# MTA (INDIA) Inaugural Conference

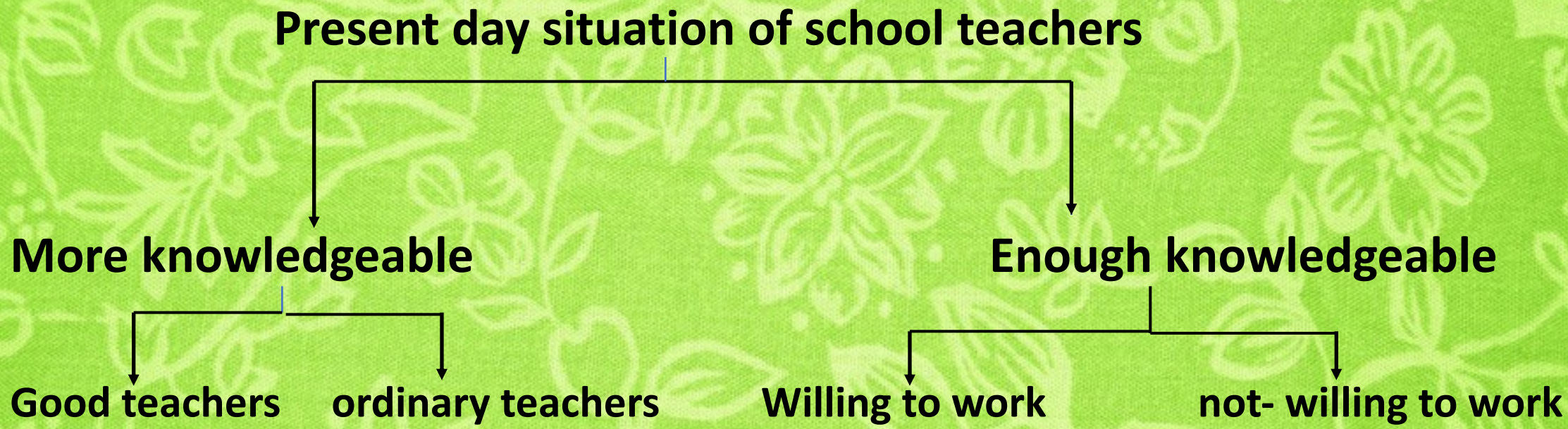
## Venue: Homibabha Science Centre – Mumbai

## Date: 03-01-2019

## Theme session

## Challenges in school Mathematics

Dr S. R. Santhanam


Present day situation of school teachers
More knowledgeable
Enough knowledgeable
Good teachers
ordinary teachers
Willing to work
not- willing to work

# Conference on Mathematics Education

# Challenges in Mathematics Education for the next decade

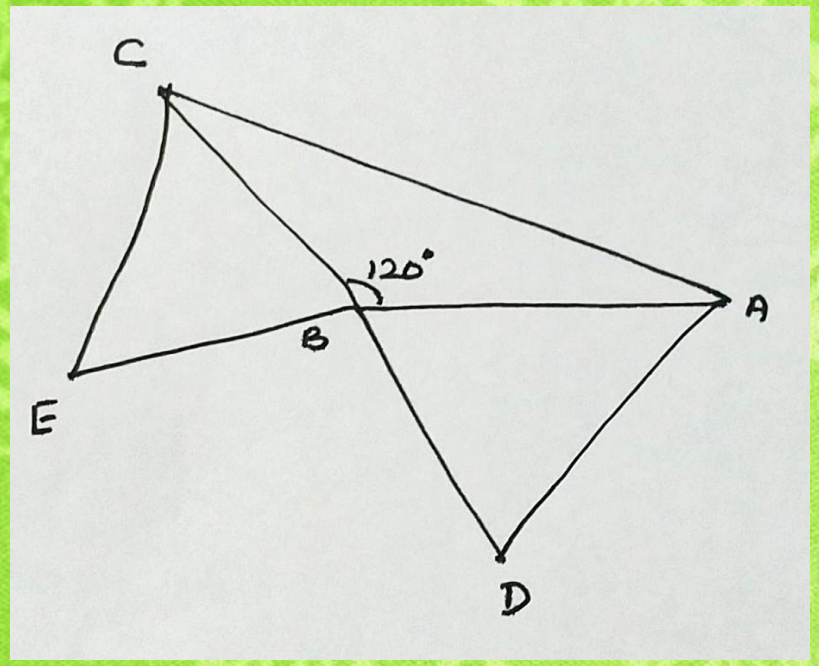
**September 10th – 15th 2017 – Hungary**
**70 papers were presented**

