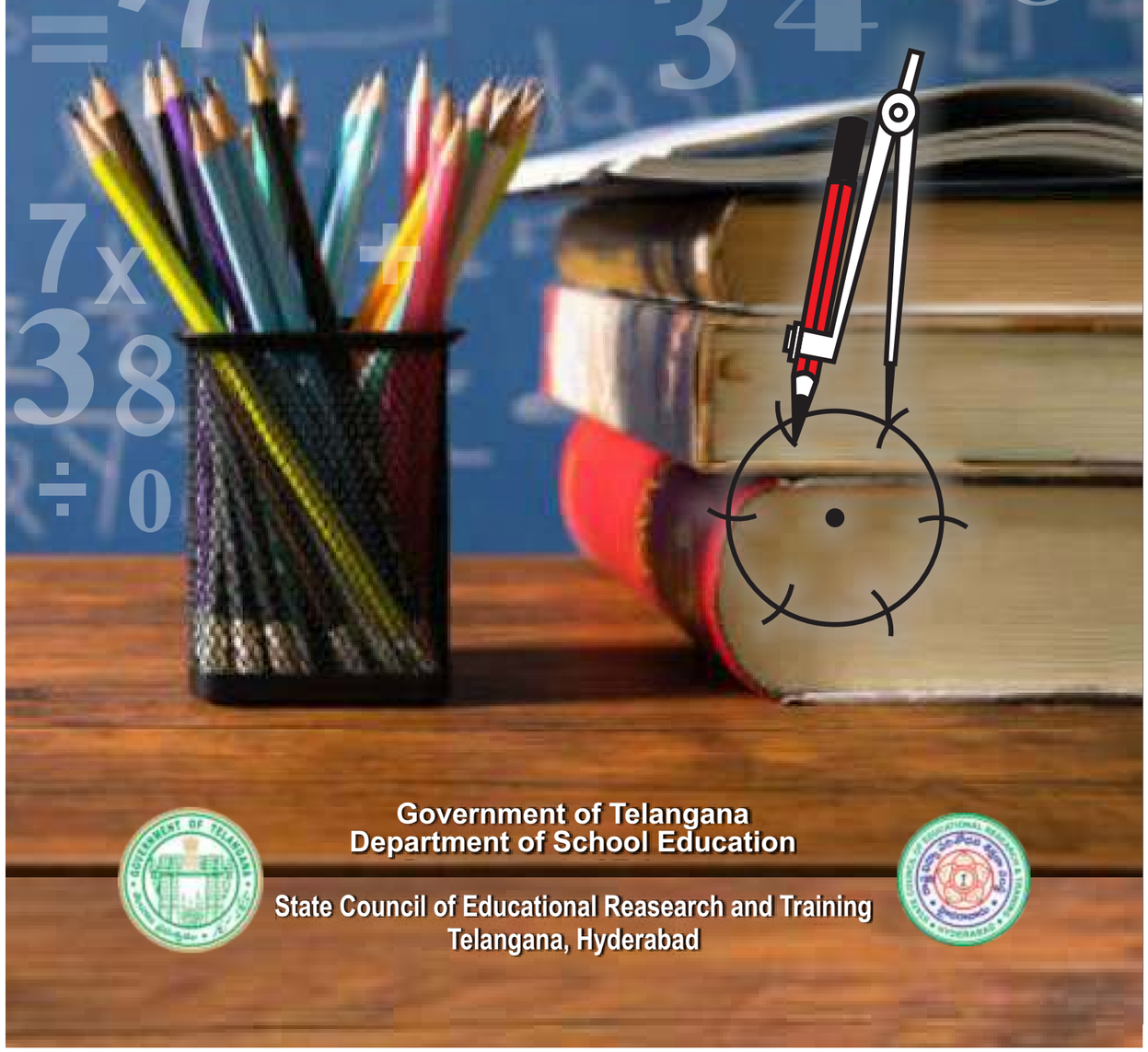
State Council of Educational Reasearch and Training,
Telangana, Hyderabad

State level e-Seminar On

Mathematics Education - the way ahead in the context of NEP 2020

22nd December, 2020



Government of Telangana
Department of School Education

State Council of Educational Reasearch and Training
Telangana, Hyderabad

STATE LEVEL MATHEMATICS SEMINAR

22nd DECEMBER, 2020

"Mathematics Education the way ahead in the context of NEP 2020"

DEPARTMENT OF MATHEMATICS AND SCIENCE

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING,

TELANGANA, HYDERABAD

Smt. M. Radha Reddy
Director

State Council of Educational Research and Training,
Opp. L.B. Stadium,
TS, Hyderabad

FOREWORD

State Council of Educational Research and Training being the Academic Wing of School Education in the state, strives for academic excellence in School Education as well as teacher education. For the purpose of constant professional growth of teachers, the SCERT every year organizes various academic activities such as trainings, workshops, symposia, conferences, seminars etc., in areas of different school subjects as well as in areas such as child psychology.

Every year our country celebrates, National Mathematics day on 22nd December to commemorate the birth anniversary of Srinivasa Ramanujan, a great Indian Mathematician.

I am glad that, on this occasion the Department of Mathematics and Science of SCERT has taken the initiative to organize a one day online seminar on "Mathematics Education the way ahead in the context of NEP 2020".

For this seminar, papers were invited from the Teacher Educators, Teachers and others who are working in the field of Mathematics Education, in response to which 67 papers were received. All the papers were scrutinized by a scrutinizing committee and 19 papers were selected for presentation. These are compiled into this compendium. We thank all the contributors who have sent their papers, and congratulate all the delegates whose papers are presented in this seminar.

I strongly believe that, this seminar will ignite Mathematics teachers to think for making Mathematics teaching more interesting, effective and application oriented. I hope this seminar, will motivate the teachers to prepare themselves for effective implementation of NEP 2020.

DIRECTOR, SCERT-TS

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Mathematics Seminar - 2020

PERSONAL DETAILS

Name of the participant	**:**	**RADHIKA MALEPU**
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THEME: - Mathematics Education the way ahead in the context of NEP 2020

SUB THEME:- Reforms in Mathematics Curriculum of School Education to enable our student to be on par with global student in terms of standards.

INTRODUCTION:-

The body of knowledge and practice known as "Mathematics". The goal a mathematics program at a school level is to develop an individual's capacity to understand the role of mathematics in the world. It helps study issues situations or events of global significance that call for a mathematical solutions. An effective curriculum ensures that important concept are taught though the project everyday experiences, collaborative activities and an active curriculum.

OBJECTIVES:-

It is a very interesting learning process for students for their life. Good understanding of change and clear conception of curriculum are necessary conditions for improved of curriculum are necessary conditions for improved implementation of new curriculum in practice. "Love and Interest on the topic of math brings success shortly".

PRESENTATION:-

The rationale for three levels of Mathematics curriculum:

The categorization of math in 3 level is a path breaking step taken towards making the learning of the subject more relevant according to future college or career planning. A balanced curriculum for all the 3 levels of math's has to be teach through for enabling students to have well rounded

development at 3 different levels of math's. It will not only de-stress learners and reduce the fear of math's but it will also improve a students learning outcomes Segregating topics is a boom for learners who will be able to concentrate on the subject of their choice rather than invest time on the subject that is of less or no interest .Further, it facilities students streaming into college, career and skill development programs etc.

Below are the three levels:

FIRST LEVEL OF MATHS-M1 is :

BASIC GENERAL MATHS:

It's a relatively elementary section of the course that will include class 5th level Math and a few concepts of applied math for a living .It's useful for people looking to leave school at class 10th stage to pursue intensive training and skill development programs such as certificate courses beautician, Actors, Artists, Drivers, Dancers, Singers, Mechanic, Chef etc. The M1 Math's gives that much needs time away from it, proving students Scope for many hours of practice to be perfect in their respective specialization. Everybody should have knowledge on level-1 math's and should have knowledge on these Chapters Number system, four fundamental activities on numbers, fractions, business mathematics. For this we give full freedom to teacher to teach this subject. Then every student can achieve something.

THE SECOND LEVEL OF MATH M2:- "APPLIED GENERAL MATH"

This is start from 8th class form +2 level applied math's and sector orientation. This bracket will not include any math's topics such as Calculus, Trigonometry, Algebra etc. This category of math is designed to Medicine courses, Agriculture, Architecture etc. It is advantage for people who getting a job or taking further studies such as Retail Services sector, Healthcare Management , Banking , Finance and Accountancy, Dairy Management, Travel and Tourism Management, Animation etc. Who are pass the second level Math's stage can eligible for competitive exams.

THE 3rd LEVEL OF MATHS IS:- "ADVANCED OR COMPOSITE MATHS"

It offers high intensity Math's educational experience and rigorous standards into +2 level Math's program, It 's intensive qualification planning such as Engineering Technology, Quantitative Analysts and Technical / Higher Educational professional courses etc.

OUTCOMES:-

These 3 level of Math's

- ✓ **Every student can love & enjoy the subject due to levels.**
- ✓ **It is support to effective learning**
- ✓ **It leads professional development**
- ✓ **It is help the student become individualized learners**
- ✓ **Every child will get complete knowledge on this**
- ✓ **Every child will learn every topic easily and they will get good knowledge on this Math's**

IMPLICATIONS:-

These Changes of curriculum in Mathematics are very useful for students, Our students also par with global students in terms of standards and they can approach their goals.

REFFERENCES: - INTERNET

అంతర్జాతీయ విద్యకు ధీటుగా పాఠశాల విద్యా ప్రణాళికలో చేర్చాల్సిన సంస్కరణలు – గణిత ఆన్లైన్ సెమినార్

1. **ప్రధాన అంశం** -- జాతీయ నూతన విద్యా విధానం – 2020, గణిత విద్యా
2. **ఉప అంశం** -- అంతర్జాతీయ విద్యకు ధీటుగా పాఠశాల విద్యా ప్రణాళికలో చేర్చాల్సిన సంస్కరణలు
3. **సెమినార్ లక్ష్యాలు** -- మారుతున్న ఆధునిక పోకడలకు అనుగుణంగా మార్పు చేయబడిన నూతన విద్యా విధానం – 2020 లో గణిత విద్యా ప్రణాళికలో చేర్చాల్సిన సంస్కరణలు
4. **వ్యక్తిగత వివరములు** --

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లక్ష్యాలు :-

1. విద్యార్థులకు గణితం పట్ల ఇష్టాన్ని, మరియు నిజజీవితంలో గణితం యొక్క పాత్రని, ఆవశ్యకత ను గుర్తించి దానిని అతిశయోక్తి చేసేల ప్రేరేపించుట.
2. గణిత పుస్తక జ్ఞానాన్ని నిజజీవిత సమస్యల పరిష్కారానికి మరియు ఇతర విషయాల యొక్క పరస్పర సంబంధాన్ని అన్వయించుకోగలిగేలా చేయటం.
3. భవిష్యత్తులో ఉపాధి అవకాశాలు పొందేలా గణిత నైపుణ్యం పెంపొందించుట.

సమర్పణ:-

గణితం మన పుట్టుక నుండి చివరి వరకు అనుసంధానం అయింది. మన జీవన క్రియలలో దుస్తుల ఎంపిక, శుభ్రపరచుకోవడం, వంటచేయటం, షాపింగ్ చేయడంలో గణితం ఒక భాగం అయింది గణిత అధ్యయనం ద్వారా విద్యార్థికి సృజనాత్మకతను, విశ్లేషణను తార్కిక ఆలోచనను పెంపొందించుకోవచ్చు. దీనిద్వారా ఈ పోటీ ప్రపంచంలో విద్యార్థి తనదైన స్థానాన్ని నిలుపుకొగలుగుతాడు.

మారుతున్న ప్రపంచ అవసరాలకు సాంకేతికతకు అనుగుణంగా అంతర్జాతీయ విద్యకు ధీటుగా ప్రస్తుతం ఉన్న 10+2 స్థానంలో 5+3+3+4 గా మార్పులు చేస్తూ జాతీయ నూతన విద్యా విధానం రూపొందించబడింది. అంతర్జాతీయ గణిత విద్యకు ధీటుగా మన విద్యా ప్రణాళికలో మార్పులు తీసుకురావటానికి చేసే ప్రయత్నంఇది.

ప్రాచీన కాలం నుండి గణితంలో మన భారతీయులు ప్రపంచ దేశాలకు ఆదర్శంగా ఉన్నారు. సున్నను ప్రపంచానికి పరిచయం చేసిన ఘనత మన భారతీయులది. ఆర్యభట్ట, భాస్కరుడు, వరామిహిరుడు, శ్రీనివాస రామనుజన్, శకుంతల దేవి లాంటి ఎందరో గణిత శాస్త్రవేత్తల కృషిని, తలుచుకుంటూ, వారి సేవలను స్ఫూర్తిగా తీసుకొని రానున్న కాలంలో మరెందరో గణిత శాస్త్రవేత్తలను ప్రపంచానికి అందించే దిశగా చేపట్టాల్సిన సంస్కరణల సమయమిది.

మన భారతీయ విద్యార్థులు గణిత పుస్తక జ్ఞానంలో ధీటుగా ఉన్నప్పటికీ నిజ జీవిత గణిత పద సమస్యలను సాధించడం లో ఇతర దేశాలతో పోలిస్తే కొన్ని సమస్యలను ఎదుర్కొంటున్నారు. దీనికి నిదర్శనం, Gmat's quantitative section test - 2010 లో మన దేశం 7వ స్థానం లో ఉంది.

దీనికి కారణం విద్యార్థులలో భావనల పట్ల సరైన అవగాహన లేకపోవడం మరియు కొన్ని అమూర్త భావనలను ఆలోచించడం లో సమస్యలను ఎదుర్కోవడం మరియు చివరి వరకు కొన్ని భావనలు అమూర్తంగానే మిగిలిపోవడం.

ఏ విద్యార్థి అయితే గణితాన్ని ఇష్టంగా, ఆసక్తిగా మూర్తభావణలో నేర్చుకుంటాడో వారి యొక్క విశ్లేషణ జ్ఞానం, తార్కిక శక్తి పెరిగి పుస్తకంకు సంబంధించినవే కాకుండా ఇతర సమస్యలను సాధించగలుగుతారు.

నేటి మన పాఠ్యప్రణాళిక విద్యార్థులకు గణితం పట్ల ఆసక్తిని పెంపొందించి నిజ జీవిత సమస్యలను సాధించే విధంగా భవిష్యత్ కాలానికి ఉపయోగపడే విధంగా రూపొందించబడినప్పటికి దాని అమలులో కొన్ని ఇబ్బందులు ఎదుర్కోవడం వలన విద్యార్థులలో ఇప్పటికీ గణితం అంటే భయం.

<u>దీనికోసం మన విద్యా ప్రణాళికలో ఈ క్రింది మార్పులు తీసుకురావటానికి ప్రయత్నించాలి</u>

1. విద్యార్థికి ప్రాథమిక స్థాయిలో మొదటగా సంఖ్యల భావనను కూడా మూర్త భావనలతో ప్రారంభించాలి. మూర్త భావాల నుండి చిత్రాలకు, చిత్రాల నుండి అమూర్త భావనల ద్వారా గణిత బోధన చేసే విధంగా విద్యా ప్రణాళికలో మార్పులు చేయాలి.
2. సంఖ్యలు, సంఖ్యలకు సంబంధించిన ప్రక్రియలను కూడా మూర్త భావనల ద్వారానే బోధించే విధంగా ప్రణాళిక రచించుకోవాలి
3. విద్యార్థులకు మొదటగా సంఖ్యల యొక్క నాలుగు ప్రక్రియల పై నైపుణ్యం పెంపొందించే విధంగా ప్రాధాన్యత తర్వాత ప్రక్రియల యొక్క అనువర్తనాల పై దృష్టి సారించే విధంగా ప్రాథమిక స్థాయిలో విద్యా ప్రణాళిక రచించబడాలి.
4. గణితంలోని సూత్రాలను, నిర్వచనాలను విద్యార్థి స్వయంగా తయారు చేసుకొనే విధంగా ప్రాజెక్టులను విద్యా ప్రణాళికలో చేర్చాలి.
5. విద్యార్థిలో గణితం అంటే భయం పోగొట్టి గణితన్నే అభినందించే విధంగా ప్రతి అధ్యాయంలో ఆ భావనకు సంబంధించిన నిజ జీవిత అనువర్తనాన్ని హైలైట్ చేసే విధంగా ప్రణాళిక రచించుకోవాలి.
6. ప్రతి భావనకు సంబంధించిన శాస్త్రజ్ఞుల కృషిని, ఇంకా మనం చేయాల్సిన కృషిని రచించుకోవాలి. గణితం యొక్క ప్రతిభావన కు సంబంధించిన చిన్న చిన్న మూల్యాంకన పరీక్షలను అక్కడికక్కడే చేసే విధంగా విద్యా ప్రణాళికలో చేర్చాలి.

7. గణితంతో ఆడే ఆటలను చేసే మ్యాజిక్లను విద్యా ప్రణాళికలో భాగం చేయాలి. కొత్త కొత్త బోధన పద్ధతులను, నూతనంగా వస్తున్న సాంకేతికతను విద్యా ప్రణాళికలో ఎప్పటికప్పుడు సవరించుకొగలగాలి.
8. విద్యార్థుల నైపుణ్యం పెంపొందేలా, పోటీ పరీక్షల్లో విజయం సాధించేలా "వేదగణితం" ను విద్యా ప్రణాళికలో భాగం చేయాలి.

చిక్కులు:-

1. గణిత నైపుణ్యాన్ని పెంపొందించేందుకు విద్యార్థికి తగిన సమయం ఇవ్వలేకపోవడం.
2. ప్రాథమిక స్థాయిలో ఒకే ఉపాధ్యాయుడు అన్ని విషయాలు భోదించాల్సిరావటం.
3. ప్రాథమిక స్థాయిలో అందరు ఉపాధ్యాయులకు గణిత ప్రత్యేక బోధన పద్ధతులపై పట్టు లేకపోవటం.

సూచనలు:-

1. ప్రాథమిక స్థాయిలో, సెకండరీ స్థాయిలో గణితానికి మిగితా విషయాలకంటే ఎక్కువ పిరియడ్ లు కేటాయించాలి.
2. ప్రాథమిక స్థాయిలో గణితాన్ని ప్రత్యేక పద్ధతులలో బోధించే విధంగా ఉపాధ్యాయులకు శిక్షణ ఇవ్వాలి.
3. ప్రతి పాఠశాలలో గణిత క్లబ్, గణిత సెమినార్లు నిర్వహించేలా ప్రేరేపించాలి.
4. గణిత మ్యాగజైన్స్, గణిత ఒలింపియాడ్లను ప్రతి పాఠశాల స్థాయి నుండే అధికారికంగా నిర్వహించాలి.
5. "వేదగణితం" యొక్క విశిష్టతను అందరికి తెలిసే విధంగా ప్రచారం నిర్వహిస్తూ విద్యా ప్రణాళికలో భాగం చేయాలి.

పై సూచనలను పరిగణలోకి తీసుకొని మన గణిత విద్యా ప్రణాళికలో మార్పులు చేసినట్లైతే మన భారతీయ విద్యార్థులు అంతర్జాతీయ స్థాయిలో అందరికంటే ముందు ఉంటారు.

Mathematics seminar 2020

"Mathematics Education - The way ahead In the context of NEP 2020"

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Sub Theme

Reforms in Pedagogical practices of Mathematics to make its teaching more interesting, effective and of application value.

Title of the Paper

Innovative methods in Mathematics Teaching

Introduction:

I want to ask a small question. What is one third plus one third? You may be smiling at my question. But I want to ask this question to a first grader. Now this question becomes a serious question. If any teacher makes the student answer the above question, there we have the best teacher.

Teaching mathematics is not really a tough job if we, the mathematics teachers started teaching in out-of-the-box methods. If we change the method of teaching mathematics, it would increase the problem solving skill, analyzing ability and understanding ability of the student.

Present day, the teacher's task goes beyond teaching a topic in the classroom. There is a need to innovate and evaluate student learning outcomes. As a teacher, we should encourage the students learning from observing the surroundings. Ask them to experiment and learn from their observations. Innovative methods of teaching mathematics and creating games in mathematics increase the interest among the pupil.

Objectives:

In this paper, I present efforts to discuss innovations and innovative practices in teaching mathematics at the school level by the means of **Inquiry based learning.**

Method and Procedure:

The class room teaching can be made effectively by using the following methods. As a physical science teacher I always tell my students only one thing, **"If you want to learn physics then you have to learn math effectively. If we consider physics as a treasure in the box then the key of the box is mathematics."**

Inquiry based learning

This method of teaching math is time taking but the results are really effective. The students practice problem solving and critical thinking skills to arrive a conclusion.

The 4C's to be developed are

Curious: This is about the concepts embedded in the content that learners can think about and discuss to drive their curiosity forward.

Connect: Bringing the content to learners by making relevant connections to different concepts inspires real learning.

Communicate: Here, we state what message and essential learning. We want our students to gain.

Create: This is what learners will present to demonstrate their understanding of, and appreciation for, what they've learned.

A typical inquiry lesson would generally incorporate the following three phases.

Phase 1: Task presentation

Teacher offers a problem, a situation, a prompt or a question stating what students are expected to do, but leaving the mathematical challenge open.

Example: Is $ax^2+ bx+c = 0$ a quadratic equation?

Phase 2: Small-group work

Students engage in a collaborative activity in their attempt to unravel the task.

Now discussion starts among the group. The question like what is a quadratic equation rises.

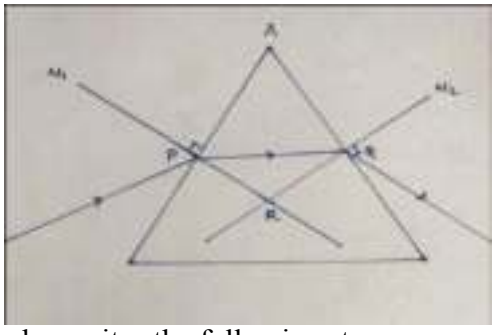
Now they start discussing the terms like degree and co efficient. Now they will practically think the importance of "a", which is x^2 co efficient.

Phase 3: A plenary

Students present their work to the whole class, providing explanations, challenging ideas and reaching agreed upon decisions.

Many of the students say that $ax^2+ bx+c = 0$ is the standard form of a quadratic equation without thinking the condition. But the teacher should guide them towards the condition where $ax^2+ bx+c = 0$ becomes a quadratic equation. Make them discuss the same equation for different coefficients such that they come to a conclusion.

Example:



From the above figure a teacher writes the following step

In □APRQ, ∟A + ∟R = 180^0 ?

Ask the students that How you reached to this conclusion?

The majority of the class will give you the answer which says "the sum of the opposite angles in a quadrilateral is $180^{0.}$" which is absolutely wrong.

Now guide them citing two or three examples where the sum of opposite angles of quadrilateral is not 180^0. Let them conclude of their own.

Ask questions which have more than one answer thus the total class will be engaged in saying answers.

Example: Find the coordinates which satisfy the equation x - y = 2

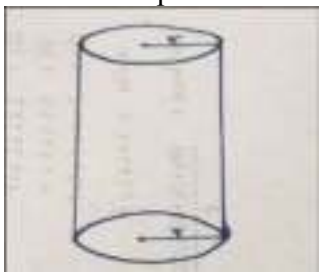
Find the Rational numbers between 1 and 2.

a) Ask them to prepare their own questions. Guide them to frame reasoning based questions like

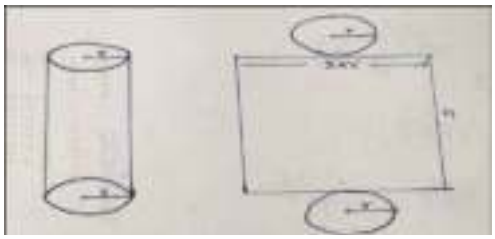
   i. **Is it essential that a data should have mode?**
   ii. **Is Real number system is biggest number system?**
   iii. **What is difference between -√1 and √-1?**

This method of teaching is really key to improve the student's communication skills and understanding of mathematics and presenting and learning mathematical language.
If the math text book is made in such a way that there is a large scope of communicating, discussion of the problem by the student- It really helps the student at larger scale.

Example: If we have to teach them the concept of TSA of a cylinder



Instead of making them write the formula TSA of cylinder = $2\pi r (h+r)$
We can draw another diagram like



By drawing diagram like above the student clearly understand the concept of total surface area not only that now u can make them write the formula as follows

TSA of the cylinder = area of rectangle + 2(area of the circle)

$=2\pi r \times h + 2(\pi r^2)$

$=2\pi rh + 2\pi r^2$

$= 2\pi r (h + r)$

Now this concept really enhances the critical thinking of the student.

Example: **Does the sum of two irrational numbers is rational or irrational. Justify your answer.**

Now divide the students into some groups. Let them have the discussion. Let them draw their conclusions. The teacher's role here is to monitor the debate and verify whether maximum number of students is participating in that oral debate.

Some students say that "the sum of two irrational numbers is again an irrational'

Ask a student from that particular group to explain how?

Example debate:

Let the two irrational numbers are $\sqrt{2}$ and $\sqrt{3}$

Their sum is $\sqrt{2} + \sqrt{3}$ is also an irrational

Let the other group respond

If no one is responding in the other way then give them some hints.

Lead the debate in a way that the other answer arises.

Let the two numbers are $\sqrt{2}$ and $-\sqrt{2}$
Their sum is $\sqrt{2} + (-\sqrt{2}) = 0$
This is a rational number
Let them draw the conclusion as "the sum may be rational or irrational."

Implications: Teaching concepts in innovative way and making mathematics as a language really helps the students solving ability. Student-centered **inquiry learning** makes it possible for students to design and participate in mathematical experiments with dialogic approaches, so they can explain, discuss, and reflect upon their own ideas. Students are urged to use guess and check methods when they lack ways to solve problems.

