

TOPIC- HRDC WEBINAR REPORTS

DEPARTMENT-MATHEMATICS DEPARTMENT

ATTENDED BY- Ms. Bindu Parmod, Ms. Nidhi Keswani,

Ms. Sumeet Makkar, Ms. Sarika Gulati,

Ms. Pushpa Yadav, Ms. Bhumika Dhingra,

Ms. Shalini Aggarwal

WEBINAR REPORT

**TOPIC1: Pedagogical aspects of Polynomials in the Mathematics Classroom
Surface Areas and Volumes: Area of a Circle**

CONDUCTED BY: HRDC DPSS

RESOURCE PERSON: Dr. Monika Singh

ATTENDED BY: Ms. Bindu Pramod (TGT Mathematics)

DAY/DATE: Monday, 8th August 2022

TIME: 2.30 pm to 4.30 pm

A webinar on Pedagogical aspects of Polynomials in the Mathematics Classroom Surface Areas and Volumes: Area of a Circle was organized for Mathematics teachers by DPSS-HRDC on 8th August 2022. Dr. Monika Singh, Asst. Professor, Lady Shri Ram College, Delhi University was the resource person.

Dr. Singh started the session with the difference between an algebraic expression and a polynomial. The resource person explained the zeros of the polynomial and how to explain the concept of zeros of a quadratic polynomial with real zeros and non-real zeros with the help of technology. The requirement of explaining concepts empirically with the use of various softwares like Desmos, Maxima and Mathematica was also demonstrated. Deriving the formula to find the area of a circle from the acquired knowledge of the area of regular polygons by increasing the number of sides of polygon was explained through the software Mathematica. Also, the videos that can be made with the help of software to aid the visual representation of 3d objects with a combination of solid shapes was presented.

An interesting piece of story related to the mathematicians Gauss and Evariste Galois was discussed as examples that could be shared with students, to motivate them to think out of the box and develop/inspire them to bring out their best. The session was concluded with a question-answer session, where teachers' doubts were clarified.

TOPIC 2: Real Numbers and their Applications

CONDUCTED BY : HRDC DPSS

RESOURCE PERSON: Dr. Aparajita Dasgupta

ATTENDED BY: Ms. Nidhi Keswani (TGT Mathematics)

DAY/DATE: Wednesday, 10th August 2022

TIME: 2.30pm to 4.30pm

A webinar on the topic-Real numbers and their Applications was organized for Mathematics teachers by DPSS-HRDC on 10th August 2022. Dr. Aparajita Dasgupta, Asst. Professor, Department of Mathematics, IIT-Delhi was the resource person.

Dr. Dasgupta started the session with introduction of numbers and their requirement in day to day life with the help of an interesting video. The resource person explained the axioms of famous Italian Mathematician Peano and discussed the relationship between numbers. She also explained the evolution of integers, rationals and irrationals. The algebraic properties of various mathematical operations were also discussed in detail. The resource person explained the properties of prime numbers with the help of examples. The concept of finite and infinite numbers was also discussed.

In a nutshell, the need of real numbers and their evolution was discussed in detail with the help of examples so it could be taken up with students to motivate them to think out of the box and develop/inspire them to bring out their best. The session was concluded with a question-answer session, where teachers' doubts were clarified.

TOPIC 3: Trigonometry

CONDUCTED BY: HRDC DPSS

RESOURCE PERSON: Dr. Shabd SharanKhare

ATTENDED BY: Ms. Sumeet Makkar(TGT Mathematics)

DAY/DATE: Friday, 12th August 2022

TIME: 2.30 pm to 4.30 pm

A webinar on Trigonometry and its Applications in the Mathematics Classroom was organized for Mathematics teachers by DPSS-HRDC on 12th August 2022. Prof. Shabd Sharan Khare Fellow National Academy of Sciences(FNAsc), Former Pro-Vice Chancellor North-Eastern Hill University was the resource person.

Prof. Khare started the session by dividing it in two Parts: Part A and Part B.

