STATE SEMINAR ON MATHEMATICS EDUCATION

22nd December, 2022

"Way Forward towards Innovation in Mathematics Teaching"

DEPARTMENT OF MATHEMATICS AND SCIENCE

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING,

TELANGANA, HYDERABAD

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FOREWORD

'You can.… if you think you can'. The SCERT, Telangana proudly recognises the efforts of the teachers of both primary, upper primary and secondary schools, the teachers who have been coming up with various innovative practices and material for Mathematics teaching learning process. Despite challenges, they have been making significant contributions helping the child to enjoy the true essence of Mathematics.

The department of Mathematics and Science has been conducting theme-based seminar every year coinciding with the Birth Anniversary of Srinivasa Ramanujan, one of the greatest Mathematical minds that Bharat has ever produced. Besides encouraging innovative Mathematical processes beneficial for the students, it would be an icing on the cake if **these endeavours fetch recognition to the innovative minds of the teachers.** Continuing the endeavour, this year, the Department of Mathematics and Science of SCERT took the initiative to organize a one- day seminar on the theme, 'Way forward towards Mathematics teaching.'

We all know that if we look at the world with a positive attitude and persistence, everything comes to us, eventually. Unlike the past two years where the seminar was held online, this year, it would be a gentle swing where the Seminar is going to be held on the premises of the SCERT in full physical presence of the participants, dignitaries, and Mathematics lovers.

Seminar papers on the relevant theme were invited not only from the teachers of Mathematics but also from all the individuals who have interest in Mathematics' teaching. An overwhelming number of 64 papers were received. We appreciate all the Mathematics' enthusiasts who have sent their papers. After the careful review by senior professors, we have selected the 35 papers.

I conclude that motivation is a force that energizes, sustains, and directs one's behaviour towards a goal. Hoping that these small efforts would bring a great change in the teaching field, enlighten, and empower our classrooms that would make the child participate and learn non-consciously with more joy than ever.

DIRECTOR, SCERT-TS

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STATE LEVEL MATHEMATICS SEMINAR 2022

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Sub Theme:

Interventions and Innovations in teaching mathematics at secondary level

Title of the project:

CUBE ROOT (Division Method)

Introduction

అన్ని సంఖ్యలు మరియు బిజియ సమాసాల యొక్క వర్గమూలమును కనుగొనడానికి మనకు రెండు పద్ధతులు అందుబాటులో ఉన్నాయి. అందులో ఒకటి ప్రధాన కారణాంక లబ్ద పద్ధతి. పరిపూర్ణ వర్గాలకు వర్గమూలమును కనుగొనడానికి మాత్రమే ఉపయోగపడుతుంది. ఈ పద్ధతి ద్వారా ఒక సంఖ్య లేదా బీజీయసమాసం పరిపూర్ణ వర్గంకావాలంటే ఏ సంఖ్య లేదా బిజియ సమాసము చే గుణించాలి లేదా భాగించాలి అనే దానిని తెలుసుకోవచ్చును. కానీ పరిపూర్ణ వర్గం కావాలంటే ఏ సంఖ్య లేదా బీజీయ సమాసమును కలపాలి లేదా తీసివేయాలన్నది తెలుసుకోవాలంటే భాగహార పద్ధతి మాత్రమే వినియోగించాలి. అంతేకాకుండా భాగహార పద్ధతి ద్వారా అన్ని సంఖ్యలకు మరియు పరిపూర్ణ బీజీయ సమాసాలకు వర్గమూలమును కనుగొనవచ్చును.

అదే విధంగా పరిపూర్ణ ఘన సంఖ్యల యొక్క ఘన మూలమును ప్రధాన కారణాంక లబ్ద పద్ధతి ద్వారా కనుగొనగలము. కానీ అన్ని సంఖ్యల యొక్క ఘన మూలమును ఈ పద్ధతి ద్వారా కనుగొనలేము.పరిపూర్ణ

బీజీయ సమాసములకు కారణాంక పద్ధతి ద్వారా ఘన మూలమును కనుగొనవచ్చును, కానీ అది చాలా సుదీర్ఘమైన పద్ధతి. ఈ పద్ధతి ద్వారా పరిపూర్ణ ఘనము కావాలంటే ఏ సంఖ్య లేదా బీజీయ సమాసమును కలపాలి లేదా తీసివేయాలనే దానిని తెలుసుకోలేము. ఇది భాగాహార పద్ధతి ద్వారా మాత్రమే సాధ్యమవుతుంది. కానీ ఘన మూలమును కనుగొనడానికి మనకు భాగాహార పద్ధతి అందుబాటులో లేదు. నేను ఈ సెమినార్ ద్వారా ఘనమూలమును కనుగొనడానికి భాగాహార పద్ధతిని పరిచయం చేస్తున్నాను. ఈ పద్ధతిని అర్థం చేసుకోవాలంటే వేదగణితంలో ఉపయోగించే గుణకారం పై కొద్దిగా అవగాహన కలిగి ఉండాలి. భాగాహార పద్ధతి పై లోతుగా అధ్యయనం చేయడానికి నాకు వేద గణితం చాలా ఉపయోగపడింది. నా దృష్టిలో నూతన గణిత ఆవిష్కరణలకు వేద గణితం ఒక గొప్పగ్రంథంగా చెప్పగలను.

Objectives

- వర్గమూలం అనేది వర్గం యొక్క విలోమం అని ఘనమూలం అనేది ఘనం యొక్క విలోమం అని తెలుసుకోవడం.
- వేద గణితంలోని గుణకారం పై అవగాహన పొందడం.
- ఒకేసారి మూడు ద్విపదులు మరియు మూడు త్రిపదులను గుణించడంపై అవగాహన పొందడం.
- స్థాన విలువల యొక్క ప్రాముఖ్యతను గుర్తించడం.
- బాగాహార పద్ధతి ద్వారా వర్గమూలం మరియు ఘన మూలము కనుగొనుట.
- భాగఫలంలోని పదాలను కనుగొనడానికి కావలసిన సూత్రాలపై అవగాహన పొందడం.
- భాగఫలంలోని ఏ పదానికి ఏ విభాజకం ఉండాలి అనేదానిపై అవగాహన పొందడం.
- భాగహార పద్ధతిని ప్రతిపాదించడంలో వేద గణితం యొక్క పాత్రను తెలుసుకోవడం.

Presentation(భాగహార పద్ధతి)

- బీజీయ సమాసం లోని పదాల అమరిక చాలా ముఖ్యమైనది. బీజీయ సమాసంలో ఒకే చరరాశి ఉన్నప్పుడు ఘాతాలను బట్టి అవరోహణ క్రమంలో రాయవచ్చు.కానీ వేరువేరు చరరాశులు ఉన్న సందర్భంలో కొన్ని సమాసాలలో పదాల యొక్క డిగ్రీ ఒకే విధంగా ఉంటుంది. అలాంటి సందర్భాలలో స్థాన విలువలను పరిగణలోనికి తీసుకోవాలి.

- విభాజకంలో ఒకే రకమైన స్థాన విలువలను కలిగిన పదాలను కలపాలి. సంఖ్యల యొక్క ఘన మూలాలను కనుగొనడంలో ఇది చాలా ముఖ్యమైన పాత్ర పోషిస్తుంది. కానీ బీజీయ సమాసాలలో మాత్రం బీజీయ పదాలు విజాతి పదాలుగా ఉంటాయి కాబట్టి వాటిని కలుపనవసరము లేదు.
- బీజీయ సమాసంలోని పదాల యొక్క స్థానవిలువలను తెలుసుకోవడానికి వేద గణితంలో గుణకారం చేసే విధానం చాలా ఉపయోగకరంగా ఉంటుంది.
- భాగహార పద్ధతిఅనేది ఒక సంఖ్య ఖచ్చితమైన వర్గము లేదా ఘనము కావాలంటే ఏ సంఖ్యను కలపవచ్చు లేదా తీసివేయవచ్చు అన్నది తెలుసుకోవడానికి ఉపయోగపడుతుంది.

వేద గణితం(రెండంకెల సంఖ్యను రెండంకెల సంఖ్యతో గుణించుట)

Ex:(10a+b)(10c+d)

101

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

position	100	10	1
term	(a×c)	(a×d)+(b×c)	(b×d)

Ex:25×13

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

=(2×1) / (2×3)+(5×1) / (5×3)

= 2 / 6 + 5 / 15

=2 / 11 / 15

=325 (ఒకే స్థాన విలువలను కలిగిన సంఖ్యలను కలపాలి. పదుల స్థానంలో ఉన్న అంకెను దాని తరువాత స్థాన విలువకు క్యారీ చేయాలి.)

వర్గాలు(త్రిపది యొక్క వర్గము)

Ex:$(a+b+c)^2$

$$\begin{pmatrix} a & b & c \\ a & b & c \end{pmatrix}$$

$= (a^2)+(ab+ab)+b^2+(ac+ac)+(bc+bc)+c^2$

$= a^2+2ab+(b^2+2ac)+2bc+c^2$

ఘనము(ద్విపది యొక్క ఘనము)

Ex: $(a+b)^3$

10 1

$$\begin{pmatrix} a & b \\ a & b \\ a & b \end{pmatrix}$$

position	1000	100	10	1
term	a^3	$a^2b+a^2b+a^2b$	$ab^2+ab^2+ab^2$	b^3

$(a+b)^3 = a^3 + (3a^2b) + (3ab^2) + b^3$

త్రిపది యొక్క ఘనము

Ex: $(a + b + c)^3$

100 10 1

	a	b	c
	a	b	c
a	b	c	

position	1000000	100000	10000	1000	100	10	1
term	a^3	$3a^2b$	$3ab^2+3ca^2$	b^3+6abc	$3cb^2+3ac^2$	$3bc^2$	c^3

$(a+b+c)^3 = a^3+3a^2b+3ab^2+3ca^2+b^3+6abc+3cb^2+3ac^2+3bc^2+c^3$

Ex: $(231)^3$

$(a+b+c)^3 = a^3 / 3a^2b / (3ab^2+3ca^2) / (b^3+6abc) / (3cb^2+3ac^2) / 3bc^2 / c^3$

a = 2; b = 3 ; c = 1 లను పై సమాసంలో ప్రతిక్షేపించగా

$(231)^2 = 8 / 36 / 12+54 / 27+36 / 27+6 / 9 / 1$

$= 8 / 36 / 66 / 63 / 33 / 9 / 1$

= 12326391

వర్గమూలము/ ఘనమూలము

భాగాహారనియమం:(విభాజకం × భాగఫలం)+శేషము=విభాజ్యం

పరిపూర్ణ వర్గమూలం కనుక్కునే క్రమంలో శేషము సున్నా అవుతుంది కాబట్టి

విభాజకం × భాగఫలం = విభాజ్యం

భాగఫలం = విభాజ్యం ÷ విభాజకం

విభాజ్యం లోని నియమాలు

1)మొదటి విభాజ్యంలో 'a'కు మాత్రమే సంబంధించిన పదాలు ఉండాలి. అది పరిపూర్ణ వర్గము లేదా ఘనము అయి ఉండాలి.

2)రెండవ విభాజ్యం తీసుకునే క్రమంలో 'b'కు సంబంధించిన పదాలు మరియుa,bకి సంబంధించిన పదాలు ఉండాలి.

3)మూడవ విభాజ్యం తీసుకునే క్రమంలో 'c'కు సంబంధించిన పదాలు a,c మరియు b,c కి సంబంధించిన పదాలు ఉండాలి.

4) వర్గమూలం లేదా ఘనమూలమును కనుక్కునే క్రమంలో తీసుకున్న ప్రతి విభాజ్యం ను స్థాన విలువలను బట్టి అవరోహణ క్రమంలో రాసుకోవాలి.

$(a+b+c)^3=(a^3)+(3a^2b+3ab^2+b^3)+(3ca^2+6abc+3cb^2+3ac^2+3bc^2+c^3)$

విభాజకంలోని నియమాలు

(విభాజ్యంలోని పదాలను విభాజకం మరియు భాగఫలాల లబ్ధంగా రాయగా)

$(a+b+c)^2=(a)a+(2a+b)b+(2a+2b+c)c$

1)మొదటి విభాజ్యంలో 'a' ను కామన్ తీయగా ఏర్పడిన మిగిలిన పదం మొదటి విభాజకం అవుతుంది. 'a' భాగఫలం అవుతుంది. $a=\sqrt{a^2}$

2)రెండవ విభాజ్యంలో 'b' ను కామన్ తీయగా ఏర్పడిన మిగిలిన పదం రెండవ విభాజకం అవుతుంది. 'b' భాగఫలం అవుతుంది. $b=2ab/2a$

3)మూడవ విభాజ్యంలో 'c'ను కామన్ తీయగా ఏర్పడిన మిగిలిన పదం మూడవ విభాజకం అవుతుంది.'c'భాగఫలం అవుతుంది.$c=2ac/2a$

4)భాగఫలంలోని పదాలనుపొందడానికి విభాజ్యంలోనిమొదటిపదాన్నిదానికిఅనుబంధమైనవిభాజకంలోని మొదటి పదంతో భాగించాలి.

5) భాగఫలంలోని పదాన్ని దానికిఅనుబంధమైనవిభాజకంతో గుణించి అనుబంధమైన విభాజ్యం నుండి తీసివేయాలి

వర్గమూలం

Ex:$a^2+2ab+b^2+2ac+2bc+c^2$కు వర్గమూలం కనుగొనుము.

$a^2+(2ab+b^2)+(2ac+2bc+c^2)=(a)a+(2a+b)b+(2a+2b+c)c$

క్రమ సంఖ్య	విభాజకం	విభాజ్యము	భాగఫలం	భాగఫలంలోని పద సూత్రము
1	a	a^2	a	$a=\sqrt{a^2}$
2	2a+b	$+2ab+b^2$	b	b=2ab / 2a
3	2a+2b+c	$+2ac+2bc+c^2$	c	c=2ac / 2a

a $a^2+2ab+b^2+2ac+2bc+c^2$ a+b+c

$-a^2$

2a+b $+2ab+b^2$

$-(+2ab+b^2)$

2a+2b+c $+2ac+2bc+c^2$

$-(+2ac+2bc+c^2)$

0

$a^2+2ab+b^2+2ac+2bc+c^2$కు వర్గమూలం a+b+c

ఘన మూలము

Ex: $a^3+3a^2b+3ab^2+b^3$ కు ఘన మూలము కనుగొనుము

$=a^3+3a^2b+3ab^2+b^3$

$=(a^2)a+ (3a^2+3ab+b^2)\ b$

క్రమ సంఖ్య	విభాజకం	విభాజ్యము	భాగఫలం	భాగఫలంలోని పద సూత్రము
1	a^2	a^3	a	$a= \sqrt[3]{a^3}$
2	$3a^2+ 3ab + b^2$	$3a^2b+3ab^2+b^3$	b	$b=3a^2b / 3a^2$

$a^2a^3 + 3a^2b + 3ab^2 + b^3$ $\quad a + b$

$-a^3$

$3a^2+ 3ab + b^2$ $\quad 3a^2b + 3ab^2 + b^3$

$-(3a^2b + 3ab^2 + b^3)$

0

$a^3 + 3a^2b + 3ab^2 + b^3$ కు ఘన మూలము$a+b$

Ex:$8x^3 - 60x^2 + 140x -120$ నుండి ఎంత తీసివేసిన పరిపూర్ణ ఘనము అవుతుంది

క్రమ సంఖ్య	విభాజకం	విభాజ్యము	భాగఫలం	భాగఫలంలోని పద సూత్రం
1	$a^2 = 4x^2$	$a^3= 8x^3$	$a = 2x$	$a= \sqrt[3]{a^3}= \sqrt[3]{8x^3}$
2	$3a^2+ 3ab + b^2=12x^2-30x+25$	$3a^2b+3ab^2+b^3 =-60x^2+140x-120$	$b = -5$	$b=3a^2b / 3a^2$ $= -60x^2 / 12x^2$ $= -5$

$4x^2$ $\quad 8x^3 - 60x^2 + 140x -120$ $\quad 2x-5$

$-8x^3$

$12x^2-30x+25$ $\quad - 60x^2 + 140x -120$

$-(-60x^2 + 150x - 125)$

$-10x + 5$

$8x^3 - 60x^2 + 140x - 120$ నుండి $-10x + 5$ ను తీసివేసిన పరిపూర్ణ ఘనము అవుతుంది

$\sqrt[3]{(8x^3 - 60x^2 + 150x - 125)} = 2x-5$

Ex:$a^3+3a^2b+3ab^2+b^3+3ca^2+6abc+3cb^2+3ac^2+3bc^2+c^3$ కు ఘన మూలమును కనుగొనుము

క్రమ సంఖ్య	విభాజకం	విభాజ్యము	భాగఫలం	భాగఫలంలోని పద సూత్రం
1	a^2	a^3	a	$a= \sqrt[3]{a^3}$
2	$3a^2+ 3ab + b^2$	$3a^2b+3ab^2+b^3$	b	$b=3a^2b / 3a^2$
3	$3a^2+6ab+(3b^2 +3ac)+3bc+c^2$	$3a^2c+6abc+3cb^2 +3ac^2+3bc^2+c^3$	c	$c=3a^2 c / 3a^2$

$a^3+3a^2b+3ab^2+b^3+3ca^2+6abc+3cb^2+3ac^2+3bc^2+c^3$ కు ఘన మూలము a+b+c

సంఖ్యల యొక్క ఘనమూలము

- ఒకట్ల స్థానం నుండి ప్రతి మూడు అంకెలకు కామా పెట్టుకోవాలి.
- ప్రతిసారి మూడు అంకెలను క్రిందికి దించుకోవాలి.విభాజ్యంలోని పరిపూర్ణ ఘనసంఖ్య లేనియెడల దానికన్నా ముందు ఉన్న చిన్న సంఖ్య యొక్క ఘనమును పరిగణలోనికి తీసుకోవాలి .
- విభాజకంలో ఒకే స్థాన విలువ కలిగిన సంఖ్యలు ఉన్నప్పుడు ఆ రెండింటిని కలిపిన తర్వాత మాత్రమే క్యారీ ఫార్వర్డ్ చేయాలి. కానీ బిజియ సమాసంలో విజాతి పదాలుగా ఉంటాయి కాబట్టి వాటిని కలపనవసరం లేదు.
- 3rd డివిజన్లో $3b^2$,3acఒకే స్థాన విలువ కలిగిన పదాలు(సంఖ్యలు).అప్పుడు 3^{rd}విభాజకం$3a^2 / 6ab / (3b^2+3ac) / 3bc / c^2$ అవుతుంది.