Our NEP mainly focusing on student centered education system. With NEP 2020, teachers will have an opportunity to nurture these very same values of adaptability and innovation in their classrooms. A key focus area of NEP is transforming the 'quality of teaching,' where teachers will be empowered to lead change.

Conclusions: The above mentioned are the implications and teaching strategies are applied by me in my teaching practice. I strongly believe that no student is dull. It's all depending on the teacher and his innovative teaching ability. If a student cannot learn or cannot enjoy the mathematics class then it is a failure of the teacher too. An effective teacher is who always learn, passionate towards innovation, experimentation and keen on student development.

References:

1) Ted talk.
2) GCSE
3)www.mnd.su.se

State level e- seminar on Mathematics Education 2020

"Mathematics -- this may surprise or shock some -- is never deductive in creation."

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Sub-Theme

Reforms in Pedagogical practices of mathematics to make its teaching more interesting, effective and of application value

Mathematics Education-the way ahead in the context of NEP 2020

Dr K.Kasturirangan, the chairman of the panel that drafted NEP 2020 termed this as a 'seminal moment' in the educational trajectory of our country that will change India and 'transform' education for the next two decades. In his statements on the day the policy was notified he highlighted policy-continuity by regarding NPE 2020 draft as a response to the enormous challenges related to *equity* and *quality* of education in our country; policy-concerns that are a part of the unfinished agenda outlined in the previous two policies of post-independent India: National Policy on Education 1968 and the National Policy on Education 1986. According to him contemporary India with recognition of education as a fundamental right, neoliberalised economy, exponentially altered communication processes, increased participation of all social segments in political-economic processes, , life-threatening challenges like climate change and unprecedented technological advancement constituted an altered socio-political-economic context that was very different from that of NEP 2020's predecessor policies. Consequently post-2016 years have marked a new policy-change phase in the educational planning and policy-making history of post-independent India. NEP 2020 is only the third national policy on education in the more than seven decades of independent India but the first one to emerge from this new policy-context of post-liberalization India.

The NEP 2020 policy-text begins by speaking of education for 'developing an equitable and just society', 'providing universal access to quality education' , of emphasizing 'mathematics, computer science, and data science, in conjunction with multidisciplinary abilities across the sciences, social sciences, and humanities', of multi-disciplinary learning for addressing 'climate change, increasing pollution, and depleting natural resources' not by a narrow posing but through 'collaborative research'. In articulating the aims of education the policy-text combines

instrumentality with deeper purposes of education by recommending that education should aim to 'build character' while preparing for gainful employment. In articulating these aims of education NPE 2020 makes reference to previous policies namely National Policy on Education 1968 and 1986, (modified in 1992) as also to the Right of Children to Free and Compulsory Education Act 2009. It does not forget to speak of the constitutional idea of education as a tool for democratic citizenship by speaking of education 'for building an equitable, inclusive, and plural society as envisaged by our Constitution'.

Objectives

- To promote the professional development of Mathematics teachers
- To provide teachers to think of alternative ways of teaching Mathematics to make it more interesting and effective
- To encourage teachers to come out with innovative ideas in Mathematics to meet the appreciations and challenges of developing India

Impact of use of ICT in teaching learning process

I believe that ICTs can and will empower teachers and learners, transforming teaching and learning processes from being highly teacher-dominated to student-centered, and that this transformation will result in increased learning gains for students, creating and allowing for opportunities for learners . ICTs potentially offer increased possibilities for codification of knowledge about teaching and for innovation in teaching activities through being able to deliver learning and cognitive activities anywhere at any time. In many classroom situations it is difficult to allow students to be sufficiently active as participants. Typically students are often passive, spending a lot of time listening or reading. It is well known that students are more likely to be interested and attentive and will achieve a wider range of learning outcomes if they can be active. Their engagement with the curriculum will increase as they

are afforded opportunities to create their own information and represent their own ideas. Expert system can be used to provide students with learning experiences where they are interacting directly with the computer system, and are not just passive but active participants in the learning process, thus increasing the quality of education. Technology makes the students take an active role in learning instead of taking on a passive role of receiving information from the teacher.

How can the use of ICT help improve the quality of education?

ICT is the ability to use technology as a tool to research, organize, evaluate, and communicate information and the possession of a fundamental understanding of the ethical/legal issues surrounding the access and use of information. It is viewed as a major tool for building knowledge societies, as a mechanism at the school education level that could provide a way to rethink and redesign the educational systems and processes, thus leading to quality education for all. ICT incorporates electronic technologies and techniques used to manage information and knowledge, including information-handling tools used to produce, store, and process, distribute and exchange information. My future plan is in the next couple years, robot teachers, virtual lessons, a more globalized curriculum, and moveable schools. Mobile tech is the wave of the future, and if our schools are supposed to be preparing students for the workforce, kids had better be proficient with these devices. In order to this our Google lab providing chrome books to every student. Encouraging students to participate in various competitions like Student innovation challenge, Inspire awards, and Boot camps and promote the children for innovation and get patent on their innovation.

Educators and workforce experts alike often warn that our children need improved 21st century skills. Without these skills, they will not be able to successfully participate in the global economy. More than technological expertise, 21st century skills refer to content knowledge, literacies and proficiencies that prepare individuals to meet the

challenges and opportunities of today's world.Flexibility and adaptability, Global and cultural awareness, information literacy, Leadership,Civic literacy and citizenship, Oral and written communication skills, Social responsibility and ethics, Technology literacy, Initiative are the required skills for all students.Learning and innovation skillsare critical thinking and problem solving, communications and collaboration, creativity and innovation.Digital literacy skills are information literacy, media literacy, Career and life skills are flexibility and adaptability, initiative and self-direction, social and cross-cultural
interaction, productivity and accountability. Many of these skills are also identified as key qualities of progressive education, a pedagogical movement that began in the late nineteenth century and continues in various forms to the present. Science fests, Inspire awards, innovation challenges are develop these skills.

Without both good technical support in the classroom and whole□school resources, teachers cannot be expected to overcome the obstacles preventing them from using ICT. Fortunately school net organization providing technical support to us. Learning links foundation is supporting to our school and students by teaching and technical assistance. Microchip Company provides technical support in the form of teaching and activities. Integrating ICT into teaching and learning is a complex process and one that may encounter a number of difficulties. low numbers of computers, oldness or slowness of ICT systems, and scarcity of educational software in the school were barriers to the successful ICT implementation but fortunately our school have good laptops ,Google chrome books, advanced Kyans, projects are help me to transact the class in effective manner. Self-learning and investigation, experimentation are the main focused things at our three labs Google lab, ATL lab and Robotics lab.

Teachers need to cope with classroom challenges and handle student feelings, which will make it easier for them to manage theirstudent's feelings. So it is vital that I take

care of my own wellbeing by managing the stress they experience. This helps me in teaching effectively and helping students deal with their stress. To enable student I manage stress efficiently several workshops and activities are conducted in the school by virtual meetings. The school conducts a workshop on Stress Management. Students are trained in meditation, relaxation techniques and wellness activities by voluntary organization kalaam seva. Yoga sessions are carried out throughout the year by who are professionally trained Yoga practitioners with help of NGO.Nurturing through the remedial teaching program, Mentoring through an individual counselling, provide various comprehensive psychological services to students and resolve their emotional, behavioural, academic, and social issues.Organizing workshop in the area of Stress management, Emotional intelligence, Self-awareness, Learning disabilities, offering counselling in the area of psychology and career guidance on request basis.

Implications:

Flipped Classroom

A new pedagogical strategy adopted in the classroom using Google Chromebooks and Intelli space software, Google Note. Children will write the examination in Google class software with online Mode. Their performance evaluated and remedial teaching also incorporated. A periodical Time Table is given to all the classes for conduction of Digital Classes at google Lab

Concepts of Super students: - As majority of the students have Low Potential in academics it would be extremely difficult for the teacher to reach out to every student explaining their doubts as per learning Pyramid teaching to others is more effective than the other parts of the pyramids. So, we introduced this model of concept of super

student where every high rigour student will be explaining and teach the subject contents with teaching learning material and digital tool to their friends who are academically poor. This works like a pro because peer sharing would be fun and effective.

Major Learning

During the process of school transformation there were some learnings that we observed based on few outcomes are results in this process they are documented below

- Technological innovation helps the students to accelerate their academic growth
- Leadership qualities were imparted in the high report kits
- Teacher and student relationship strengthen because of mentorship
- Students participates Innovation bootcamps, and National and international competitions like Bebras challenge.

References:

National Education Policy (NEP) of 2020,

MATHEMATIC SEMINAR 2020

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I.Sub Theme:

Reforms in pedagogical Practices of Mathematics to make it's teaching more interesting, effective and of application value.

II. Title of the Topic:

Effective and Joyful Learning in Trigonometry by using **"MULTIPURPOSE MAGIC HEXAGON"**

III. Introduction:

"The True sign of Intellegence is not knowledge but Imagination" -------- Albert Einstein

The word Innovation is used in many different ways. Innovation means a new idea which involves creative thinking. There is no limit for childs innovation or creativity thinking. Using Working Models in the Class Rooms in Teaching Learning Process is one such method of Innovation, which creates new thoughts and curiosity among the children in learning Hard Concepts like Trigonometry Formule in Mathematics. These type of innovative ideas moves away the traditional methods of teaching Mathematics by bringing Child Friendly atmosphere in Teaching Learning Process. More over These type of New Methods in teaching will eradicate Maths fobia in children and Children will enjoy alot in learning mathematics. Working Models provides real life

opportunities for students to develop and practice mathematics. Psychologists are suggesting the Joyful Learning will leads to better understanding of concepts and "Learning by Doing" method is the most powerful method of teaching.

IV.Objectives:

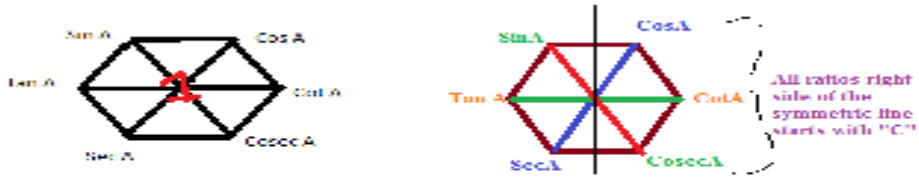
By using this working model while Teaching Trigonometry Chapter for Higher Secondary Level

1. We can Develop Curiosity in learning Trigonometry formulae.
2. Children never forget the these formule because they are learning these formulae in "**Learning by Doing**" method.
3. Children can develop Scientific Attitude by deriving formulae.
4. Child never gets bore or feel burden, because he is involving in the Teaching Learning Process very actively and interestingly.

V. Presentation:

a) Description of the Innovation:

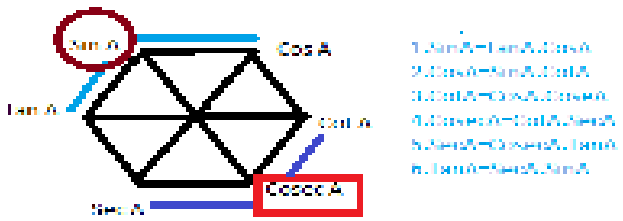
This Working model will consists of a Hexagon which will have Trigonometric ratios as its Vertices. We have to Write **"1"** in the middle (Centre) of the hexagon and by joining its opposite vertices we get 3 Diagonals. While writing the Trigonometric ratios we have to remember the order. We have to start Clockwise with Tangent successing with Sine and Cosine. If we draw a vertical symmetric line The ratios starting with the letter "C" should be on the right side of the symmetric line. Our Hexagon will look like this. We can observe hear that The Ratios which are on the same diagonal are inverse ratios to each other.



b) **Presentation:**

1. Prodcuct Identity: Take any three Consecutive Ratios, the 2nd Ratio will be equal to the product of 1st and 3rd ratios.

For ex: if we take Tan, Sin, Cos, here the 2nd Ratio is Sin, then this ratio will be equals to the product of Tan and Cos. i.e SinA=TanA.CosA



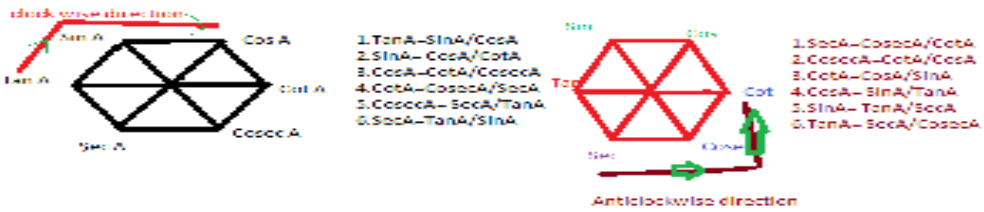
2.The Product of two ratios which are on same Diagnol is 1.

For ex: From above Hexagon we may notice that Tan and Cot ratios are on the same diagnol so the product of these two ratios will be equals to 1. i.e TanA.CotA= 1

similarly SinA.CosecA=1, CosA.SecA =1 (3 Formulae)

3.Every Trigonometric Ratio on above Hexagon is equal to the fraction made by its successive ratioes. (Clockwise/Anticlockwise)

For Example: Lets us take 3 consecutive rations Tan, Sin and Cos in clockwise direction. According the rule Tan will be equal to sin/cos i.e TanA= SinA/CosA

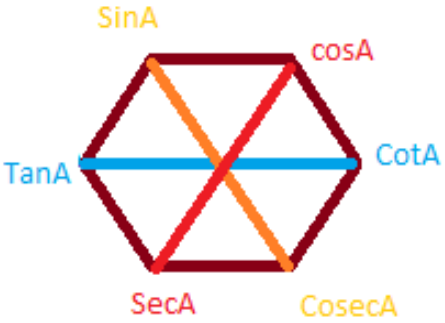


if we take anticlockwise Tan,Sec,Cosec then TanA=SecA/CosecA (6 formule)

4. Reciprocal Identity:

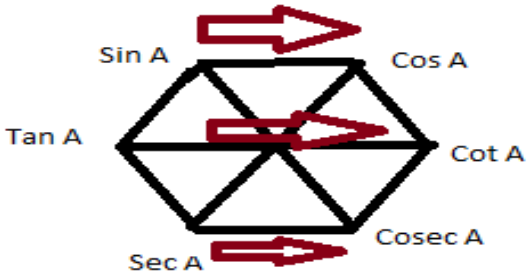
Ratios on Diagnolly Opposite Vertices will be reciprocal to each other.

for ex: Sin and Cosec are extreme ratios of the same Diagnol. Therefore SinA=1/CosecA and CosecA=1/SinA



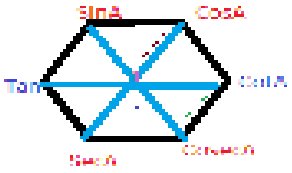
1. TanA=1/CotA
2.CotA=1/TanA
3.SinA=1/CosecA
4.CosecA=1/SinA
5.SecA=1/CosA
6.CosA=1/SecA

5.Complementary Identity: If the sum of 2 angles is 90^0, then they will be said to be complemtary angles,

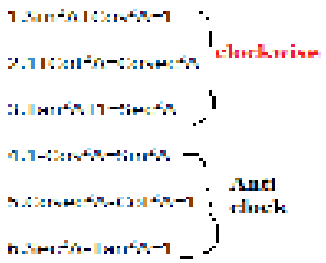


. SinA= Cos(90-A)
cos A=Sin(90-A)
TanA=Cot(90-A)
CotA=Tan(90-A)
CosecA=Sec(90-A)
SecA=Cosec(90-A)

6.Pythogorean Identities:



In this hexagon 3 triangels make 6 triangles.from this let us take 3 triangles.
we have written like 7 in the triangles. in clockwise direction we have to take addition and in anticlock wise direction we will do sub tataction



VI. Outcomes/ Result:

Using working models in Teaching Learning Process leads to joyful learning in the class room and this makes the class room environment child centred. It encourages the children to learn maths happily without any burden or tention. There will be improvement in Achievement levels of children.

VII. Applications/ Implication:

1.Students show more interest to learn the trigonometric formulae.

2.Students can use these 41 formulae and solve related problems.

3.Students get confidence to do Trigonometric problems by selecting suitable formulae.

VIII. Rreferences:

1. 10th Class Maths Textbook SCERT TS.

2.10th class Maths textbook NCERT.

Thank you

MATHEMATICS SEMINAR - 2020

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Sub-Theme: Reforms in Pedagogical practices of Mathematics to make its teaching more interesting, effective and of application value.

Title of the Topic: "Modifications in teaching methods of Mathematics to enhance the understanding of the subject and promote its significance through real life examples.**"**

Introduction: There has been a growing awareness in India for the need to improve student learning in a continually changing and highly demanding environment. In facing this challenge, it is essential to understand the complexity of the educational system and the multitude of problems it comes with. Over the years, India has made small but significant efforts in the form of intervention at various levels in K-12 mathematics education. These efforts have begun to indicate the direction in which we need to put in our efforts for improving both student thinking and learning and teacher pedagogical practices.

We need to tackle this problem through engagement of teachers in novel pedagogical practices both inside and outside of classrooms, through creation of rich tasks and problems with varying levels of cognitive demand, through recognition of multiple approaches to problem solving in a classroom and through a culture of lesson study to promote a collaborative teacher network. Such innovative reforms will not only enhance the mathematics education curriculum in India but also will help prepare students with lifelong twenty-first-century skills including collaboration, communication, critical thinking and creativity.

Objectives:

- Development of conceptual understanding in mathematics.
- Enhancement of procedural skills.
- To entice greater participation levels in mathematics throughout the school years.
- To identify potential ways to improve developmental students' math success.
- To enhance learning outcomes.

Presentation:

Observational studies at community colleges in California found that mathematics instruction was characterized by review, lecture, independent seat-work, and math problems devoid of application to the real world. Although traditional features of math instruction have been linked to better performance on standardized tests and much of the mathematics we encounter in our lives requires the ability to use algorithms to quickly and accurately solve computations, in order to understand mathematics, students need much more than procedural fluency.

Indicate the usefulness of a topic: For example, in high school geometry, a student could be asked to find the diameter of a plate where all the information he or she has is a section of the plate that is smaller than a semicircle. It's great when you can use actual examples from other subjects of higher classes and let the students know that's where they'll use each math topic.

Start with an interesting real-world problem (preferably localized): Most math lectures start with "Here's the new formula for today, here's how you plug in values, here's the correct answer."

Problem is, there's no attempt to motivate the learners.

It is good to incite curiosity with a photograph, a short video, a diagram, a joke, or perhaps a graph. This technique should outline an interesting problem in your local area (so students can relate to it better).

Mathematics is used as a problem solver in every field of science. Mathematics is playing a very important role in our daily lives. In fact mathematics is involved directly or indirectly wherever we go and everything that we may use. The more examples that are used, it would help to inspire the students towards the subject and broaden the perspectives of learning that topic.

When we use a computer or mobile phone, whatever sources we might be using for accessing internet is based on the mathematics. Thecommunication device must have some computing speed, amount of memory, storage space etc., so without mathematics it will not be possible for us to know even about the resources our computing device has got.

Some more examples which portray mathematical concepts in everyday life include:

- **Symmetry:**It is easily noticeable in various arts, buildings, and monuments. Nature uses symmetry to make things beautiful. For example, consider the pictures of the butterfly and the leaf. Reflection of trees in clear water and reflection of mountains in a lake. Similarly architecture and other creative fields rely heavily on symmetry. Not only is symmetry beautiful, but it also offers stability because these structures tend to even out weight distribution. Symmetry also offers human beings an additional extension to their capabilities. For example, two eyes are necessary for stereoscopic vision. Two ears helps us get a better 3-dimensional sensation of hearing. By looking at symmetry in a broader

context, students can see the interconnectedness of mathematics with other branches of knowledge.

- **Mensuration:** Mensuration tells us about the lengths of sides, heights and perimeters, measures of angles, surface areas and volumes of 2-dimensional plates and 3-dimensional solids. We all know the common applications like:
    - Measurement of agricultural fields, floor areas
    - Measurement of volumes required for packaging milk, liquids, and other products.
    - Measurements of surface areas required for estimation of painting houses, buildings etc.
    - Volumes and heights are useful in knowing water levels in rivers or lakes.

More Elaborative examples like Construction of Dams, Design of Bridges and Skyscrapers and even in the Developmental Projects of Roadways, Railways, etc. Such bigger examples will help to instill a sense of astonishment among the students and would therefore help to attract them towards the topic. A seminar or exhibition may be conducted in this regard in the school in which students would display such examples in the form of posters, models, presentations, etc.

- **Statistics and Probability:** The applications of Statistics are directly linked with those of probability. Statistics mainly deals with analyzing the data, using which future events may be predicted, i.e. Probability. Statistics is essential for all sections of science, as it is amazingly beneficial for decision making and examining the correctness of the choices that one has made.
    - With the application of statistics in computer science and machine learning, algorithms' efficiency can be increased significantly.
    - Statistics are widely used in consumer goods products. The reason is consumer goods are daily used products. The business use statistics to calculate which consumer goods are available in the store or not.
    - The importance of statistics in governance is utilized by making judgments about health, populations, education, and much more. The government can assemble specific data about the population of the country using a census.
    - The computer used in weather forecasting is based on the set of statistics functions. All these use statistics functions to compare the weather condition with the pre-recorded seasons and conditions.
    - It helps the politicians to have an idea about how many chances they have to win an election in a particular area.Statistics also help the news channel to predict the winner of the election.
    - Engineers use statistics to estimate the success of their ongoing project, and they also use the data to evaluate how long it will take to complete a project.

Statistics and probability both are considered as the method of handling the aggregation or ignorance of data. Therefore, it can be seen that statistics and probability are the methods to

formalize the deep learning process mathematically. Besides all this, statistics can be utilized for concluding the information quickly and effectively. Therefore, statistics is one of the helpful measures for data scientists to obtain the relevant outputs of the sample space. The statistical problems in real life consist of sampling, probability, estimating, enabling a team to develop effective projects in a problem-solving frame.

- **Similar Triangles and Trigonometry:** Trigonometry simply means calculations with triangles. Trigonometry spreads its applications into various fields such as architects, surveyors, astronauts, physicists, engineers and even crime scene investigators. Geometry is much older, and trigonometry is built upon geometry.

    - For example music, as you know sound travels in waves and this pattern though not as regular as a since or cosine function, is still useful in developing music.
    - In physics, trigonometry is used to find the components of vectors, model the mechanics of waves (both physical and electromagnetic) and oscillations, sum the strength of fields, and use dot and cross products. Even in projectile motion you have a lot of application of trigonometry.
    - In criminology, trigonometry can help to calculate a projectile's trajectory, to estimate what might have caused a collision in a car accident or how did an object fall down from somewhere, or in which angle was a bullet shot etc.
    - Flight engineers have to take in account their speed, distance, and direction along with the speed and direction of the wind. The wind plays an important role in how and when a plane will arrive where ever needed this is solved using vectors to create a triangle using trigonometry to solve.
    - It is used in navigation in order to pinpoint a location. It is also used to find the distance of the shore from a point in the sea. It is also used to see the horizon.
    - It is used in cartography (creation of maps).
    - Also trigonometry has its applications in satellite systems.
    - Calculus is made up of Trigonometry and Algebra.

Use recreational mathematics: Recreational motivation involves puzzles, games, riddles, quiz, mind-maps, stories, exhibitions, paradoxes, or the school building. An effective execution of this technique will allow students to complete the recreation without much effort.

A story of a historical event (for example, the story of how Carl Friedrich Gauss added the numbers from 1 to 100 within one minute when he was a 10-year-old in 1787) or a contrived situation can motivate students. Teachers should not rush while telling the story—a hurried presentation minimizes the potential motivation of the strategy.

Collaboration with Poster Proofs and Gallery Walks:It is designed to give students opportunities to communicate, collaborate and reason through their ideas using multiple representations. After students consolidated their work in poster proofs, they go on gallery walks and view others' solution strategies.

Technology Based Learning:You can find lots of free math games online, and students will love this break in the day! Some of the favorites are Sushi Monster, Aplus Math, Prodigy, Mathville, Math Cats and Math Playground.

Download **math apps**. This is a great way to make practice fun for your students. A few include Mathmateer, Thinking Blocks Multiplication and Crazy Times Tables.

Boost Creativity and Confidence:There are many ways we can encourage creativity in math. Get students to use creative means to describe a mathematical concept (it could be a video, an animation, a diagram or perhaps a concept map).Such individualized assignments get them thinking about the bigger picture, encourages creativity, and is more likely to generate feelings of ownership than the normal mass-produced assignment.

Math Games: Scavenger hunts are already exciting and fun. One clue leads you to another, and then another, until there's finally a prize at the end. For this scavenger hunt, make math problems the clues. So, in order to move on, students must really think about the problems and give the correct answers. I suggest dividing up into teams for a little friendly competition.

Similarly, Mathematics Events should be conducted comprising of Math Exhibition, Math Quiz like "Kaun Banega Mathematician". Other creative ways are "Math Riddles" and "Math Jokes".

Math Restaurant: On the occasion of "Sales Day" in the school, this event can be held. Students describe all the food items and groceries in the form of 2D and 3D Geometrical shapes and hence relate to their formulae and their properties. For example, Chocolates come in all sorts of shapes including square, rectangle, cube, cuboid, spheres, semi-circle, etc.

Math Posters and Math Flowcharts: Posters and Flowcharts/Mind-maps can be created for each chapter, summarizing the whole concept and can be displayed in the Classroom and hall-ways.

Outcomes: Students would be able to:

- appreciate the usefulness, power and beauty of mathematics
- enjoy mathematics and develop patience and persistence when solving problems
- develop mathematical curiosity and use inductive and deductive reasoning when solving problems
- become confident in using mathematics to analyse and solve problems both in school and in real-life situations
- develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics
- develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others

Implications: All such pedagogical techniques, if implemented properly, would greatly help in making mathematics, as a subject, more interesting to the students and reduce "math- fear". The fun that these recreational examples generate should be carefully handled, so as not to distract from the lesson.