In Part A, he focused on the importance of Mathematics and gave various suggestions that can make Mathematics more student- friendly. He stated that Mathematics is like a coconut-

hairy, shabby and hard from outside and difficult to crack, but once cracked, one can find sweet and pure water as well as absolutely white copra which is extremely tasteful.

In Part B, The resource person explained how each topic of Mathematics should be introduced especially Trigonometry in order to gather attention of the learners. He took various real life examples based on Trigonometry and Inverse functions of Trigonometry.

Interesting pieces of discovery related to the mathematician, Aryabhata, were discussed as examples that could be shared with students, to motivate them to think out of the box and develop/inspire them to bring out their best. The session was concluded with a question-answer session, where teachers' doubts were clarified.

TOPIC4: 3 D Geometry - Lines and Planes

CONDUCTED BY: HRDC DPSS

RESOURCE PERSON: Prof. R Parthasarathi

ATTENDED BY: Ms. Sarika Gulati (PGT Mathematics)

DAY/DATE: Tuesday, 16th August 2022

TIME: 2.30 pm to 4.30 pm

A webinar on 3D geometry - Lines and Planes was organized for Mathematics teachers by DPSS-HRDC on 16th August 2022. **R Parthasarathi**, Asst. Professor, Ramanujan Institute for Advanced study in Mathematics, University of Madras was the resource person.

The Professor started the session with explaining the difference between representation of a point in 2 D as well as 3 D plane. He interpreted that geometry is interesting in many ways as it can be visualized and we can apply existing knowledge.

Deriving the formula to find the distance between two points in a plane, equation of line in various forms, angle between two lines from the acquired knowledge of the vectors was explained. He also explained that a plane can be determined by its distance from origin and normal direction. Various other methods to determine planes were also discussed. Different forms (Normal form, planes passing through 3 non collinear points, intercept form) of the equation of plane were derived. Concept of planes passing through intersection of two given planes was also explained. The session was concluded with a question-answer session, where teachers' doubts were clarified.

TOPIC 5: SUMS: Techniques that one can use and ways of visualisation

CONDUCTED BY: HRDC DPSS

RESOURCE PERSON: Dr. Gaurav Bhatnagar

ATTENDED BY: Ms. Pushpa Yadav (TGT Mathematics)

DAY/DATE: Wednesday, 17th August 2022

TIME: 2.30 pm to 4.30 pm

HRDC DPS Society organized an online training session on Mathematics for teachers teaching Grade 6 to Grade 12 on 17th August 2022. The session focused on Sums: Techniques that one can use and ways of visualisation.

The webinar commenced with a welcome message from Ms. Vanita Sehgal, Executive Director HRDC DPSS. She introduced the participants to the resource person, Dr Gaurav Bhatnagar, visiting faculty of Ashoka University.

Dr. Bhatnagar, started the session with the discussion on sum of first n - positive integers and the sum of squares of first n - integers. The resource person explained the figure to visualise the sum of first n - odd natural numbers. He explained triangular numbers and telescopic method for finding sums. In the telescopic method subsequent terms cancel each other, leaving only initial and final terms. Induction method was also discussed to explore various series as sums. Derivation of formula to find area under curves from the acquired knowledge of the series was also demonstrated. The requirement of understanding sums for calculus was explained. Binomial sums, recursive formula and general factorial formula were also discussed.

A number of educators of the DPS fraternity from different parts of India participated in this webinar. The session was concluded with a question-answer session, where teachers' doubts were clarified.

TOPIC 6 : FUNCTIONS, CONTINUITY & DIFFERENTIABILITY

CONDUCTED BY: HRDC DPSS

RESOURCE PERSON: Dr. Ranjana Jain

ATTENDED BY: Ms. Bhumika Dhingra (PGT Mathematics)

DAY/DATE: Thursday, 18th August 2022

TIME: 2.30 pm to 4.30 pm

A webinar on the Basis of Calculus (Sets, Functions, Limits & Continuity) was organized for Mathematics teachers by DPSS-HRDC on 18th August 2022. Dr. Ranjana Jain, Professor, Lady Shri Ram College, Delhi University was the resource person.