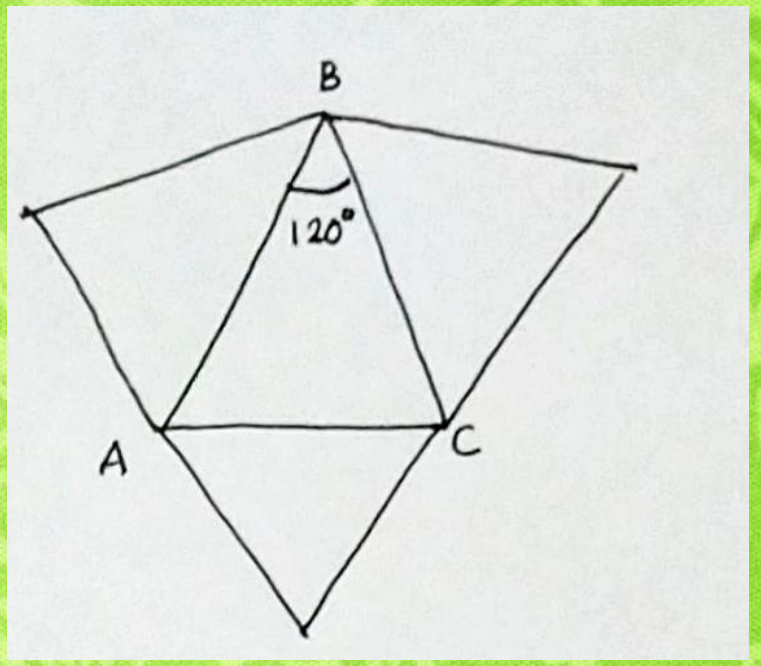
## An Analysis of the Geometry Knowledge Among Students And Teachers at School level – An Indian Scenario