Ex: 12326391 ఘనమూలమును కనుగొనుము?

క్రమ సంఖ్య	విభాజకం	విభాజ్యము	భాగఫలం	భాగఫలంలోని పద సూత్రం
1	$a^2=4$	$a^3 = 12$	a = 2	$a= \sqrt[3]{a^3}$ = cube rootof 8
2	$3a^2$ / 3ab / b^2=12 / 18 / 9 =1389	$3a^2b+3ab^2+b^3$ =4326	b = 3	$b=3a^2b$ / 3 a^2 =43 / 12
3	$3a^2$ / 6ab / ($3b^2$+3ac) / 3bc+c^2=12 / 36 / 27+6 / 9 / 1 =159391	$3a^2c+6abc+3cb^2+3ac^2+3bc^2+c^3$ =159391	c = 1	$c=3a^2$ c / $3a^2$ =15 / 12

4 | 12,326,391 | 231

-8

1389 | 4326

-4167

159391 | 159391

-159391

0

STATE LEVEL MATHEMATICS SEMINAR – 2022

Personal Details :

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ప్రధాన అంశం: **గణిత బోధనలో ఆవిష్కరణ దిశగా ముందుకు సాగండి.**

ఉప అంశం: **సెకండరీ స్థాయిలో గణితాన్ని బోధించడంలో జోక్యాలు మరియు ఆవిష్కరణలు.**

సమర్పణ: **నా దృష్టిలో ప్రపంచం మొత్తం గణితమయం .ఎందుకంటే ఏ రంగం తీసుకున్న ఆ రంగంలో గణితం ఇమిడి ఉంది. అనగా మన జీవితం నుండి గణితమును వేరు చేసి చూడలేము.**

గణితంలోని విభాగాలలో రేఖాగణితముది కీలకమైన పాత్ర రెనేడేకార్ట్ అనే గణిత శాస్త్రవేత్త బీజ గణితంను రేఖాగణితంలోకి మార్చగలిగాడు .అందుకే వీరిని రేఖాగణిత పితామహుడు అని అంటారు.

జాతీయ గణిత దినోత్సవం సందర్భంగా గణిత పరిశోధనా పత్రం.

టాపిక్ శీర్షిక: **వర్గ బహుపది యొక్క శూన్యాలను కనుగొనుటలో ఆవిష్కరణ.**

లక్ష్యాలు:1) ప్రతి విద్యార్థి సులభంగా అవగాహన చేసుకుని సమస్యలను సాధించుట.

2) గణితం పై సకరాత్మక భావనను పెంపొందించుకొనుట.

3) తన మేధాశక్తికి తగిన అభ్యాసములు విద్యార్థి సాధించుట.

ఆవిష్కరణ రూపకల్పన:

X^2+3x+2

ఇది ax^2+bx+c రూపంలో కలదు.

శూన్యాల లబ్దము $=a\times c$

శూన్యాల మొత్తం $=b$

ఇక్కడ x^2 గుణకం= 1, c=2

$a\times c=1\times 2=2$

2 కారణాంకాలు 1,2 లేదా 2,1

$b=3=1+2$

శూన్యాలు=-1,-2

అనగా మనం ముందుగానే శూన్య విలువలను అంచనా వేయవచ్చు. వీటిని పట్టికలో x యొక్క విలువలుగా తీసుకోవాలి.

ఆవిష్కరణ వివరణ:1) మొదట ఒక పట్టికలో మొదటి అడ్డు వరుసలో x యొక్క విలువలు-3,-2,-1,0,1,2,3,4,5 లుగా తీసుకోవాలి.

2) తర్వాత రెండవ అడ్డు వరుసలో x యొక్క వర్గాలు రాయాలి.

3) మూడో వార్డు వరుసలో 3ఆవిష్కరణ వివరణ:1) మొదట ఒక పట్టికలో మొదటి అడ్డు వరుసలో x యొక్క విలువలు-3,-2,-1,0,1,2,3,4,5 లుగా తీసుకోవాలి.

2) తర్వాత రెండవ అడ్డు వరుసలో x యొక్క వర్గాలు రాయాలి.

3) మూడో వార్డు వరుసలో 3×x విలువలు రాయాలి.

4) నాలుగో అడ్డువరుసలో స్థిర సంఖ్య+2 రాయాలి.

5) ఐదవ అడ్డు వరుసలోx^2+3x+2 విలువలు కనుగొనాలి.

6) ఆరవ అడ్డు వరుసలో

(x విలువ, x^2+3x+2) లు రాయాలి.

వీటిని XY తలం అనగా గ్రాఫ్ పై ప్రాతినిధ్య పరిచినచో పరిచి వాటిని సన్నని వక్రంచే కలపాలి. మనకు కొన్ని విలువల దగ్గర వక్రము X అక్షాన్ని తాకును. మనము వాటిని శూన్య విలువలుగా తీసుకొనవలెను.

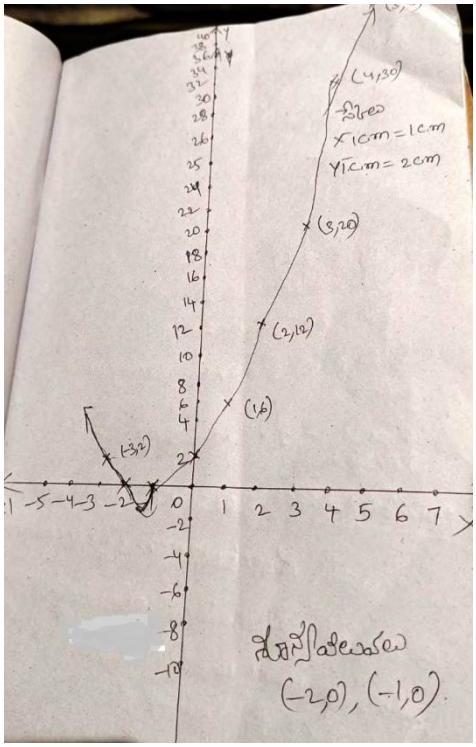
ఆవిష్కరణ యొక్క ఫలితం: ఈ ఆవిష్కరణ వలన విద్యార్థులు సులభంగా వర్గ బహుపది శూన్యాలను కనుగొనుటలో ఉత్సాహంగా పాల్గొంటాడు.

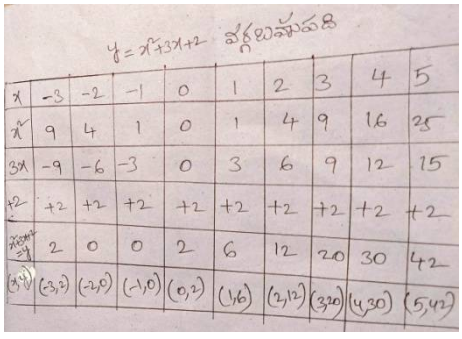
చిక్కులు: 1) ప్రతి విద్యార్థి వర్గాలు రాసేటప్పుడు కంగారుపడుట.

2) రుణాత్మక మరియు ధనాత్మక విలువలు వస్తే పరిక్రియలు చేయుటలో కంగారుపడుట.

3) గణితం అంటే కష్టంతో కూడిన పనిగా భావించుట.

ప్రస్తావనలు: NCERT MATHEMATICS TEXT BOOKS





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STATE LEVEL MATHEMATICS SEMINAR 2022

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SUB-THEME:- INTERVENTIONS AND INNOVATIONS IN TEACHING MATHEMATICS AT PRIMARY LEVEL.

TITLE OF THE TOPIC:- INNOVATIONS IN TEACHING MATHEMATICS AT PRIMARY LEVEL.

INTRODUCTION:

Primary education is like the foundation of schooling. It paves the way for the achievement of educational goals. Students will be able to achieve elementary and higher level skills only when proper foundational skills are practiced at the primary level. Unfortunately, quality education in schooling has become ambiguous over the past decade. Students are lagging behind at the primary level in the acquisition of basic competencies and the gap keeps widening throughout schooling.

The nature of the mathematics is abstract. We need to sensitize it. Basically at primary level the children get lot of confusion, while understanding the concepts. Hence I designed Live worksheets for classroom.

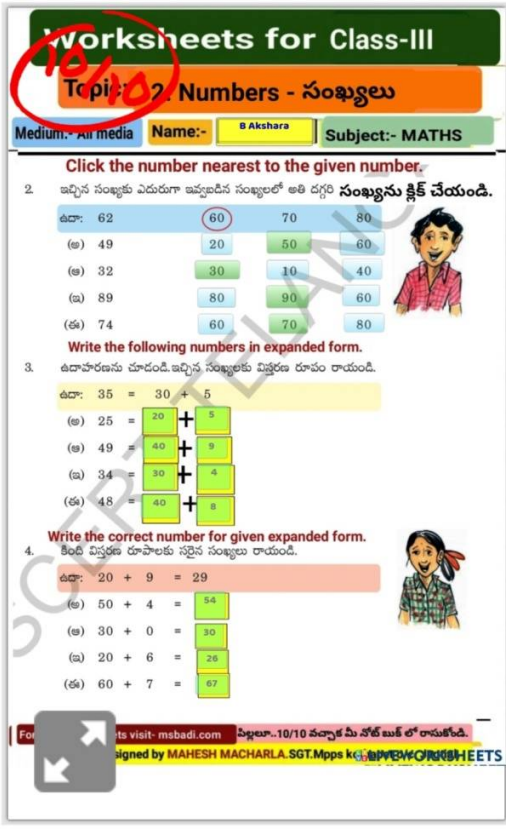
OBJECTIVES:-

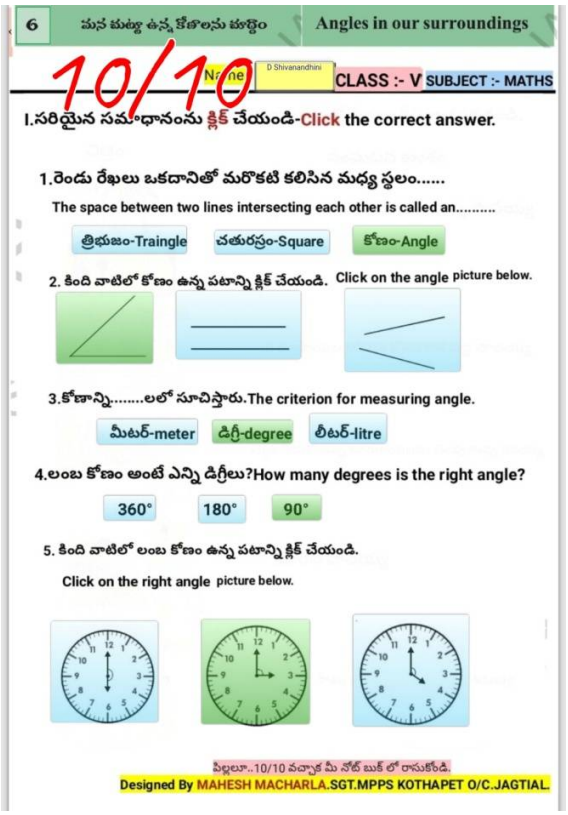
The objectives of Innovations in Teaching Mathematics are

- Learn mathematics in an easy way.
- It leads to self learning.
- Easy to understand the abstract concepts.
- Gives large scope for practice mathematics.
- To encourage and enable students to enjoy mathematics at home also.

DESIGN OF THE INNOVATION:-

Here, I would like to explain about Innovative practices of mathematics what we adopted at primary level.





I prepared live worksheets for class-1 to class-5 children by using live worksheet.com website.

Designing the Live worksheets is in 3 stages.

1. Making the Live worksheets
2. Programming the Live worksheets.
3. Practicing the Live worksheets.

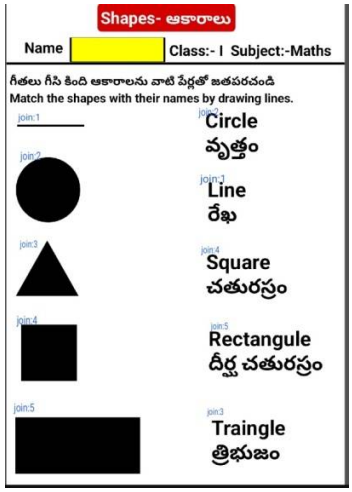
1. Making the Live worksheets :-

By using mobile phone/computer, I have been preparing math Live worksheets based on content and student's level. It takes 10-15 mins time for each Live worksheet designing.

2. Programming the Live worksheets :-

After completion of the designing the Live worksheets, I have used my laptop for programming. Here, I added simple program for the math bits. It was very easy to add the program. Just draw the selection boxes and give the answers/program to the each selection box.

Answer didn't show in the Live worksheet at first to the students. After completing the worksheet, they will get the immediate feedback by showing their marks out of ten.

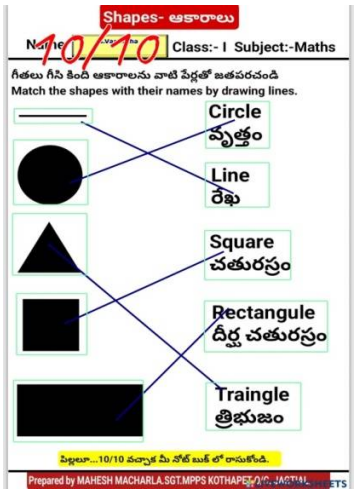


3. Practicing the Live worksheets :-

Here, student will access and practice the Live worksheets. I sent the Live worksheets via a link, through the whatsapp groups to the students.

MODEL LIVE WORKSHEETS LINKS:-

1. https://www.liveworksheets.com/jy2111247bq
2. https://www.liveworksheets.com/zb2066648bt
3. https://www.liveworksheets.com/lo1216388nf
4. https://www.liveworksheets.com/ip1405522mx

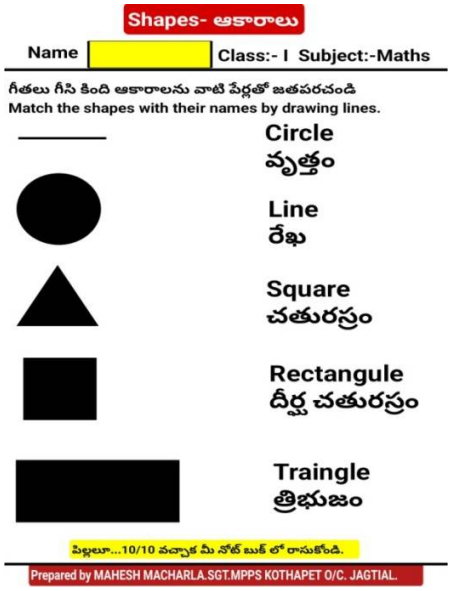


Description of the Innovation :-

1. Making the Live worksheets :-

Here, I want to make a live worksheet on the topic of Shapes.

- Open MS Word on computer.
- Give the title of the lesson, name of the student box, class and subject.
- Type the instruction in simple sentences
- Draw/add the shapes at left side.
- Type their names at right side.



2. Programming the Live worksheets :-

Here, I want to add the program for the above worksheet.

- Select the Shapes.
- Draw the boxes on Shapes and their names.
- Write the simple program like join:1, join:2… for left and right sided boxes.
- Save the live worksheet with topic and class name.

3. Practicing the Live worksheets :-

Here, children practices the live worksheet.