Dr. Ranjana started the session by talking about five basic principles of Learning. The resource person also discussed the importance of Calculus in daily life like in Google Search, wavelets (Radio Transmission), Building Construction and many more. Besides this, she also discussed how to test whether a given number is prime or not, Hilbert Infinite Hotel and different ways to describe a function.

Many interesting and common questions which are generally asked by students in the class were taken up by the resource person. Significance of studying topics like Integration, Functions, Continuity was explained by connecting its applications in daily life. The session was concluded with a question-answer session, where teachers' doubts were clarified.

TOPIC7: Applications of Derivatives, Integrals

CONDUCTED BY: HRDC DPSS

RESOURCE PERSON: Prof. Jayde Sarkar

ATTENDED BY: Ms. Shalini Agarwal (TGT Mathematics)

DAY/DATE: Tuesday, 23rd August 2022

TIME:2.30pm to 4.30pm

A webinar on the topic-Applications of Derivatives, Integral was organized for Mathematics teachers by DPSS-HRDC on 23rd August 2022. Prof. **Jaydeb Sarkar**, Professor at the Indian Statistical Institute was the resource person.

Prof. Jaydeb Sarkar started the session with the introduction of Calculus and how it has evolved over time and the contribution of various mathematicians with special mention of Newton and Leibniz. He talked about the two part of calculus: differential calculus and Integral Calculus and how they are related. The resource person explained that locating the local maximum and local minima gives the feel of the function which is important. The Rolle's theorem was also discussed in detail. The resource person explained the difference between local maxima/local minima and Absolute minima/maxima with the help of examples.

In nutshell, the need of calculus and its evolution was discussed in detail with the help of examples so it could be taken up with students to motivate them to think out of the box and develop/inspire them to bring out the best in them. The session was concluded with a question-answer session, where teachers' doubts were clarified.



Prof Jaydeb Sarkar
Professor
Indian Statistical Institute
Bangalore



Calculus

Order

Start from left. Start from right.

[Remember: always possible to combine terms.]

Use of brackets

Age?



Zeros of a polynomial

A value of the variable x which makes the polynomial $p(x)=0$

Problem:

Find zero of a polynomial.
or
Find roots of a polynomial equation $p(x)=0$.

- Does every polynomial equation has a root?
- How many roots a polynomial equation has?
- What are the methods of find the roots?
- Interpretation of the solutions of the polynomial equation.



Division Algorithm (Numbers)

Given integers a and b with $b > 0$ there exists unique integers q and r such that

$$a = bq + r$$

$$0 \leq r < b$$

Handwritten: 41, 25, 6, 1, 1

Division Algorithm (Polynomials)

If $p(x)$ and $q(x)$ are two polynomials with $q(x) \neq 0$ then there exist unique polynomials $O(x)$ and $R(x)$ such that the following holds:

$$p(x) = O(x)q(x) + R(x)$$

where $R(x) = 0$ or $\text{Degree } R(x) < \text{Degree } q(x)$

Handwritten: 0 = R(x), 0 < R(x) < 2, 2, 2, 2

Legend:
 $p(x)$: Dividend
 $q(x)$: Divisor
 $O(x)$: Quotient
 $R(x)$: Remainder



Aug $1+x+\dots+x^n = ? = S_n$

$$S_n = x + x^2 + \dots + x^{n+1}$$

$$(1-x)S_n = 1 - x^{n+1} \quad (\text{Telescoping})$$

$$S_n = \frac{1 - x^{n+1}}{1-x}$$

OR

$$S = 1 + x + \dots$$

$$xS = x + x^2 + \dots$$

$$S(1-x) = 1$$

$$S = \frac{1}{1-x}$$

Handwritten: What we do in + part for telescopic function