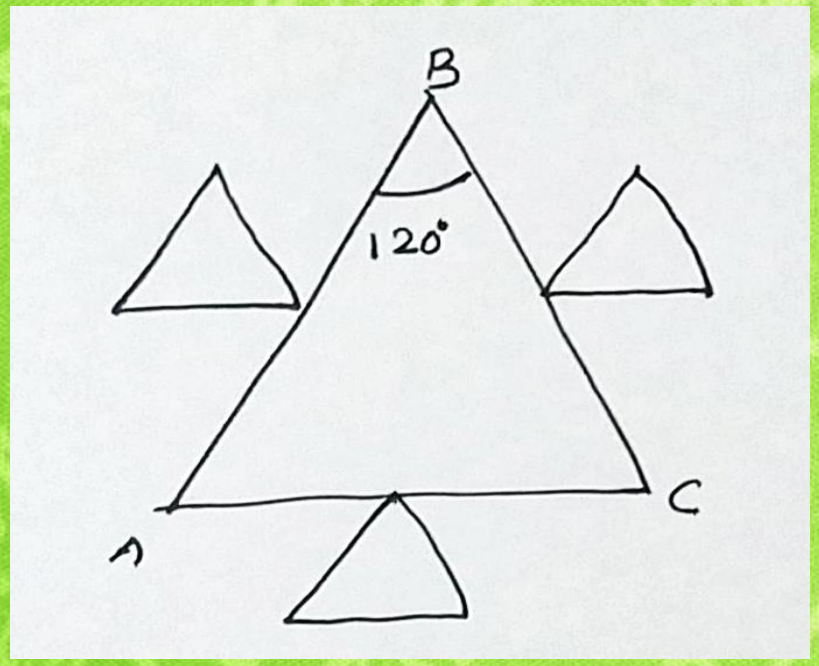
**Questionnaire: 22 questions**

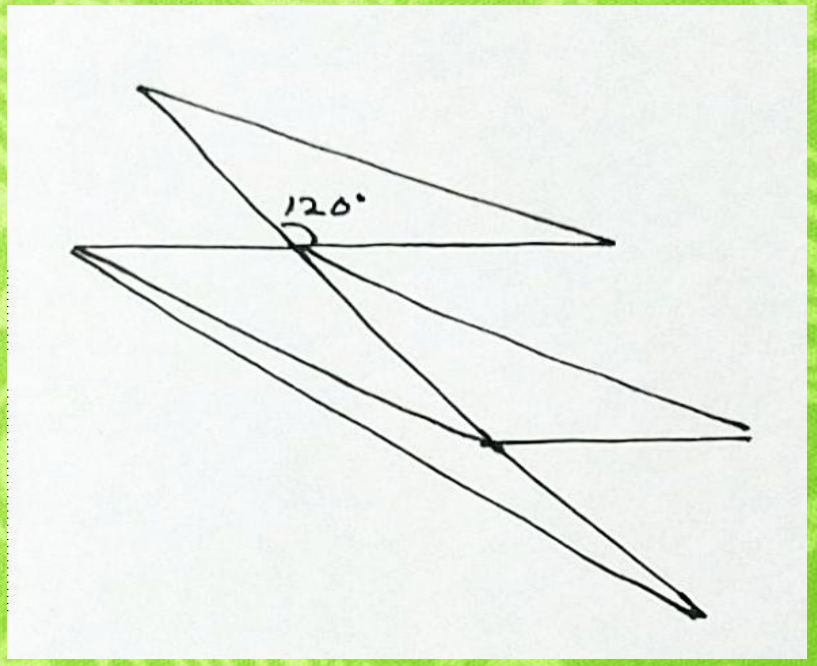
ABC is a triangle in which $\angle B = 120°$. Draw a free hand diagram of three equilateral triangles on the sides of this triangle pointing outside the triangle.

**Only 40% of the teachers drew correctly**


C
120°
A
B
E
D


B
120°
A
C


B
120°
C
A


120°

# Problem Posing

1. If the circles $x^2 + y^2 + 2x + 2ky + 6 = 0$ and $x^2 + y^2 + 2ky + k = 0$ intersect orthogonally , then $k$=

a)2 or $\frac{-3}{2}$ b) -2 or $\frac{-3}{2}$ c) 2 or $\frac{3}{2}$ d) -2 or $\frac{3}{2}$

$2gg_1 + 2ff_1 = c+c_1$ , $2k^2-k-6=0$ , k=2 or 3/2

The radius of the first circle is $\sqrt{1 + k^2 - 6} = \sqrt{k^2 - 5}$

2. A line makes the same angle θ with each of the x and z axes. If the angle β which makes with y axis is such that $\sin^2\beta = 3\sin^2\theta$, then $\cos^2\theta =$

a) $\frac{2}{5}$ b) $\frac{1}{5}$ c) $\frac{3}{5}$ d) $\frac{2}{3}$

$2\cos^2\theta+\cos^2\beta=1$ , $\sin^2\beta = 3\sin^2\theta$ (Given)