- Every saved worksheet has a sharing link on the top of the live worksheet.
- Through this link, we copy the link of the live worksheet
- Open the wthatsapp app and send this link.
- In the presence of the teacher also, children will practice the live worksheet.

OUTCOME OF THE INNOVATION:-

By using this live worksheets

- Students will do the live worksheet and it will give the marks immediately.
- Students will get the knowledge and understanding easily.
- Teacher will give guidance in the requirement area.
- Classroom mathematics teaching will become more interest and effective.
- Mathematics becomes concrete.
- Students will get the encouragement of their Parents/elders in math learning.
- One can do it many times. It helps more practice.
- Students will get vast of math Knowledge unknowingly.
- Here is a large scope for JOYFUL LEARNING to the students.

IMPLICATIONS:-

- Requires smart mobiles.
- Teacher readiness is important and these are all time taking methods.
- Not suitable for all topics.
- Needed self interest.

****

STATE LEVEL MATHEMATICS SEMINAR 2022

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Title of the topic : **A study of Students Errors in Learning of Quadratic Equations at Secondary level**

Abstract

The purpose of the study was to determine the students' error in learning quadratic equation. The sample of 30 was selected form a secondary school ZPHS Polkampally, Mahabubnagar Dist., Telangana State. Diagnostic test was used as the instrument of this study consisting of four components: factorization, completing the square, quadratic formula and nature of roots. An individual counseling was also conducted to identify at which level students' errors that occur in solving problems. The type of errors is that includes reading the problem comprehension, transformation, process skill, and encoding error. Data was analyzed using statistical tools, percentage and frequency. The findings showed that most students committed errors in transformation and process skill in solving quadratic equations. There was an error found in reading. The number of students who made encoding error and carelessness was moderate. The students' errors in solving quadratic equations were due to their lack of knowledge in language of algebra, fractions, negative integers and algebraic identities.

Keywords: Quadratic equation, Comprehension error, Transformation error, Process skill error

1. Introduction

Problems that are associated with mathematics are complex in nature. Mathematics is the basic knowledge required by students at secondary level to extend their learning to a higher level. Even mathematics is required in our daily life situations for every human being in their social context. The benefitof mathematics is not only limited to knowledge in computation, but more important, when each individual can master mathematics well, then their pattern of thinking is more rational and critical. The principles of mathematics enable people to see the problems as facts not as fiction (Hudoyo, 1998).

Most of studies throughout globe have emphasized the goal of mathematics education reform is to produce students who are skilled in resolving problems, in addition to fostering attitudes, interests and a high motivation towards mathematics. Students should be exposed to skills in interpreting problems, planning solutions strategy, implementation of plan and rechecking of answers. In order for the students to think mathematically, students should be exposed to various strategies of problem solving by doing each step carefully,and systematically.

Error in solving mathematical problems often occurs either in writing, or orally. During the process of teaching and learning mathematics, students will face many obstacles because problem solving in mathematics is a skill that is very complex. Sometimes students know how to answer the question stated, but careless in computation. According to reports of the Third International Mathematics and Science Study (TIMSS, 1999), in general, It shows mastery of mathematics

among students in India as a whole is still to be improved This weakness may be due to the learning process that focus more on rote learning, involves less group work, interaction and communication. The mastery of basic mathematical knowledge is essential in concept development. Without a clear understanding of basic concepts and skills learned in the early stages, will result in the learning process Mathematical concepts are interrelated with one another.

In the light of quadratic equations .There are many errors performed by the students particularly in solving quadratic equations. Most errors are found in solving quadratic equations as compared to other topics. The reason of the occurrence of the errors is because students have difficulty in solving quadratic equations. A study by Clarkson (1991) found that comprehension errors make up a high proportion of the errors made when students attempt to solve mathematical word problems. However, Norasiah (2002) found that most students in her study made comprehension and process skill errors. Findings by Noraishiyah (2002) revealed that process skill errors are the most common.

The conceptual framework that is used in this study is based on Newman Error Hierarchical Model. The model of error investigation proposed by Newman (1997) has proved to be a reliable model for mathematics teachers. The framework has six types of errors: reading error, comprehension, transformation, process skill, encoding error and carelessness. The Newman Error Hierarchical Model is suitable to be used in identifying students' error in mathematics. This model has the hierarchy that classifies types of error based on the problem solving level done by students. According to Clements and Ellerton (1996), Newman used the word "hierarchy" because she reasoned that failure at any level of the sequence prevents students from obtaining satisfactory solutions. Prakitipong and Nakamura (2006) pointed out, in the process of problem solving there are two kinds of obstacle that hinder students from arriving at correct answers:

(a) Problems in language fluency and conceptual understanding that correspond with level of simple readingand understanding the meaning of problems.

(b) Problems in mathematical processing that consists of transformation, process skills, and encoding answers.

This classification implies that the students have to analysis and interpret the meaning of the question before they proceed to mathematical processing to obtain suitable answer.

The result of study in their test will be evaluated according to the type of error

Purpose and Objective of the study

The purpose of this study was to analyze students' errors in learning quadratic equations which targeted on subtopics such as factorization method, completing the square method, quadratic formula and nature of roots. The following are the objectives ofthe study:

a) To determine the type of students' error while applying factorization method.

b) To determine the type of students' error while applying completing the square method.

c) To determine the type of students' while applying quadratic formula.

d) To determine the type of students error while applying finding the nature of the roots.

2. Methodology

This study is a case study that used a survey method. The respondents were 30 from a secondary school in Mahabubnagar dist. Telangana State. The justification of selecting these students as respondents is as follows

i) easy access to school, ii) has a situation that is rich in process and sample iii) the researchers can develop a close relationship with the sample to maintain the quality and credibility of research data.

2.1 Instrumentation

The study used a set of test question to identify type of students' error. The researcher developed all the items and made some modifications. The final instrument has four subtopics: factorization, completing the square, quadratic formula and nature of roots

The subtopic of factorization has 4 questions, 4 questions for completing the square, 4 questions for quadratic formula and 4questions for nature of roots. The researcher also interviewed the respondent. The interview procedure was based on a modified Newman Error Hierarchical Model and it was conducted if the respondent failed to answer correctly in their written test. If they managed to get the answer correct for the second time then the first error that they make would be considered as carelessness. If the answer was wrong again for the second time then the students were required to read the question and explained what is required by the question. They were also asked to interpret the quadratic problem, perform operations and write the answer. Table 1 below shows the number of items according to subtopics and the tested skills.

Respondent were interviewed based on Newman interview procedure. The following are the questions of the interview:

i) Are you able to read the problem? (Reading level)

ii) What is to be found in the question? (Comprehension level)

iii) What procedure do you adapt to solve the question? (Transformation level)

iv) Can you show me the working steps that you have used to get conclusion and hence find the answer? (Process Skills)

v) What is your final answer? (Encoding)

Results

The respondent's profile according to gender and their achievement is represented in Table 2 below. As shown in Table 2, the students are grouped in three different category of achievement: low, medium and high. The school has classified students' achievement based on placement test. Three (3) male and four (4) female students belong to high category, the medium category has 5 males and 7 females and the low category has 6 males and 5 females.

2.2 Type of Error in Using Factorization method

For item 1 to 4, most type of error made by students in using factorization to determine the root of a quadratic equation were transformation errors followed by process skill errors. The details of the error type based on item are shown in Table 3.

2.3 Type of Error in Using Completing the Square Method

For item 5 to 9. Most type of errors made by students was process skill errors. The details of the error made according to their type are shown in Table 4.

2.4 Type of Error in Solving Quadratics Equation Using Quadratic Formula and nature of roots

For item 10 to 16, In solving quadratic equation, using quadratic formula and to interpret the nature of roots. it was found that most students made process skill errors. The details of the error made according to their type are shown in Table 5. The findings of this study conclude that the error made in learning quadratic equations consist of error in comprehension, transformation, process skill, encoding and carelessness. However, most of the errors made were transformation and the process skill errors.

3. Discussion

3.1 Type of error in using factorization

The most frequent errors made by student in using factorization include comprehension error, transformation error and process skill error. They have problem in the meaning of the word root.

Most comprehension errors occur when students do not understand the terms used. Students' often misunderstood what the question wants. This weakness is probably due to the lack of emphasize by teachers in teaching the factorization method. Teachers must ensure that the teaching of mathematical concepts must be balanced with the arithmetic skills. The findings of the study are supported by most of the research available stated that students always make error in understanding the terms used since the mathematical terminology is being ignored.

The error type in transformation occurred during computation process especially during multiplication. This takes place due to computation problem especially among low achievers. Most students make error at the process skill level especially while splitting middle term of quadratics expressions. In computation,the students make mistake in positive and negative signs when developing algebraic expressions. Errors also occur when replacing value that has a negative sign. that most low and average students face difficulty in factorization and simplifying algebraic expressions as well as performing algebraic operations.

3.2 Type of error in completing the square

In completing the square method, students have shown the tendency to make error in transformation and process skill. This error occurs because students failed to understand and describe what is required by the questions. Most students did not manage to perform the completing the square method. This results in failure to solve the problems. in which problematic students failed to communicate mathematical problems into mathematical form and also having problem understanding the special terms in mathematics. This failure may be caused by lack of emphasis by teachers on understanding the language of mathematics and the skills needed by the students. This may also result from the failure or inability of teachers to ensure that every student master the basic skills before moving to new topics.

3.3 Type of error in Solving Quadratics Equation Using Quadratic Formula and the nature of roots

Transformation errors and process skill errors are the most errors found among students in solving quadratics equation using quadratic formula and nature of roots. The students have problem in computation and applying the quadratic formula and discriminant. Examples of process skills errors committed by students involve the operation of addition, subtraction, multiplication, division, exponents and powers. At the same time students also experienced difficulties in replacing the positive and negative sign, resulting in errors in using the formula. Although there are some other errors in solving quadratic equations such as carelessness and encoding errors,

4. Conclusion

The results of this study emphasized that most error are transformation errors and process skills errors. A simple study on analysis of students' error in solving quadratic equations will be of most benefit to teachers in secondary mathematics. The analysis of each student's problem will enable the teachers to plan their teaching effectively, meaningful and to adapt alternative teaching strategy. Based on the analysis, teachers will identify the problems encountered by students in learning. As a result, the outcome of the study can be shared with their colleagues in order to solve the students' problem. This study will also help mathematics educators get information on the students' problem in mathematics learning. In order to counter students' problem, teachers should be well prepared and be able to conduct analysis on students learning. The findings of this study can be as a reference for teachers to find alternative ways in solving students' problem especially in light of solving different problems in quadratic equations.

Appendix

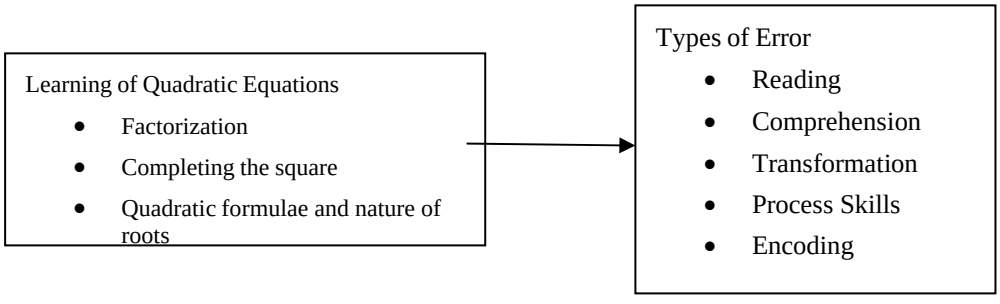
Table 1: Number of Items According to Skills

Sub topic	Skill	Item Number	Number of Item
Factorization	Determine the root of quadratic equation using factorization	1 - 4	4
Completing the square	Solving quadratic equation using completing the square method	5 - 9	4
Quadratic formula and nature of roots	Solving quadratic equation using a formula And using discriminant	10 - 16	7

Table 2: Respondent's Profile

Profile	Category	Frequency	Percentage (%)
Gender	Male	14	37.8
	Female	16	62.2
Achievement Male	Low	6	20.00
	Medium	5	16.05
	High	3	10.00
	Low	5	17.87
Female	Medium	7	22.33
	High	4	13.33

Figure 1: Conceptual Framework of the study.



STATE LEVEL MATHEMATICS SEMINAR 2022

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II. THEME: "WAY FORWARD TOWARDS INNOVATION IN MATHEMATICS"

III. TITLE OF THE TOPIC: "SUBTRACTION"

IV. OBJECTIVE: TO SOLVE THE SUBTRACTION VERY EASILY

V. DESIGN OF THE INNOVATION:

- The symbol of Subtraction is " - "
- Means: We have to close or fold equal number of fingers.
- Minuend: We have to show or open equal number of fingers.
- Subtrahend: We want to close or fold equal number of fingers.
- Difference: The remaining number of opened fingers that are left with us.
- In case, we do not have to close or fold sufficient number of fingers, first of all we have close or fold how many fingers are there with us. Now we have to show or open all fingers. Then count the after number how many fingers we were closed and still to close or fold the required number of equal fingers.
- We have to write the rest of the number of the minuend of the before number.
- The remaining opened number of fingers is called as difference.

VI. DESCRIPTION OF THE INNOVATION:

Now we can see this method with the help of three examples.

Example No. 1:

58-32=

Sol:

$$\begin{array}{r} 058 \\ -32 \\ \hline 26 \\ \hline \end{array}$$

We are going to subtract 2 from 8. First of all we have to open 8 fingers and close 2 fingers. Then the remaining opened fingers are 6. We have to write 6 at ones or units place. Next we have to open 5 fingers and close 3 fingers. Then the remaining opened fingers are 2. We have to write 2 at tens place.

Therefore: 58-32 = 26
The difference of 32 from 58 is 26.

Example No. 2:

41-27=

```
      3
Sol:  041
     -27
     ---
      14
     ---
```

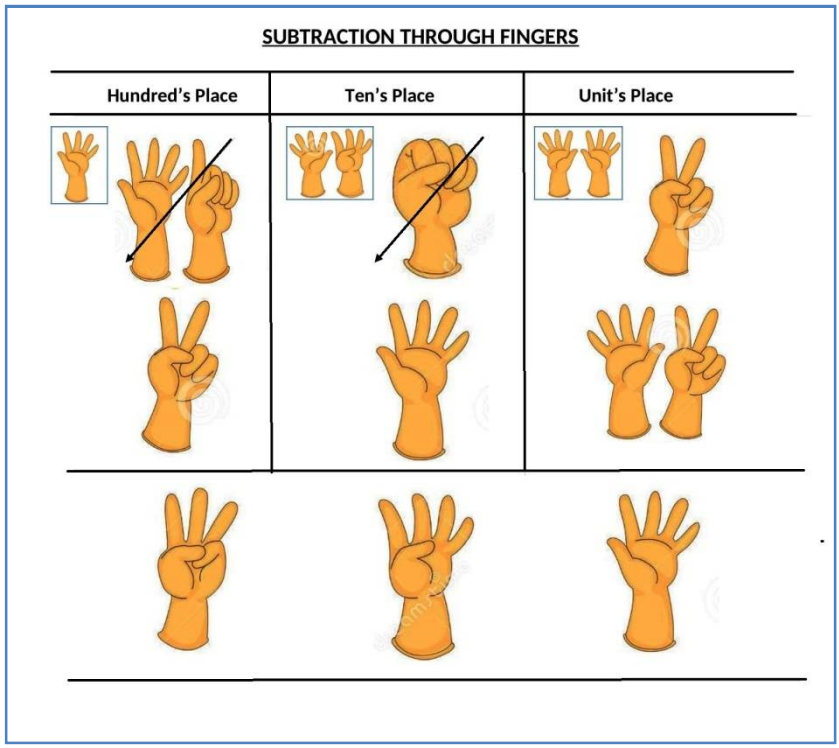
We are going to subtract 7 from 1.
here we have to open 1 finger and close it. But here we want to close some more fingers. now we have to open all fingers. Then count and close after number of 1. Count still the number 7 comes. The remaining opened fingers are 4. We have to write 4 at units place. Here we were opened all fingers now we have to write the before number of the 4. 3 is before number of the 4. We have to cut the 4 and write 3. We have to open 3 fingers and close 2 fingers. Then the remaining opened number of fingers is 1. We have to write 1 at tens place.

Therefore: 41-27 = 14
The difference of 27 from 41 is 14.

Example No. 3:

602-257=

```
      59
Sol: 0602
     -257
     ----
      345
     ----
```



Therefore: 602-257 = 345
The difference of 257 from 602 is 345.

We are going to subtract 7 from 2.first of all we have to open 2 fingers and close 2 fingers. But here we want to close some more fingers. Now we have to open all fingers. Then count and close after number of 2. Count still the number 7 comes. The remaining opened number of fingers is 5. We have to write 5 at units place. Here we were opened all fingers, now we have to write the before number of the 60. 59 is before number of the 60. We have to cut the 60 and write 59. Then we have to open 9 fingers and close 5 fingers. The remaining opened number of fingers is 4. We have to write 4 at tens place. Then we have to open 5

fingers and close 2 fingers. The remaining opened number of fingers is 3. We have to write 3 at hundred's place.