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- http://yayoi.senri.ed.jp – *"Mathematics: Aims and Objectives".*
- https://www.miu.edu--"*Symmetry — A Link Between Mathematics and Life*" By Cathy Gorini
- https://www.cuemath.com
- https://statanalytica.com
- https://www.mathnasium.com

e-SEMINAR ON "**MATHEMATICS EDUCATION THE WAY AHEAD IN THE CONTEXT OF NEP-2020"**

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SUB-THEME:- REFORMS IN PEDGOGICAL PRACTICES OF MATHEMATICS TO MAKE ITS TEACHING MORE INTERESTING, EFFECTIVE AND OF APPLICATION VALUE.

TITLE OF THE TOPIC:- BEST PEDOGOGICAL PRACTICES OF MATHEMATICS AT PRIMARY LEVEL.

INTRODUCTION:

The world of today which leans more and more heavily on Science and Technology demands more and more mathematical knowledge on the part of its people. So,it necessary to prepare the child with a strong base of mathematical knowledge to face the challenges of the modern technological society.

Two eyes for mathematics are **speed** and **accuracy.** The aim of teaching mathematics is...Both of these can be nurtured in students. Learning mathematics is a joyful activity. Students are enthusiastic in participating the activities which effect their perceptions and personal experiences. They accept any challenges. They have their own style in learning. Therefore they are acquainted with some skills on basic concepts of mathematics before they come to school. By developing these skills children enjoy learning mathematics at primary stage.

Mathematics is abstract. In generally, we are following common methods while teaching mathematics like explaining numbers one to ten first, next we will expand it to 1000,2000….etc, then we will focus on number places and its values and next we will teach addition, subtraction, multiplication and division …etc. it is an artificial method of teaching mathematics. But in practical method, we will use the best pedagogical practices in our classroom.

OBJECTIVES:-

The objectives of pedagogical practices of Mathematics are to encourage and enable students to

- Making subtraction easily by using fingers.
- Recognize the correct time in the clock without do any mistake.
- Learn mathematics in an easy way and it leads to self learning.

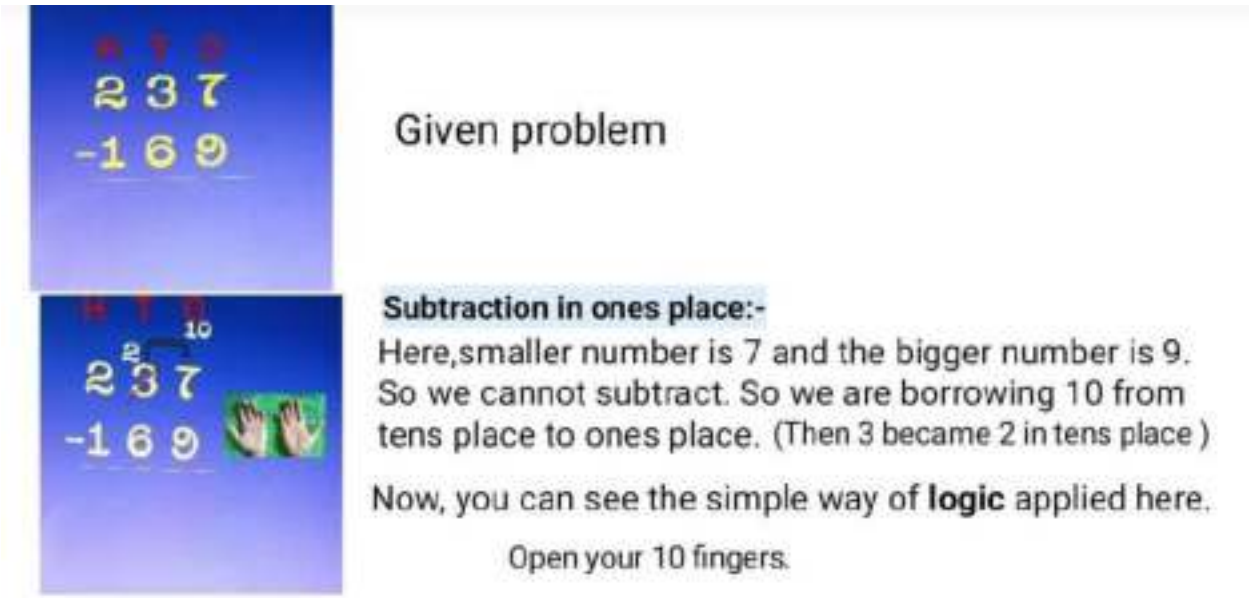
PRESENTATION:-

In my presentation, I would like to explain about natural way of teaching/learning methods of mathematics at primary level.

Easy method of Subtraction by using fingers:-

Generally In subtraction, students will do simple subtractions easily by counting fingers. But in borrowing they confused more, we should explain it in an easy way.

For example in 237-169,



Now, count immediately the next number of upper number to lower number(8,9) by closing your fingers.

Now, the remaining opened fingers are '8'.

So the answer is '8'.(at ones place)

Subtraction in tens place:-

Here,smaller number is 2 and the bigger number is 6. So we cannot subtract. So we are borrowing 10 from hundreds place to tens place.(Then 2 became 1 in hundreds place

Open your 10 fingers.

Now, count immediately the next number of upper number to lower number(3,4,5,6) by closing your fingers.

Now, the remaining opened fingers are '6'.

So the answer is '6'. (at tens place)

Subtraction in hundreds place:-

Next 1- 1=0.

The final answer is 68.

<u>An easy way to see time:-</u>

While we teaching about time, we should follow some techniques like..

In a clock there are three hands.

1. Hour hand-Small hand

2. Minute hand-Big hand

3. Second hand-Thin hand

In the clock, small hand represents Hours,that is you can see here, the small hand is near the '6',so it is 6'o clock.

The big hand, it represents Minutes.
In this clock, the big hand is near the '2'.

Multiply the number of the minute hand(2)with '5',we will get minute hand time. That is 2×5=10min.

So the time is 6 : 10 hours.

In the clock, you can see here, the small hand is near the '3', so it is 3'o clock.

And the big hand is near the '4'.

Multiply the number of the minute hand(4)with '5',we will get minute hand time. That is 4×5=20min.

So the time is 3 : 20 hours.

Students recognize hour hand's time easily, but they will get some difficulty in finding minute hand's time. For this, Teacher should explain…" multiply the number of the minute hand with "5", we will get minute hand time

Teacher should create the situations for learning mathematics. For example while teaching directions and corners, teacher takes the class outside and stands towards sun, explain the directions and corners. And while teaching sides, edges, corners, teacher should show the real objects like brick or duster or any box for easy understanding the concept. This situations, exercises and activities given in my presentation are aimed at to develop among children the abilities of problem solving, logical thinking, expressing ideas in mathematical language, representing data in different forms, connectivity between concepts and different contexts.

As such, the teaching learning process should be able to promote children's interactions, critical thinking, creativity and viewing things in different angles to achieve the prescribed standards at this level.

These methods promote teacher's professionalism and makes teaching of mathematics a pleasant activity and joyful learning for children. This will also become a helpful tool in the Continuous Comprehensive Evaluation (CCE).

I hope all the teachers will implement these methods in a meaningful way in their classroom teaching for the development of academic standards of our children.

OUTCOMES:-

By using this pedagogical practices

- Students will get the knowledge and understanding easily.
- Classroom mathematics teaching will become more interest and effective.
- Mathematics become concrete and student implement this knowledge in their daily life situation.
- This primary level concept helps the students for their higher education and this basic is continuing at all levels of learning.

IMPLICATIONS:-

- Teacher readiness is important and these are all time taking methods.
- Syllabus doesn't complete in the given time.
- Teacher doesn't focus on all the students at the same time.

REFERENCES:-

- Telangana state SCERT primary(I-V) E/M Text books
- Scholar.google.com
- My classroom practices.

Mathematics seminar 2020

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2. Title of the Topic:

   "Challenges being faced in Online Mathematics teaching in Government Schools and ways to overcome them"

3. Theme: Mathematics Education the way ahead in the context of NEP 2020.

4. Sub Theme : "Challenges being faced in teaching Mathematics in remote mode or Online mode and ways to overcome them".

"Challenges being faced in Online Mathematics teaching in Government Schools and ways to overcome them"

Introduction

NATIONAL EDUCATION POLICY 2020

The world is undergoing rapid changes in the knowledge landscape. With the rise of big data, machine learning, and artificial intelligence, many unskilled jobs worldwide may be taken over by machines, while the need for skilled labour, particularly involving mathematics, computer science and data science, in conjunction with multi-disciplinary abilities across the sciences, social sciences and humanities, will be in rapidly increasing demand.

With the quickly changing employment and global ecosystem, it is becoming increasingly important that children not only learn but learn how to learn. Education must thus, move towards less content, and more towards learning about how to think critically and solve problems, how to be creative and multi-disciplinary, and how to innovate, adapt, and absorb new material in novel and changing fields. While learning by rote can be beneficial in specific contexts, pedagogy must evolve to make education more experiential, holistic, integrated, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable. The curriculum must include basic arts, crafts, humanities, games, sports and fitness, languages, literature, culture, and values, in addition to science and mathematics, to develop all aspects of learners' brains and make education more well-rounded, useful, and fulfilling to the learner. Education must build character, enable learners to be ethical, rational, compassionate, and caring, while at the same time prepare them for gainful, fulfilling employment.

Objectives

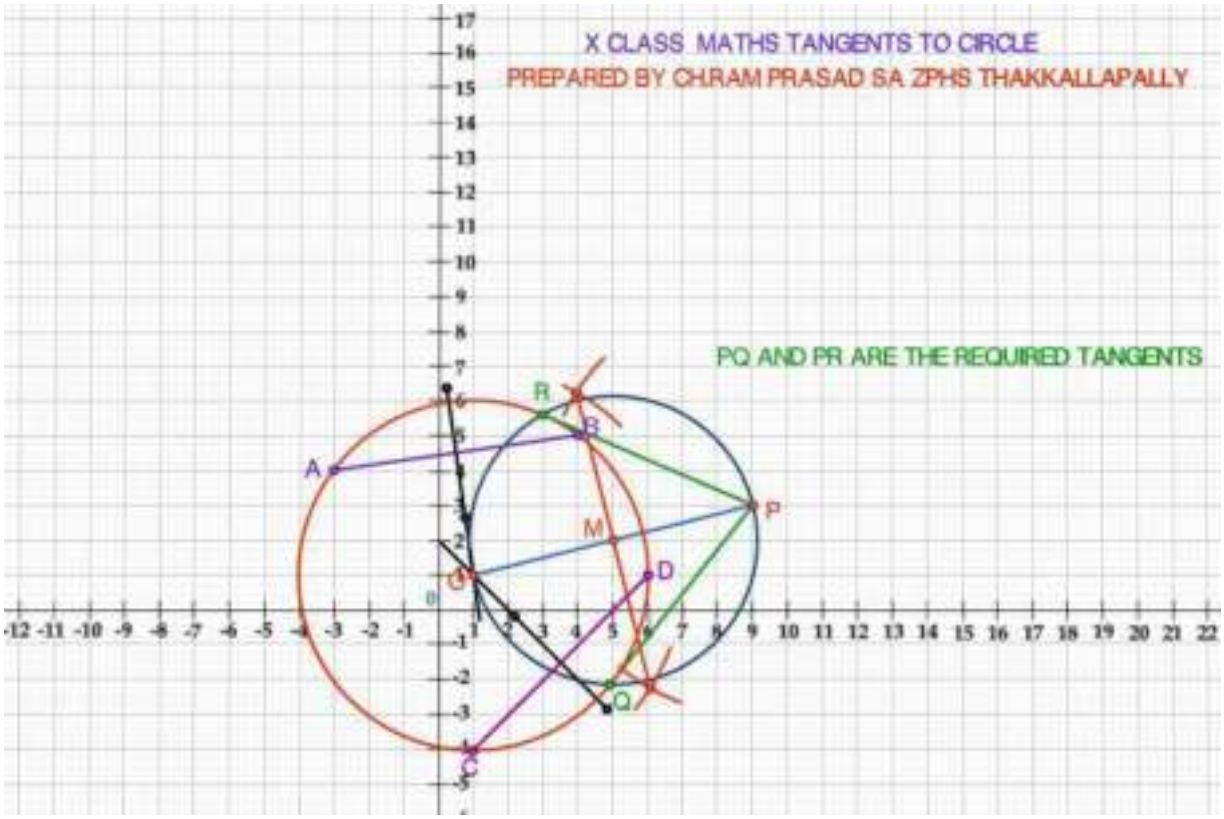
1) To promote the professional development of the mathematics teachers.
2) To enable the teachers to relate Mathematics with modern technologies.
3) To study the applications used by teachers during online mode of teaching.
4) Various technologies/ softwares used for mathematics teaching in online mode.
5) To study the challenges faced by school teachers during online teaching

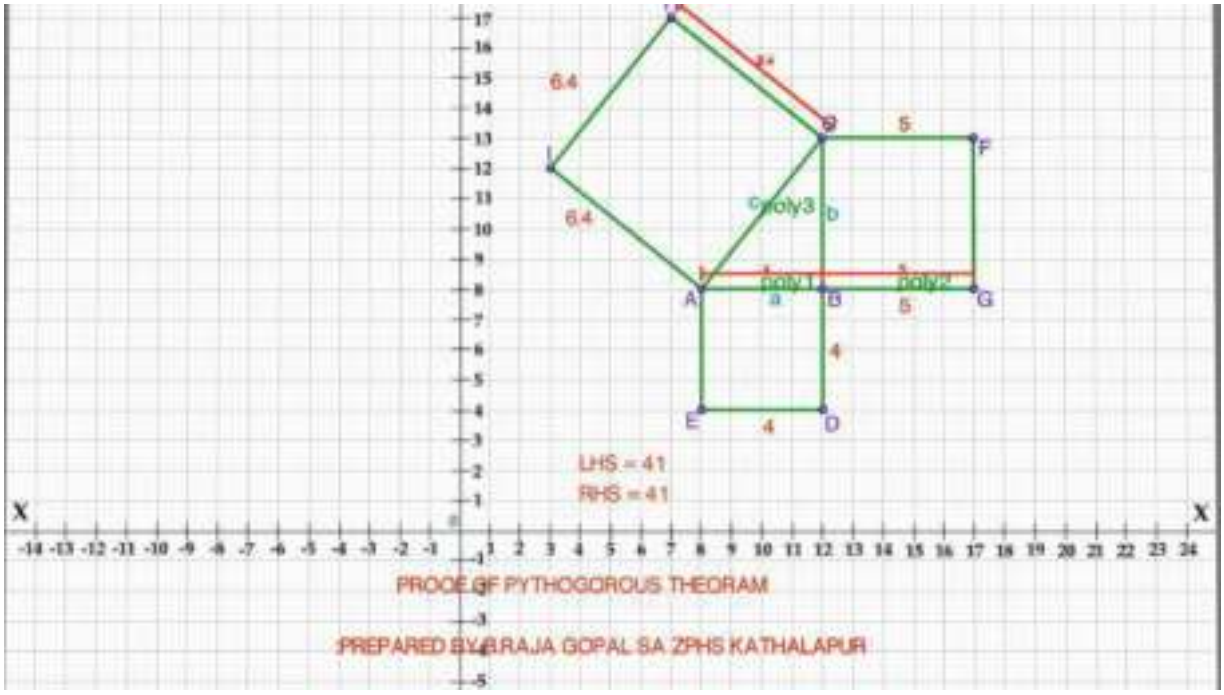
Digital education appears to be a viable solution to fill in the void for classroom education. A complete revolution in education has been brought about by technology. Each student gets in contact with a world class education, which is not easy to impart by the traditional method of teaching. This new learning is more interesting, personalized and enjoyable. Online distant learning programmes give a great opportunity to avail high quality learning with the help of internet connectivity. Digital learning has many advantages in itself like digital learning has no physical boundaries, it has more learning engagement experience rather than a traditional learning. It is also cost-effective and students get to learn in the confines of their comfort zone. Digital learning is not without its limitations and challenges, since face-to-face interaction is usually perceived as the best form of communication as compared to the rather impersonalized nature of remote learning.

In Jagtial district all mathematics teachers given 9 days training in virtual mode to teach the students via online mode. The training contains demonstration of Geo gebra, Robo Compass, Vedic Mathematics, Creation of Mathematics TLM/Kits, Power Point Presentations, Conversion of content to Powerpoint, OBS Studio, Creation of Interactive video, Multi Link Unit Cubes, Basic Computer Knowledge with the subject experts all over the state of Telangana in

collaboration with SCERT &Telangana mathematics Forum from 4th August 2020 to 12Th August 2020.

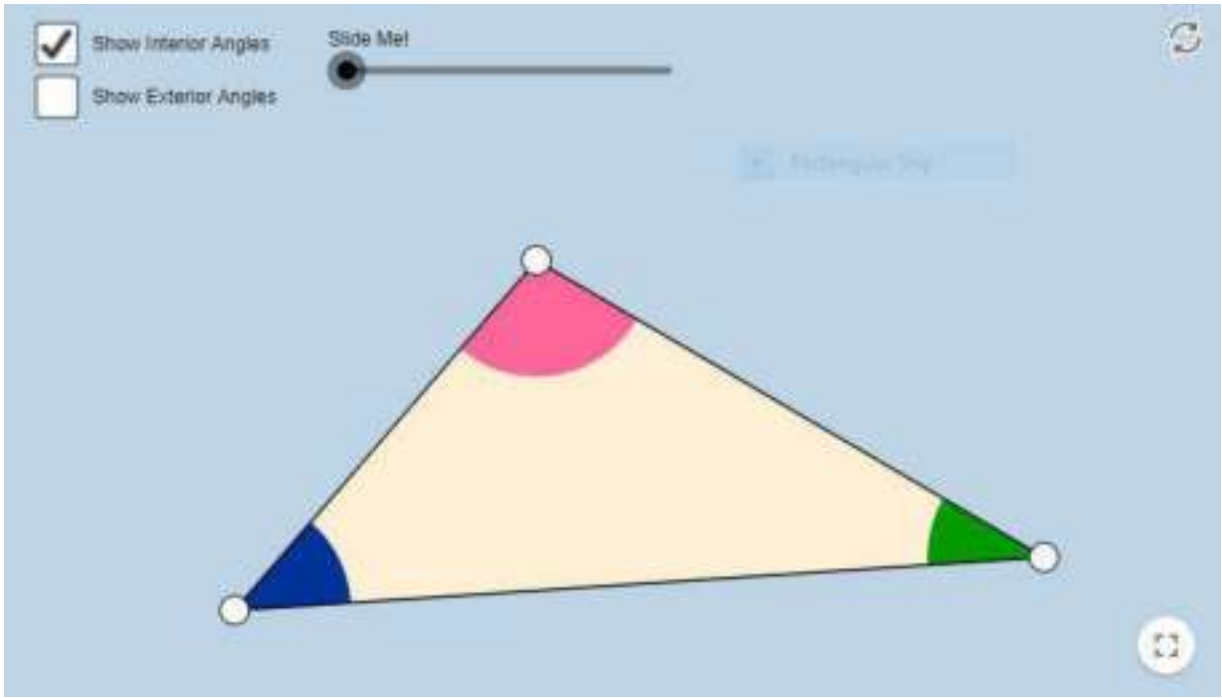
Robo compass: Beyond the basic commands used for building geometrical constructions, Robocompass comes with a rich set of commands to do creative mathematical art and tessellations using basic geometrical transformations such as reflection, translation, and rotation. This has encouraged many schools to give creative project assignments to students using Robocompass. The flexibility of Robocompass to deconstruct each step of the actual mathematical art in animated fashion reinforces the essential ideas such as symmetry, perpendicularity and parallelism.

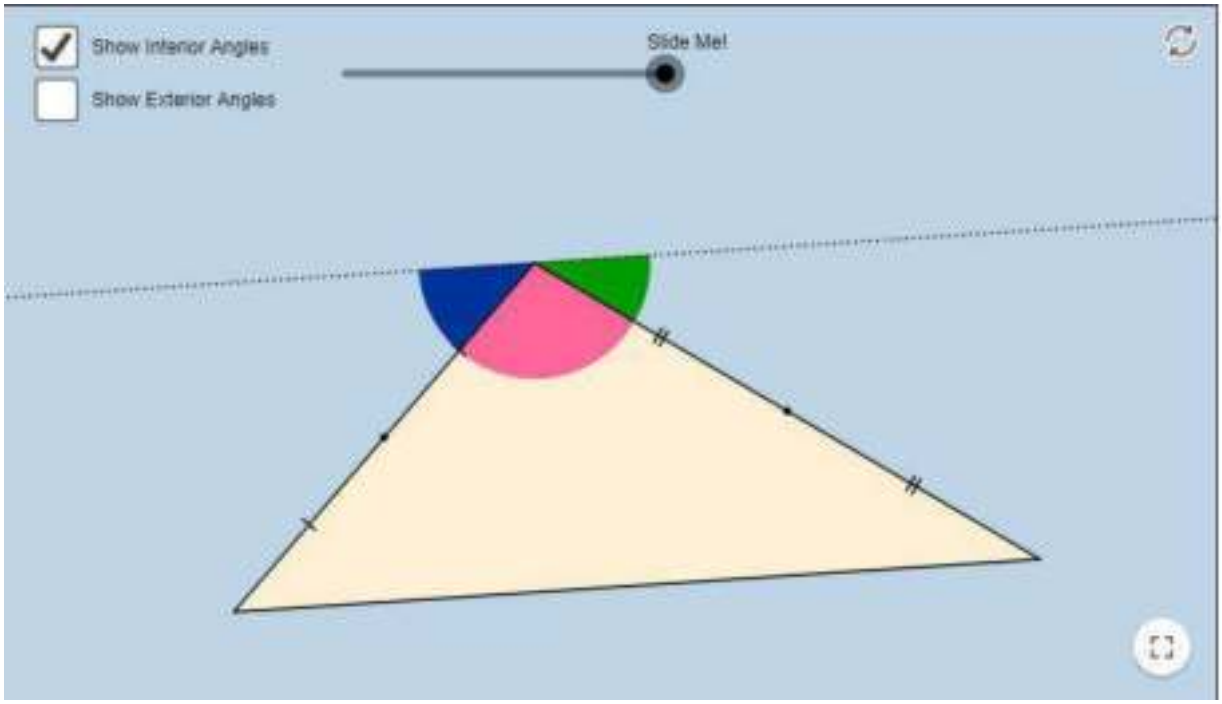




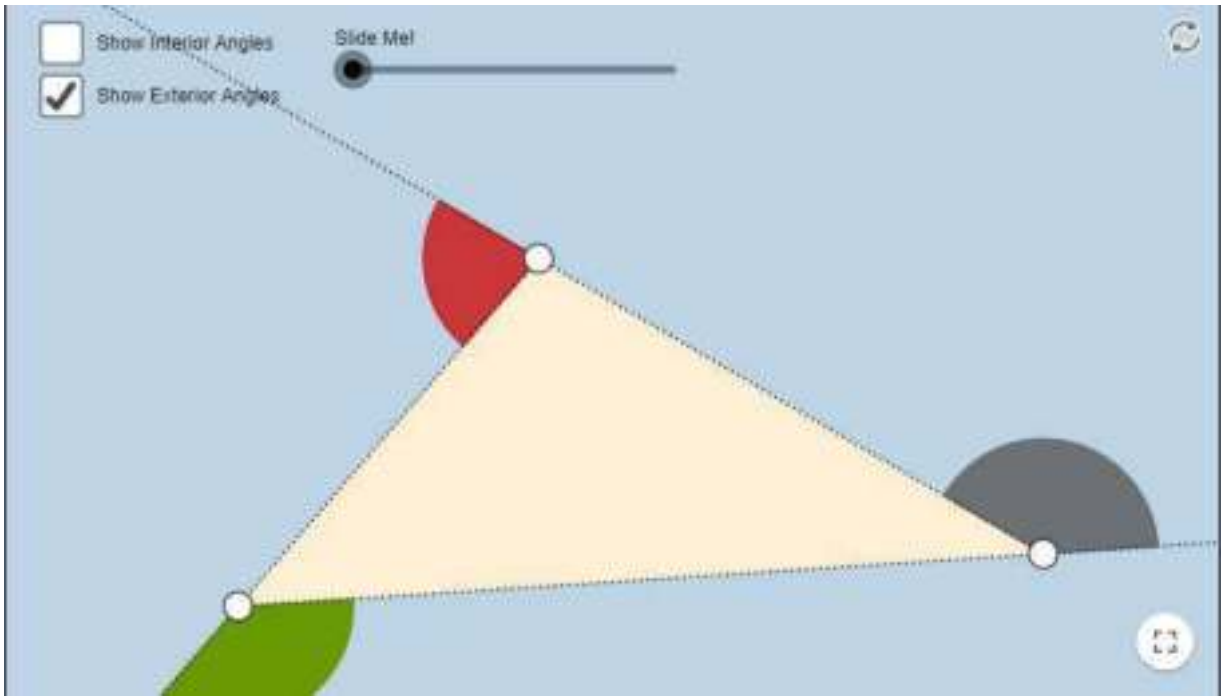
Geogebra:

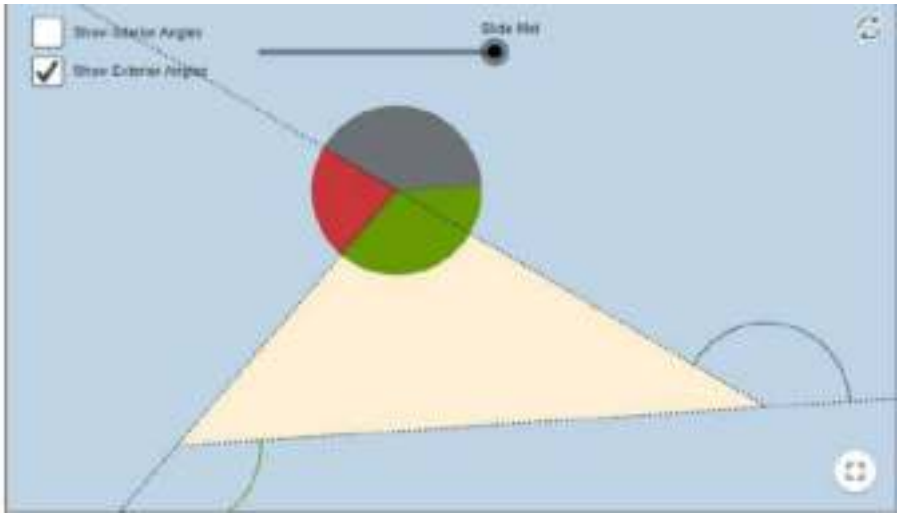
: Geogebra is a dynamic mathematical software. It is made for every level of education, from beginner to expert. This app combines Geometry, Algebra,Graphs, Statistics and Trigonometry.