$\Rightarrow \tan^2\theta = \frac{2}{3}$

$\Rightarrow \cos^2\theta = \frac{3}{5}$

$\Rightarrow \sin^2\theta = \frac{2}{5}$

From the given we get, $\sin^2\beta = 6/5$, which is greater than 1

# Examples of Problems

*Primary Level*

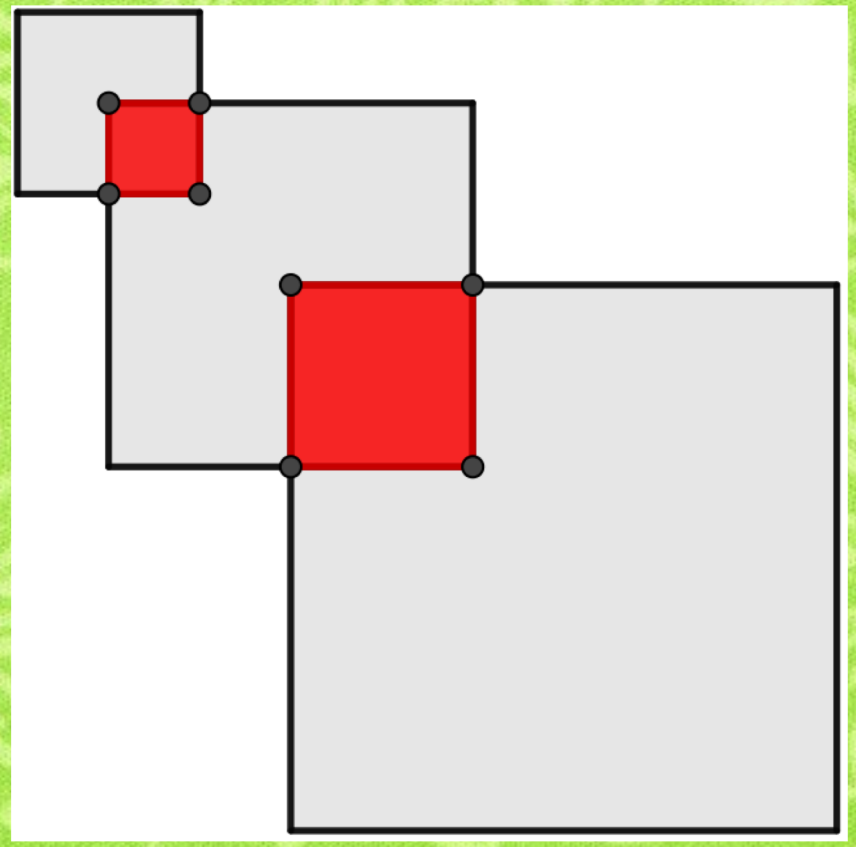
1) Taking two digits of 2019, two-digit numbers are formed. What is the maximum difference and minimum difference of such numbers?

2) Consider the number 201920192019… … … what number will come in the $2019^{th}$ place?

*Middle School*

1) Consider the number 2019. Fractions with integral parts being a two-digit number are formed using the digits of 2019 with no repetition. Find the sum of all such fractions.

2) A square of side 1 unit is taken. A square of side 2 units is placed as shown. This is continued till 2019 squares of increasing sizes are placed. What is the sum of all shaded areas?



# *High School*

**1) What is the units digit of $2019^{2019}$ ?**

**2) Solve :**

$$x_1 + x_2 + \ldots + x_{2019} = 2019$$

$$x^4_1 + x^4_2 + \ldots + x^4_{2019} = x^3_1 + x^3_2 + \ldots + x^3_{2019}$$

**where the 2019 variables are real numbers.**

## *Senior School*

1) The sequence $\{ a_n \}$ is obtained from the sequence of natural numbers { 1, 2, 3,…. } by deleting all multiples of 3 or 4 but not 5. Find $a_{2019}$

2) Swetha tosses 2019 fair coins. Sholapurkar tosses 2018 fair coins. What is the probability that Swetha gets more heads than Sholapurkar?

# CONCLUSION

The conclusion is in the form of a request.

As far as school teachers are concerned, on one hand we have to concentrate on the higher order thinking techniques and on the other hand refining teaching methods by conducting several workshops in different parts of India.

Either individually or collaborating with the existing Mathematics associations this can be achieved.

Associations like AMTI, AIMER and Pie Mathematics Association and similar such can be roped in to meet this.


Thank You