Please watch my YouTube Video for this method from below link:

https://www.youtube.com/watch?v=MJhXsQPJwjY

VII. OUTCOMES OF THE INNOVATION:

Pupil can solve the Subtraction very easily with their fingers.

VIII. IMPLICATION:

Pupil can solve the subtraction with their fingers
1. No borrowing
2. No adding
3. No clumsy

IX. REFERENCE:

This method is created by me. Actually my child was asked me, "Why do we need to borrowing from another number. Can't we do Subtraction without borrowing?" These questions are inspired me to create this method.

*****

State level Mathematics seminar – 2022

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Sub Theme : Interventions and Innovations in teaching Mathematics at Intermediate Level

Developing a Culture of mathematics through creative Curricular process

Title of the topic : Explaining Differential Equations

INTRODUCTION

Variable

We live in a world of interrelated changing entities like, the position p (t) of earth changes with time t , the velocity of a falling body v(d) changes with distance d , the area of circle A (r) changes with the size of radius r .In the language of mathematic changing entities are called variables.

Example

Position of earth p(t) , time t , velocity of falling body v(d) , distance d , Area of circle A (r) ,radius of circle r , all are variables.

Independent and Dependent Variable

The variables to which the value is assigned is called independent variables and the variable whose value is obtained corresponding to the assigned value is called dependent variable.

(Independent variable) causes a change in (Dependent variable) and it is not possible that (Dependent variable) could cause a change in (Independent variable). Example: (Time Spent Studying) causes a change in (Test Score) and it isn't possible that (Test Score) could cause a change in (Time Spent Studying). We see that "Time Spent Studying" must be the independent variable and "Test Score" must be the dependent variable because the sentence doesn't make sense the other way around.

Derivatives

The concept of derivative is at the core of Calculus and modern mathematics. The definition of the derivative can be approached in two different ways. One is geometrical (as a slope of a curve) and the other one is physical (as a rate of change).

The Physical Concept of the Derivative: This approach was used by Newton in the development of his Classical Mechanics. The rate of change of one variable with respect another variable is called derivative.

Applications of Derivatives in Real life

1. To check the temperature variation
2. To determine the speed or distance curved such as miles per hour etc
3. Finding Rate of change of a quantity
4. Finding the approximation value
5. Determining increasing Ed decreasing functions

Differential Equation

The equation which expresses the relationship between dependent variables, independent variables and the derivatives of dependent variables with respect to independent variables is called differential Equation.

Differential Equations have a remarkable ability to predict the world around us. They are used in a wide variety of disciplines from biology, economics, physics, chemistry & engineering

1. They can describe exponential growth & decay
2. The population growth of species
3. The change in investment return over time
4. Differential equation can be used to model the motion of particles in a fluid or the trajectory of a projectile
5. D.E used to calculate the movement or flow of electricity, motion of an object to & fro like a pendulum, to explain thermodynamic concepts.
6. Newton's second law of motion can also be rewritten as a differential equation
   F= ma which we can rewrite as

$$F= m.\frac{d^2s}{dt^2}$$

Classification of Differential Equation

When you study differential equations, you learn to look at an equation and classify it into a certain group. The reason is that the techniques for solving differential equations are common to these various classification groups. And sometimes you can transform an equation of one type into an equivalent equation of another type, so that you can use easier solution techniques. Here there are some of the major classifications of differential equations

Ordinary Differential Equation: A differential equation which expresses relationship between one or more dependent variable which are function of a single independent variable and the total derivatives of dependent variables with respect to independent variable, i.e., the differential equation involving only total derivatives. That is **"An ordinary differential equation (ODE) contains differentials with respect to only one variable"**

Partial Differential Equation: A differential equation which contains the derivatives of one or more dependent variables with respect to more than one independent variables i.e., the differential equation involving partial derivatives. That is **"Partial differential equations (PDE) contain differentials with respect to several independent variables".**

Partial derivatives used in real life

Partial derivatives are used in basic laws of physics for example Newton's law of liner motion, maxwells equations of elector magnetism & Einstein's equation in general relativity. In economics we use partial derivatives to check what happens to other variable while keeping are variable constant.

Classification of Ordinary Differential Equations:

Simple/ordinary differential Equations: An ordinary differential equation (ODE)which contains one dependent variable and derivatives of dependent variable with respect to independent variable.

Example: Let *y = y (x), x* is independent variables the

$$\frac{d^3y}{dx^3} + sinx\frac{dy}{dx} = cosy$$

a simple/ordinary differential equation.

System of Differential Equations: A differential equation which contains one independent variable, more than one dependent variables and derivatives of dependent variables with respect to independent variables.

Example: let $y = y(x)$ and $z = z(x)$ are two dependent variables of a single independent variable x then $\frac{dz}{dx} + \frac{dy}{dx} = \sin x$ and $\frac{dy}{dx} + x\frac{dz}{dx} = \cos x$ together is a system of the differential equations.

Partial Differential Equations:

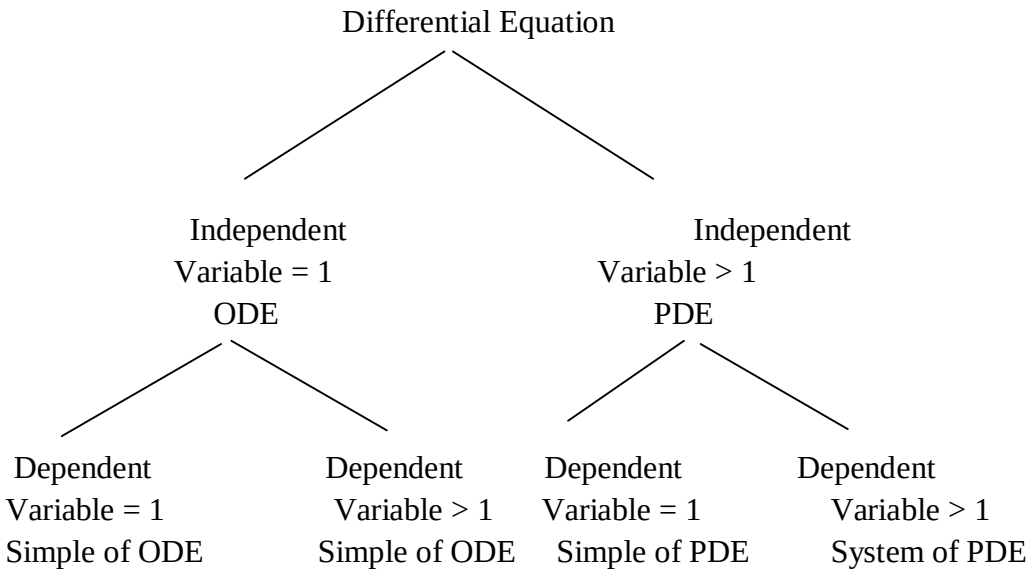
A differential equation with one dependent variable which is the function of more than one independent variables.

Example: let *z = z(x,t)* , where x, t independent variables are then

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial t^2} = 0$$

is a partial differential equation.

System of Partial Differential Equations: A differential equation which contains more than one independent variables with more than one dependent variables and their derivatives with respect to independent variables.



Example: Let $y = y(x,t)$ and $z = z(x,t)$, where x, t are independent variables then $\frac{\partial^2 y}{\partial x^2} + \frac{\partial^2 z}{\partial t^2} = 0$, $\frac{\partial^2 y}{\partial t^2} + \frac{\partial^2 z}{\partial x^2} = 0$ together is a system of partial differential equation

STATE LEVEL MATHEMATICS SEMINAR 2022

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SUB THEME

Interventions and innovations in teaching mathematics at primary level.

TITLE OF THE TOPIC

Worksheets for multiplication and division word problems.

OBJECTIVES

- Able to read and understand the verbal problems.
- Discriminate whether it is a multiplication problem or division problem.
- Identifies the type of the problem (Which situation or strategy given in the problem)
- Enable them to write mathematical steps on their own
- Provides plenty of practice.
- Covers all the situations of multiplication and division given in our text books.
- Apt for multi grade teaching (Suitable for 4^{th} and 5^{th} classes)
- Suitable for individual and group practice.

INTRODUCTION

We all know the importance of mathematics in our daily life and also know the prominent role of verbal problems in mathematics in our school curriculum.

In summative assessment, the problem solving skill is occupied 50% of weightage, mostly this skill is tested by solving word problems.

Introducing “first Step” (FLN) also emphasizes the importance of solving verbal problems

But

I noticed my students struggle with word problems, even though they are able to perform the basic four fundamental operations of mathematics. Most of my students are

nor even made a single attempt to solve the word problems, when conducting 3R's test. I noticed there is a much gap between basic operations and their use in solving word problems.
Thebarriers are as follows

- Problem of language

(our medium if instruction is different from their mother tongue. So they are unable to read and understand and write mathematical steps)

- Unable to express word problem
- Unable to find out the type of the problem
- Unable to choose correct operation for the situation given in the verbal problems.
- Not able to solve in a right way.
- Lack of understanding math vocabulary.
- Unable to express word problem into mathematical expressions.

To bridge this gap, I felt the need of some interventions, which are in the form of worksheets.I found these worksheets are effective with my students especially in solving word problems writing will all necessary steps.

DESIGN OF THE INNOVATION

TYPE OF WORD PROBLEMS

MULTIPLICATION

Arrays	**At the rate**	**Unit price**	**Cartesian product**	**Product**
Rows with equal amount in each	@ times	Unit price to costof number of some articles	How many choices are available	Product of multiplicand and multiplier
In a plantation, there are 12 rows of mango trees. If each row contains 10 trees, how many mango trees are there in the plantation?	One pencil cost Rs. 5. Cost of the pen is 6 times the cost of pencil. What is the pen cost?	A School bag costs Rs. 75. How much will 3 such bags cost?	At a curtain shop, curtains are available in 8 colors and 4 designs in each color. What is the total number of choices that a customer can choose from?	How much is the product of 523 and 63?
DIVISION				
Arrays		**At the rate**	**Unit price**	**Product**
Count the number of groups	Count the number of	How many times it will fit?	Finding cost of one thing.	Inverse of product.

	objects in each group?			
How many rows?	How many objects in each row?		Cost as number of objects to cost of one object	Finding out multiplicand or the multiplier
There are 36 boys in a class. They are arranged in rows with equal number of boys in each row. If there are 6 boys in each row, how many rows are there?	There are 105 lemon plants in 15 rows equally. How many plants are planted in each row?	10 years back the price of sunflower oil was Rs. 45 a liter. Today it is a Rs. 90. How many times has the price of sunflower oil gone up in ten years?	If 6 oranges cost Rs. 54 then how much does 1 orange cost?	The product of two numbers is 72. One of the numbers is 12. What is the other number?

DESCRIPTION OF THE INNOVATION:

It is clearly stated in our "Hand book for maths teachers 4,5 classes", Our mathstext books dealt with five situations as multiplication problem. Hence this intervention contains worksheets for 10 types of verbal problems, in which 5 types for multiplication and other 5 types for Division verbal problems.

Out of these 10 types, each type has a set of worksheets. Within the set of each type of worksheets, included one transaction sheet, one illustration and other are practice sheets.

The transaction sheet is intended to help the students to understand that particular type of problem. This transaction should be done by the teacher as a whole class activity. While transacting this sheet, the teacher should made enable his students to do the right margin work.In the right margin students put their thoughts on the paper. This right margin works play a crucial role in solving verbal problems. Thus the right margin work paves the way to write down the steps for verbal problems.

The transaction sheet followed by illustration sheets which are usually done as a group activity. In these sheets one or two problems are given with some of the steps are written to help the children. Thus we provide support to students to write the steps.

And then we have 3 or 4 practice sheets. Each sheet contains 4 to 5 problems, which provides plenty of practice and made conditioned their learning.

Therefore, these sheets provide exposure to a wide variety of word problems and opportunities to practice them.

OUTCOMES

- Students can learn at their own pace.
- There is no more being confused in choosing the right strategy between multiplication and division.
- They develop the attitude of solving verbal problems.
- They can apply these problem solving skill to solve the word problems of other chapters like “Measurement”
- They can able to solve two step problems also and enjoy learning mathematics.

IMPLICATIONS

- Before going to start with these worksheets one should be able to perform basic four operations.
- One should be known all the strategies of multiplication and division.
- These sheets are practiced either in row wise or column wise.

ROW WISE: Complete all the multiplication strategies first and then go for division.
COLUMN WISE: Complete one of the multiplication strategy then go for the inverse type of division strategy. Here multiplication and division go hand in hand.

REFERENCS

- Text books of mathematics for class I, II, III, IV and V by S.C.E.R.T.
- Hand book for maths teachers by S.C.E.R.T. (for class 4 & 5)
- Easy steps to mathematics for classes I to V by ShiridiDatta Series.
- Enjoy Mathematics Book 1 to Book 5. – Apple Book Company.
- Excellence in mathematics for class 4. – PRACHI

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STATE LEVEL MATHEMATICS SEMINAR 2022

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(1) ذاتی تفصیلات (Personal Details)

(2) ذیلی موضوع (Sub-Theme)

ثانوی سطح پر ریاضی کی تدریس میں اختراع اور تعرض

"Interventions and Innovations in teaching Mathematics at High School Level"

(3) موضوع کا عنوان (Title of the Topic)

گروہی معطیات کے اوسط معلوم کرنے کا آسان اور اختراعی طریقہ

"An easy and Innovative Method of finding Arithmetic Mean of a Grouped Data"

(4) مقاصد (Objectives)

* اوسط درجے کے طلباء میں اوسط حسابیہ کے محسوبات کو آسان کرنا۔
* بعض خاص معطیات اور بٹاؤ کے اوسط کی قدر معلوم کرنے کا موزوں ترین طریقہ معلوم کرنا۔
* اوسط کے متبادل طریقوں پر غور کرنا۔

(5) اختراع کا خاکہ (Design of the Innovation)

اختراع کا یہ خاکہ (Design)تین عوامل پر منحصر ہے۔پہلاکمزور طلباء کے لئے گروہی معطیات کے اوسط معلوم کرنےکے مروجہ طریقہ میں محسوبات کے مشکل اور بوجھل ہونے کو محسوس کرنا۔ دوسرا گروہی معطیات کے اوسط معلوم کرنے کے متبادل طریقوں پر غور کرناجس میں وقفہ جماعت یا وسطی قدر کو تعداد کے ساتھ ملا کر محسوبات بوجھل نہ بنایا گیا ہو۔ تیسرا زیادہ تر یکجائی تعداد کے صرف ایک اضافہ کالم کے ذریعہ گروہی معطیات کے اوسط معلوم کرنے کا ایک نیا ،آسان اور اختراعی طریقہ دریافت کرنا۔

(6) اختراع کی تشریح (Description of the Innovation)

شماریات میں مرکزی رجحان (Central Tendency)دراصل اس پیمائش کو کہتے ہیں جس میں واحد قدر دیئے ہوئے معطیات کی نمائندگی کرتی ہے۔ مرکزی رجحان کی پیمائش دئیے ہوئے معطیات میں تین مقداروں کی قیمت کے تعین کے ذریعہ کی جاتی ہے۔ وہ مقداریں اوسط، وسطانیہ اوربہتانیہ ہیں لیکن ان میں "اوسط حسابیہ"نہایت اہمیت کا حامل ہے۔ وسطانیہ اور بہتانیہ کے مقابل عام لوگوں میں اوسط کا تصور اجنبی نہیں ہے۔گروہی معطیات کے اوسط کی قدر معلوم کرنے کیلئے ریاضی دانوں نے متعدد طریقے سمجھائے ہیں جن میں تین طریقے بہت معروف ہیں۔

راست طریقہ(Direct Method)،مفروضہ اوسط کا طریقہ(Assumed Mean Method) اور انحرافی طریقہ(Deviation Method)۔ان طریقوں میں سب سے معروف طریقہ راست طریقہ ہے۔ اکثر طلباء اوسط معلوم کرنے کے لیے اسی طریقہ کو ترجیح دینا چاہتے ہیں۔ البتہ یہ محسوس کیا گیا ہے کہ اکثر کمزور طلباء اس طریقہ سے اوسط محسوب کرنے میں غلطیاں کر بیٹھتے ہیں جس کی وجہ سے صد فی صد صحیح نتیجہ حاصل نہیں کر پاتے۔ اس کی اہم وجہ یہ ہے کہ اس طریقہ میں بہت زیادہ اور مشکل محسوبات (Heavy Calculations) پائے جاتے ہیں۔ اگر چیکہ راست طریقے کے مقابل دیگر طریقوں میں محسوبات کم ہیں لیکن ان میں وقفہ جماعت اور تعداد کے کالم کے علاوہ طلباء کو تین اور اضافہ کالم بنانے اور ان کی قدریں تیار کرنا ہوتا ہے اور یہ عمل وقت طلب ہے۔