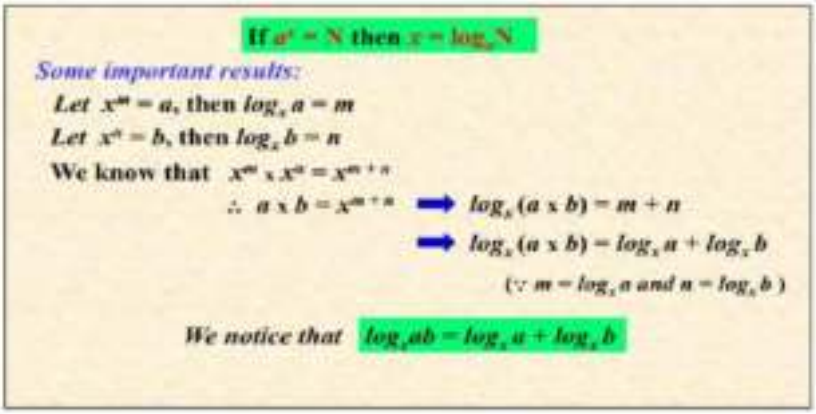
Proof of Sum of Interior angles is 180 degree using Geogebra.

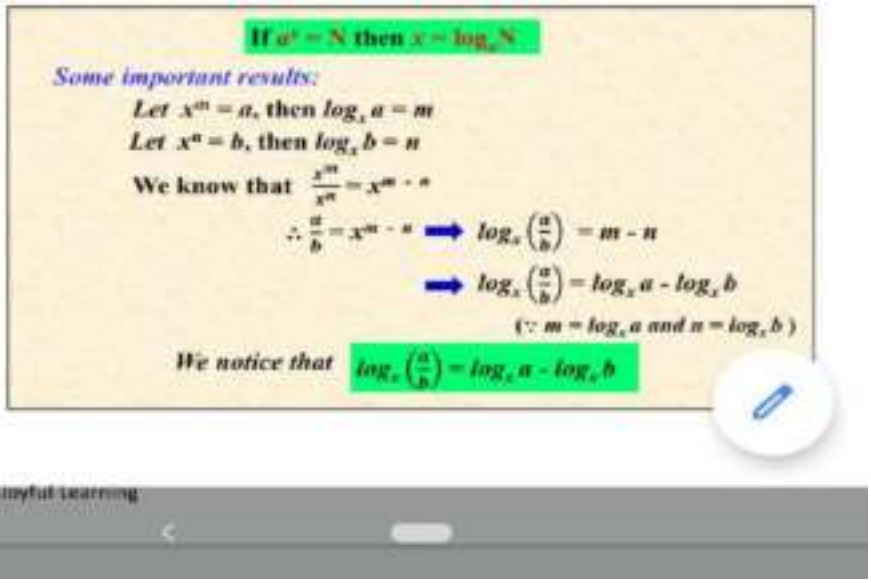




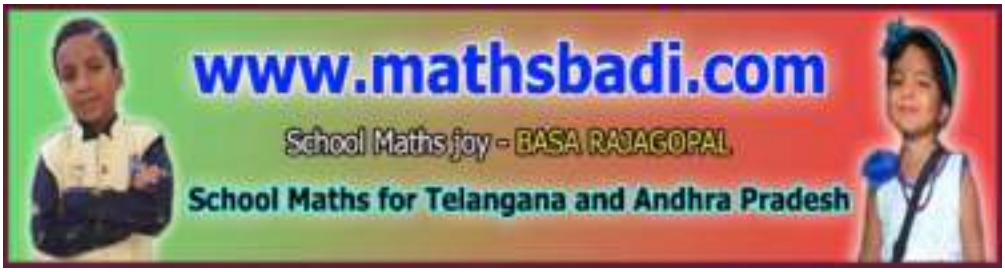
Proof of sum of exterior angles in a triangle is 360 degrees using Geogebra

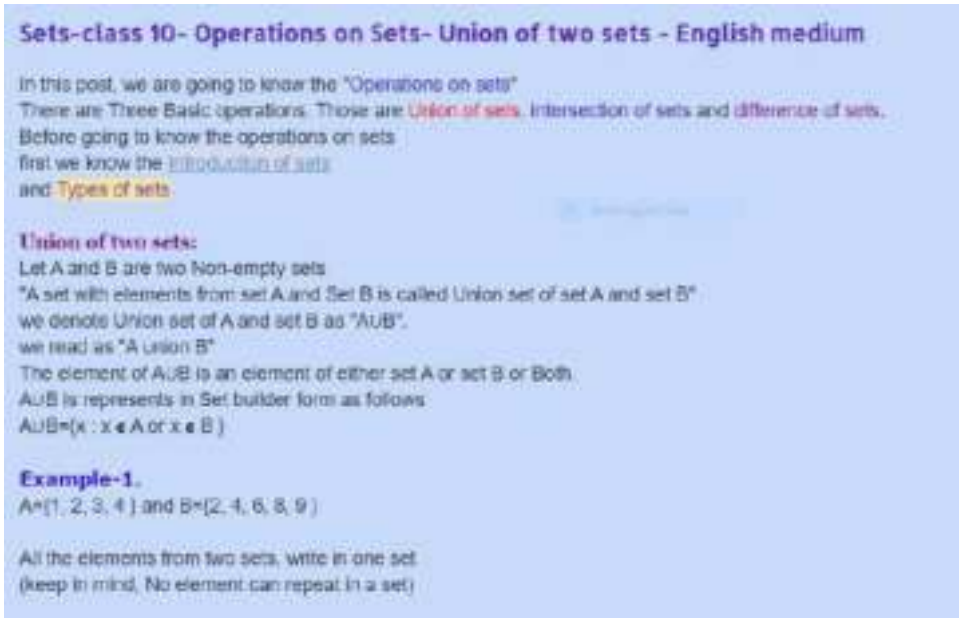
Creation of Mathematics Kits/Teaching Learning Material using material supplied by SCERT Telangana.





Websites created by Teachers of Jagtial District:





Tools used for online mathematics teaching:

1. Videos prepared by teachers and uploaded in You tube.
2. Lessons telecasted in Doordarshan and TSAT channels.
3. Video / text lessons/work sheets prepared by teachers and uploaded in their individual websites like mathsbadi.com ,rpmathshunt.com, S cube Channel, Dr.Anitha Maths Classes, Bhasker Bura, High school Maths, Mahesh's Maths Classes, Aaditha Channel etc.,
4. Zoom
5. Whatsup
6. Google class rooms /Google meet
7. Microsoft Teams
8. Cisco Webex
9. Khan academy videos

Soft wares/ Technologies used for online mathematics teaching:

1. Geogebra :
2. Robocompass: used for geometrical constructions
3. Shapes 3D : Shapes 3D is a Augmented Reality app to teach geometry. Teachers can create prisms, pyramids, solid shapes, solids of revolution and platonic solids.
4. Desmos: Desmos is used for teaching graphs. It includes a free graphing calculator that can be used by students. It is evenly accessible for visual impaired students .
5. Geometry pad : Geometry Pad offers a fun way to learn geometry and practive important constructions. Students can easily present their geometric constructions, use the compass and experiment with a lot of different geometric shapes.
6. CK 12 : CK12 offers adaptive practice,workbooks, quizzes, tests and several simulations
7. Buzzmaths : student focusses app useful for elementary to high school students.

8. MathBoard: Math Board is created for all school age students.
9. Microsoft Mathematics: Microsoft Mathematics is a free software offered by Microsoft that helps maths students to be able to solve complex math problems in less time. It especially helps the student with algebra and equips with a graphic 2D and 3D diagrams.
10. Euler Math Toolbox: Euler Tool box perform several different mathematical calculations like addition, subtraction, multiplication & division, algebra, matrices
11. Tibi's Mathematics Suite: Tibi's Suite is useful for teaching geometry easily.
12. Maths is Fun: This website aims to make math enjoyable and entertaining. The site uses puzzles, games, quizzes, worksheets, and a forum to help guide students through their learning. The problems and solutions are all explained in simple language, making it easier for students to learn on their own without the necessity of an adult or teacher to translate.

Online mathematics teaching with technology has the following advantages.

It has led to advancements in the education sector.

It has opened up new horizons during the schools closed situations like pandemic.

It has resulted in major advancements in the field of Educational Technology.

It has led the government to explore new methods and ways and to release different platforms for digital education.

Increased use of online resources and access to online materials resulted in higher retention power of students and lifelong learning.

It is fun loving and highly interactive mode of communication.

It is more convenient for both teacher and student to attend lectures online.

It offers flexibility and bring education to children doorstep.

It helped in making linkages, meeting and connecting with new people from different fields.

Websites:

The Mathforum@ Drexel University (http://www.mathforum.org)The Centre for Innovation in Mathematics Teaching (CIMT)
(http://www.cimt.plymouth.ac.uk)Math cats – Fun math for kids (http://www.mathcats.com), Count on (http://www.counton.org)1
Illuminations – Resources for teaching maths (http://illuminations.nctm.org) Inter Activate (http://www.shodor.org/interactivate/)Gadsden Mathematics Initiative (http://www2.gisd.k12.nm.us/GMIWebsite/IMathResources.htm)Mathematical Interactivities - Puzzles, Games and other Online Educational Resources (http://mathematics.hellam.net)MathNet – Interactive mathematics in education (http://www.mathsnet.net)National Library of Virtual Manipulatives (http://nlvm.usu.edu/en/nav/vlibrary.html)NewZealand Maths (http://www.nzmaths.co.nz

)Primary Resources – Maths (http://www.primaryresources.co.uk/maths/maths.htm)ProTeacher! Maths lesson plans for elementary schoolteachers (http://www.proteacher.com/100000.shtml)Maths activities (http://www.trottermath.net/contents.html)Maths powerpoints http://www.worldofteaching.com/mathspowerpoints.htmlMaths is fun – maths resources http://www.mathsisfun.comMiddle school portal for maths and science teachers (http://www.msteacher.org/math)Maths games, maths puzzles and maths lessons – designed for kids and fun http://www.coolmath4kids.comNumbersMagic Squares, Magic Stars & Other Patterns (http://recmath.org/Magic%20Squares)Number recreations (http://www.shyamsundergupta.com)Broken calculator – Maths investigation (http://www.shyamsundergupta.com)Calculator chaos http://www.shyamsundergupta.comPrimary School Numeracy (http://durham.schooljotter.com/coxhoe/Curriculum+Links/Numeracy)Quarks to Quasars, powers of 10 http://durham.schooljotter.com/coxhoe/Curriculum+Links/NumeracyAlgebraAlgebra puzzle (http://www.mathplayground.com/Algebra_Puzzle.html)Algebra tiles (http://mathbits.com/MathBits/AlgebraTiles/AlgebraTilesMathBitsNew07ImpFr...http://mathbits.com/MathBits/AlgebraTiles/AlgebraTilesMathBitsNew07ImpFr...)Geometry http://www.cyffredin.co.uk/The Fractory: An interactive tool for creating and exploring fractals (http://library.thinkquest.org/3288/fractals.html)Tessellate (http://www.shodor.org/interactivate/activities/Tessellate)MathSphere – Free graph paper (http://www.shodor.org/interactivate/activities/Tessellate)Paper models of polyhedral http://www.mathpuzzle.com/Problem solvingMathpuzzle http://www.mathpuzzle.com/Puzzling world of polyhedral dissections http://www.johnrausch.com/PuzzlingWorld/contents.htmInteractive Mathematics Miscellany and Puzzles http://www.johnrausch.com/PuzzlingWorld/contents.htm Puzzles and projects (http://www.delphiforfun.org/Programs/Indices/projectsIndex.htm)10ticks Daily Puzzle Page (http://www.10ticks.co.uk/s_dailyPuzzle.aspx)Archimedes' Laboratory – Teachers' resource: Improve problem solving skills (http://www.archimedes-lab.org/index_teachers.html)Brain teasers (http://www.pedagonet.com/brain/brainers.htm) Gymnasium for Brain (http://www.gymnasiumforbrain.com)Puzzles and games (http://www.thinks.com)

Outcomes/Implications:

Challenges of Online Mathematics in Government Schools:

1.It requires more time than offline classes thus is time consuming.

2.Procrastination is very easy due to online education.

3.It required good management skills, active participation.

4.It depends upon the competency of teachers and the knowledge of latest approaches in online education.

5. It requires higher degree of self-discipline, higher computer literacy for students.

6.Online education increases the stress and mental stress between teachers and students

7.Lack of appropriate materials and resources

8.Technical Problems like internet connectivity, data

9.Lack of confidence among teachers and students.

10.Difficult to assemble all the students for class.

11.Lack of cooperation from parents especially in rural areas.

12.It is highly difficult to follow up the learning of students.

13. Students engaged in agricultural / domestic works.

Conclusion

Teachers need to be equipped with the pre service and in service awareness training programs on online teaching and with new technologies. The training to teachers in managing technology and counselling of parents regarding the benefits of online teaching. With many innovative techniques and activities, interest and motivation among students to study can be developed. Students mental, emotional and psychological health must be taken care of.

State Government should give free Cell phones to the needy students and high speed internet for educational apps and software to all students in the state. Training can be given to teachers, on how to convert content to an electronic format, familiarity with different functions of an e-learning platform. Long term programs like online instruction design, multimedia production, animation given to all mathematics teachers.

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THEME: "MATHEMATICS EDUCATION THE WAY AHEAD IN THE CONTEXT OF NEP 2020"

Sub Theme :

Challenges being faced in teaching Mathematics in remote mode or through online mode and ways to overcome them.

Title of the Topic :

Mathematics Teaching and Learning in the Era of COVID-19

Introduction :

The pandemic poses an excellent opportunity to change the way we teach Mathematics in schools. Because of the pandemic, education has had to migrate to the online environment. This change has impacted not only schools and their staff but also families by allowing mothers and fathers to be more involved with their children's education. The education worldwide being thrown into disarray by Corona virus, more and more educators are being forced to teach their students from home. The Mathematics teacher might not have signed up for distance Mathematics teaching, but in true The Mathematics teacher style it's time to throw the lesson plan out the window and make the best of a bad situation through online teaching.

Objectives:

- The Challenges faced by the Teachers and Students in teaching and learning Mathematics through remote mode or online mode.
- How the Mathematics teacher run-down on the challenges of Mathematics teaching through remote mode or online mode and the strategies need to navigate them with confidence.
- The step by step ways to overcome the challenges.

Design of innovation:

- It is a creative procedure for teaching Mathematics for remote or online mode.
- It is an illustrated method to avoid difficulties online Mathematics teaching and learning.
- We live in the age of the internet. Google is there to help teachers learn about things they didn't know before. So maybe the teacher has had an obligation to become more aware of the background of the mathematics being taught and not just live in the foreground.

Outcome of the innovation:

- The Teachers find out the challenges in teaching Mathematics remote or online mode and how to overcome them.

The Challenges Faced in Remote mode or Online mode of Mathematics teaching.

Isolated Learning:

Learning Mathematics from home can be lonely. Without the buzz of the classroom setting and the company of their peers, it's no surprise that some students can begin to feel a strong sense of isolation that slowly erodes their desire to learn.

Despite what they say, many students will find that they miss school when the alternative is to be desk-bound at home.

The important things of Mathematics learning group work, class discussion and collaborative activity can disappear from the program entirely if we aren't careful, and with them go the associated levels of student engagement and rich learning that those experiences provide.

The following are the ways to overcome the isolated Learning Mathematics online mode :

- **Coordinate virtual group activities** using chats, discussion boards or cloud tools for collaboration.
- **The teacher must show the face and let students hear voice** using video or audio recordings. Don't let Teacher become a robot who only communicates via text.
- **Schedule regular checkings with students** via email or chat, if he has the capacity. Pay attention to those at risk of disengagement in particular.

Communication

Communication is the first hurdle for those of us who have been thrust into remote or online Mathematics teaching.

Discussion boards, live chats, emails and video calls are the new normal — but **no tool will work when you've got a confused student on one end and a struggling teacher on the other**.

The teacher communication with students can be via text, video and/or audio. Each method has its own strengths and limitations in teaching Mathematics especially online.

The following are the mix strategies to overcome hurdle of communication in Mathematics teaching.

Text

Composing messages of solutions of given problems via text is arguably the most efficient way to communicate with students online Mathematics teaching. But that doesn't mean it's the best way. Without body language or tone of voice, The teacher will need to go to extra effort to ensure his instructions and feedback do not become too impersonal.

Video

Videos are a great way to stay connected. Students will feel much closer to the Mathematics teacher if they can see teacher's face and hear voice. However, they'll also need reliable technology for downloading or streaming — so the teacher want to assess whether this is possible for all members of his class.

Audio

A quick voice recording is an easy way to provide personal communication to students. Just ensure that recordings are clear and concise. If you have an important message for the whole class, text might be a more reliable option.

Make Teacher's Communication personal to get sense of togetherness.

Personal communication makes teacher students feel cared for and closer to teacher and it is this bond that will carry you through the challenges of such an unprecedented time.

Keep teacher communication personal by:

- **Using names**: This is a simple touch that indicates familiarity and connection.
- **Self-disclosure**: Let students know how teachers are finding their time away from the classroom. Introduce them to teacher's pets and the hobbies that keep teacher busy at home.
- **Off topic chat**: Set aside a space for general discussion online so that everyone can touch base and feel a sense of togetherness.

Lack of motivation in online learners

As hard as online mathematics teaching might be for us, it's likely even harder for our students. They've gone from classrooms explicitly designed to support learning, to bedrooms and kitchen tables where distractions are plentiful and expert support isn't always on hand. It's no surprise that more than a few will be tempted to opt out.

Clear, measurable goals are the best source of motivation in Online teaching Mathematics. Set them regularly so that students have something to focus on. Instead of setting an open-ended and clearly specify the following

- The time students should spend on the task
- A measurable or quantifiable outcome
- A means of accountability A due date.

The teacher can consider more apps and programs on Mathematics as another way to increase motivation, There are plenty of puzzles and online software on Mathematics .Also, don't forget that parents can be Our biggest asset when it comes to maintaining student motivation at home. It pays to get them onside!

Technical difficulties with online teaching tools

Assess whether our students have reliable access to Technology before the Mathematics teaching start. Not every home will always have a reliable internet connection or readily available device for students to use. An initial email, whattsapp, message or text to parents will give them the opportunity to flag these issues so that you can prepare to accommodate such students ahead of time.

It's also important to remember that, for all the talk of our students being 'digital natives', many of them aren't that proficient when it comes to tackling unfamiliar software or using it in a responsible manner Teacher should consider giving parents a brief orientation too via whatsapp, video call or email.

The teacher also take on a full-time role in IT support using gadgets.

A great challenge for the Educators using ICT tools in Mathematics teaching

- We should keep in mind that the use of ICT tools for teaching Mathematics online is **not an easy task for many teachers**.
- **Training is essential to the teachers** for using various ICT hardware and software tools for Online teaching mathematics.
- The extremely fast development of IT in the recent years can be seen as an additional difficulty.
- Therefore, it is a great challenge for the educators to create ICT courses that **prepare teachers for complex, reasonable and effective usage of modern didactic tools** in their courses.

Issues to be addressed

- The current level of **use of ICT tools for teaching mathematics through online mode** at schools are not satisfactory.
- **Funding** constraints to have the online teaching gadgets in the children who are studying in local body , government and remote areas..
- The great challenge for educators is to prepare teachers for casual, conscious and **free use of the latest technology** in their Online teaching classes.
- The need **to prepare mathematics teachers** for general computer and Internet usage, Online platforms like zoom, Google meet.. teaching especially in the aspect of lifelong learning.

Remote areas badly hit by Online Teaching

The situation is worse for those from remote, non-urban areas. Highlighting India's digital divide, poor connectivity and lack of smart gadgets is proving a hassle for many students. We have to highlights problems students face in sharing resources with parents who, as seen in many households, are also working from home.

However, some of our teachers including myself feel things can be managed over a phone call or via local television cable networks provided by village stake holders and Y tube. Learning cannot stop even if schools are closed. My students, who do not possess laptops, are getting connected via their phones. I have divided them in batches of five. During the teleconference, I answer students' queries on mathematics in every weekend about online TV show lessons which are transmitted in the week. When the schools are suspended, students are getting connected via online platforms – Zoom, WhatsApp, YouTube, and other social media platforms. A good support for students who do not possess laptops or tablets, classes are being conducted via television or phones.SCERT Telangana has started an education channel T-SAT and Yadagiri TV to complete the syllabus during pandemic period.

Conclusion :

Virtual Classes of Mathematics will not be same as conventional classes, but they will be used to explain basic concepts and once the schools reopen, the lessons can be revised.

The Covid-19 crisis is a deep and sudden shock, but it is unlikely to be the last. Government should not lose sight of long-sight of the long-game: ensuring that all children and young people in low and middle-income groups are educated. To build a healthy ,prosperous, and secure future, let's ensure school systems are adequately financed, make smart use of technology, and protect teachers.

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Mathematics seminar 2020

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Sub Theme

Challenges being faced in teaching Mathematics in remote / online mode and ways to overcome them.

Title of the Paper

Online teaching – Out comes

Introduction: With education worldwide being thrown into disarray by coronavirus, more and more educators are being forced to teach their students from home. You might not have signed up for distance teaching, but in true teacher style it's time to throw the lesson plan out the window and make the best of a bad situation. To get you prepared, we've got the run-down on the five main challenges of distance teaching and the strategies you need to navigate them with confidence. Learning from home can be lonely. Without the buzz of the classroom setting and the company of their peers, it's no surprise that some students can begin to feel a strong sense of isolation that slowly erodes their desire to learn. Despite what they say, many students will find that they *miss* school when the alternative is to be desk-bound at home.

Isolation can also undermine many of the instructional strategies that we take for granted in our classrooms. Group work, class discussion and collaborative activity can disappear from the

program entirely if we aren't careful, and with them go the associated levels of student engagement and rich learning that those experiences provide.

Objectives: The purpose of this study was to explore instructors' perspectives on the effect of using pen-based technology in the online mathematics courses and understand instructors' experiences in online mathematics teaching with pen-based technology. In this study, two instructors who taught online mathematics courses in fourteen weeks used digital pen as a pen-based technology. The data were obtained from semi-structured interviews and observation of online mathematics course records. The findings indicated that the use of digital pen in the online mathematics course was fairly beneficial in pedagogical and interaction aspects and it was necessary to use digital pen in online mathematics courses for displaying steps of problem solving process synchronously. It was concluded from the study that digital pen technology plays a positive role in the enhancement of interaction between the elements of an online learning environment by providing real-time feedback to students and permitting to digitize mathematical concepts. The observation findings also supported the statements of the instructors. The findings of the study have further provided some insight into how to use digital pen by an instructor in online mathematics course efficiently.

Method and Procedure:

The challenge: passive students

Unless thoughtfully crafted, online instruction can turn students into passive observers rather than active participants. Although these unengaged students may acquire the lecture content, they aren't able to apply their learning's outside the virtual classroom. They might pass assessments and complete learning activities, but they aren't planning on using their new knowledge to make connections with previous material or real-world examples. For learning to be effective, students must be engaged in the quality, breadth and depth of their learning.

The challenge: staying connected with students

In an online classroom, much of the learning is completed asynchronously and students often feel disconnected from their instructor, as well as their peers. It can be difficult for instructors to teach online when they struggle to gauge how students comprehend course content, and whether they are participating in learning experiences.

The challenge: encouraging collaboration

Interaction among students is one of the single most important elements of successful online education. Collaborative engagement motivates learning and promotes a deeper and more

critically aware approach to the subject matter. Unfortunately, collaboration is one of the most difficult things to achieve when students are not physically present together.

Many discussion assignments do not support organic conversation. Posts are asynchronous, formal responses to prompts and so the required "discussion" of other students' ideas is understandably forced. Such forums are more akin to prepared response papers than group exercises, and this may well be appropriate for your online content.

Results and Discussions: In online learning environments, it's important to help students engage with course material in a way that makes sense for them. Providing them with ample flexible opportunities to reinforce course concepts will ensure that learning material sticks with them, even after they've completed their final assessment.

Especially when students are learning remotely, educators must recognize that students will only engage with course materials if they see them as valuable. With digital courseware, online teachers can adopt or create a customizable interactive textbook to extend active learning outside of class meetings. With in-line interactive questions, it is easy to track completion and comprehension of course content. These questions can be used to introduce new concepts, reinforce students' understanding of topics and assess learning. Instructors can also easily export grades and participation data to their learning management system (LMS).

