From TSCST, Agartala			Kunjabasini Scholarship Fund	10,000.00	
For JMO (State)	40,000.00		Krishna Sushoma Award Fund	6,000.00	
For JMO (Sadar)	4,000.00		Pradip Datta Scholarship Fund	10,000.00	
For Mathmatics Day	3,000.00		Dipak Sarkar Encouragement Fund for Aptitude Test	10,000.00	
2. NBHM, RMO/INMO	70,000.00		Joydeep Bhattacharjee Memorial Fund	7,000.00	
3. From SBI (For ICRTMS'18)	25,000.00	1,42,000.00	Satyabrata Mahapatra Memorial Scholarship Fund	50,000.00	
			Radha Ranjan Deb Choudhury Memorial Silver Medal/Cash Award Fund	1,00,000.00	
" ***Collection of Exam. Fee***			Ramesh-Jogamaya Silver Medal Fund	1,00,000.00	
1. Agartala Unit	71,890.00		Prizes by M/s. Parul Prakashani Fund	40,000.00	
2. Amarpur Unit	6,130.00		Mr. A Datta Fund	5,000.00	4,83,000.00
3. Belonia Unit	10,240.00		**2. Life Membership Fund**		1,50,720.00
4. Bishalgarh Unit	10,640.00		**3. General Deposit**		12,87,739.00
5. Dharmanagar Unit	29,950.00		**4. Books & Periodicals**		37,770.00
6. Kamalpur Unit	7,580.00		**5. Mr. Amlan Bhowmik**		7,590.00
7. Kailashahar Unit	21,740.00		**6. Cash at Bank :**		
8. Khowai Unit	4,000.00		S.B.I., MRBC Branch (A/c No. 10933227928)	2,37,680.82	
9. Teliamura Unit	21,440.00		**7. Cash in hand**	13,280.00	2,50,960.82
10. Udaipur Unit	7,830.00				
11. Santirbazar Unit	14,800.00	2,06,240.00			
" ***Bank Interest :***					
1. S/B A/c	4,702.00				
2. Fixed Deposit	57,027.00	61,729.00			
		25,07,295.82			**25,07,295.82**

Signed in terms of our report of even date as stated separately

20/04/2019

For T.K. Saha & Co.,
Chartered Accountants.

T. K. SAHA & CO. CHARTERED ACCOUNTANTS TAPAN KUMAR SAHA CHARTERED ACCOUNTANT MEMBERSHIP No. 052007 AGARTALA

Place : Agartala
Date : 20-04-2019

TRIPURA MATHEMATICAL SOCIETY

Reg. No. 662/1979
Website: www.tms-in.org

EXECUTIVE COMMITTEE OF TMS: 2019 - 2020

SL.no.	Post	Name	e-mail	Phone
1.	**President**	Dr. Premtosh Majumder	---	M- 9436459895 L- 0381-2388486
2.	Vice-President	Dr. Sharmistha Bhattacharya (Halder)	halder_731@rediffmail.com	M-9862676027
3.	Vice-President	Mrs. Nilima Chakraborty	nilimac128@gmail.com	M-9436465982
4.	**General Secretary**	Dr. Jaydip Bhattacharya	jay73bhatta@gmail.com	M-9436180490
5.	**Treasurer**	Dr. Runu Dhar	runu.dhar@gmail.com	M-8837275378
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Bulletin of the

TRIPURA MATHEMATICAL SOCIETY

Volume : XXXX : 2019-2020
ISSN : 2395-3071
Website : www.tms-in.org
e-mail : information.tms@gmail.com

CONTENTS

Published by : **General Secretary**, on behalf of Tripura Mathematical Society
Agartala, Tripura, India.
Editor-in-Chief : **Dr. Subrata Bhowmik**
Printed by : **New Unique Computer**, Dhaleswar, Agartala.