اکثر چند اساتذہ اور ان کے ذریعہ کمزور طلباء کی یہ ضرورت سامنے آتی ہے کہ اوسط معلوم کرنے کا ایک ایسا طریقہ ہو جس میں اضافہ کالم بھی کم ہوں اور وہ بہت زیادہ مشکل حسابات سے بوجھل نہ ہو۔ اب سوال یہ پیدا ہوتا ہے کہ"گروہی معطیات کا اوسط معلوم کرنے کے لیے کیا کوئی ایسا طریقہ بھی ہے جس میں اضافی کا لم کم ہو اور اس میں وقفہ جماعت یعنی وسطی قدر کو دیگر محسوبات سے بالکل الگ کر دیا جائے ؟" اس سوال کا جواب تلاش کرنے سے قبل یہ جائزہ لینا چاہئے کہ راست طریقہ اتنے زیادہ حسابات سے بوجھل کیوں ہے؟ ظاہر ہے کہ راست طریقے میں محسوبات کی زیادتی کی وجہ وسطی قدر x_iکا کالم اور پھر تعداد f_iاور وسطی قدر کے حاصل ضرب$f_i x_i$کا کالم ہے۔ پھر تعداد اور حاصل ضرب کے کالم کے مجموعوں کی تقسیم بھی بہر حال ایک آسان تقسیم نہیں ہوتی۔

(7) اختراع کا حاصل (Outcome of the Innovation)

بہت غور و فکر اور تحقیق کے بعد میں نے پایا کہ ایسا طریقہ ممکن ہے جس میں اوسط حسابیہ محسوب کرنے کے لیے اضافی کالم بھی کم ہوں اور جس میں وسطی قدر کو محسوب کرنے کی ضرورت ہی نہ پڑے۔گروہی معطیات کے اوسط حسابیہ کی قدر کو محسوب کرنے کے ایسے ہی خاص طریقہ کو یکجائی طریقہ (Cumulative Method)کہتے ہیں ۔ اس طریقہ میں حسب ذیل مراحل اختیار کیئے جاتے ہیں۔

(i)۔ گروہی معطیات کے جدول میں صرف ایک اضافہ کالم بنایا جاتا ہے جو کہ "زیادہ تر یکجائی تعداد" کا کالم ہے۔ بالکل اسی طرح جیسے وسطانیہ کی قدر معلوم کرنے کے لئے کیا جاتا ہے۔

(ii)- اس طریقہ میں زیادہ تر یکجائی تعداد کابھی مجموعہ معلوم کیا جاتا ہے جو طلباء کے لیے ایک نئی چیز ہے اس کو Mسے تعبیر کیا جارہا ہے۔

(iii)- حسب ذیل ضابطہ کے ذریعہ بآسانی اوسط حسابیہ معلوم کیا جاتا ہے۔

$$Mean \text{ اوسط حسابیہ} = a + \left(\frac{M}{N} - \frac{1}{2}\right) \times h$$

جہاں a= پہلے وقفہ جماعت کی نچلی سرحد(Lower Boundary of first class)

N= جملہ مشاہدات کی تعداد(Number of Observations) ؛ h= وقفہ جماعت کا سائیز(Class Size)

M =تر یکجائی تعداد کے کالم کا مجموعہ(Sum of Greater than Cumulative frequency columns)

(8) نتائج اور مضمرات (Implications)

مثال اور تقابل نمبر(1): عام گروہی معطیات جس میں وقفہ جماعت اور تعداد کی قدریں دی گئی ہیں۔

مروجہ راست طریقہ کے ذریعہ اوسط حسابیہ معلوم کرنا

وقفہ جماعت C.I	تعداد f_i	وسطی قدر x_i	$f_iX x_2$
10-25	2	17.5	35.0
25-40	3	32.5	97.5
40-55	7	47.5	332.5
55-70	6	62.5	375.0
70-85	6	77.5	465.0
85-100	6	92.5	555.0
	$\sum f_i$ = 30		$\sum f_i x_i$ = 1860

$$\text{اوسط} = \frac{\sum f_i x_i}{\sum f_i} = \frac{1860}{30} = 62$$

نئے یکجائی طریقہ کے ذریعہ اوسط حسابیہ معلوم کرنا

وقفہ جماعت	تعداد	زیادہ تر یکجائی تعداد
10-25	2	30
25-40	3	28
40-55	7	25
55-70	6	18
70-85	6	12
85-100	6	6

	30	119

$a = 10, M = 119 ; N = 30, h = 15$

$$\text{اوسط} = a + \left(\frac{M}{N} - \frac{1}{2}\right) \times h$$

$$= 10 + \left(\frac{119}{30} - \frac{1}{2}\right) \times 15 \qquad = 10 + \frac{238-30}{60} \times 15$$

$$= 10 + \frac{208}{41} = 10 + 52 \qquad \text{اوسط} = 62$$

مثال اور تقابل نمبر(2): ایسے سوالات ہیں جن میں وقفہ جماعت اور تعداد کی راست قدریں نہیں دی گئی بلکہ وقفہ جماعت کے بجائے نچلی سرحدیں اور تعداد کے بجائے زیادہ تر یکجائی تعداد دی گئی ہیں۔

مروجہ راست طریقہ کے ذریعہ اوسط حسابیہ معلوم کرنا

غیر مسلسل وقفہ جماعت	وقفہ جماعت C.I	زیادہ تر یکجائی تعداد	تعداد	وسطی قدر	f_iXx_2
5یا اس سے زیادہ	5-10	30	2	7.5	15.0
10 یا اس سے زیادہ	10-15	28	12	12.5	150.0
15 یا اس سے زیادہ	15-20	16	2	17.5	35.0
20 یا اس سے زیادہ	20-25	14	4	22.5	90.0
25 یا اس سے زیادہ	25-30	10	3	27.5	82.5
30 یا اس سے زیادہ	30-35	7	4	32.5	130.0
35 یا اس سے زیادہ	35-40	3	3	37.5	112.5
		$\sum f_i = 30$			$\sum f_i x_i = 615$

$$\text{اوسط} = \frac{\sum f_i x_i}{\sum f_i} = \frac{615}{30} = 20.5$$

نئے یکجائی طریقہ کے ذریعہ اوسط حسابیہ معلوم کرنا

زیادہ تر یکجائی تعداد	وقفہ جماعت
30	5 یا اس سے زیادہ
28	10 یا اس سے زیادہ
16	15 یا اس سے زیادہ
14	20 یا اس سے زیادہ
10	25 یا اس سے زیادہ
7	30 یا اس سے زیادہ
3	35 یا اس سے زیادہ
108	

$a = 5, M = 108 ; N = 30, h = 15$

$$\text{اوسط} = a + \left(\frac{M}{N} - \frac{1}{2}\right) \times h$$

$$\text{اوسط} = 5 + \left(\frac{108}{30} - \frac{1}{2}\right) \times 5$$

$$\text{اوسط} = 5 + (3.6 - 0.5) \times 5$$

$$= 5 + 3.1 \times 5 = 5 + 15.5$$

$$\text{اوسط} = 20.5$$

(9) حوالہ جات (References)

1- درسی کتب ریاضی جماعت دہم، حکومت تلنگانہ

2- درسی کتب ریاضی جماعت نہم،حکومت تلنگانہ

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Sub Theme :

TEACHING MATHEMATICS THROUGH STORY TELLING AT PRIMARY LEVEL

Title of the Project :

THE EFFECTS OF STORY TELLING IN MATHEMATICS.

INTRODUCTION :

Story telling is an important method for removing obstacles to learn mathematics and making lessons understandable. This seminar aims to analyze primary school teacher's stories written to teach students – concepts of problem solving, fluency, reasoning and understanding skills. Mathematics within stories provides context that illuminates the meaning of otherwise abstract concepts.

Objectives :

- ❖ The objective of story telling in teaching mathematics can spark students' interest, reduce their anxiety, engage them in the educational process.
- ❖ Encourage active participation
- ❖ Increase verbal proficiency
- ❖ Enhance listening skills
- ❖ Increase children's willingness to communicate thoughts and feelings
- ❖ Encourage use of imagination and creativity

Design of the innovation :

The mathematical concepts in the stories in a more comfortable way in their minds contribute to the students mental process. After the story telling, the students share their thoughts and communicate with their friends and strengthen their communication skills. Stories can make children participate actively in mathematical class activities. It ensures the participation of the whole class instead of only those students who are considered good in mathematics. It helps children to not only think about the given problem but also to solve them in different ways. Story telling is an important method for removing obstacles to learn mathematics and making lessons understandable. This research aims to analyze primary school teacher's stories written to teach students concepts of problem solving, fluency, reasoning and understanding skills.

Effects of story telling :

Story telling provides many psychological and educational benefits, such as enhanced imagination to help visualize spoken words, improve vocabulary and more refined communication skills. It helps your child get to know sounds, words and language and develop early literacy skills.

Description of the project :

During one of my lesson on numbers, I told a story i.e once upon a time 100 birds were sat on a tree. One shooter shooted the birds. Then I asked the children, 'How many birds were there on the tree? And after shooting how many birds were there?' In this lesson 'ZERO' concept developed. Children listened very interestingly the story method and shown enthusiasm.

During another chapter on Geometry, I was showing 3-dimensional objects to my students. The purpose of the lesson was to help students develop understanding the relationship between an object and its net, while using real life examples like chocolate boxes, lunch boxes. I demonstrated for my students (while holding 3-dimensional object in

my hand) that if we open up all the sides of this object and lay it flat, it would result in a net. And that if we put together all the sides of the net together, it will result in a 3-dimensional object. Next as a class, we discussed about the characteristics of a net, which upon folding can result into 3-dimensional object.

While students are working, a student asked me, what is a side? I responded by saying, it is one of the faces of an object. Student asked again, what is the definition of side? Is a side always straight? Because, if it is a straight, then why do we call a side of a road, when the road is curvy? At this point, I knew that student was thinking beyond what I intended to teach. I was aware that without knowing about different branches of mathematics, student was talking about. The difference between Euclidian and non-Euclidian Geometry. Consequently, I knew that had also become a participant in knowledge creation of Mathematics.

Outcome of the Innovation:

Research findings in the field of mathematics education emphasize that story telling is an effective instructional tool in the teaching of mathematics, as it provides a meaningful context that attracts student interest and makes learning a pleasant process. The use of stories and fairy tales in the teaching of mathematics motivates students to learn and provides students with an authentic context to understand mathematical concepts and procedures. It is a clear way to incorporate mathematics into other broader cognitive domains and promotes mathematical discussion in the class room.

Implications :

The mathematical concepts in the stories in a more comfortable way in their minds contribute to the students mental process. After the story telling, the students share their thoughts and communicate with their friends and strengthen their communication skills.

Good stories make mathematics come alive and children find that mathematics is not boring or inaccessible.

References :

- SCERT Telangana, Class III, IV and V mathematics books.
- Telangana strategies – Narayana.
- Internet.

*****

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Sub theme :

Teaching mathematics through storytelling at primary level.

Title of the topic:

Once Upon a Time.

Objective:

To teach certain aspects of the number concept through a story.

Design of the innovation :

Creating a story to cater to the needs of class 1

Description of the innovation:

One of my colleagues went on medical leave. I was substituting her for mathematics.

To be honest I was not much aware of the pedagogy of mathematics.

Just before handing the class over to me she mentioned that most of them have joined recently and are not completely settled yet.

On day one I planned to teach them to count up to three.

I entered the class with some tamarind seeds.

I assured myself that I would use the available objects like pencils, water bottles and bags etc for counting.

The thought that there are ample exercises in the textbook encouraged me to be confident.

It didn't take much time for me to realize that I was not able to gather their attention as expected.

I felt that they weren't enjoying the class.

I managed to get done with the session. It was utterly unsatisfactory.

I was scared that I might not be able to make the children learn the basics of math.

The next session was storytelling.

I began my story "Once upon a time….."

I could sense the change in their reception.

They were excited. The glee on their faces during story sessions gave me the idea of bringing math into stories.

I searched for the stories that would help me in my mission but failed to find the apt one.

I realized that these ready-made stories are not going to be very effective.

I consulted an expert in math teaching and explained my situation.

He encouraged me to design my own stories to suit the needs of my class .

That's how this story was born.

Once upon a time there was a king named Arya. He had three sons . His eldest son was Harsha. Veera and Vijay were his two brothers.

Three of them were happy together. The king had a golden chariot. It was drawn by four white horses . The three brothers liked the chariot very much.

Once their mother asked the three brothers to bring her some flowers for puja . The king told his sons that whoever brings special flowers for the queen will get a special ride in the chariot.

Harsha went into the royal garden . The garden was full of beautiful flowers. There were jasmine ,rose ,lily, marigold, hibiscus, nandivardhana and parijatha plants. He liked the red hibiscus flowers. He plucked six of them and went back to the palace.

Veera, who entered the garden after Harsha found the yellow marigold flowers very attractive. He plucked eight big sized flowers and ran to his mother.

Vijay saw his brothers taking hibiscus and marigolds. He wanted to give something special to his mother. He searched here and there in the garden. He found nothing special. He was sad. Just then the gardener came . Vijay told his problem to the gardener. The gardener smiled and gave nine beautiful pink lotuses to Vijay. Vijay made his way to the palace.

The queen was very happy to see her three sons getting flowers for her puja.

She made a garland of all the flowers her sons had brought.

The king asked the queen to decide whose flowers were special.

The queen said" The garland looks beautiful because of all the flowers in it. All my sons are special to me . Please arrange a ride for three of them."

The king said " That is very nice. Let us make it a family ride then."

After the puja all the five members of the royal family went on a ride in the chariot.

I used the pictures of all the characters and objects in the story except for the palace.

I showed them the pictures focussing more on numbers .

For example, when I told them about the golden chariot and four horses, I showed them the pictures and made them count the horses.

When Harsha plucked the hibiscus flowers or Veera plucked the marigolds , I made sure that they were counting along with me .

Wherever there was a chance of exposing them to the different mathematical and pre mathematical concepts I did so by posing the questions such as

How many sons did the king have?

How many brothers/sisters do you have?

Who is the eldest son?

Who is taller than Vijay ?

What is the number of horses ?

Who brought more flowers ?

How many flowers did Harsha get ?

How many flowers did Veera get ?

How many more flowers did Veera bring than Harsha?

Which flowers are the biggest?

Which flowers are smaller than lotuses?

Which flowers would you take ,if you wanted the special ride?

On day one, I narrated the story with the help of the pictures.

On day two I asked them to recall and identify the numbers while retelling the story.

On day three I asked them to arrange the flowers in the order of their number and size.

(in both ascending and descending order)

On day four I asked them to tell the story in their own words using the pictures and counting them wherever needed.

On day five, they had to enact the story.

They asked for the pictures I used. I told them that I forgot the pictures at home and I was sorry.

All of them were very eager to play their roles.

I indirectly hinted that other objects could be used in place of picture cards.

After some inputs , they tried to use their pencils , erasers and sharpeners in place of flowers. They divided the characters among themselves. The characters included horses too.

On day six , I divided them into groups and asked them to enact the story.

Now that they had tasted liberty , there were changes in the number of objects(also the type) and characters.

It was a feast to the eyes and heart to watch the tiny tots explore the numbers.

Outcomes of the innovation

Children counted up to 9 without any stress.

They identified big/small ,more/less and arranged them in order(in both ascending and descending order).

They could relate the numbers to the real life situations/objects.

They created their own stories (with flowers replaced by sweets and other objects).

Implications

Simple mathematical concepts can be embedded into stories to make the learning more fun and stress free.

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STATE LEVEL MATHEMATICS SEMINAR 2022

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ప్రధాన అంశం: "గణిత బోధనలో ఆవిష్కరణ దిశగా ముందుకు సాగే మార్గం "

ఉప అంశం: "ప్రాథమిక స్థాయిలో కథలు చెప్పడం ద్వారా గణితబోధన"

శీర్షిక : "కథలు చెప్పుకుందాం గణితం నేర్చుకుందాం"

లక్ష్యాలు : * ప్రాథమిక స్థాయి గణితం ఉపాధ్యాయులను కథలు చెప్పడం ద్వారా అమూర్త భావనలను,నిజజీవిత సంఘటనలకు అన్వయింపజేస్తూ గణితం బోధించేలా ప్రోత్సహించడం.

* కథ చెప్పడం ద్వారా, వినూత్నమైన ఆలోచనలకు పిల్లల్లో రేకెత్తించి,సురక్షితమైన అభ్యాస వాతావరణాన్ని సృష్టించుకొని ఉపాధ్యాయుల,పిల్లల మధ్య గణితానుబంధాన్ని పెంపొందించుకునేలా ప్రోత్సాహించడం, గణిత బోధనాభ్యసన ప్రక్రియలో 'అర్థం చేసుకోవడం ' మరియు అంచనా వేసే నైపుణ్యాన్ని పిల్లల్లో పెంపొందించేలా ప్రోత్సహించడం.