Classroom response systems can also help faculty members understand how students are performing. When questions are posed to the class, for example, students can respond anonymously through their personal devices—the responses are then displayed on the screen in real-time. Some online learning platforms also offer weekly course reports to track student comprehension, outlining where they performed well and where they need more work. This can make it easier to identify students who are struggling and allows faculty to reach out with additional resources and support.

To encourage collaborative problem-solving, consider giving students a more specific task than simply "commenting" on each other's ideas. Ask directly for constructive feedback about their classmates' submissions. For example: "Focus on one claim in a colleague's response that you think deserves to be developed in more depth. Suggest how that claim could be further developed

and supported with evidence."Problem-based learning is a collaborative learning strategy that gives students the opportunity to apply course material to real-world case studies in small groups. This method, whether used in group learning or individually, helps students build upon their creativity and critical thinking skills. Students are invited to analyze, synthesize and then critique the information presented. By drawing on one another's expertise and through seeking out online resources and tools, students who use problem-based learning can reach their course's learning objectives in collaborative, meaningful ways. The shift to online learning can be difficult. It can require restructuring course components using new pedagogical approaches, learning activities and tech tools that may be new to you and your students. The pandemic has surely caused a change in the usual teaching and learning practices employed in the on-campus classroom environments, but that doesn't mean they must be abandoned altogether. By instilling collaboration, frequent communication and active learning into your classroom, you can still ensure students receive valuable and engaging educational experiences, regardless of where learning takes place.

Conclusions:

The above mentioned are the implications and teaching strategies are applied by me in my teaching practice. I strongly believe that no student is dull. It's all depending on the teacher and his teaching ability. If a student cannot learn or cannot enjoy the mathematics class then it is also a failure of the teacher. An effective teacher is who always learn, passionate towards experimentation and keen on student development.

Reference:

Tophat. blog , maa.org

MATHEMATICS SEMINAR - 2020

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THEME: Challenges being faced in Teaching Mathematics in remote mode or through online mode and ways to overcome them.

INTRODUCTION: India is a global technology leader in information and communication and in othercutting-edge domains such as space. The Digital India Campaign is helping to transform the entire nation into a digitally empowered society and knowledge economy. While education will play a critical role in this transformation, technology itself will play an important role in the improvement of educational processes and outcomes; thus, the relationship between technology and education (at all levels) is bi-directional. All use and integration of technology to improve multiple aspects of education will be supported and adopted, provided these interventions are rigorously and transparently evaluated in relevant contexts before they are scaled up. An autonomous body, the National Educational Alliance for Technology (NEAT), will be created to provide a platform for use of technology to enhance learning, assessment, planning, administration, and so on, both for school and higher education. The National Education Policy 2020 (NEP 2020), which was approved by the Union Cabinet of India on 29 July 2020, outlines the vision of India's new education system. The policy aims to transform India's education system by 2040. NEP- 2020 is stressing on **DIGITALEDUCATION. E-learning has become the new way of learning and teaching nowadays. Educationists believe that E-learning might prove to be better than conventional schooling as it allows a student to attend class remotely, hence, increasing attendance. As is it, children of this generation are tech-savvy, but they might never have imagined that online classes would replace their regular classes to such a large extent. Now, as countries around the world many schools and universities globally are moving classes online. Teaching and learning from home is a big change for most students and educators. There are many advantages to taking pursuing an online education; however, online learning can be a lot different from traditional in-classroom learning. New circumstances and realities require new initiatives. The recent rise in epidemics and pandemics necessitates that we are ready with alternative modes of quality education whenever and wherever traditional and in-person modes of education are not possible. In this regard, the National Education Policy 2020 recognizes the importance of**

leveraging the advantages of technology while acknowledging its potential risks and dangers. It calls for carefully designed and appropriately scaled pilot studies to determine how the benefits of online/digital education can be reaped while addressing or mitigating the downsides. In the meantime, the existing digital platforms and ongoing ICT-based educational initiatives must be optimized and expanded to meet the current and future challenges in providing quality education for all.

The Major Objectives Of Online teaching: There are certain goals when it comes to eLearning and some of these are to: Enhance the quality of learning and teaching.2.Meet the learning style or needs of students.3.Improve the efficiency and effectiveness.4.Improve user-accessibility and time flexibility to engage learners in the learning process.

CHALLENGES IN ONLINE TEACHING MATHEMATICS: Teaching should be full of ideas instead of stuffed with facts."Online education is ineffective because of the basic character of education, and not merely because of lack of access to the net and online resources, especially for school-age children," said Anurag Behar, vice chancellor, Azim Premji University, while releasing the study in Bengaluru. Both the Teachers and students are facing problems in online teaching Mathematics.

Online Learning Challenges Faced by Teachers: As education is going on online, many educators are being asked to teach their students from home. We know that all the teachers are not aware of online learning and their process as most of them are into traditional classroom teaching. It sometimes makes it difficult for them to change their way of teaching. Proper online training should be given to teachers before teaching students. With all the benefits of online learning still there are few challenges faced by teachers. There is a saying for every problem, there is a solution. So let us not only see the challenges but also find solutions to overcome them. Here are 10 challenges for teachers faced during the online learning process along with ways to overcome them.

#1.Engagingstudents: As students are moving towards online learning from traditional classrooms, it becomes difficult for teachers to adjust to a new learning platform. Teaching online may not influence and engage students for longer periods of time. They can easily get distracted and lose concentration during live sessions.

How to overcome the challenge?:You need to understand that online learning has a lot of advantages with respect to tools and interesting platforms to engage students in learning. Try to include those tools and multiple types of learning approaches such as podcasts, videos (teaching channel, own videos, live classes), discussions, various forms of text through articles and blogs, different assessment methods (tests, quizzes, assignments and projects) learning activities and collaboration for better learning outcomes.

#2.Time Commitment: If the course content is thought in person then you might not really understand the time commitment. It is still difficult to convert those learning into effective online

format. Teachers should be given some time for proper planning of the content and methods to deliver to the students. Teachers are not able to deliver the effective content in time. It said that teachers take more time in teaching online than face to face. If students exceed their deadline in submitting assignments or projects can lead to more work for you. How to overcome the challenge: Use a friendly tone for communicating with your students to establish rapport. You can set reminders for assignments and projects in your learning management system. Send it to your students one week prior to the submission deadline

#3.Communication:The more detailed the syllabus, the easier to communicate to the students. Sometimes teachers are not given enough time for the preparation of content for their students. And also there are students who avoid communication with teachers during online learning. Online teaching is like communicating without body language, so students might misunderstand and can result in their poor performance. Sometimes students might ask for an extension for their work or give any excuse for the delay.

How to overcome the challenge?: Give flexibility for the students when they ask for not making up to their deadlines. You must recognize the need of keeping in contact with the students and understand what kind of activities can accomplish your goal. Conduct discussions for specific content for the students with the opportunity to solve the problem and learning effectively. Also providing discussion on practical questions by the students that can reduce frustration, problem-solving skills and handling technical issues. You should provide a platform for the students in order to communicate and collaborate with other fellow classmates.

#4.Assessment: Assessment is the most important part of online learning for students as well as teachers. And it causes stress to students at times. So whenever there are assignments or projects, teachers might face a lot of questions from the students. As there is less communication between students and teachers, expectation from the students' performances also differs. Students are likely to experience less homework, less assignments or lack of examination at times. This can cause difficulties for teachers in assessments.

How to overcome the challenge?: You must understand the type of questions students might ask and prepare FAQs for the common questions. Make sure that you give proper assignments and conduct tests at regular intervals. This can help you to assess them based on their performance.

#5.Feedback:Every student needs feedback for their performance for improvement. Teachers find it difficult to give feedback to all students individually. Sometimes few students get benefited from it and others don't. As students are not given proper feedback leading to poor performance. Teachers do not find proper methods of providing feedback to all the students.

How to overcome the challenge?:You should understand how important it is to give feedback for the students for their growth and improvement. Make sure that you provide personalized guidance to all the students so that they can work on their learning abilities.

6.Learning Management Systems: Teachers experience a hard time in expressing their content to students, especially assignments and assessments. There have been problems with understanding the level of difficulty in terms of course content among students. According to teachers, the incident opportunities that happen face to face communication fail in online learning. How to overcome the challenge?:You should have an understanding of the strong learning management system and web technologies that can help your pedagogy. Think and take advantage of the training and workshops attended during teacher training. Apply the methods for effective teaching and management systems. You can also approach other teachers who know about the management system in online learning.

7.TeachingMethods:We know that most of the teachers follow typical classroom-style teaching methods, as they use to teach with only blackboard and books. It becomes difficult for them to adopt new teaching methods that are completely virtual and technology-driven.

How to overcome the challenge?: Most important thing is to get comfortable in a virtual classroom. Find out different kinds of tools that make teaching and assessment simple and easy. You can develop many teaching methods that can improve their learning such as conductingdifferent activities, model making, debates, group activities, virtual tours, group discussions, role play etc.

#8.Fear of Cheating: Sometimes teachers might feel concerned about the risk of cheating in online learning. They feel that students can cheat to get better results in the tests and assignments. How to overcome the challenge?: There are many reliable ways to enhance the integrity of online learning. You should allow students to take exams according to their convenience. Do not force for assignments or any tests unless they are ready.

9.TechnicalIssues: Many teachers struggle with technical issues that are unavoidable and cause stress. They become helpless if something technical errors come in the middle of the live session or communicating with students. How to overcome the challenge?:You should contact technical support for solving problems that can cause hindrance in the learning process. Make sure you upgrade your computer with apps and software that can help in an effective learning process with a high-speed internet connection.

#10.CourseContent: The course content was designed earlier with respect to traditional classrooms. But with the shift to online learning, it requires redesigning of course which can take a considerable amount of time and energy. It would have been successful when it started well in advance for better learning outcomes. Most of the cases, these courses work well in traditional classrooms but go flat in online learning. It happens when there are no content-related activities, assignments or projects that can be done online.

How to overcome the challenge?: You must understand the course content and how to fit it into your online course. Make sure you modify some changes in terms of activities and assignments for a better understanding of the concepts.

OUT COMES: Students will be independent learners who are self-motivated and actively seek out help if they need it. Course content will be delivered mostly through text-based materials and asynchronous discussion boards. Instructors will play the role of “content manager” and “guide on the side.”Instructors will not be “on call,” particularly over the weekend. If students want more help, information, or feedback on assignments, they will seek it out.

IMPLICATIONS: The advancement of technology has led to the conversion of traditional courses into Web courses. This conversion is becoming easier and occurring more systematically in higher education. Education is increasingly embracing active learning models over the traditional transmission mode of instruction. These factors are making Web-based courses easier to implement, more desirable, and pedagogically relevant. However, as the medium is relatively new, it is not yet precisely known what variables contribute more to students’ learning.

CONCLUSION: Remote teaching presents its fair share of challenges, and it can be especially problematic for Teachers used to an ILT environment. The key to delivering any good online Teaching is planning and preparation, and remote learning is no exception to this rule. By taking the proper time to plan and keep participants informed, you will go a long way toward avoiding some of these remote learning challenges.

MATHEMATICS SEMINAR 2020

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SUB THEME:

Challenges being faced in teaching mathematics in remote mode or through online mode and ways to over come
Them

TITLE OF THE TOPIC:

Online classes of mathematics

INTRODUCTION:

Challenges of remote teaching:

The obvious challenge of remote maths teaching is that we no longer have a physical room where we get face to face teaching time with our students where as in a class room we would be engaging with the children
as we teach, when teaching remotely we are broadcasting information rather than interacting and getting feedback as we go.

OBJECTIVES:

- To know the problems of online teaching of mathematics
- To solve the problems when we teaching the mathematics in online mode
- To know the advantages of online teaching

PRESENTATION:

In remote teaching, unfortunately it is not as simple as just taking our usual teaching techniques online. It's much harder to hold the pupil's attention when they are not there with our and our also cannot follow what they are doing step by step. They will have far more distractions and worries than usual too, making it even more difficult to stay focused and engaged.

Another complication is that different children will have different learning situations at home. Their schedules will vary, with some having more responsibilities than others, they may not all have the same type of equipment or amount of space in which to learn and levels of parental support will vary too. There could also be the added complication of self- isolating family members to deal with.

REMOTE TEACHING SOLUTIONS:

In order to make the transition to remote teaching we may need to adjust our teaching style to be more suitable Try some of the following strategies to see what works best for we and our students.

- **Don't just lecture:** Without the feedback of the students it can be easy to slip into just lecturing them, reeling off the information like a text book. Unfortunately this is likely to lose their attention. Try to keep our tone conversational, perhaps throwing in an anecdote or joke now and then. If appropriate you could also try breaking the lesson up with videos or GIFs on the screen so the students or not just watching we teach.

  Although students won't be working through our lessons while we are presenting them, they will stillneed help and feedback. Letting them know how to contact we if they need to will go a long way to reassuring them that they are not doing this alone. If it's possible in our situation check for messages from our students regularly and try to respond as quickly as we can so they are not left hanging if they getstuck. The motto for higher education should be less listening and more learning use variations in our voice and gestures to encourage interest and understanding.
  Using visual aids, figures or practical demonstration would be better than words. Following activities can be performed to demonstrate the concepts to avoid lecture.

- Symmetry concept can be developed among students through paper cuttings using colour papers.
- Pythagoras theorem can also be proved Pythagorean triplets on a graph paper.
- Concept of "Angle sum property in triangle" can be proved through paper cutting of different types of triangles.

- Preparing models for better understanding of 3D shapes like cube, cuboid, cone, cylinder, sphere, hemisphere etc.
- Verification of Euler's relation [F+V=E+2] for polyhedrons using the models.
- Properties of angles made by transversal with parallel lines through two protractors, two fixed sticks [parallel lines] and a movable stick [transversal].

- **Make expectation clear:** When we can't see our students face to face it's even more important to be clear about exactly what we expect from them. Make sure they know when assignments are due, what's involved and roughly how much time they should be spending on their maths lessons each week.

  Some expectation for students:

- Respect themselves the teacher and others.
- Put forth their best effort at all times.
- Be prepared for class each day. Come prepared with all materials necessary.
- Follow directions when given.
- Preserve a positive learning environment.

  Classroom expectations - examples:

- Ask questions.
- Respect and listen to the teachers.
- Be prepared for class.
- Be quiet when the teaching is going on.
- Interactive learning experiences.

- **Make use of technology:**There is some great technology we can use to help we adjust to remote teaching. For instance, we can review task see student progress in real time, and focus in an where our students are struggling. Without all those marking and admin tasks taking up our time, we will be able to give additional support to students who need it and prepare new lessons that are more suitable for remote learning.

  ICT Tools are the latest technology are devices and concepts used in information and communication technology among students to students, students to teacher interaction ex: flipped classroom, mobile apps and clickers devices ICT tools stimulate the development of the imagination, as well as the initiative of all class members.

Some mathematical apps are:

- Geogebra
- Microsoft math solver
- Photo math
- Zoom

Geogebra: Geogebra is a simple but powerful tool which can be used by students to understand math concepts to help solve problems and check solutions. Geogebra has very clear and intuitive interface divided into parts corresponding to the algebra and geometry. Depending on our need it can be freely modified to suit the considered issue. Geogebra can be used for statistics, for probability, for geometry, for trigonometry, for algebra and for functions.

Geogebra can be used for all classes to teach geometrical topics clearly some of them are given below:

- 6^{th} class: basic concepts like line, line segment, ray, angle, perpendicular bisector and angle bisectors.
- 7^{th} class: construction of triangles 1. Equilateral triangle. 2. Isosceles triangle. 3. Scalene triangle. 4. Right- angled triangle
- 8^{th} class: construction of quadrilaterals when 5 measurements are given.
- 9^{th} class: construction of different angles using compass and ruler only.
- 10^{th} class: Division of given line segment in the required ratio. Construction of similar triangle using scale factor. Construction of tangents to circle from an external point.

OUTCOMES:

- Better knowledge retention
- It enables micro learning
- Flexibility to choose where and when
- Easily update content
- Improves digital skills
- Saves time and less costly

IMPLICATONS:

- Requires self discipline and time management skills
- Communication with the instructor if often limited
- Not suitable for every topic
- Spending hours at a computer/tablet without any breaks can ruin our vision, back problems could become a serious issue
- Requires internet connection and computer skills
- Less supervision
- Needed self interest
- Not suitable for all students

REFERENCES: The new teacher's survival guide by Marilyn Nathen, Teaching online by Claire howell.

STATE LEVEL MATHEMATICS SEMINAR-2020

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MAIN THEME:

MATHEMATICS EDUCATION THE WAY AHEAD IN THE CONTEXT OF NEP 2020

SUBTHEME :

CHALLENGES BEING FACED IN TEACHING MATHEMATICS IN REMOTE MODE OR THROUGH ONLINE MODE AND WAYS TO OVERCOME THEM

TITLE OF THETOPIC:

CHALLENGES AND SOLUTIONS IN TEACHING LEARNING OF MATHEMATICS THROUGH ONLINE MODE IN COVID-19

INTRODUCTION :

Due to covid -19, the education system is suffering very loss due to not running of schools, there is no interaction between students and teachers and there is no classroom transaction. But Govt. of Telangana and school education department decided to continue the education by online mode because there will be no loss for the students in the education. But

there are some problems to give this kind of education to the students and even teachers also facing the problems to continue online education. In this paper,I am discussing the problems and its solutions in the online education.

OBJECTIVE:-

In this paper i am discussing about common online education problems for the students and teachers and its solutions to overcome it.

PRESENTATION:-

Due to covid 19 pandamicGovt of Telangana implemented online education to the students to recover them due not running of schools and no loss of the education to the students in the education. But there are some problems are facing by the children and even teachers also.

In this paper i am explaining the common problems and its solutions to over come.

Here I am dividing the problems are three types , those are

1. Technical problems
2. student problems
3. Teacher problems

- PROBLEM NO 1:-TECHNICAL ISSUES (TECHNICAL PROBLEM)

No internet connections and no smart phones and no cable tv

- THE SOLUTION:

- The most important step is to stay in touch with teachers and inform them about what's happening, experts say. They will hopefully understand and be flexible about the situation, perhaps even recording class sessions as a backup.Watchclasses in offline mode after downloading and see the classes in the friends house.

- PROBLEM NO 2:-DISTRACTIONS AND TIME MANAGEMENT
- (STUDENT PROBLEM):-

- While studying from home or wherever students may be, there can be more distractions than usual, especially with family and possibly younger siblings aroundthem agricultural works.
- As a result of these distractions – and possibly having additional responsibilities – time management becomes more challenging.
-
- THE SOLUTION:
- Try to think about building a schedule – figuring out when you're going to do what you're going to do and then sharing that with the other people in your house,. . Students should still prioritize their physical and mental health, even if life is busier than usual, she adds.
- Students should also try to identify a quiet time and place in their house to complete their coursework, if possible – even if that time is late at night. If their other responsibilities become too overwhelming, students should consider talking with their teachers about course load options for their subjects..
-
- PROBLEM NO 3:- STAYING MOTIVATED
- (TEACHER AND STUDENT PROBLEM)

- Given that students may not be attending class at a set time on a physical campus, finding the motivation to get started on coursework can be difficult.
-
- THE SOLUTION:
-
- In addition to creating a daily schedule and finding a productive workspace, Coder says it can also help to simply focus on the ultimate goal.
- At the end of the day, look back on the day and check mark off all of those items that you've completed. Knowing that you did will help to motivate you as well.

- She adds that staying in touch with classmates, in addition to reaching out to faculty or academic staff as needed, can also help motivate students.
-
- PROBLEM NO.4 :- UNDERSTANDING COURSE EXPECTATIONS
- (STUDENT PROBLEM)
-
- The sudden switch to online learning has left some students confused about some course requirements for the rest of the semester. They may wonder, for instance, if a final group presentation is still happening given that students can no longer meet on campus, or if they need to complete labs for science classes.
- Video lessons,at a set time on a certain day, or whether students are expected to learn the material on their own time.

THE SOLUTION:

- Experts say students should be proactive in asking their teachers questions about course expectations for the spring and whether there are any changes to requirements given the transition. Whether classes will be held live varies depending on the school, teacher and discipline.
- "Knowing the expectations as an online learner will help with time management because, again, you can plan out and schedule what's really needed week after week.

- PROBLEM NO. 5 :- LACK OF IN-PERSON INTERACTION

(TEACHER AND STUDENT PROBLEM)

- The lack of in-person interaction with both instructors and classmates can be particularly challenging,
- The adjustment can be particularly difficult for students taking classes that are better suited for the face-to-face format, like those with science lab components.
- who now watches physics labs in a digital recording and then takes a quiz afterward. "I consider myself a visual learner as well, but I prefer to play around with the materials as well as converse with other students to understand the material better.
- "

- THE SOLUTION:
- Experts say students should take advantage of the tools at their disposal. While not ideal for all learners, the best alternative to actual face-to-face interaction may be videoconferencing programs like Zoom, Skype or FaceTime. Talking on the phone with classmates or a teacher is also an option.

PROBLEM NO 6 :- ADAPTING TO UNFAMILIAR TECHNOLOGY

(TEACHER AND STUDENT PROBLEM)

I think all of us have had to learn to use technology in the last FEW months that some of us have never heard of, some of us may have used just a little bit of, who typically teaches classes on campus.

THE SOLUTION:

Use the resources available through the school. While this can include reaching out to technical support, students should determine whether they can save themselves time by looking up answers to their technology questions online or watching a video CLASSES.

PROBLEM NO 7.:-UNCERTAINTY ABOUT THE FUTURE

(STUDENT PROBLEM)

The sudden switch to online classes for the spring semester – and the summer, in some cases – has caused anxiety and raised questions among students about their academic futures. Some are considering taking the fall semester off if their school continues to stick with online classes, for instance, while others are concerned about upholding a full course load while juggling family responsibilities at home.

THE SOLUTION:

Smith recommends students speak with the teacher or student support services as needed to determine whether adjustments can be made to their class course schedule or a future class if needed. For example, he says, a student may want to take fewer course credits in a future semester

if his or her school continues offering only online classes and the student finds this format challenging.

Regardless of the challenges that come with the transition to online classes, students should remember that assistance is available.

OUT COMES: The children and teacher understand the importance of the education in the students life. They will use online classes very prestigiously and time to time completing the lessons by watching and gaingsubjects knowledge and concepts of the topics.

IMPLICATIONS:-

In any situations education is very important to the students in their life. Some natural problems will arise but we should not stop our development and overcome them with such new techniques and overcome them.

REFERENCE :- 1. NCERT New delhipragyatha guidelines.

2. DSE Telangana , director scerttsHyd guidelines in covid 19 for implementation of online classes.

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THANKYOU

Theme of the Seminar: Mathematics Education the way ahead in the context of NEP-2020.

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Sub-Theme : "Vedic Mathematics" - its relevance in teaching current mathematics curriculum in schools.

Title of the topic :

- Application of Vedic Mathematics in teaching current mathematics in schools.

Introduction:

- Vedic mathematics is an ancient form of understanding mathematics which enables the learners to understand the subject in more holistic way, thus creating higher interest in the mathematics subject.
- Vedic mathematics was simplified during the Vedic times creating **SUTRAS** (word formulae) which explains most of the concepts of mathematics. These sutras are so beautifully co-related and unified with different concepts, thus making us to understand mathematics in a more holistic way.
- Vedic mathematics is a unique system on the basis of Ancient Indian Mathematics were reconstructed in the earlier of 20th century by Late **His Holiness Bharathi Krishna Thirthaji (1844-1960),** a former shankaracharya of Puri based on **16 SUTRAS (**APHORISMS**)** and **13 SUB – SUTRAS** (COROLLARIES). Still, advanced research continuing on these sutras to create and develop applications on Geometry, Algebra, Calculus etc…

Objectives :

- ✔ Vedic Mathematics allow learners to master the concepts of mathematics in a simplified way.
- ✔ Calculations can be carried mentally which leads to more creativity, interest and develops intelligence also.
- ✔ Perfect practice increase ones speed drastically, increases self confidence and makes the learner mathematics as a joy of playing with numbers, learner start loving mathematics from the bottom of their heart.

Presentation :

APPLICATION OF URDHAVA-TIRYAGBHYAM.

- In the introduction, we have seen that there are 16 SUTRAS and 13 SUB-SUTRAS. In that, now we are going to learn the application of **URDHAVA-TIRYAGBHYAM**

➢ (VERTICALLY CROSS –WISE or CRISS CROSS METHOD) (or)  METHOD

- **Arithmetic :**

Let us consider an example of two digits by two digits multiplication.

38	**75**	**637**
X 64	**X 75**	**X 549**
……..	……..	……
3x6 / 3x4 +8x6 / 8x4	**7x7 / 7x5 + 7x5 / 5x5**	**6x5 / 6x9+3x4 + 7x5 / 7x9**
18 / 60 / 32	49/ 70 / 25	30 / 101 /63
=2432	=5625	= 349713
∴ 38 x 64 = 2432	**∴ 75 x 75 = 5625**	**∴ 637 x 549 = 349713**

➔ **Detailed Explanation for the problem:** **38 x 64 = 2432**

➔ Multiply the Tens digit with the Tens digit (**3 x 6 = 18**)

➔ Sum of the Multiplicands of the Units digit and the Tens digit (**3 x 4 + 8 x 6 =12 +48 = 60**)

➔ Multiply the Units digit with the Units digit (**8 x 4 = 32**)

➔ Write the units digit (2) of 32 in Units place and carry the digit 3 to 60, which makes 60+3=**63**

➔ Write the units digit (3) of 63 in Tens place and carry the digit 6 to 18, which makes 18+6=**24**

➔ Finally the product of **38** and **64** makes to **2432**.

➔ Similarly, we can solve the remaining Arithmetic examples too.