" ప్రాథమిక విద్యాదశలో కథ చెప్పడం ద్వారా గణితబోధనలు"- ఆవిష్కరణకు రూపకల్పన"

" Desing of Innovation"

* E- Experiential Learing – ప్రత్యక్ష అనుభవం/ గణిత పూర్వానుభవం

L- Language – పరిచయం చేసే గణితభావనకు సంబంధించిన పదాలను పదే పదే పలకడం

P- Picther – గణితభావనకు సంబంధించిన చిత్రాలను,వస్తువులను పిల్లల ముందుకు తీసుకురావడం.

S- Symbol or Sign – గణిత అమూర్త భావనను పరిచయం చేయడం,అభ్యాసం చేయించడం.

C- Concreate objects
P- Pictures
A- Abstract

* పిల్లల యొక్క గణితపూర్వభావనలకు అనుగుణంగా,పిల్లల అవసరాలకు గుర్తిస్తూ, వారు అర్థం చేసుకునే స్థాయికి తగ్గట్టుగా కథ చెప్పడానికి రూపకల్పన చేసుకోవాలి.
* కథాసారాన్ని పునర్బలనం చెందించే విధంగా తగిన చిత్రాలు మూర్త వస్తువులు వాడాలి. తెలిసిన విషయం నుండి తెలియని విషయం వైపుకు పిల్లల దృష్టిని మళ్ళించేలా అభినయ పూర్వకంగా చెప్పాలి.
* కథను కథలోని గణిత పదాలను,భావనలను పిల్లలచే సొంత మాటల్లో చెప్పించాలి.
* లెక్కించడం,అంకెలు,సంఖ్యలు,ముందు,తరువాత,మధ్య, ఆరోహణ,అవరోహణక్రమాలు,స్థాన విలువ,సహజ విలువలు,కూడిక,తీసివేత,గుణకార,భాగహారం నిష్పత్తి,భిన్నాలు క్రమత,మొ॥ భావనలు చెప్పేలా ప్రోత్సహించాలి.అర్థం చేసుకోవడం, అంచనా వేసే నైపుణ్యాలను పరీక్షించడం.

వివరణ Description **:**

భారత దేశం సర్వమానవాళికి,విజ్ఞానం అందించిన సుజ్ఞానధామం గణితాన్ని జీవన విధానంగా భావించి ఆచరించి నిరూపించిన భారతీయ గణిత వేత్తలు ఎందరో... ఖగోళ,భౌగోళిక,వైజ్ఞానిక ప్రకృతి రహస్యాలను ఛేదించి వాటి అంత:సూత్రాలను వివిధ గణిత పద్ధతుల్లో విశదపరచి భావితరాలకు గణిత శాస్త్రం విజ్ఞానాన్ని శ్లోకాల రూపంలో, ఆ గణిత సాహిత్యాన్ని భద్ర పరచి భావితరాలకు అందించిన గణితశాస్త్ర వేత్తలకు సహస్ర ప్రణామాలు.

మానవ జీవన విధానం లో "కథ –"గాఢమైన భావనలు సులభంగా అర్థం చేసుకోవాడానికి అవకాశం కల్పించే ఒక ప్రక్రియ అమూర్త భావాలను ప్రతిబింబింపజేసి.ప్రత్యక్ష అనుభవాన్ని కలిగించి ప్రతిస్పందింపజేసే అద్భుతమైన ప్రేరేపకం "కథ–"

"కథ చెప్పడం"అనేది జ్ఞానాన్ని బదిలీ చేయడానికి ఒక ప్రాథమిక పద్ధతిగా వినియోగించ బడుతుంది. గణితబోధనలో కథ చెప్పడం అనేది సురక్షితమైన అభ్యసనవాతావనణాన్ని సృష్టించడానికి ఉపయుక్తంగా ఉండే ఉల్లాస విధానం.ఈ విధానంలో విద్యార్థి గణిత భావనను అర్థం చేసుకోవచ్చు అభినందివచ్చు ఆనందించవచ్చు ప్రాథమిక స్థాయిలో గణితంలో "కథ చెప్పడం ద్వారా"బోధనజరిగితే పిల్లల్లో నేర్చుకోవాలి అనే కుతూహలం పెరిగి బోధనాభ్యసన ప్రక్రియలో నిమగ్నం కావడానికి మరింత వీలుబాటు లభిస్తుంది.

కథ చెప్పడం ద్వారా గణితబోధన ఏకకాలంలో పిల్లలందరి భావోద్వేగాలను ప్రేరేసిస్తుంది. కథలోని అమూర్త భావనను గ్రహించిన పిల్లవానికి ఆ భావన యొక్క సోపాన క్రమం దృశ్యీకరణ జరుగుతుంది. మూర్త భావనలతో నిజ జీవిత సందర్భానికి అనుసంధానం చేసుకొని సమస్య పరిష్కారాన్ని సొంత మాటల్లో వ్యక్తి పరచి సమస్యను నిరూపించుటకు తగిన కారణాలు చూపుతూ,నిర్ధారణలు చేస్తాడు సమస్యసాధన చేస్తాఉ. ప్రాథమిక స్థాయిలో పిల్లలు సాంధించే భాష,గణిత సామర్థ్యాలు పైననే పై తరగతులలో వారి అభ్యసనం ఆధారపడి ఉంటుంది. పిల్లలు వారికి తెలియకుండానే అర్థవంతమైన సన్ని వేశాలు ద్వారా అంచనా వేయడం, లెక్కించడం రాశులను పోల్చడం చేస్తుంటారు. వారు బడికి రాక ముందే గణిత పరమైన భావనలు కలిగి ఉంటారు.

NCF,2005 మౌళిక సూత్రాలు ప్రకారం మరియు RTE 200 ప్రకారం గణిత అభ్యసనం అన్వేషణ,పరిశీలనల ద్వారా గణిత భావనలను గ్రహించడం,నిర్ధారించడం,సాధారణీకరించడం ద్వారా జ్ఞాన

జ్ఞాన నిర్మాణం జరగాలి. గణిత భాషలో వ్యక్తీ కరించడం వంటి సామర్థ్యాలు లను కథ చెప్పడం ద్వారా సత్ఫలితం పొందవచ్చు.

కథ వినడం వల్ల విద్యార్థి ఊహశక్తి పెరుగుతుంది ధారణశక్తి పెరిగి భావాల మధ్య సంబంధాన్ని గ్రహిస్తాడు సహజంగా తనకు తెలిసిన గణిత పూర్వభావనల ద్వారా ఆకళింపు చేసుకొని ఆకారాలు,లెక్కించడం సున్నాభావన,సహజ,స్థానవిలువలు,ఒక అంకె కూడికలు,తీసివేతలు,డబ్బులు,కాలం,బరువు, కొలతలు,పరిమాణం, సమాచార సేకరణ,భిన్నాలు,క్రమతలు/నమూనాలు (Pattern) ఇత్యాది భావనలు గుర్తిస్తాడు. సమస్యసాధనలో గుర్తుకు తెచ్చుకుంటాడు. "కథ చెప్పడం ద్వారా గణితబోధనం"పిల్లల్లో జ్ఞాన వికాసాన్ని పెంపొందించడంతో పాటు గణితాన్ని మానవీయ దృక్కోణంలో చూడడం నేర్పిస్తుంది. హృదయానికి హత్తుకునేలా,భావావేశంతో అభినయిస్తూ కథ చెప్పడం విన్న పిల్లలు తాము విన్న కథల ద్వారా చర్యను ఊహించడం,దాని ప్రభావాలను ఊహించడం ఒక పనిని చేయాలా వద్దా,అని నిర్ణయించుకునే జ్ఞానాన్ని పెంపొందించుకుంటారు.

కథ చెప్పడం ద్వారా గణిత బోధనలను నేర్పేప్రాల్లో ELPS లేదా CPA క్రమాలను వాడుతారు ఈ క్రమాల్లో వివిధ దశలుంటాయి.

E - Experiential learing L - Language - P - Pictures -S Symbol or sign

C - Concrete P - Pictures A - Abstarct

ఇలాంటి దశలను క్రమ పద్ధతిలో దాట గలినపుడు పిల్లలు అమూర్త మైన భావనలను అర్థం చేసుకోవడం పట్టు సాధిస్తారు.

ఉదాహరణకు ఒక కథ (ఒకటవ తరగతి పిల్లలకోసం)

సంతోష్ వాళ్ళ అమ్మ ఒక రోజు రెండు అరటి పండ్లు తెచ్చింది.తమ్ముడు,నువ్వు,నేను ముగ్గురం తిందామని సంతోష్ అన్నాడు అంతలో సంతోష్ ఫ్రెండ్ రవి వచ్చాడు అందరికి పంచాల అని వేళ్ళు లెక్క పెడుతూ నలుగురిని చూస్తూ సైగతో అడిగారు వద్దు అని సైగ చేశాడు సంతోష్. ఇంతలో గోపి,రాజు,అనిల్ వచ్చారు. పదరా మనం ఐదుగురం కలిసి ఆరు బయట ఆడుకుందాంమని చెప్పాడు. ఆడుకుంటుండగా రాజు కింద పడి ఏడుస్తున్నాడు. ఎనిమిది డబ్బాల ఆటను ఆపేసి ఇంటి నంబరు తొమ్మిదిలో ఉండే డాక్టర్ దగ్గరకు తీసుకెళ్ళి చూయించామ్ పది రూపాయలు ఫీజుకట్టి డాక్టర్ దగ్గరకు తీసుకొచ్చి మందులు తీసుకొని, డాక్టర్ మాటలు విని రాజును వాళ్ళింటి వద్ద వదిలి సంతోష్, రవి, గోపి, అనిల్ తమ ఇళ్ళకు వెళ్ళి పోయారు సంతోష్ ఇంటి కొచ్చక అరటి పండు గుర్చి తమ్ముని అడగగా రెండు అరటి పళ్ళను ఒక ముసలి తాత ఆకలి అని అడిగితే అమ్మయిచ్చిందని తమ్ముడు చెప్పాడు. ఆకలితో ఉన్నవారికి తినడానికి ఏమైనా యిస్తే మంచిదని అమ్మ చెప్పిన మాటలు గుర్తుకు తెచ్చుకున్నాడు. తమ్ముని కోసం అరడజను అరటిపండ్లు తీసుకోస్తానని, అమ్మ వద్ద ఉన్న 5, 2 రూపాయలు బిళ్ళలు,3,5 రూపాయ బిళ్ళలను తీసుకెళ్ళాడు. పండ్లు తెచ్చి అమ్మ తమ్ముడు,సంతోష్ తిన్నారు. సాటి వారికి సాయం చేయడం మనిషి లక్షణమని ఇలా సాయపడే వారికి మంచి జీవితాన్ని గడుపుతారని అమ్మ తనపిల్లలకు చెప్పింది.

ఒక కథను భావాత్మకంగా చెప్పిన ఉపాధ్యాయుడు గణిత భావనను నేర్పించే బోధనా క్రమంలో, క్రమాన్ని పరీశీలిస్తే గణిత భావనను నేర్చుకునే క్రమంలోని ఈ దశలు కల్పించాలి మెదట మూర్త వస్తువులతో ప్రత్యక్ష అనుభవం పొంది తద్వారా కథను అర్థం చేసుకుంటాడు మూర్త వస్తువులను, చిత్రాలను కథ చెప్పడంతో

వాడడం వల్ల నిజజీవితానికి అనుసంధానం చేసుకొని ఊహశక్తిని ఉపయోగిస్తూ సొంత మాటల్లో అడిగిన ప్రశ్నలకు సమాధానం వ్యక్త పరుస్తాడు. అమూర్త మైన సంఖ్యలను గుర్తిస్తాడు. అవసరమైనపుడల్లా గుర్తుకు తెచ్చుకుంటాడు, సమస్య సాధనలో గణిత ప్రక్రియను పూర్తి చేస్తాడు మొత్తం, భేదం చెబుతాడు.

ఉపాధ్యాయుడు,పై కథ ద్వారా 1,2,3,4,5,6,7,8,9,0 అంకెలు సంఖ్యలు పరిచయం చేస్తాడు. చిన్న చిన్న ప్రశ్నల ద్వారా సంఖ్యలను చెప్పిస్తాడు చిత్రాలను చూపిస్తూ వారు చెప్పిన జవాబుతో అనుసంధానం చేస్తాడు.

 1  3  9

పిల్లలతో సొంత మాటల్లో కథ చెప్పిస్తూ చిత్రాలను ఉపయోగించేలా సహకరిస్తూ ధ్వని సంకేతానికి తగ్గట్టుగా అంకెను జోడించేలా సూచనలిస్తాడు. బోర్డు పై కాఫీలో నోట్ చేయిస్తాడు.

* స్థానం విలువ – సహజ విలువ అమూర్తమైన విషయాలు కాబట్టి దీని మూర్త విషయాలతో జోడించి చెబితే గణితం అభ్యసనం పట్ల ఉత్సుకత పిల్లల్లో పెరిగి బోధనాభ్యసన ప్రక్రియ విజయవంతం కావడానికి దోహదపడుతుంది.

"కథ చెప్పడం" ద్వారా సహజ విలువ –స్థానం విలువ పరిచయం చేయడం "

ఒక రోజు ఒక ఈగ తనెవరో మర్చిపోయింది. తన పిల్లలను నేనేవరు అని అడిగింది మా అమ్మవి అని సమాధానం చెప్పారు. తన తండ్రిని అడిగింది నేనేవరిని నా కూతురువని సమాధానం చెప్పాడు. తండ్రి అత్త–మామ దగ్గరకు వెళితే కోడలు అనిచెప్పారు అమ్మమ్మ దగ్గరికి వెళితే మనవరాలు అవుతావని చెప్పింది తన భర్త దగ్గరికి వెళితే భార్య వని చెప్పాడు తన అక్క నడిగితే చెల్లెలు వని తన చెల్లెను అడిగితే అక్కవని,బావనడిగితే మరదుల వని ఇలా ఒక్కొక్క స్థానంలో ఒక్కొక్కరు ఒక్కో వరుసతో ఒక్కొ విలువను చూపుతే చెప్పారు. సహజంగా తనెవరో చెప్పలేర పోయారుని దిగులుగా ఎగురుతూ ఒక సూల్క్ వద్ద పిల్లల టిఫిన్ బాక్స్ పై కూర్చుంది. అది గమనించిన ఆయమ్మ అరే ఈగ వాలింది వెళ్ళ గొట్టాలని గట్టిగా అరిచింది. ఆ ఈగకు తన పేరు "ఈగ" అని గుర్తుకు వచ్చింది. అరె సహజంగా నన్ను అందరూ ఈగ అంటారు. కానీ వరుసైన వారి వద్దకు వెళితే ఒక్కొస్థానంలో ఒక్కోపేరు వచ్చిందని గ్రహించింది. ఎవరికి ఏమి కాకపోతే .ఎవరి వద్దకు వెళ్ళక పోతే ఈగ నని నా సహజవిలువ ఈగ యని, ఒక్కొక్కరి స్థానం వద్దకు వెళితే ఆయా స్థానాల్లో ఒక్కొరకమైన పేర్లతో విలువిచ్చారని అంటే స్థానాన్ని బట్టి విలువ ఉంటుంది దాన్నే స్థానం విలువ అంటారని గ్రహించింది. నా సహజవిలువ ఈగ...స్థాన విలువ రకరకాలు అనుకుంటూ తన పిల్లల వద్దకు ఎగిరిపోయింది.

ఈ కథను ఈగ చిత్రాన్ని ఇతర సంబంధిత చిత్రాలను వాడుతూ పిల్లలకు కథ చెబితే సహజ విలువ–స్థాన విలువలను అమూర్త భావనలు తను అను భవంలోకి తెచ్చుకుంటారు.

ఒక సంఖ్య యొక్క భావన కథ చెప్పడం ద్వారా మెదలు పెట్టి సంఖ్యను గుర్తించడం, గుర్తుకు తెచ్చుకోవడం సామర్యాలను కని పెట్టాలి తర్వాత, ఒక సంఖ్యను పిల్లలు నేర్చుకోవడానికి ఈ క్రింది దశలను వస్తువులను క్రమ పద్ధతిలో పేర్చడం→ వర్గీకరించడం→ లెక్కించడం→వస్తువుల సంఖ్యకు గుర్తుకు మధ్యసంబంధం ఏర్పచడం→ సంఖ్యలను గుర్తించి చదవడం → చెప్పిన సంఖ్యను రాయండి తరగతి స్థాయిని బట్టి "కథ చెప్పడం"జరగాలి కథ చెప్పడం ద్వారా భావన అవగాహన జరిగిన తర్వాత పైన తెలిపిన దశలను అమలు పర్చాలి.

* **ఫలితాలు:**

ప్రాథమిక స్థాయిలో "కథ చెప్పడం"ద్వారా గణిత బోధన" వల్ల పిల్లల్లో

→ శ్రవణ నైపుణ్యం పెరుగుతుంది

→ భావగ్రహణశక్తి పెంపొందుతుంది

→ ఊహించేశక్తి, ధారణశక్తి, అర్థం చేసుకోవడం, తార్కికంగా ఆలోచించడం మౌఖికంగా అంచనా వేసే సామర్థ్యాలు పెంపొందుతాయి.