- **ALGEBRAIC MULTIPLICATION:**

(K+2)	**(2K-3)**	**(4K-3)**
X (K+7)	**X (5K+8)**	**X (4K-3)**
…….....	….……..…	……..……
K. K / 7K + 2K /14	2K.5K/ 8(2K)+ (-3)5K /(-3)x8	4K. 4K / -12K -12K/9
$= K^2+9K+14$	$= 10K^2+K-24$	$= 16K^2 -24K+9$
∴ (K+2)(K+7) = K^2 + 9K + 14	**∴ (2K-3)(5K+8) = $10K^2$ + K - 24**	**∴ (4K-3)(4K-3)= $16K^2$ - 24K + 9**

➔ **Detailed Explanation for the problem:** **(K+2) x (K+7)= K^2 + 9K + 14**

➔ Multiply the variable of first expression with the variable of Second expression (**K x K = K^2**)

➔ Sum of the Multiplicands of the variable and the constant (**K x 7 + 2 x K =9K**)

➔ Multiply the constant with the constant (**2 x 7 = 14**)

➔ Finally the product of **(K+2)** and **(K+7)** makes to $\mathbf{K^2 + 9K + 14}$.

➔ Similarly, we can solve the remaining algebraic examples too.

- **TRIGONOMETRIC IDENTITIES:**

1). **secθ + tanθ**

secθ - tanθ

……

secθ .secθ / secθ (-tanθ) + tanθ secθ / -tanθ.tanθ

$= sec^2\theta /0/-tan^2\theta$

$=sec^2\theta - tan^2\theta$

∴ (sec θ + tanθ) (secθ - tanθ) = $sec^2\theta - tan^2\theta$

2). cosecθ + cotθ

cosecθ - cotθ

……

cosecθ .cosecθ /cosecθ (-cotθ) + cotθ .cosecθ / cotθ .cotθ

$= cosec^2\theta /0/ -cot^2\theta$

$= cosec^2\theta - cot^2\theta$

∴ (cosec θ + cotθ) (cosecθ - cotθ) = $cosec^2\theta - cot^2\theta$

➔ **Detailed Explanation for the problem:** **(sec θ + tanθ) X (secθ - tanθ) = $sec^2\theta - tan^2\theta$**

➔ Multiply the **sec θ** of first expression with the **sec θ** of second expression (**secθ .secθ =$sec^2\theta$**)

➔ Sum of the Multiplicands of the **sec θ** and the **tanθ** [i.e.,**secθ (-tanθ) + tanθ secθ =0**]

➔ Multiply the **tanθ** with the **tanθ**, which makes to **$tan^2\theta$**

➔ Finally the product of **(sec θ + tanθ) and secθ - tanθ) makes to $sec^2\theta - tan^2\theta$.**

➔ Similarly, we can solve the remaining Trigonometry examples too.

- **Outcomes:**

Important aspects of Indian Vedic Mathematics.

✔ Vedic mathematics is far more systematic, simplified intuitive and unified than the conventional system of mathematics. It lays emphasis on fast and simplified techniques by using SUTRAS to solve complicated problems too.

✔ Speed and accuracy wins the race in this Modern World. So, by using sutras in Vedic Mathematics, many problems can be solved easily with high speed and accuracy.

✔ A complete child's brain developing program. Both the left and right side of the brain are used while solving problem in Vedic mathematics. There will be an important in mental ability, focus (concentration) sharpness, creativity and intelligence.

✔ Alternative approaches to problem solving and provides with a set of procedure for self cross checking during the regular or any competitive examinations.

- ✔ Vedic mathematics reduces the burden of remembering large number of multiplication tables because it asks us to learn tables up to nine (9) only.
- ✔ In Vedic system the very first step is to recognize the pattern of the problem and pick up the most efficient Vedic technique or Sutra.
- ✔ It reduces dependence on calculations and there by sharpens our Quantitative to the best of mind.
- ✔ It is a complementary to regular mathematics from high school onwards. Hence on learning Vedic mathematics, one can excel in regular mathematics at school level onwards. It keeps the mind alert and lively because of the element of choice and flexibility.
- ✔ It is helpful to slow learners to grasp the basic concepts of mathematics. More and more use of Vedic mathematics can generate interest in mathematics that is generally dreaded by learners.
- ✔ Vedic mathematics is also beneficial to those who are appearing for entrance examinations like Civils, SAT, CAT, IIT, EAMCET, VRO, RRB, Bank exams etc. Research has shown that learning Vedic mathematics can help the candidates in saving time about 15-20 minutes in the competitive examinations.

Conclusion:

In this presentation, I have covered one and only one sutras of Vedic mathematics by comparison, to make the exact position clear to all seekers. Arithmetic and Algebra are the basis on which all the mathematical operations have to depend. This is an introductory of Vedic mathematics through my article.

If this article achieves the purpose and stimulates the reader's interest and prompts to go in a further detailed study of Vedic mathematics. I shall feel more than amply rewarded and gratified there by.

Implication:

- ➢ If vedic mathematics need to be in the classroom then it need to be in the staff room first.
- ➢ As new knowledge needs to be connected to prior knowledge, the order of teaching information must be very carefully sequenced.
- ➢ Planning the sequential development of knowledge, the learning flow, is the critical first step in planning a series of lessons or scheme of learning.
- ➢ We need to develop a spiral style of curriculum where pupils are able to revisit key ideas over time, spaced learning.
- ➢ Vedic mathematics should be introduce from VI – X class mathematics text books as a separate chapter in the name of **"Joy of Playing with Numbers".**

Reference :

- ➔ Vedic Mathematics book by V.S .Agrawala and
- ➔ Two decades of teaching experience as a Vedic Mathematics Master Ttrainer for students as well as mathematics Teachers in and around the Telangana State.

STATE LEVEL SEMINAR ON “Mathematics Education the way ahead in the context of NEP 2020.”

On 22nd December 2020.

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SUB THEME: “Vedic Mathematics”- its relevance in teaching current mathematics curriculum in schools.
TITLE OF THE PROJECT: Algebraic multiplication using Vedic Mathematics.

INTRODUCTION:
వేద గణితం లో రెండు సంఖ్యల లబ్ధాన్ని కనుగొనుటకు ఉపయోగించిన పద్ధతిలోనే బీజీయ సమాసాల లబ్ధం ను కనుగొనవచ్చును.
అంతేకాకుండా మూడు లేదా నాలుగు బీజీయ సమాసాల లబ్ధాన్ని(ద్విపది,త్రిపది..) ఒకేసారి కనుగొనవచ్చును. అందుకోసం మనం బీజీయ సమాసాలను మాత్రికల రూపం లోనికి మార్చుకోవాలి.
అన్ని బీజీయ సమాసాల లో చరరాశులు ఒకే రకమైనవి ఉండనవసరం లేదు. ఒకే రకమైనవి ఉన్నచో సజాతి పదాలను కూడాలి.

OBJECTIVES:

- మాత్రికలు విద్యార్థి సులభంగా నేర్చుకునే అంశము కాబట్టి బీజీయ సమాసాల లబ్ధాన్ని మాత్రికల రూపంలో సులభంగా అర్థం చేసుకుంటారు.
- రెండు ద్విపదుల లబ్ధాన్ని కనుగొనే విధానాన్ని తెలుసుకుంటారు.
- రెండు బహుపదుల లబ్ధాన్ని కనుగొనే విధానం పై అవగాహన పొందుతారు.
- మూడు ద్విపదుల లబ్ధాన్ని కనుగొనే విధానం పై అవగాహన పొందుతారు అంటే ఒకేసారి మూడు ద్విపదుల లబ్ధాన్నికనుగొంటారు.
- మూడు త్రిపదుల లబ్ధాన్ని కనుగొను విధానము పై అవగాహన పొందుతారు.
- నాలుగు ద్విపదుల లబ్ధాన్ని ఒకేసారి కనుగొనగలరు
- ఎక్కువ బహుపదులను గుణించే పద్ధతిని అన్వేషిస్తారు.
- సమస్యలను వేగంగా, సరళంగా, ప్రణాళికతో తప్పులు లేకుండా చేయగలరు.
- గుణించకుండానే ఒక పదము యొక్క గుణకమును సులభంగా కనుగొనవచ్చును మరియు మూలాల మొత్తము,లబ్ధం పై అవగాహన పొందుతారు..

DESIGN AND DESCRIPTION OF THE INNOVATION:

▶ ద్విపదిని ద్విపది తో గుణించడం :

ఉదా: $(a_1x+b_1y)(a_2x+b_2y)$ లేదా $(a_1x+b_1y)(a_2p+b_2q)$

*[దిగువ ఇవ్వబడే అన్ని సమస్యలకు చరరాశులు ఒకేరకంగా ఉంటే సజాతి పదాలను కూడుతాము. వేరు వేరుగా ఉంటే విజాతి పదాలుగా అలానే ఉంచుతాము. కానీ రెండింటికి ఒకేరకమైన పద్ధతి వినియోగిస్తాము.]

▶ $(a_1x+b_1y)(a_2x+b_2y)$ (ఒకేరకమైన చరరాశులు ఉన్నపుడు) మాత్రికా రూపంలో మార్చుకొనగా

x y

$$\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \rightarrow \begin{bmatrix} \cdot & \cdot \\ \cdot & \cdot \end{bmatrix}$$

గుణించే విధానం dots and arrow రూపంలో

x^2 గుణకం: $[[\ \ \cdot] = a_1a_2$

y^2 గుణకం: $[\cdot\ \ ]] = b_1b_2$

xy గుణకం: $[\times] = a_1b_2 + b_1a_2$

$\therefore (a_1x+b_1y)(a_2x+b_2y) = a_1a_2x^2 + b_1b_2y^2 + (a_1b_2+b_1a_2)xy$

▶ రెండు బీజీయ సమాసాలలో వేరు వేరు చరరాశులు ఉన్నపుడు

$(a_1x+b_1y)(a_2p+b_2q)$

మాత్రికా రూపంలోకి మార్చుకొనగా

$$\begin{bmatrix} a_1x & b_1y \\ a_2p & b_2q \end{bmatrix}$$

పై పద్ధతిలో రాయగా

$\therefore (a_1x+b_1y)(a_2p+b_2q) = a_1a_2xp + b_1b_2yq + a_1b_2xq + a_2b_1py$

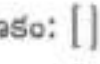
▶ త్రిపదిని త్రిపదితో గుణించడము:

2 ఉదా: $(a_1x+b_1y+c_1z)(a_2x+b_2y+c_2z)$

మాత్రికా రూపం లోనికి మార్చుకొనగా

$$\begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{bmatrix}$$

గుణించే విధానం dots and arrow రూపంలో

x^2 గుణకం:  $= a_1a_2$

xy గుణకం:  $= a_1b_2 + a_2b_1$

y^2 గుణకం:  $= b_1b_2$

xz గుణకం:  $= a_1c_2 + a_2c_1$

z^2 గుణకం:  $= c_1c_2$

yz గుణకం:  $= b_1c_2 + b_2c_1$

$\therefore (a_1x+b_1y+c_1z)(a_2x+b_2y+c_2z) = a_1a_2x^2+b_1b_2y^2+c_1c_2z^2+(a_1b_2+a_2b_1)xy$
$+(a_1c_2+a_2c_1)xz+ (b_1c_2+b_2c_1)yz$

a1=a2=b1=b2=c1=c2=1 అయితే

$(x+y+z)^2 = x^2+y^2+z^2+2xy+2xz+2yz$

▶ మూడు ద్విపదులను ఒకేసారి గుణించడము:

3 ఉదా: $(a_1x+b_1y)(a_2x+b_2y)(a_3x+b_3y)$

మాత్రికా రూపం లోనికి మార్చుకొనగా

$$\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \\ a_3 & b_3 \end{bmatrix}$$

గుణించే విధానం dots and arrow రూపంలో

x^3 గుణకం:  $= a_1a_2a_3$

x^2y గుణకం:  $= a_1a_2b_3+a_2a_3b_1+a_3a_1b_2$

y^3 గుణకం:  $= b_1b_2b_3$

xy^2 గుణకం: $= b_1b_2a_3+b_2b_3a_1+b_3b_1a_2$

$\therefore (a_1x+b_1y)(a_2x+b_2y)(a_3x+b_3y) = a_1a_2a_3x^3 + b_1b_2b_3y^3 + (a_1a_2b_3+a_2a_3b_1+a_3a_1b_2)x^2y$
$+ (b_1b_2a_3+b_2b_3a_1+b_3b_1a_2)xy^2$

If a1=a2=b1=b2=c1=c2=1 అయితే $(x+y)^3 = x^3+y^3+3x^2y+3xy^2$

▶ మూడు త్రిపదులను ఒకేసారి గుణించడము:

4 ఉదా: $(a_1x+b_1y+c_1z)(a_2x+b_2y+c_2z)(a_3x+b_3y+c_3z)$

మాత్రికా రూపం లోనికి మార్చుకొనగా

$$\begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}$$

గుణించే విధానం dots and arrow రూపంలో

x^3 గుణకం:  $= a_1a_2a_3$

x^2y గుణకం:  $= a_1a_2b_3+a_2a_3b_1+a_3a_1b_2$

y^3 గుణకం:  $= b_1b_2b_3$

y^2x గుణకం:  $= b_1b_2a_3+b_2b_3a_1+b_3b_1a_2$

z^3 గుణకం:  $= c_1c_2c_3$

x^2z గుణకం:  $= a_1a_2c_3+a_2a_3c_1+a_3a_1c_2$

y^2z గుణకం:  $= b_1b_2c_3+b_2b_3c_1+b_3b_1c_2$

z^2x గుణకం:  $= c_1c_2a_3+c_2c_3a_1+c_3c_1a_2$

z^2y గుణకం:  $= c_1c_2b_3+c_2c_3b_1+c_3c_1b_2$

xyz గుణకం:  $= a_1(b_2c_3+b_3c_2) + a_2(b_1c_3+b_3c_1)+ a_3(b_1c_2+b_2c_1)$

5 ఉదా: $(2x+3y+z)(x+2y+3z)(2x+2y+3z)$

$$= \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 2 & 2 & 3 \end{bmatrix}$$

$= 4x^3 + 12y^3 + 9z^3 + (24+11+22)xyz + (4+6+8)x^2y + (6+2+12)x^2z + (12+8+6)y^2x + (18+4+18)y^2z + (6+18+3)z^2x + (6+27+6)z^2y$

$= 4x^3 + 12y^3 + 9z^3 + 57xyz + 18x^2y + 20x^2z + 26y^2x + 40y^2z + 27z^2x + 39z^2y$

Recheck with normal method

$(2x+3y+z)(x+2y+3z)$

$=2x^2+3xy+xz+4xy+6y^2+2yz+6xz+9yz+3z^2$

$= [2x^2+6y^2+3z^2+7xy+7xz+11yz][2x+2y+3z]$

$= 4x^3 + 4x^2y + 6x^2z + 12y^2x + 12y^3 + 18y^2z + 6z^2x + 6z^2y + 9z^3 + 14x^2z + 14xy^2 + 21xyz + 14x^2y + 14xyz + 21xz^2 + 22xyz + 22y^2z + 33yz^2$

$= 4x^3 + 12y^3 + 9z^3 + 57xyz + 18x^2y + 20x^2z + 26y^2x + 40y^2z + 27z^2x + 39z^2y$

▶ నాలుగు ద్విపదులను ఒకేసారి గుణించడము:

6 ఉదా: $(a_1x+b_1y)(a_2x+b_2y)(a_3x+b_3y)(a_4x+b_4y)$

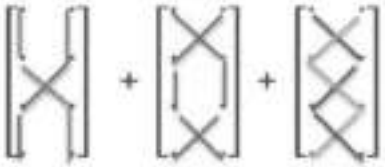
మాత్రికా రూపం లోనికి మార్చుకొనగా

$$\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \\ a_3 & b_3 \\ a_4 & b_4 \end{bmatrix}$$

గుణించే విధానం dots and arrow రూపంలో

x^4 గుణకం: $= a_1a_2a_3a_4$ x^3y గుణకం: $= a_1a_2a_3b_4 + a_2a_3a_4b_1 + a_1a_3a_4b_2 + a_1a_2a_4b_3$

y^4 గుణకం: $= b_1b_2b_3b_4$ y^3x గుణకం: $= b_1b_2b_3a_4 + b_2b_3b_4a_1 + b_1b_3b_4a_2 + b_1b_2b_4a_3$

x^2y^2 రూపం: 

$= a_1a_2b_3b_4 + b_1b_2a_3a_4 + a_1a_4b_2b_3 + b_1b_4a_2a_3 + a_1a_3b_2b_4 + b_1b_3a_2a_4$

7 ఉదా: $(2x+3y)(x+y)(2x+y)(x+3y)$

$$\begin{bmatrix} 2 & 3 \\ 1 & 1 \\ 2 & 1 \\ 1 & 3 \end{bmatrix}$$

$= 4x^4 + 9y^4 + (12+4+2+6)x^3y + (3+18+9+6)y^3x + (6+12+2+18+3+6)x^2y^2$

$= 4x^4 + 9y^4 + 24x^3y + 36y^3x + 47x^2y^2$

Recheck with normal method

$(2x+3y)(x+y)$

$= 2x^2 + 3xy + 2xy + 3y^2$

$= 2x^2 + 5xy + 3y^2$

$(2x^2 + 5xy + 3y^2)(2x+y)$

$= 4x^3 + 3y^3 + 10x^2y + 6xy^2 + 5xy^2 + 2x^2y$

$= 4x^3 + 3y^3 + 12x^2y + 11xy^2$

$(4x^3 + 3y^3 + 12x^2y + 11xy^2)(x+3y)$

$= 4x^4 + 9y^4 + 12x^3y + 33y^3x + 12x^3y + 3y^3x + 36x^2y^2 + 11x^2y^2$

$= 4x^4 + 9y^4 + 24x^3y + 36y^3x + 47x^2y^2$

మడుపు ముత్యంరెడ్డి **M.A.(English), PGDTE**
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వేద గణితం
ప్రస్తుత గణిత బోధనలో దాని ప్రాధాన్యత

జాతీయ విద్యాప్రణాళిక
2020 కి వేదగణితంతో అనుసంధానం

ముందుమాట

నూతన జాతీయ విద్యా ప్రణాళిక 2020 సక్రమ ప్రయోగం ఒక రకంగా మన ప్రాచీన విద్యావిధానమే అనడంలో ఎలాంటి సందేహం ఉండదు. విద్య అంటే పుస్తకాలలో ఉన్న దానిని చదవడం, ఎక్కడికో వెళ్ళి ఏదో కోరుకున్న జీవితానికి అవసరమైన అర్హతలు సంపాదించడము అనే ప్రస్తుత విధానం ఎంత మాత్రమూ కాదు. నిజమైన విద్య అంటే మన చుట్టూ ఉండే ప్రకృతినీ, సంఘాన్ని చదవడము, అర్థం చేసుకోవడము, వారితో సహజీవనం చేయడానికి అవసరమైన జ్ఞానాన్ని ప్రకృతి మనకిచ్చిన సహజ సామర్థ్యాలతో నేర్చుకొని బ్రతకనేర్వడమేనన్న అవగాహన రావాలి. అది నేర్చుకోవడం తొలినాళ్ళలో మనకు తెలిసిన మన మాతృభాష....ప్రథమభాషలో మొదలెట్టడము ఆ జ్ఞానాన్ని లోతుగా అర్థం చేసుకోవడానికి మనుషులు వరుసగా చేయాల్సిన పనులు, తీసుకోవాల్సిన జాగ్రత్తలను తెలిపే పద్ధతులను శ్రీశ్రీశ్రీ భారతీకృష్ణ తీర్థ స్వాముల వారు వేద వేదాంగాలసారాన్ని పరిశీలించి, ఎనమిది సంవత్సరాల సుదీర్ఘ తపస్సు రూపేన అవగాహన చేసుకొని మనందరికి అర్థమయ్యే సాధారణ సంస్కృతభాషలో చెప్పినదీ, తెలిపినదీ ఈ వేద గణితము, స్వామి గారు మన నూతన విద్యా ప్రణాళికలో చెప్పినట్టుగా చదువు ఒక్క గణితమో, శాస్త్రమో, సాంఘికమో, నూతన వైజ్ఞానిక పరిశోధనల అవగాహనకో అన్నట్టుగా కాక ప్రతీ కోణంలోనూ సామర్థ్యాలను పెంచుకునేలా మార్గదర్శనం చేయగల సూత్రాలను ఇచ్చారు. చాలామంది ఇప్పటికీ ఈ వేద గణితాన్ని గణితశాస్త్రంలో ఓ విభిన్న భాగంగా మాత్రమే చూడడం జరుగుతోంది. అది తప్పని....మన జ్ఞానార్జన...అదే గణన లేక పరిశీలనాత్మక విద్య మన అలవాటుగా, సహజ ప్రక్రియగా జరిగితే మళ్ళీ ప్రపంచానికి మన భారతదేశం ఎంత గొప్ప మార్గదర్శనం చేయగలడో తెలిపే ప్రయత్నమే నా ఈ నేటి గణితబోధనలో వేద గణిత ప్రభావము అన్న కోణంలో నా అభిప్రాయము. ఇందులో నేను తెలిపినవి చాలా తక్కువ విషయాలు అందుకు కారణం. నాకున్న పరిమితులు.

మన దశాంతమానమును ఇప్పడు ప్రపంచవ్యాప్తంగా ఉపయోగిస్తున్నారు. అందుకు కారణం చెప్పదలచుకొన్న సంఖ్య ఎంత పెద్దదైనా మన పద్ధతిలో స్పష్టంగా మరియు సులభంగా తెలపగలము. మన దశాంశమానమును ఆధారం చేసుకొని ద్విసంఖ్యా మానములను అర్థం చేసుకొని దాని ఆధారంగా ఈనాటి కంప్యూటర్లు ఉనికిలోకి వచ్చాయి. ఇంతటి గొప్ప గణిత భావనను మనవాళ్ళే సరిగ్గా అర్థం చేసుకోకుండా గుడ్డిగా పాశ్చాత్యుల పద్ధతులను అనుసరించడానికి అలవాటు పడుతున్నారు. అందుకే మన గణిత బోధనలో మన భారతీయ ప్రాచీన గణిత విధానాన్ని అనగా " వేద గణిత " విధానాన్ని అమలుచేయడం ద్వారా మన పిల్లలలో గణితమంటే ఉండే భయాన్ని పోగొట్టి దానిపట్ల చక్కని అభిరుచిని పెంచడము ద్వారా ఎందరో రామానుజాలను, శకుంతలలను తయారు చేయవచ్చును అని మీకు అర్థవంతంగా వివరించడానికే ఈ ప్రయత్నం.

మన ప్రాచీన గణిత భావన అంటే మన చుట్టూ ఉన్న, ఉండే రాశులను అనగా ప్రాణులే కాకుండా నిర్జీవ పదార్థాలను **Lifeless matters,** నిరాకార మూలకాలను **Non-visible elements** అనుభూతులను **feelings** ఇలా మన పంచేంద్రియాలతో గుర్తించగల ఏ రాశినైనా మరోసారి ఎదురైనప్పడు అదే రాశిగా గుర్తించడాన్ని గణన **Counting** అంటామని, అలా దేనినైనా పలుమార్లు మనకు వీలైనన్ని కోణాలలో పరిశీలించడము **Observation** ద్వారా ఆ రాశి గురించిన పూర్తి అవగాహననే దాని గణితము లేక జ్ఞానము అంటామనీ అనాలనీ అర్థం. మన జీవితంలో ప్రకృతిలో సహజంగా మన చుట్టూ ఉండే పలు విభిన్న రాశుల ప్రభావం అనివార్యమూ మరియు ఆవశ్యకము. అందుకే మన జీవితం సుఖమయం మరియు తృప్తికరంగా ఉండడానికి ఈ గణనే అవసరమని పెద్దలు చెబుతారు. దీనినే " గణనేవ ఇతి గణితః " అన్న సూత్రముతో వివరించారు.

ప్రకృతిలో ఉండే రాశులు రకరకాలు కాబట్టి ఆయా రాశులకు వేరువేరుగా గుర్తించడానికి మరియు సూచించడానికి వాటిలో ఒక్కో రాశికి ఒక్కో పేరును పెట్టుకోవడము జరిగింది, జరుగుతుంది. అలా మొదటిసారిగా చూసి పెట్టుకునే పేరును అదే ఎందుకు? అని ప్రశ్నించడము అర్థరహితము అనీ, ఆ పేరును తలచుకోగానే, వినగానే ఆ రాశే మనసుకు స్ఫురించాలనే అర్థంలో ఆ తొలి మాటను లేక పేరును " స్వీకృతం " **postulate** అన్నారు. అందుకే గణితంలో ఈ స్వీకృతాల సంఖ్య అధికంగా ఉంటుందనీ, ఆ స్వీకృతాల అవగాహనే గణితానికి, జీవితానికి చాలా అవసరమనీ పెద్దలు చెబుతారు.

ఇప్పడు వేదగణితములోని కొన్ని ముఖ్యమైన మరియు ఎంతో ఉపయుక్తమైన సూత్రాలను ఉదాహరణలతో వివరిస్తాను.

1) విలోకన Deep Observation : ఏ ప్రాణికైనా పుట్టుకతోనే సంప్రాపించే గొప్ప సామర్థ్యం తనకు సహజంగా ఉన్న జ్ఞానేంద్రియాలను ఉపయోగిస్తూ తన జీవనాన్ని సజావుగా సాగించేందుకు

పరోక్షంగా సహకరించడానికి " ప్రకృతి " లేక " దైవం " ప్రసాదించిన ఈ "లోతైన పరిశీలన"నే "విలోకన" అంటారు. ఈ విలోకనను చిన్నప్పటి నుండీ వాడుకునే అలవాటును పిల్లలలో పెంచుతూ బోధన చేయడము వలన ఎంత గొప్ప ఫలితం ఉంటుందో మీరే ఆలోచించండి. కొత్తగా పరిచయమయ్యే ప్రతి స్వీకృతాన్ని భావయుక్తంగా అర్థం చేసుకోవడానికి అంతకు ముందే తనకు బాగా తెలిసిన అదేజాతి రాశిని ఈ కొత్తదానితో పోల్చుకోవడం ద్వారా దాని గురించిన జ్ఞానం విస్తృతమయి ఆ రాశితో తన జీవనానికి అవసరమయ్యే పనులు లేక ప్రక్రియలను చాలా సులువుగా చేయడానికి ఎంతో పనికివస్తుంది. ఇది నిజం.

ఉదాహరణకు ' 49 ' తో గణిత ప్రక్రియలు అనగా జమ, తీసివేత, గుణకార, భాగహారాలను చేయడం సాధారణ పద్ధతిలో నేరుగా చేయడం కష్టంగా అనిపిస్తే ఆ '49' తనకు తెలిసిన '50' లేక " వందలో సగం " కన్న 1 తక్కువ అన్న స్పృహ, అవగాహన ఉంటే ఆ 50 తో మొదట అవతలి ప్రక్రియను చేసి ఫలితములో జమలో1 ని తగ్గించడము , తీసివేతలో1 పెంచడం , గుణాకారంలో అవతలి సంఖ్యనే 1 సారి తీసివేయడం, భాగహారములో 50 తో భాజ్యమును భాగించగా వచ్చిన భాగఫలాన్ని మిగిలిన శేషానికి జమచేయడం ఎంత సులువో క్రింద చూడండి.

జమ: 73 + 49 = (73+50) -1 = 123-1=122

తీసివేత: 73 - 49 = (73-50) +1 = 23+1 =24

గుణకారం: 73 x 49 = 73 (50 -1) = 73/2 వందలు -73 = 3650-73 = 3577

భాగహారం: 73 / 49 = భాగఫలము 1 మరియు శేషము 23 + 1 = 24

వీటి జవాబులను కాగితం & పెన్నుల అవసరం లేకుండా చెప్పగలరు కదా. అలాకాక సాధారణ పద్ధతిలో పై ప్రక్రియలను చేయడానికి ఎంత శ్రమ మరియు సమయం అవసరమవుతుందో ఆలోచించండి. ఇలా తాను ఉపయోగించాల్సిన వాటిని 'పరిశీలన' తో తెలుసుకోవడానినే వేదగణితం లో " అనురూప విలోకన " అంటారు. మనిషికి జీవితంలో స్వయంగా తన పరిశీలన ద్వారా తెలిసివచ్చిన జ్ఞానం తనకు అనుక్షణం పనికిరావడం కాదనలేని నిజం. చిన్నతనంలో మనకు బాగా తెలిసిన సంఖ్యలతో ఏ ఉపకరణ అక్కర లేకుండానే గణిత ప్రక్రియలు చేయగలగడం మీకు అనుభవమయ్యే ఉంటుంది. అందుకే ఏ చదువురాని, లేని పల్లెటూరి జనాలు పెద్దపెద్ద సంఖ్యలతో జమ, తీసివేతలు అలా అలా చాలా సులభంగా చేయడానికి వారు ఉపయోగించే పద్ధతి ఆ విలోకనమే. ఉదాహరణకు ఉన్న 4,796/- రూ॥లకు, ఓ 997/- లను జమచేయమంటే అలవోకగా డబ్బుకు 4,796/-కు ఒక వెయ్యి కలిపి వచ్చే 5796/- రూ॥ల నుండి 3 తగ్గించి క్షణంలో 5793/- అని చెబుతారు. అదే డబ్బు నుండి 997/- రూ॥లను తీసివేయమంటే ఉన్న 4796/- రూ॥ల నుండి ఒక వెయ్యి తీసేసి వచ్చే 3796/- రూ॥లకు 3 కలిపి వెంటనే 3799/- రూ॥లు అని చెబుతారు. అలాగే గుణకారం చేయమంటే అవతలి 4796/- రూ॥లను " వేలు " గా అనగా 47,96,000లుగా తీసుకొని దాని నుంచి ఆ 4796/- కు మూడింతలను **(3x4796)**ను తీసేయడమనీ అంటే 47,96,000-14,03,88 అనగా 4781, 612 అని కూడా చెప్పగలరు. ఇదంతా ఆ 997 అన్నది 1000 కి 3 తక్కువ అన్న విలోకన నుంచే వస్తుంది.

2) " వింకులం సంఖ్యలు ": మన దశాంశమాన పద్ధతిలో సంఖ్యలను వ్రాసి చూపడంలో ఉన్న 10 అంకెలను వివిధ స్థానాలలో ఆయా అంకెల విలువలను వాటి వాటి స్థాన విలువల స్థాయికి పెంచి జమ చేయడమనే పద్ధతిని వాడుతున్నాము, వాడుతుంటారు. శ్రీశ్రీశ్రీ భారతీకృష్ణ తీర్థస్వామి వారు ఇంతకు ముందు సాధారణ స్థాయి మనుషులు ఉపయోగించే " అనురూప " అవగాహనా పద్ధతిలో సంఖ్యలను వ్రాయడము అనగా ఒక సంఖ్యను దానికి దగ్గరలోని పెద్ద సంఖ్య కన్న " ఇంత తక్కువ " అన్న ఆలోచనను సంఖ్యారూపంలో తెలిపే కొత్త భావనను " విన్‌కులమ్ సంఖ్య " అన్న పేరుతో ప్రవేశ పెట్టినారు. అనగా ఉదాహరణకు 49 ని ఇలాగే వ్రాస్తే పదుల స్థానంలో ఉన్న 4 ను 40 గా చూసి దానికి 9 ఒకట్ల ను కలిపి 49 అంటామని తెలపడం అన్న మాట కదా! మరి దానినే 5 పదుల కన్న 1 ఒకట్లు తక్కువ అని **5<u>1</u>** గా వ్రాయమని ఇందులో 1 కి కిందున్న - గుర్తును తక్కువ **bar** అని చదవమని.. గుర్తించమనీ అనగా పదులస్థానంలోని 5 అనగా '50' కన్న ఒకట్ల స్థానపు 1 తక్కువ **less** అని చూపితే 49 కన్న **5<u>1</u>** గణిత ప్రక్రియలలో చాలా ఉపయోగకరమనీ తెలిపినారు. మరిన్ని ఉదాహరణలలో **30<u>12</u>** అంటే వేలస్థానపు 3 లేక 3 వేలకు పదుల స్థానపు 1 మరియు ఒకట్ల స్థానపు 2 కలిసి పన్నెండు తక్కువ అన్న అవగాహన అనగా 2988 అన్న దశాంశ సంఖ్యను ఇలా **30<u>12</u>** గా వ్రాయడం అలవాటు చేసుకోవడం ద్వారా మనకు స్థాన విలువలలో 5 కన్న పెద్ద అంకె వాడకం అవసరము రాదని దాని కారణంగా ఆయా సంఖ్యలతో గణిత పరికర్మలు సులువవుతాయనీ తెలిపారు. నిజానికి ఈ ప్రక్రియ నిరక్షరాస్యులైన పల్లెటూరి జనాల అవగాహనా గణిత జ్ఞానము నుండే వచ్చిందన్న సత్యాన్ని స్వామిజీ ప్రతిపాదించారు. అయితే ఈ వింకులం సంఖ్యలను చదివేప్పడు " - " గుర్తులున్న సంఖ్యలను మొదట చదివి " అంత తక్కువ " మిగిలిన సంఖ్య అని చదివే అలవాటు చేసుకోవాలి. అనగా **13<u>2</u>1** ని " ఇరవై " తక్కువ 1301 అని చదవాలి. **1<u>32</u>1** ని 320 తక్కువ 1001 అని చదవాలి. **1<u>32</u>1** ని 301 తక్కువ 1020 అని చదవాలి. గమనించండి..... సాధన చేయండి.

3. " నిఖిలం నవతః చరమం దశతః " సూత్రము :

మన దశాంశమాన పద్ధతిలో సంఖ్యలలో స్థాన విలువ ఆ స్థానంలో వున్న అంకె విలువను మార్చుతుందన్న మూల భావనను జీవితంలో ఒక మనిషి విలువు తాను ఉన్న స్థానాన్ని బట్టి మారుతుందన్న ఉదాహరణతో వివరిస్తే వారు చక్కగా అర్థం చేసుకోవచ్చును. ఒక స్థానంలో ఉన్న "1" అంటే దాని తరువాయిగా ఉండే అన్ని స్థానాల్లో "9" లే ఉంటూ మనం వాడే చివరిస్థానంలో అనగా మూలకపు ప్రమాణ స్థానంలో మాత్రం "10" ఉన్నంత విలువ కలిగివున్న రాశి అన్న అర్థాన్ని వేదగణితంలో "నిఖిలం నవతః చరమం దశతః" అన్న సూత్రంతో చెబుతారు. ఉదాహరణకు 1 లక్ష అంటే దాని విలువ లక్షగా " ఒకటి " మాత్రమే అయినా దాని తరువాయిగా ఉండే " పదివేలు, వేలు, వందలు " మరియు " పదుల" స్థానాల్లో "9" లే ఉంటూ చివరి " ఒకట్ల " స్థానంలో సూత్రం "10" ఉన్నంత విలువ అని అర్థం అనగా 1 లక్షను చిల్లరగా మారిస్తే తొంభై తొమ్మిది వేల తొమ్మిది వందల తొంభై పైన పది ఒకట్లు వస్తాయని... ఇంకా చెప్పాలంటే ఆ 1 లక్షను చిల్లరగా చూస్తే 99,999 కన్న 1 ఎక్కువ ఉంటుందన్న అవగాహన వస్తే, పిల్లలకు తెలియజెప్తే వారికి మన దశాంశమాన విధానం సరిగా అర్థమయి ఏ సంఖ్యలతో ఐనా జమలు, తీసివేతలు, గుణకారాలు మరియు భాగహారాలు చాలా సులువుగా చేయగలుగుతారు. అందుకే చూసే ప్రతి సంఖ్యను

దానికి దగ్గరగా ఉన్న మనకు బాగా తెలిసిన సంఖ్యతో పోల్చి దానితో ప్రక్రియలు చేయడము వలన జవాబులు త్వరగా, ధైర్యంగా మరియు వేగంగా చేయగల సత్తా వస్తుందన్నది ప్రయోగ రూపంలో నిరూపించబడిన వాస్తవం. సంఖ్యలలో కొన్ని సంఖ్యలు ప్రత్యేకమైనవి అన్న స్పృహ వాటిని చూడగానే తెలిసివస్తే వాటితో కొన్ని ప్రక్రియలను సాధారణ పద్ధతుల కంటే భిన్నంగా చాలా సులువుగా చేయగలమని తెలుసుకోండి, తెలపండి. ఉదాహరణకు అన్ని '9' లే ఉండే సంఖ్యలతో జమ, తీసివేత, గుణకారం మరియు భాగహారంలు ఎంత సులభంగా చేయవచ్చో చూడండి.

జమ : జమచేయాల్సిన ఈ అన్ని 9 ల సంఖ్య తరువాతి సంఖ్య విలువను అవతలి సంఖ్యకు అంటే దాని ఆస్థాన విలువలో కలిపి మొత్తం జవాబులో 1 తగ్గించండి అంతే. అనగా ఉదాహరణకు 2456 కు 999 ని జమచేయడానికి 2456 కు 999 తరువాత సంఖ్య అనగా 1000 ని కలిపి వచ్చిన 3456 నుండి 1 తగ్గించి 3455 గా చెప్పడము ఎంత సులువో చూడండి. అలాగే తీసివేత అంటే జమకు వ్యతిరేకంగా చేయడమే కదా అంటే 2456 నుండి 999 తీసివేయడమంటే 2456 లో 'వేయి' తగ్గించి వచ్చే 1456 కు 1 కలిపి 1457 అని చెప్పడము సులభమా? కాదా? చూడండి.

గుణకారము : ఉదాహరణతో పరిశీలించండి. 2346 ను 999 తో గుణించాలి అనుకోండి. లెక్క ప్రకారం 999 అంటే వేయి కన్న 1 తక్కువ కాబట్టి 2346 వేల నుండి అనగా 23,46,000 నుండి 2346 ను తీసివేయడము ఎంత సులభమో చూడండి. ఇక్కడ 9 తో గుణకారము చేయడం అవసరమే లేదుకదా. దీనిని కూడా ఇంకా త్వరగా చేయడానికి 2346 లో 1 తగ్గించి వచ్చే 2345 ప్రక్కన 999 వ్రాసి అనగా 2345999 వ్రాసి దాని నుండి ఆ 2345 ను తీసివేయండి.

2346 x 999 = 23,45,999

2,345

23,43,654 అంతే

జవాబు సరిచూసుకోండి.

భాగహారము : 2346 ను 999 తో భాగించాలి అంటే భాజ్యములో ఉన్న స్థానాలలో వేల స్థానపు 2ను భాగఫలముగా వ్రాసి ఆ భాగఫలాన్నే మిగతా 346 కు జమ చేసి వచ్చే 348ను శేషముగా చెప్పడమే. అనగా 2346/- రూపాయలను 999 మందికి భాగిస్తే లేక పంచితే తలా 2 రూపాయలు వచ్చి ఇంకా 348 శేషంగా మిగులుతుంది. పరిశీలించండి. **(2 x 999)** అనగా 1998కు 348 ని కలిపితే 2346 వస్తుంది. జవాబును సరిచూసుకోండి. మరో ఉదాహరణను చూడండి. 2346ను 99 తో భాగిస్తే 2346 లోని మొదటి రెండు స్థానాలలో ఉన్న అనగా 2346లో వేల మరియు స్థానాలలో ఉన్న 23ను అనగా భాజకము 99 లో ఉన్నవి రెండు '9' లు కాబట్టి 2346లో చివరి నుండి రెండు స్థానాలలో 46 ను తగ్గించగా వచ్చే 23 ను భాగఫలముగా మరియు ఆ 23 ను మిగిలిన 46 కు కలిపి వచ్చే 69 ని శేషముగా చూపండి. అంతే జవాబును పరిశీలించండి. ఇదంతా వేదగణిత ప్రభావమే కదా!

ఈ వివరణ అంతా ప్రాథమిక స్థాయిలో గణిత ప్రాథమిక పరికర్మల వరకే ఉన్నా నిజానికి వేద గణితము ప్రతి గణితంలోని ప్రతి విభాగంలోను మరియు జీవితంలో ప్రతి సందర్భంలోను వాడవచ్చును. దాని వివరణకి చాలా సమయం పడుతుంది కాబట్టి ఇంతటితో ప్రస్తుతానికి ముగించుచున్నాను.

STATE LEVEL SEMINAR ON "MATHEMATICS EDUCATION THE WAY AHEAD IN THE CONTEXT OF NEP-2020"

On 22nd December,2020

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SUB THEME :

" VEDIC MATHEMATICS" - its relevance in teaching current mathematics curriculum in schools.

TITLE OF THE TOPIC : " SQUARES by VEDIC method"

INTRODUCTION : If a x a = a^2 then a^2 is called square of a

OBJECTIVES :

To promote the professional development of mathematics teachers.

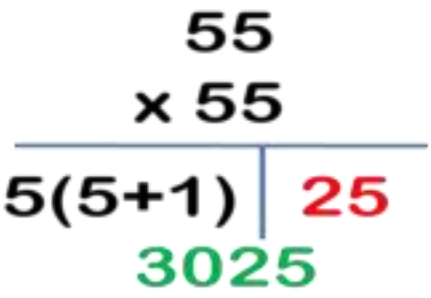
To provoke teachers to think of alternative ways of teaching Mathematics to make it more interesting and effective.

To encourage teachers to come out with innovative ideas in Mathematics to meet the aspirations and challenges of developing India.

PRESENTATION :

If a x a = a^2 then a^2 is called square of a

- $1^2 = 1 \times 1 = 1$
- $2^2 = 2 \times 2 = 4$
- $3^2 = 3 \times 3 = 9$
- $4^2 = 4 \times 4 = 16$
- $5^2 = 5 \times 5 = 25$
- $6^2 = 6 \times 6 = 36$
- $7^2 = 7 \times 7 = 49$
- $8^2 = 8 \times 8 = 64$
- $9^2 = 9 \times 9 = 81$
- $10^2 = 10 \times 10 = 100$
- **End with 5 no.s**
- $5^2 = 25$
- $15^2 = 225$
- $25^2 = 625$
- $35^2 = 1225$
- $45^2 = 2025$
- $55^2 = 3025$
- $65^2 = 4225$
- $75^2 = 5625$
- $85^2 = 7225$
- $95^2 = 9025$
- $105^2 = 11025$



Algebraic Proof

$$(ax+b)^2 = a^2x^2 + 2abx + b^2$$

$$(10a+5)^2 = 10^2a^2 + 2.10a.5 + 25$$
$$= 10^2a^2 + 10^2a + 25$$
$$= 10^2(a^2+a) + 25$$
$$= a(a+1)10^2 + 25$$
$$= a(a+1) \mid 25$$

BASES

10	100	1000	10000
20	200	2000	20000
30	300	3000	30000
40	400	4000	40000
50	500	5000	50000
60	600	6000	60000
70	700	7000	70000
80	800	8000	80000
90	900	9000	90000

Sub Bases

Deviation : The difference between the number and base is termed as Deviation.

$1^2 = 1$	1 or 2 digits
$10^2 = 100$	3 or 4 digits
$100^2 = 10000$	5 or 6 digits
$1000^2 = 1000000$	7 or 8 digits

Yavadunam Tavadunikritya Vargamcha Yojayet

$$N^2 = N + d \mid d^2$$

$12^2 = 12 + 2 \mid 4$

$12^2 = 144$

$107^2 = 107 + 7 \quad 49$
$= 11449$

$114^2 = 114 + 14 \quad 196$
$= 128 \mid 196$
$= 12996$

- The integer which is multiplied by itself is called as the **square of a given number**.
- A square root of a number goes the other way. It is a value that can be multiplied by itself to give the original number.

This method is applicable to obtain the squares of numbers close to bases of powers of 10.

PROCESS:-

In the first example, 12 is a number. It is close to the base number 10 and surplus is 2.
So, this surplus is added to the number. (12+2)
The square of the surplus is 2^2 which is 4.
Therefore, the answer is 12+2 | 4 = 14 | 4 = 144

Similarly, in the second example, 107 is a number, it is close to the base number 100 and 7 is the surplus. This surplus is added to the number. (107+7) The square of the surplus is 7^2 which is 49.
Therefore, the answer is, 107+7 | 49 = 114 | 49 = **11449**

In the 3rd example, 114 is a number, it is close to base number 100 and 14 is surplus. This surplus is added to the number. (114+14) The square of the surplus is $(14)^2$ which is 196.
Therefore, the answer is, 114+14 | 196 = 128 | 196
Here, the ones digit of first part is added to the hundreds digit of second part.
So, 12 | (8+1) | 96
= **12996**

Here are some more examples:-

$1016^2 = 1016 + 16 \mid 256$
$= 1032256$
$10065^2 = 10065 + 65 \mid 4225$
$= 101304225$
$100105^2 = 100105 + 105 \;\; 105^2 = 10021011025$

$97^2 = 97 + (-3) \mid 09 = 9409$

$986^2 = 986 + (-14) \mid (-14)^2$
$= 972 \mid 196$
$= 972196$

$9915^2 = 9915 + (-85) \mid (-85)^2$
$= 9830 \mid 7225$
$= 98307225$

$$N^2 = R(N + d) \mid d^2$$

$$\text{Ratio (R)} = \frac{\text{Sub base}}{\text{Base}} \qquad \text{Ex : } \frac{200}{100} = 2$$

$$\text{Ex : } 206^2 = 2(206 + 6) \mid 6^2$$
$$= 2(212) \mid 36$$
$$= 42436$$

$$8022^2 = 8(8022 + 22) \mid 22^2$$
$$= 8(8044) \mid 484$$
$$= 64352484$$

$$5035^2 = 5(5035 + 35) \mid 35^2$$
$$= 5(5070) \mid 1225$$
$$= 25350) \mid 1225$$
$$= 25351225$$

<u>OUTCOMES:</u> Students can square numbers easily

<u>REFERENCE:</u> 1. Vedic Mathematics Made Easy – Dhaval Bathia

2. Maths Sutra – The Art of Vedic Speed Calculation – Gaurav Tekriwal

Thank you.

Mathematics Seminar 2020

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THEME:

Mathematics Education – the way ahead in the context of NEP – 2020.

SUB THEME:

'Vedic Mathematics' – its relevance in teaching current Mathematics curriculum in schools.

TITLE OF THE TOPIC:

"Vedic Mathematics templication in school level"

INTRODUCTION:

- It takes its name form the collection of scared texts known as the "Vedas." Vedism is the oldest stratum of religious activity in India for which these exist written materials. It was one of the major traditions that shaped Hinduism.
- Vedic mathematics is a book written by the Indian monk **"Bharati Krishna Tirtha",**and first published in 1965.
- It contains a list of mathematical techniques, which the author claimed where retrieved from the Vedas and supposedly contained all mathematical knowledge. These claims have been rejected in there entirely.

OBJECTIVES:

- Vedic mathematics refers to a technique of calculation based on a set of 16 sutras or aphorisms, algorithms and their upa-sutras or corollaries derived from the sutras.
  Its enthusiasts advance the claim that any mathematical problem can be solved mentally with these sutras.

- The simplicity of Vedic mathematics means that calculation can be carried out mentally. The several advantages of Vedic math are :
- It lessens the load of remembering large amount of information because it requires you to learn only tables up to 9. When compared to conventional method it enables faster calculations.
- Vedic mathematics is mostly a set of tricks that help you to do arithmetic.
- It is really a great section which is to be explored and taught to children at school level. It enhances their calculation speed which improves their brain.
- It helps an individual to speed up his mental calculation with easy and fun tricks.

PRESENTATION:

In this we are going to do the addition in very easy and simple manner.

1) **By Dropping Method:**

In general method we do the calculation like 7+8+6+5+4+3+6+5=44. But in dropping method,

- 7
- 8
  6
- 5
  4
  3
- 6

  5 = 44.

  STEP-1 : In droping method we take one drop after every ten. We count the numbers from bottom to top.

  Ex: 5+6=11,In this the sum is 11,so we take a drop after 6.

  STEP-2: So in 11 units place is 1.to this1we add 3,4,5 so we get the sum is 13.So we take 1 drop after 5.

  STEP-3: In 13 units place is 3,if we add 6,8 we get the sum is 17 so we take one drop after 8.

  STEP-4: In 17 units place is 7,if we add 7 to this the sum is 14.So we take after 7

  STEP-5: By adding all the numbers we are taking the units place value as 4 and simply we calculate all the drops. And the sum is 44.

  - In dropping method we take one drop after every ten. So it is very easy to calculate and find the solution very quickly. This method is also known as “Bar Method”.

2) By Balancing Method:

For example, here we are doing two – digit addition and it is,

23
47**.**
.59
.68**.**
79**.**
.56**.**
44
33
= 36 / 49
= 409.

- In this method also we use the same technique which is used in the dropping method. In dropping method we did only single digit addition. In this we are doing two digit additions.

  STEP-1: In this we are adding 3+4+6=13. In this the sum is 10 crossed so we are taking a drop after 6.

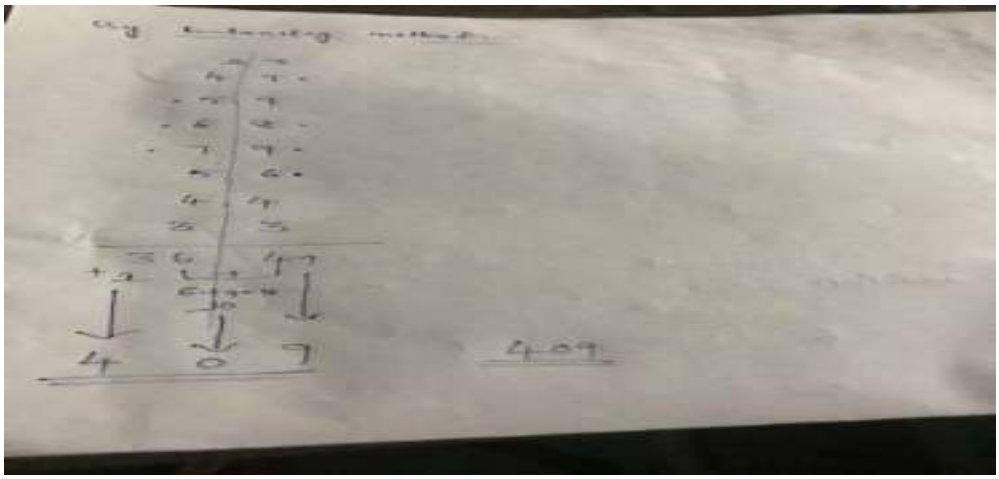
  STEP-2: In 13 the units place is 3,here we are adding 9 so 3+9=12.In this the sum is 10 crossed, so we are taking a drop after 9.

  STEP-3: In 12 the units place is 2,here we are adding 8 so we get 2+8=10. So the sum is 10 crossed, so we are taking after 8.

  STEP-4: In 10 units place is 0, so we add 9,7 so 0+9+7=16, here the sum is 10 crossed so we are taking the drop after 7.

  STEP-5: In 16 units place is 6, if we add 3, the sum is 6+3=9, by adding all the terms we got 49 as units place value, by following same dropping method to the second column we got the sum as 36.In this the sum of units place is 49 and 10 place is 36.

  STEP-6: **36/49=**As shown in belowpicture.