→ అమూర్త గణిత భావనలను గణితభాషలో వ్యక్తపర్చడం, సోపాన క్రమయుతంగా కారణాలు చూపిస్తూ, సమస్యను నిరూపించడం, సాధించే నైపుణ్యాలు పెరుగుతాయి.

→ ప్రాథమికస్థాయి పిల్లల్లో బుద్ధివికాసం కలిగి అమూర్తత్వాన్ని నిజజీవితానికి అనుసంధానం చేసుకునే సామర్థ్యం పెరుగుతుంది.

* **కథ చెప్పడం ద్వారా గణిత బోధన సమస్యలు**

→ సమయం ఎక్కువగా అవసరమవుతుంది

→ ఒక తరుచుదనాన్ని ప్రతిరోజు నిర్వహించలేము

→ ప్రతి అమూర్త భావానికి కథ నిర్మాణం సాధ్యం కాకపోవచ్చు

* రిఫరెన్సులు:

→ 1వ – 5వ తరగతి గణిత పాఠ్యపుస్తకాలు

→ పిల్లలు – లెక్కలు – టీచర్ – శ్రీ పోరెడ్డి అశోక్ గారి పుస్తకం

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STATE LEVEL MATHEMATICS SEMINAR 2022

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SUB-THEME::

Teaching Mathematics through story telling at primary level**.**

Title of the topic::

వింత పరికరం - విలువైన పరికరం

Objectives

(అభ్యాసన ఫలితాలు, సూక్ష్మ సామర్థ్యాలు) ::సమయాన్ని గుర్తించడం, సమయాన్ని అంచనా వేయడం, సమయానికి పూటకు(పగలు- రాత్రి) రోజుకు మధ్య సంబంధం, నిమిషాలు గంటల మధ్య సంబంధం, సంకలనం, వ్యవకలనం, గుణకారము, భాగహారము అంతరలీనంగావినియోగించడం, భిన్నాలు,జ్యామితిలు,భాషలఅనుసంధానం, శాస్త్రం పట్లవిశ్వాసం పెంపొందించుకోవడం ఆధ్యాత్మికత ప్రాముఖ్యత.....

సమయము - గడియారము

(సూర్యచంద్రుల మధ్య సంభాషణ)

ఒకరోజు లక్ష్మి అనే అమ్మాయికి తెల్లవారుజామున మేలుక వచ్చింది. అప్పుడే బయట నుండి మాటలు వినిపించాయి నమో ఆదిత్య..... నమో సోమాయ..... కుశలమేనా భూలోకవాసులకు గాఢనిద్రను ఇచ్చి విశ్రాంతిని కలిగించి మేలుకొలిపినావా!, అవును ఆదిత్య మీ ఆశీర్వాదంతో వారికి గాఢనిద్రను కలిగించి విశ్రాంతిని కలిగించాను అయితే మేల్కొనడం పడుకోవడం పనులు చేయడము వారికి వారే చేసుకుంటున్నారు. స్వయంగా చేసుకుంటున్నారా సోమాయ, అవును ఆదిత్య వారు మిమ్మల్ని ఆదర్శంగా తీసుకొని ఒక వింత పరికరాన్ని తయారు చేసుకున్నారు, అబ్బా నీవు ఆదర్శవంతుడివి సోమాయ... ఇంతకీ ఆ వింత పరికరము ఏంటి వివరించు కుతూహలంగా ఉంది (లక్ష్మి కలలో కుతుహరంగా ఈ మాటలన్నీ వింటూ ఉంది) సరే ఆదిత్య ఆ పరికరం పేరు గడియారం, సమయాన్ని తెలియజేస్తుంది మీ దర్శన కాలాన్ని ఒక పూటగా నా పర్యవేక్షణను మరొక పూటగా చేసుకొని అలా రెండు భ్రమణాలను ఒక రోజుగా పరిగణిస్తున్నారు, భలేగా ఉంది వివరంగా చెప్పు సోమయా, సరే ఆదిత్య వినుండ్రి మీ ఆకారంలో వచ్చే విధంగా ఒక వస్తువును తయారు చేశారు ఇగో ఈ విధంగా(వృత్తాన్ని గీసి చూపిస్తాడు చంద్రుడు) ఆ వృత్తాకారం మీద ఒక బలమైన చిన్నవాడిని అతని పేరు గంటల ముళ్ళు అతన్ని కేంద్రం వద్ద ఉంచి భ్రమణం చేయు విధముగా ఉంచారు అతని కోసము పైనుండి ప్రారంభిస్తూ 12 సమాన భాగాలుగా ఒకటి నుండి 12 సంఖ్యలను సూచించారు , అతను దాని దగ్గరికి వచ్చినప్పుడు అన్ని గంటలు చూపిస్తాయి, ఈ విధంగా మీరు దర్శించే సమయంలో ఆరు గంటల మీద, మీరు భగభగ మండుతూ ఉన్న సమయంలో ఆ చిన్నవాడు 12 గంటల వద్ద ఉంటాడు, మీరు సాయంత్రం వేళలో వీడ్కోలు చెబుతున్నప్పుడు ఆరు గంటల వద్దకు వస్తాడు, ఇక రాత్రి వేళలో నేను భ్రమించే కాలముకు అనుగుణంగా ఆ చిన్నవాడు ఆ సమయాలను చూపిస్తాడు తిరిగి మీరు దర్శించగానే ఆరు గంటలకు వస్తాడు ఈ విధంగా మీయొక్క పగటిపూటను, నా రాత్రిపూటను కలిపి భ్రమణం చేసి ఒక రోజును పూర్తిస్తారు ఇగో ఈ విధంగా(చంద్రుడు పరికరాన్ని చూపిస్తాడు)

(Advanced ఉన్నత స్థాయి:: రెండు సంఖ్యల గంటల మధ్య గంట యొక్క పావుగంటను1/4, అరగంటను1/2, ముప్పావు గంటను3/4 కూడా చూపిస్తారు)

ఆహా మనుషులు చాలా తెలివిగలవారు మర్యాద కలవారు సృష్టికలాన్ని కాపాడుతున్నారు అవును ఆదిత్య ఈ గంటల బుల్లె మ్మ కాదు మరొక సన్నటి పొడుగు వాడిని తీసుకువచ్చారు అతనిని నిమిషాల ముళ్ళు అంటారు ఇతన్ని గంటల ముళ్ళు పైన భ్రమణం చేయు విధంగా ఉంచారు ఇతని కోసము ప్రారంభం నుండి మరొక సంఖ్య వచ్చువరకు ఐదు గీతాలు గీశారు వాటిని నిమిషాలు అంటారు ఐదవ గీత సంఖ్య పైన ఉంటుంది, నిమిషాల ముళ్ళు ఎక్కడ ఉంటుందో అక్కడి వరకు ప్రారంభం నుండి ఉన్న గీతాలను లెక్కపెట్టి అని నిమిషాలుగా పరిగణిస్తున్నారు

ఇక్కడ ఒక సంఖ్యనుండి తర్వాత సంఖ్యకు వరకు ఐదు నిమిషాలు అంటే సంఖ్య ఒకటి ఐదు నిమిషాలను చూపిస్తుంది సంఖ్య రెండు (5 ప్లస్ 5 పునరావృత సంకలనం) రెండు ఐదుల 10, పది నిమిషాలను చూపిస్తుంది. సంఖ్య 3(5 ప్లస్ 5

ప్లస్ 5) మూడు ఐదుల 15, 15 నిమిషాలు ఇలా చివరగా సంఖ్యా 12 అనేది (12 ఐదులు) 12 ఐదుల 60, 60 నిమిషాలు చూపిస్తుంది, ఇగో ఈ విధంగా ఇప్పుడు చెప్పండ్రి ఆదిత్య ఈ పొడుగు ముళ్ళు నాలుగు దగ్గర ఉంటే ఎన్ని నిమిషాలు అదేవిధంగా ఐదు దగ్గర ఉంటే ఎన్ని నిమిషాలు కనుక్కోండి!, ఆహా సోమయ్య నన్ను పరిక్షిస్తున్నావే నీ వివరణ నాకు బాగా అర్థమయింది నాలుగు దగ్గర అంటే నాలుగు ఐదులు 20, 20నిమిషాలు ఐదు దగ్గర అంటే ఐదు ఐదులు 25, 25 నిమిషాలు భలే ఆదిత్య భలే!!, ఇంకా వివరించు సోమాయ సరే సరే వినుండ్రి !

మనలాగే ఆ రెండు కూడా సమన్వయంతో పని చేస్తాయి అవి ఎలా సమన్వయంగా ఉంటాయో వాటి మధ్య సంబంధం ఎలా ఉంటుందో వివరిస్తాను చూడండి రెండు ముళ్ళు కూడా ప్రారంభము (సున్నా మరియు 12) దగ్గర ఉంటాయి గంటల ముళ్ళు నిమిషాల ముల్లులా **ప్రయాణ దూరము వేరువేరుగా ఉన్న సమయం మాత్రమే ఒకటే చూపిస్తుంది** గంట అంటే విలువ ఎక్కువ నిమిషము అంటే విలువ తక్కువ, నిమిషాల ముళ్ళు ప్రారంభం నుండి 12 వరకు తిరిగి వస్తే గంటల ముళ్ళు ప్రారంభం నుండి ఒకటి వరకు వస్తుంది కదా అయినప్పటికీ నిమిషాల సమయం 60 నిమిషాలు, గంటల ముళ్ళు ఒక గంట అంటే రెండు విలువలు సమానము ఇక్కడ 60 నిమిషాలు అంటే ఒక గంట అదేవిధంగా ఒక గంట అంటే 60 నిమిషాలు (**కూలికి వెళ్లేవాడు మరి ఇంటి దగ్గర పనిచేసేవారికి ఉదాహరణ చూపిస్తూ ఇద్దరు సంపాదన ఒకటి అని చెప్పవచ్చును)** అదేవిధంగా రెండు గంటలు అంటే రెండు అరవైలు 120 నిమిషాలు అన్నమాట ఆ విధంగా మనము నిమిషాలను గంటలలో, గంటలను నిమిషాలలో చెప్పవచ్చును అలాగే ఇక్కడ మరికొన్ని ముఖ్యమైన సంబంధాలు ఉన్నాయి **60 నిమిషాలు అంటే ఒక గంట అని చెప్పుకున్నాం కదా అలాగే 30 నిమిషాలు అంటే అరగంటగా(1/2గంట) 15 నిమిషాలను పావుగంటగా(1)4 గంట) , 45 నిమిషాలు అంటే ముప్పావు గంట (3/4 గంట) గా చెప్పుకుంటారు**

ఇక్కడ మరో ముఖ్యమైన సంబంధం ఉన్నది నిమిషాల ముళ్ళు ఎన్ని భ్రమణాలు తిరిగిందో గంటల ముళ్ళు చెబుతుంది ఎలా అంటే ఇప్పుడు గంటల ముళ్ళు ఒకటి దగ్గర ఉంటే నిమిషాల ముళ్ళు ఒక భ్రమణం చేసింది అన్నమాట ,గంటల ముళ్ళు రెండు దగ్గరికి వచ్చినప్పుడు నిమిషాల ముందు మరొక భ్రమణం చేసి రెండు భ్రమణాలను పూర్తి చేస్తుంది ఈ విధంగా (**చంద్రుడు పరికరం ద్వారా వివరంగా చూపిస్తాడు**) ఇప్పుడు మీరు చెప్పండ్రి ఆదిత్య! ,సరే అడుగు సోమాయ! ఆట బాగుంది, ఒకవేళ గంటల ముందు ఆరు గంటలు చూపిస్తే నిమిషాల ముళ్ళు ఎన్ని భ్రమనాలు చేసి ఉంటుంది ఆహా సోమాయ చాలా సులభం ఆరు భ్రమనాలు, భలే భలే!!

ఇంకా చూపించు వారి గమ్మత్తులు

ఇప్పుడు రెండు ముళ్ళు లను ఉపయోగించి ఏకకాలంలో ఎంత సమయము అవుతుందో సులభంగా తెలుసుకుందాం, **గంటల ముళ్ళు ముందు ఎక్కడ ఉందో చూడాలి ఒక సంఖ్య మీద ఉంటే అదే సంఖ్యను అన్ని గంటలుగా సమయాన్ని తెలియజేయాలి నిమిషాల ముల్లును పరిగణలోకి తీసుకోవద్దు, (చంద్రుడు పరికరం ద్వారా చూపిస్తూ ఉంటాడు**) ఒకవేళ గంటల ముందు ఒక సంఖ్య తర్వాత ఉంటే ఆ సంఖ్యను అన్ని గంటలుగా తీసుకొని నిమిషాల ముళ్ళు ఏ సంఖ్య వద్ద మీద ఉందో చూసి అన్ని నిమిషాలు (సంఖ్యను అయిదు తో గుణించి వచ్చిన సంఖ్యను నిమిషాలు గా

తీసుకోవాలి)తీసుకొని **ఈ గంటలని ఈ నిమిషాలని కలిపి చెప్పాలి,** గంటల ముళ్ళు 8 తర్వాత ఉండి నిమిషాల ముళ్ళు ఆరు దగ్గర ఉంటే అప్పుడు సమయాన్ని ఎనిమిది గంటల 30 నిమిషాలుగా చెప్పాలి, ఎందుకు 30 నిమిషాలు అని చెప్పాలి ఆదిత్య!, నాకు గుర్తుంది సోమాయ! నిమిషాల ముందు ఆరు దగ్గర ఉంది అంటే ఆరు ఐదుల 30 అంటే 30 నిమిషాలు,

భలే! భలే! ఒక్కొక్కటి అడుగుతాను చెప్పుండ్రి, గంటల ముళ్ళు 12 దగ్గర ఉండి నిమిషాల ముందు పది దగ్గర ఉంటే చెప్పుండ్రి

ఆఆఆ...12 గంటలు పది ఐదులు 50 నిమిషాలు, 12 గంటల 50 నిమిషాలు. సరిగా చెప్పారు అందుకే అందరూ మిమ్మల్ని అనుసరిస్తాం, పూజిస్తాము.

వీటిని ఉదయము మధ్యాహ్నము సాయంత్రము రాత్రిలకు అనుసంధానించి ప్రత్యేకంగా మనల్ని అనుసరిస్తూ సమయాలను చూపిస్తూ చెప్తూ ఉంటారు

ఆహా సోమయ్య చాలా గర్వంగా ఉంది మన మన భూలోకవాసులు గడియారాన్ని ఉపయోగిస్తూ మంచి క్రమశిక్షణతో సమయాన్ని వాడుకుంటున్నారు భలే వివరించావు సోమాయ... మరి నేను వెళ్లి వస్తా ఆదిత్య నమస్కారము నమస్కారము సోమాయ.

అంతలోనే లక్ష్మికి మేలుకో వచ్చి ఈ సూర్యచంద్రుల సంభాషణ అంతను కూడా బాగా అర్థం చేసుకొని పాఠశాలకు వెళ్లిన తర్వాత తరగతి గదిలో చక్కగా ఉపాధ్యాయుల ప్రత్యక్షతలో వివరంగా చెప్పింది, అందరు కూడా చప్పట్లతో అభినందనలు తెలియజేశారు .

(అంతర్జాతీయంగా am, noon, pm లను అదేవిధంగా 24 గంటల గడియారాన్ని ఉపాధ్యాయులు వివరించారు)

ధన్యవాదములు

STATE LEVEL MATHEMATICS SEMINAR 2022

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THEME OF THE SEMINAR

Way Forward towards Mathematics Teaching

SUB THEME OF THE SEMINAR

Developing Culture of Mathematics through creative curricular Process

Introduction:-

Structure of today's math education system

Closed layered architecture based on:

- ♦ Curricular-oriented "knowledge pushing".
- ♦ Life long teaching with:
  - Lack of subject understanding in the early layers.
  - Minimization of teaching duties in the final layers.

Problems with today's math education

These issues are related to classroom management, ethnicity, lack of trained teachers, inequity, lack of teaching aids and materials, lack of textbooks, lack of time for students, lack of clear objectives, gender issues, and issues of mathematical contents and pedagogy.

It does not:

- Integrate abstractions with applications
- Integrate mathematics with human culture.

Possibilities for improving Math education

- ✔ Promoting life-long learning based on interest.
- ✔ By using **ICT** to increase the "cognitive contact"
- ✔ By developing culture of Creativity through art oriented curriculum using ICT

by:

- o Visualizing the concepts.
- o Interacting with the formulas
- o Personalizing the presentation.
- o Routing the questions to live resources.
- o Correlating to other subjects like languages
- o By applying the Art Integration to learn mathematics concepts

Objectives :

1) To enable the Information &Communication Technology (ICT) which include both hardware and software's necessary for delivering of voice, audio, video, data especially related to Mathematics.
2) World is becoming a 'Global Village' as a result of the development in ICT.
3) ICT holds out the opportunity to revolutionaries pedagogical methods, expand access to quality education and improve the management of education in schools and colleges.
4) ICT, is regarded as a critical tool for preparing and educating students with the required Mathematics abstractions and skills for the global work place.