3) By Left To Right Addition:

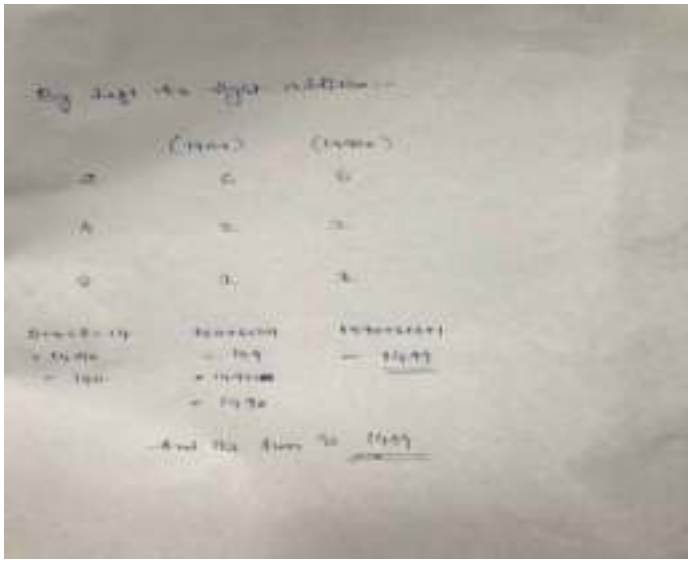
And the example is:

2	$6_{(140+)}$	$6_{(1490+)}$
4	2	2
8	1	1
14*10	149*10	
= 140	= 1490	= 1499.

STEP-1: In this we are adding the numbers from left to right that is 2+4+8=14, here we are multiplying 14 with 10 we got 140.

STEP-2: We are carrying this 140 to the next column and we are adding the numbers 140+6+2+1=149, here we are multiplying 149 with 10 and the sum is 1490.

STEP-3: We are carrying 1490 to the next column and we are adding the numbers 1490+6+2+1=1499 and the sum is 1499. As shown in below picture.



In this, we are adding the numbers by column wise from left to right and every time we are multiplying with ten up to 2nd column and simply we are adding the solution to the 3rd column and we are writing the final solution.

This method is useful in doing three or four or more digit addition in easy and simple manner. We have just follow and know the tricks of this type of addition.

OUTCOMES:

- It creates interest towards mathematics.
- Enhance logical thinking process.
- Reduces the finger counting and improves mental calculation.
- It increases concentration.
- Amazing speed math is a zero error technique.
- It saves the time during examination.
- While cross checking answers, it can be used as alternate method to rectify mistakes.
- It will be beneficial throughout life time.

IMPLICATIONS:

- Vedic mathematics is a collection of techniques or sutras to solve mathematical arithmetic in easy and faster way.
- It consists of 16 sutras (formulae) and 13 sub sutras (sub formulae) which can be used for problems involved in arithmetic, algebra, geometry, calculus, conics.
- And also it is very important tool to make CAT calculations easy being well versed in the principles of Vedic math will help you to understand complex

calculation from a different perspective and shorten the time duration of doing calculation.

- We imply this Vedic math for doing four operations of arithmetic addition, subtraction, multiplication and division.
- It will be better to make understand the problems to the students in easy and simple and very shortcut method.

REFERENCES:

School complex trainings.

THANK YOU.

Mathematics Seminar - 2020

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Sub topic :

"Vedic Mathematics"– its relevance in teaching current mathematics curriculum in schools.

Introduction:

Math today has become analogous to 'a dread' from a student's viewpoint. Students fear mathematics to the extent of hating it. Despite this dire situation, there appears to be little or no option within the existing academic system to simply it leaving students no other alternative but to dread it or simply opt out of it. Against this backdrop, Vedic Mathematics has emerged as an interest-filled contender providing learners a creative path making calculations easier. Vedic Maths fits in easily with the present academic system and any student can learn it. Vedic Mathematics can be considered as a universal language, a bit like Yoga and Ayurveda. Vedic Maths can replace the mathematic dread to mathematic fun creating a conducive learning environment for learners.

The name "Vedic Mathematics" is derived from the Vedas. To be more specific, it has originated from "Atharva Vedas" the fourth Veda. "Atharva Veda" deals with the branches like Engineering, Mathematics, Sculpture, Medicine and other sciences. Vedic Mathematics

was discovered by the Indian mathematician **Jagadguru Shri Bharathi Krishna Tirtha** in the period between 1911 and 1918 A.D.Vedic Mathematics is a rendezvous of mental mathematics. It is a set of simple techniques which can be used to solve complex mathematics with ease and speed using sutras. Vedic Mathematics consists of 16 Sutras and 13 thirteen sub-sutras. Vedic Mathematics is interrelated and the intention is to increase accuracy and rapidity of solving mathematical problems in a very simple and faster way. Vedic Mathematics presents a special approach called pattern recognition where a child/student is able to grasp the concept in a simple way. Vedic Mathematics improves the rational and computational thinking of a child/student. Vedic Mathematics can be applied to other concepts like Arithmetic, Geometry, Calculus etc. Vedic Math is being touted as an alternative to dreadful mathematics with its promising easy to use patterned blueprint based on sutras affording students extensive awareness and spotlight on mathematics.

Objectives:

- Sharpens the mind of the learner and increases intelligence and intellect.
- Improves the educational performance within the school.
- Increases the speed and accuracy in terms of calculations.
- Teachers can cultivate interest in students by teaching Vedic Mathematics.
- Teachers can mitigate the fear of mathematics among students by teaching Vedic Mathematics techniques.
- Teachers can explain monotonous and weighty mathematical operations in an exceedingly simple way, by using Vedic Mathematics sutras.
- Using Vedic Mathematics to develop students' left and right sides of their brains by thru increased visualization and concentration.
- By teaching Vedic Mathematics, teachers can help the slow-learners to show basic concepts and solve mathematical problems easily.
- Teachers can save the time by teaching Vedic Mathematics.

Presentation:

Vedic Mathematics is a budding innovative option for teachers who can teach the students in simple and easy way. As a math teacher, I am presenting some examples using Sutras and Sub sutras of Vedic Mathematics

Examples:

I) Fractions - "urdwa Tiryagbyam" Sutra

Fractions are a crucial topic in Mathematics. Students may be confused in terms of addition, subtraction, multiplication and division. Fractions can be dealt with the most powerful technique using Vedic Mathematics **"urdwaTiryagbyam"** which means vertical and crosswise or criss cross.

Generally, additions of fractions can be done by taking the L.C.M., multiplying with numerator and finally dividing with L.C.M

In Conventional Method:

For example:

i) **Addition of two fractions :**

$$\frac{4}{5} + \frac{1}{6}$$

Taking the L.C.M of 5 and 6, the L.C.M will become 30

$$\frac{4 \text{ X } 6}{5 \text{ X } 6} + \frac{1 \text{ X } 5}{6 \text{ X } 5} = \frac{24}{30} + \frac{5}{30} = \frac{24+5}{30} = \frac{29}{30}$$

ii) **Addition of three fractions :**

$$\frac{2}{5} + \frac{7}{10} + \frac{3}{4}$$

Taking the L.C.M of 5,10,4, the L.C.M will become 20

$$\frac{2 \text{ X } 4}{5 \text{ X } 4} + \frac{7 \text{ X } 2}{10 \text{ X } 2} + \frac{3 \text{ X } 5}{4 \text{ X } 5} = \frac{8}{20} + \frac{14}{20} + \frac{15}{20} = \frac{8+14+15}{20} = \frac{37}{20}$$

In Vedic Mathematics:

Here we can apply the **Urdwa Tiryagbyam Sutra** .We apply only **Triyak** (Cross)

For example: The same example which we have taken in conventional method, Now in Vedic Mathematics Method

i) Addition of two fractions :

$$\frac{4}{5}+\frac{1}{6}$$

Step 1: $= \frac{4}{5} + \frac{1}{6}$ Multiply 4 x 6 = 24

Step 2: $=\frac{4}{5}+\frac{1}{6} = \frac{4}{5} + \frac{1}{6}$ Multiply 5 x 1 = 5

Step 3:$=\frac{4}{5}+\frac{1}{6}=\frac{4}{5} + \frac{1}{6}$ Multiply denominators together = 5 x6 = 30

$\frac{4}{5} + \frac{1}{6} = \frac{24+5}{30} = \frac{29}{30}$

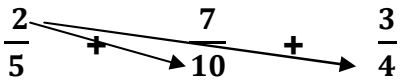
Therefore, $\frac{4}{5}+\frac{1}{6} = \frac{29}{30}$

ii) Addition of three fractions :

$$\frac{2}{5}+\frac{7}{10}+\frac{3}{4}$$

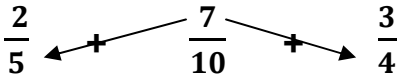
Let us consider $\frac{2}{5} = \frac{a}{b}$; $\frac{7}{10} = \frac{c}{d}$; $\frac{3}{4} = \frac{e}{f}$

Step 1: Cross multiply the numerator of one fraction by the denominator of the other two fractions.



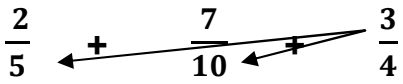
Multiply a x d x f = 2 x 10 x 4 = 80

Step 2: Cross multiply the numerator of one fraction by the denominator of the other two fractions.



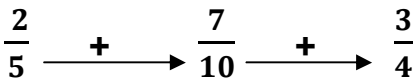
Multiply c x b x f = 7 x 5 x 4 =140

Step 3: Cross multiply the numerator of one fraction by the denominator of the other two fractions.



Multiply e x b x d = 3 x 5 x 10 =150

Step 4: Multiply Denominators together



Multiply Denominators b x d x f = 5 x 10 x 4 =

200

Combining Step 1, Step 2, Step 3, Step 4

$$\frac{a \times d \times f \; + \; c \times b \times f + e \times b \times d}{b \times d \times f}$$

$$= \frac{80 + 140 + 150}{200}$$

$$= \frac{370}{200}$$

As, '0' is common in both numerator and denominator, we can cancel '0'

$$= \frac{37}{60}$$

Similarly, Subtractions of fractions can be done by taking the L.C.M., multiplying with numerator and finally dividing with L.C.M

In Conventional Method:

For example:

i) **Subtraction of two fractions :**

$$\frac{8}{3} - \frac{9}{5}$$

Taking the L.C.M of 3, 5, the L.C.M will become 15

$$\frac{8 \text{ X } 5}{3 \text{ X } 5} - \frac{9 \text{ X } 3}{5 \text{ X } 3} = \frac{40}{15} - \frac{27}{15} = \frac{40-27}{15} = \frac{13}{15}$$

ii) **Subtraction of three fractions :**

$$\frac{3}{4} - \frac{1}{6} - \frac{2}{7}$$

Taking the L.C.M of 4, 6, 7, the L.C.M will become 84

$$\frac{3 \text{ X } 21}{4 \text{ X } 21} - \frac{1 \text{ X } 14}{6 \text{ X } 14} - \frac{2 \text{ X } 12}{7 \text{ X } 12} = \frac{63}{84} - \frac{14}{84} - \frac{24}{84} = \frac{63-14-24}{84} = \frac{25}{84}$$

In Vedic Mathematics:

Here we can apply the **Urdwa Tiryagbyam Sutra** .We apply only **Triyak** (Cross)

For example: The same example which we have taken in conventional method, Now in Vedic Mathematics Method

i) **Subtraction of two fractions :**

$$\frac{8}{3} - \frac{9}{5}$$

Step 1: $\frac{8}{3} \searrow - \frac{9}{5}$ Multiply 8 x 5 = 40

Step 2 : $\frac{8}{3} \nearrow \frac{9}{5}$ Multiply 3 x 9 = 27

Step 3: $\frac{8}{3} - \frac{9}{5}$ Multiply the denominators 3 x 5 = 15

$$\frac{8}{3} \times \frac{9}{5} = \frac{40-27}{15} = \frac{13}{15}$$

ii) Subtraction of three fractions :

$$\frac{3}{4} - \frac{1}{6} - \frac{2}{7}$$

Let us consider $\frac{3}{4} = \frac{a}{b}$; $\frac{1}{6} = \frac{c}{d}$; $\frac{2}{7} = \frac{e}{f}$

Step 1: Cross multiply the numerator of one fraction by the denominator of the other two fractions.

$\frac{3}{4} - \frac{1}{6} - \frac{2}{7}$ Multiply a x d x f =3 x 6 x 7 = 126

Step 2: Cross multiply the numerator of one fraction by the denominator of the other two fractions.

$\frac{3}{4} - \frac{1}{6} - \frac{2}{7}$ Multiply c x b x f = 1 x 4 x 7= 28

Step 3: Cross multiply the numerator of one fraction by the denominator of the other two fractions.

$\frac{3}{4} - \frac{1}{6} - \frac{2}{7}$ Multiply e x b x d = 2 x 4 x 6 =48

Step 4: Multiply Denominators together

$\frac{3}{4} - \frac{1}{6} - \frac{2}{7}$ Multiply Denominators b x d x f = 4 x 6 x 7 = 168

Combining Step 1, Step 2, Step 3, Step 4

$$\frac{a \times d \times f \; + \; c \times b \times f + e \times b \times d}{b \times d \times f}$$

$$= \frac{126 - 28 - 48}{168} = \frac{50}{168}$$

We can simplify the equation as the number '2' divides in both the numerator and denominator.

$$= \frac{25}{84}$$

II) Multiplications – "Ekadikena Purvena" Sutra

A Special type of multiplication of 2-digit with 2 digit number where ten's place of the both 2 – digit numbers are same. This type of multiplication can be done by using the technique called **"Ekadikena Purvena"** means by one more than the previous.

For Example: 8 6 x 8 4

In Conventional Method:

8 6

x 8 4

3 4 4

+ 6 8 8 x

7 2 2 4

In Vedic Mathematics Method:

8 6 x 8 4

Step 1: The number in the ten's place of both 2 – digit numbers are same i.e., 8

Ten's Place Same

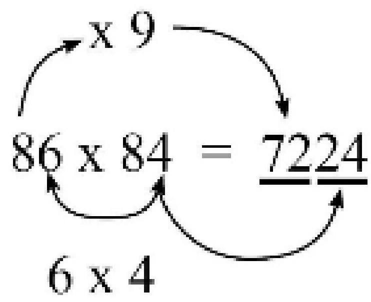
8 6 x 8 4

Step 2: Multiply Unit's place in both 2 – digit numbers

6 x 4 = 24

8 6 x 8 4

Step 3: Multiply with immediate next number to the number given in the ten's place of the first 2- digit number.



The answer for the problem 8 6 x 8 4 = 7224

III) Divisions - "DhvajAnka " Sutra

By Dhvajanka Sutra (Vertically and crosswise and on top of the flag), we can perform the division a number of any size by a number of any size.

For Example: **i)** Let us divide 1958 ÷ 32

In Conventional Method:

61

32) 1 9 5 8
- 1 9 2

3 8
- 3 2

Quotient = 61
Remainder = 6

6

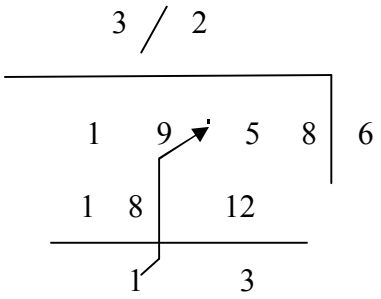
In Vedic Mathematics Method:

In this "**DhvajAnka "**Sutra we assume the divisor 32 not as thirty two but we will separate into two numbers i.e., 3 & 2.

Round 1: Check how many times does 3 goes in 19; it will go in 6 times i.e., 3 x 6 = 18, so take 6 and multiply with 3 & 2

Step 1: 3 x 6; 3 x 6 = 18, so put under 19 and subtract from 19, we will get "1". Put this "1" before the next number "5" and assume it as 15

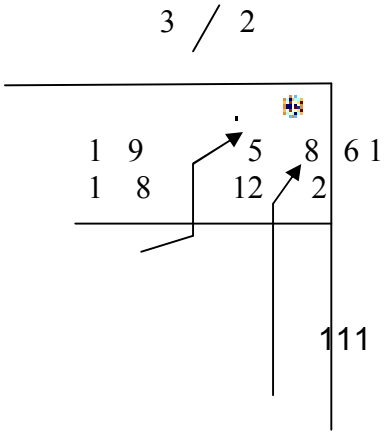
2 x 6; 2 x 6 = 12, write 12 under 15 and subtract, we will get 3.



Round 2: In the "Round 1 "we got remainder 3 .So we will check how many times goes in 3 , so its 1 time will go in 3 i.e., 3 x 1 = 3

Step 2 : 3 x 1 ; 3 x 1 =3 so put under 3 and subtract , we will get 0 , put it to the next number "8"

2 x 1; 2 x 1 = 2 so put under 8 and subtract, we will get 6, since there is no further number. There ends the division



1 3 6

\- 3

0

Therefore, 1958 ÷ 32 = 61 Rem 6

61 is the quotient

6 is the remainder

ii) Divide 76453 ÷ 243

In Conventional Method:

314

243) 76453

\- 729

355

\- 243

1123

\- 972

151

Quotient - 314

Remainder - 151

In Vedic Mathematics Method:

76453 ÷ 243

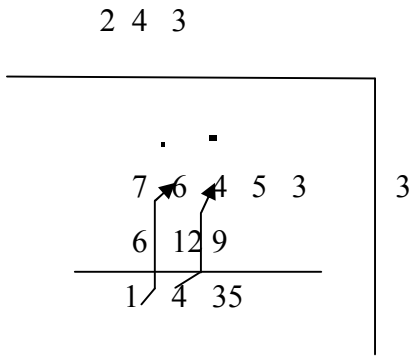
Take the divisor 243 and assume that as three separate numbers 2, 3 & 4

Round 1: Check how many times does 2 goes in 7; it will go in 3 times i.e., 2 x 2 = 6, so take 6 and multiply with 2, 4 & 3

Step 1: 2 x 3 = 6, so put under 7 and subtract from 7 i.e., 7 – 6 = 1, we will get "1" .Put this "1" before the next number "6" and assume it as 16

4 x 3 = 12, Write 12 under 16 and subtract i.e., 16-12 = 4 , we will get "4". Put this "4 "before the next number "4" and assume it as 44

3 x 3 =9, Write 9 under 44 and subtract i.e., 44 – 9 = 35, we will get "35" .



We will get the remainder as 35, but assume 35 as two separate numbers 3 & 5

Round 2: Check how many times does 2 goes in 3; it will go in 1 time i.e., 2 x 1 = 2, so take 1 and multiply with 2, 4 & 3

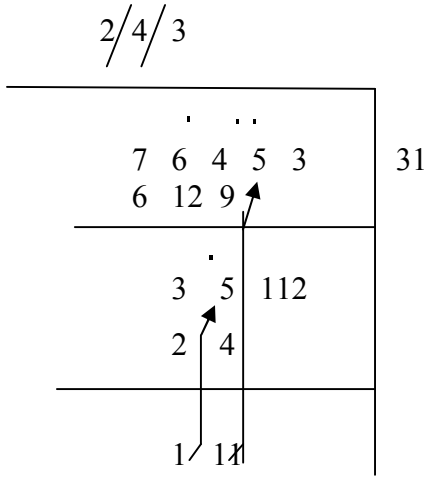
Step 2: 2 x 1 = 2, so put under 2 and subtract from 3 i.e., 3 – 2 = 1, we will get "1" .Put this "1"

before the next number "5" and assume it as 15

4 x 1 = 4, Write 4 under 15 and subtract i.e., 15-4 = 11, we will get "11". Put this "11 "

before the next number "5" and assume it as 115

3 x 1 =1, Write 3 under 115 and subtract i.e., 115 – 3 = 112, we will get "112"



We will get the remainder as 112, but assume 112 as two separate numbers 11 & 2 because if we get three digits in a number, we have to take left 2 digits as one number, and the remaining right digit as another number

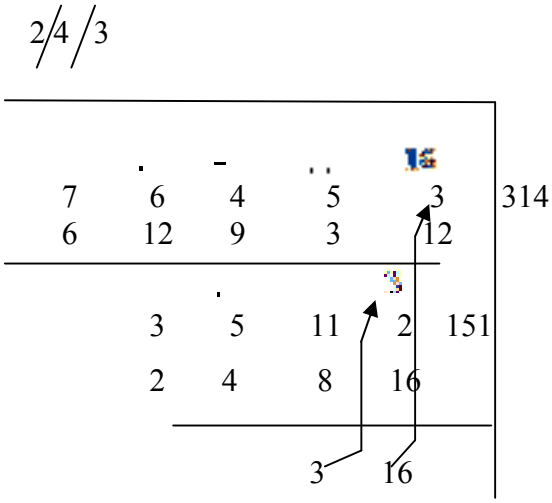
Round 3: Check how many times does 2 goes in 11; it will go in 4 times i.e., 2 x 4 = 4, so take 4 and multiply with 2, 4 & 3

Step 2: 2 x 4 = 8, so put under 11 and subtract from 11 i.e., 11 – 8 = 3, we will get "3" .Put this

"3" before the next number "2" and assume it as 32

4 x 4 = 16, Write 16 under 32 and subtract i.e., 32-16 = 16, we will get "16". Put this "16 " before the next number "3" and assume it as "163"

3 x 4=12, Write 12 under 163 and subtract i.e., 163 – 12 = 151, we will get "151"



Since we reached the remainder 151, as 151 is smaller than the divisor 243, there ends the division

Therefore, 76453 ÷ 243 = 314 Rem 151

IV) Squares of a number: "Yavadunam" Sutra

The meaning of the Sutra is 'whatever the deficiency subtract that deficit from the number and write alongside the square of that deficit'. This Sutra can be applicable to obtain squares of numbers close to bases of powers of 10.

For Example: i) For a single digit number - Find the square of 8

In Conventional Method: To find the square of a number, multiply the number by itself

$$\begin{array}{r} 8 \\ \times\ 8 \\ \hline 64 \\ \hline \end{array}$$

In Vedic Method:

To find the square of a number 8

Step 1: Find the deficiency with the nearest base

The nearest base for 8 is 10 ; Subtract 8 from 10 = 10 – 8 =2

Step 2: Square of the deficiency

$(2)^2 = 4$

Step 3: Subtract the deficiency from the number and find the carry over

8 – 2 = 6, carry over is 0

Step 4: Result = [Number – Deficiency + carry over] | [Square of Deficiency]

= (8 – 2+0) | $(2)^2$

= 6 4 |

Therefore, the square of number 8 is 64

ii) For a two digit number - Find the square of 95

In Conventional Method: To find the square of a number, multiply the number itself

$$\begin{array}{r} 9\,5 \\ \times\ 9\,5 \\ \hline \\ 4\,7\,5 \\ +\ 8\,5\,5\,x \\ \hline 9\,0\,2\,5 \\ \hline \end{array}$$

In Vedic Method:

To find the square of a number 95

Step 1: Find the deficiency with the nearest base

The nearest base for 95 is 100 ; Subtract 95 from 100 = 100 – 95 =5

Step 2: Square of the deficiency

$(5)^2 = 25$

Step 3: Subtract the deficiency from the number and find the carry over

95 – 5 = 90, carry over is 0

Step 4: Result = [Number – Deficiency + carry over] | [Square of Deficiency]

= (95 – 5+0) | $(5)^2$

= 90 25

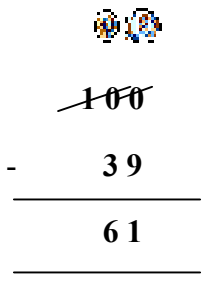
Therefore, the square of number 95 is 9025

V) Subtractions: "Nikhilam Navatashcaramam Dashatah" Sutra

The Sutra "Nikhilam Navatashcaramam Dashatah" which means all from 9, the last from 10 is used to subtract the number from power of 10 i.e., 10, 100,1000,… etc.,

For Example: i) Subtract 39 from 100

In conventional Method: We will take borrow and will subtract the small number from bigger number



In Vedic Mathematics Method:

Focus on the Subtrahend i.e., 39 .Start from the left, add Ten's place to 9 and unit place to 10

1 0 0

- 3 9

6 1

Add Ten's Place to 9 i.e., subtract 3 from 9 Last Digit, Add unit's place to 10

i.e., Subtract 9 from 10 = 10-9 =1

So the Answer for 100 – 39 = 61

ii) Subtract 274 from 1000

In conventional Method: We will take borrow and will subtract the small number from bigger number

~~**1 0 0 0**~~

- 2 7 4

7 2 6

In Vedic Mathematics Method:

Focus on the Subtrahend i.e., 274 .Start from the left, add Ten's place to 9 and unit place to 10

1 0 0 0

- 2 7 4

7 2 6

117

Last Digit, Add unit's place to

10 i.e., Subtract 4 from 10 = 10-4 =6

Add Ten's Place to 9 i.e., subtract 2 from 9

Add Ten's Place to 9 i.e., subtract 7 from 9

So the Answer is 1000 – 274 =726

Outcomes:

- It may be miraculous gizmo to condense scrape work and handle counting.
- It assists a learner to resolve mathematical problems 10-15 times faster.
- It helps in planning for competitive and various entrance exams.
- It makes learners more creative and competent through use of quick actions to resolve problems.
- It provides opportunities to students to work out their outstanding technique to solve mathematical problems.
- It helps to develop the instinct capability of the learner.
- It sharpens the memory and increase the mental agility of learners.
- These techniques enhance the accuracy of our attention, supremacy and inspection abilities.
- These techniques boost learner self esteem.
- It offers an alternative path to advance to mathematics that is both influential and excitement.

Implications:

Vedic Mathematics emphasizes consequential learning over automatic learning. Discovering resolve through Vedic Mathematics may lead to lowering a student's anxiety levels. It increases attentiveness because it encourages mental calculations. This method develops a

better understanding among students and teachers. Vedic Mathematics elicits creativity among intellectual learners, while helping the slow learners to nail the fundamental concepts of mathematics. Students may be motivated to learn mathematics interestingly if the Vedic system of mathematics is integrated in the school curriculum. Mathematics may be learnt and mastered with minimum effort in an exceedingly little time and may be rendered into a playful and a beautiful subject with the assistance of Vedic mathematics and not a subject to dread.

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