Using ICT in schools for teaching Mathematics

- The continuous development of Information and Communication Technologies (ICT) has created new opportunities for teachers.

- During classes, a modern Mathematics teacher should be able to integrate ICT with various teaching methods.
- ICT is a powerful resource for mathematics. It provides benefits for the effective learning and teaching of Mathematics. Many ICT tools are developed for teaching and learning Mathematics. These tools are helpful for teachers and students to plan and reach the goal. Such tools make students an active participant in Mathematics learning. The nature of Mathematics has changed considerably because of the availability of ICT.

Using ICT by Mathematics teachers can be divided into three major areas

1) The general use of computers, operating system, office applications and Internet.
2) Use of the measuring equipment and its integration with a computer, applications for data collecting and processing.
3) Visualization of the lessons' content with the use of modern didactic tools, modelling, use of videos and animations, interactive presentations and assessment, virtual laboratories.

A great challenge for the Educators

- We should keep in mind that the use of ICT tools is **not an easy task for many teachers**.
- **Training is essential to the teachers**for using various ICT hardware and software tools.
- The extremely fast development of IT in 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 ICTs for Mathematics** at schools is not satisfactory.
- **Funding** constraints.
- The great challenge for Math educators is to prepare teachers for casual, conscious and **free use of the latest technology** in their classes.
- The need **to prepare mathematics teachers** for general computer and Internet usage, especially in the aspect of lifelong learning.

Some progress in teachers

- ✔ A teacher tends to use ICT largely to support, enhances and complement existing classroom practice rather than re-shaping subject contents, goals and pedagogy.
- ✔ However, **teacher's motivation and commitment are high** and practice is gradually changing.
- ✔ Training teachers in using ICT in the classroom appears to have **more success in math**than in other subjects.
- ✔ **Teachers are now beginning to develop** and trial new strategies which successfully overcomes the distractions of the technology and focus attention instead of their intended learning objectives.

ICT Hardware Equipment for Mathematics teaching

- PC / Laptop with Speakers, Mic
- iPads, Tablets, Smart Phones
- Multimedia Projector with USB, Wireless
- Flat LCD/LED Screen (32" / 42")
- Portable Sound Systems (Small, Medium, Large), Wireless Mic.
- Digital board K-YAN projector
- Interactive pen displays and tablets.
- Visualize / Document Projector
- Cameras (Video and Still)
- WEB Cameras, Scanners, Printers
- Interactive Pad
- Interactive Board
- Virtual Reality gadgets
- Slide presenter
- Overhead Projector
- Voice Recorders / MP3 players / DVD players / Head phones
- Portable storage devices (HDDs, Pen drives, card readers)
- **IMAGES OF ICT HARDWARE EQUIPMENT**

Interactive pen display

ICT Software tools

- MS Office suite / Open office Suite
- Adobe suite
- Animation (flash) players
- Java software
- Internet Browsers
- Audio / Video players, conversion packages
- Movie maker tools
- You-tube videos download

ICT Media types

- Documents (pdf / WORD etc.,)
- Power Point Presentations
- Audio clips
- Images / Graphics
- Videos / Movies
- Spread sheets (Work sheets / Tables)
- Flash animations

2D & 3D Visualizations in Mathematics Teaching

- ✶ The role of visualization in Mathematics learning cannot be underestimated, especially in **Geometry learning.**
- ✶ One of the most difficult problems in teaching introductory Geometry is conveying the two and **three dimensional structures** to the students.

- That can be easily achieved with the **use of animations**, simple modelling applications and didactic movies.
- Geogebra is one of the software to represent 2D and 3D figures and calculating their parameters like lateral surface area , total surface area and volume.
- Intellispace application provides to us the flexibility to draw the graph sheet where we can show the students various kinds of equations and expressions in graphical representation like Ogive Curves, Parabola, straight line, Bar diagrams , Pie diagrams, Histograms etc.
  The equipment necessary for such visualization is a Digital board K-YAN projector
- The other improvement for the Digital board K-YAN projector, which settled in classrooms, is the so-called **Interactive Learning Environment.**
- A standard equipment of such a classroom is usually an **Interactive Whiteboard, interactive screens, Tablets** and **Electronic Assessment Systems** (also called Personal Response Systems or PRS).
- The use of **PRS** is not only allows the teacher to control the progress of the students , but it also helps them to teach classes with the use of **problem based methods.**
- In the near future we can expect further development of ICT technologies and new solutions introduced to classrooms, i.e. 3D visualization systems combined with elements of a **virtual reality** .

What are the Steps to be followed ?

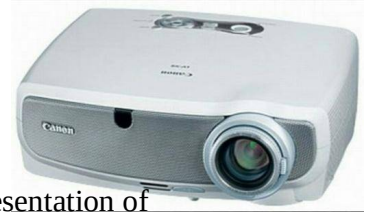
I. Basics of presentation

- ✔ Rules of the transfer of information aided by multimedia tools.
- ✔ Use various techniques of visualization;
- ✔ Design an arrangement of contents (colors, spacing, graphics etc.).

II. The use of the overhead projector

- Familiarize students with the techniques of visualization based on the overhead projector.
- Using a single layer and complex transparencies.
- Conducting experiment demonstrations on the overhead projector's plate.

III. The use of the multimedia projector



Learn how to:

- ✔ Create attractive and eye-catching multimedia presentations,
- ✔ Operate graphics, sound and video files,
- ✔ Use the digital camera and multimedia projector setup for the presentation of experiments at the micro level.

IV. Interactive learning environment

- ✔ Familiarize with the techniques of teaching with the use of the interactive whiteboard, electronic assessment systems and tablets.
- ✔ Specification, composition and advantages of various Learning Environments.
- ✔ Using PRS Personal Response System for assessment.

V. Mind and Concept maps

✔ Application of the Mind Mapping and Conceptual Mapping techniques supported by chosen software.

✔ Teaching classes with the use of activation techniques.

VI. Elements of e-learning

✔ Learn about the possibilities of enriching school courses with e-learning materials and various ways of realization of distance learning (mobile learning, blended learning, different ways of blending etc.).

✔ Students have an opportunity to watch several popular e-learning platforms and their advantages

✔ Preparation of e-learning classes with the use of files prepared in previous units.

✔ MOODLE e-learning platform.

Wolfram mathematica:-

With Mathematica Online, you can go to any web browser and immediately compute with Mathematica or read, author or interact with any Mathematica notebook or CDF document.

Maple:-

Maple is math software that combines the world's most powerful math engine with an interface that makes it extremely easy to analyze, explore, visualize, and solve mathematical problems.

Solve math problems easily and accurately, without worrying that you've lost a minus sign somewhere

Solve math problems quickly that you could never do by hand (or that you wouldn't want to do by hand because life is too short!)

Solve problems from virtually any branch of mathematics or field that relies on mathematics, such as calculus, algebra, statistics, linear algebra, physics, optimization, group theory, geometry, number theory, etc. Gain insight into your problem, solution, data, or concept using a huge variety of **customizable 2-D and 3-D plots and animations.**

SageMath :-

SageMath is a free open-source mathematics software system licensed under the GPL. It builds on top of many existing open-source packages:
NumPy, SciPy, matplotlib, Sympy, Maxima, GAP, FLINT, R and many more. Access their combined power through a common, Python-based language or directly via interfaces or wrappers.

MATHCAT:- A Flexible Testing System in Mathematics Education for Adults.

Desmos Graphing Calculator:-

At Desmos, we imagine a world of universal math literacy and envision a world where math is accessible and enjoyable for all students. We believe the key is learning by doing.

Microsoft mathematics:-

Microsoft Mathematics (formerly *Microsoft Math*) is a freely downloadable educational program, designed for Microsoft Windows, that allows users to solve math and science problems. Developed and maintained by Microsoft, it is primarily targeted at students as a learning tool. Microsoft Math contains features that are designed to assist in solving mathematics, science, and tech-related problems, as well as to educate the user. The application features such tools as a **graphing calculator** and a **unit converter.** It also includes a **triangle solver**, and **an equation solver** that provides step-by-step solutions to each problem.

Geogebra:-GeoGebra is an interactive geometry, algebra, statistics and calculus application, intended for learning and teaching mathematics and science from primary school to university level. GeoGebra is available on multiple platforms with its desktop applications for Windows, macOS and Linux, with its tablet apps for Android, iPad and Windows, and with its web application based on HTML5 technology.

On the other hand, equations and coordinates can be entered directly. These two views are characteristic of GeoGebra: An expression in the algebra window corresponds to an object in the geometry window and vice versa . GeoGebra presents the main advantages in teaching and learning mathematics: easy teaching and easy learning, quick and correct grasping of the concept, and provision of an interactive learning environment.

The following are some very useful Math websites specifically handpicked for teachers to use with their students.

www.aplusmath.com
Aplus Math provides Interactive math resources for teachers, parents, and students featuring free math worksheets, math games, math flashcards, and more.
www.mathtv.com
Math TV is a platform that features a wide range of math videos covering a plethora of mathematical concepts. These videos are browsable via topic or by textbook.
www.aaamath.com
AAA Math offers thousands of arithmetic lessons from kindergarten through eighth grade. Unlimited practice is also available on each topic which allows thorough mastery of the concepts.
www.mathisfun.com
This philosophy behind this website is to make math learning fun and enjoyable. It features a myriad of lessons and activities provided by teachers and math community from all around the world.
www.mathcentral.com
Math Central is an Internet service for mathematics students and teachers. This site is maintained by faculty and students in Mathematics and Statistics and Mathematics Education at the University of Regina in Canada.
www.tenmarks.com,www.mathsframe.com,,www.smile.com,www.themathforumatdrexel.com,www.simpsonsmath.com,www.superkids.com,www.mathwords.com,www.mathdrills.com,www.

mathguide.com,www.mathleague.com,www.mathgoodies.com,www.mathaids,com, www.mathbasics.com ..etc

My Class Room Experiences in Using ICT

- An educational approach to teaching and learning that involves groups of students working together to solve a problem, complete a task, or create a product i.e ICT tools enhances 'Collaborative learning' among students.
- In the students increased using computer generated graphics to illustrate relationships of all kinds especially dynamics processes that cannot be illustrated by individual pictures.
- When the children learn the concepts by using multimedia tools, 2D planes and 3D spinning objects, they understand better and learning level of concepts, attention on concept learning increased compared with the traditional class room(block-board) teaching.
- ICT learning improved the class attendance as well as school attendance and motivated the regular absentees to come regular to the school through the effective teaching learning process.
- Even though in my absence to the class, increased the self-learning, self-discipline and self-confidence among students by using ICT.
- ICT improved my quality of instructions about teaching concepts.
- My ICT classroom has been proven to be the right choice when it comes to interactive learning in class room.
- My ICT classroom has been increased the attention of the children on learning new concepts and knowing the concepts which are exists in text books.
- I broaden the walls of my classroom with ease, and take learning to the next level by making study material easily accessible for the students.
- Through this ICT I now feel confident with using Technology with students, as I am building an array of skills and resources which can be used in class room to enhance learning through the field of ICT.
- I am excited and I now feel ready to let go and take a **Student centered approach** to teaching as opposed to a **Teacher centered approach**.
- If employed effectively, innovative teaching practices can result in high quality learning.

Recommendations

- **Outline below are some recommendations on the way ICT can be used to enhance Mathematics education.**

✔ ICT education should be made **compulsory** in all schools.

✔ Serving Mathematics education teachers should be given the opportunity to be ICT literate through in service education.

✔ Government should ensure provision of **ICT facilities** in schools.

✔ Every school should have an **ICT coordinator**

✔ Modern **computer laboratories**should be provided in schools.

✔ Government should ensure the provision of **Internet connectivity** to every school.

STATE LEVEL MATHEMATICS SEMINAR 2022

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THEME:- "WAY FORWARD TOWARDS INNOVATIONS IN MATHEMATICS TEACHING"

Sub Theme:-"Innovative Strategies in Teaching Mathematics to create students interest towards mathematics"

"سہ ابعادی اشکال کے سطحی رقبے اور حجم- مشغلاتی طریقے کی مدد سےضوابط اخذکرنا":-

موضوع کا عنوان(Title of the Topic)

تعارف (Introduction)

بچوں کی ہمہ جہتی ترقی کے لیے کوشش کرنا ہمارا فرض ہے۔ ہم یہ جانتے ہیں کہ بچے اسکول کے باہر اپنی مرضی و پسند کے مطابق سیکھتے ہیں اور کئی چیزیں بہ آسانی سیکھ چکے ہوتے ہیں۔لیکن اسکول میں ہماری توقع کے مطابق سیکھ نہیں پاتے ہیں۔ یہ خیال درست نہیں ہے کہ مختلف دلچسپی، رجحانات اور خصوصیات کے حامل بچےایک ہی طریقے سے سیکھ سکتے ہیں اور ایک جیسی فطرت رکھتے ہیں۔ بچوں کی تدریس بامعنی اور فہم آور ہونے کے لیے ان کی قابلیتوں کی جانکاری بے حد ضروری ہے ، کیوں کہ ہر بچہ قابل ہوتاہے۔ قومی تعلیمی درسیاتی خاکہ 2005بھی اسی پر زور دیتاہے۔

پیش کش (Presentation):-

ریاضی کی نوعیت و فطرت:-

"ریاضی تہذیب کا ایک آئینہ ہے"۔ علم ریاضی کے بغیر زندگی کا تصور نا ممکن ہے۔ بچے فطرتامشاہدہ کرنا، تقابل کرنا، قیاس کرنا، نتیجہ اخذکرنا، عمومیت جیسی خصوصیات کے حامل ہوتے ہیں۔ فطری اوصاف ، اس کی صلاحیتیں بچوں میں ریاضی کے اعمال سیکھنے میں مددگار ہوتے ہیں۔

ریاضی سے مراد مسائل کا حل ہی نہیں بلکہ تصورات ، موضوعات کی گہرائی کے ساتھ تفہیم پیداکرتے ہوئے ریاضی کے تئیں شوق و ذوق پروان چڑھاناہے۔

ضوابط کا اخذ کروانا کیوں:-

♦ضابطہ دراصل ایک اُصول یا حقیقت ہے جو ریاضیاتی علامتوں سے ظاہر کیاجاتاہے۔

♦ضابطوں کی مدد سے سوالات سرعت و تیزی سے حل کیے جاتے ہیں

بالخصوص الجبراء ، جیومٹری اور دیگر عنوانات میں ضابطوں کا رول کافی کلیدی ہوتاہے۔
♦ضابطوں کی مدد سے ریاضی کے سوالات کو آسانی سے حل کرسکتے ہیں۔
♦ جواب تک رسائی میں ضوابط کا اطلاق بے حد اہم امر ہوتاہےاور وقت کی بچت بھی ہوتی ہے۔

اغراض و مقاصد(Objectives) :-

ABSTRACTمجرد ⇒ SEMI CONCRETE ⇒ CONCRETEٹھوس

ات ، موضوعات ... س ، پھر نیم ٹھو
طرف پیش کرنے میں کامیاب ہوتے ہیں تو بچوں میں ریاضی کے تئیں خوف کو دور کرنے کے ساتھ ساتھ دلچسپی پیداکرنے والے بنیں گے۔علاوہ ازیں اس سے جڑے مقاصد یہ ہیں

بچوں میں علم ریاضی سے متعلق دلچسپی پیدا کرنا۔
طلباء چشم دید اشیاء کو علم ریاضی زبان میں ظاہر کرنا۔
طلباء میں منطقی سوچ اندازہ لگانے کی صلاحیت کو ابھارنا۔
نظم و ضبط اور تہذیبی اقدار کو فروغ دینا۔
روزمرہ زندگی میں درپیش مسائل کو علم ریاضی کے ذریعہ حل کرنے کی مہارت کو فروغ دینا۔
بچوں میں صحت اور درستگی کے ساتھ مسائل حل کرنے کی مہارت فروغ دینا۔(Speed & Accuracy)
بچوں میں اختراعی صلاحیتوں کو ابھارنا۔

ڈیزائن کی اختراع (Design of the Innovation

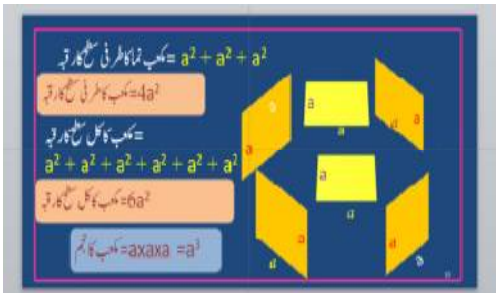
◀مستطیل کے ضوابط کی مدد سے مکعب نما کے ضوابط
◀مربع کے ضوابط کی مدد سے مکعب کے ضوابط
◀دائرہ کے ضوابط کی مدد سے استوانہ کے ضوابط
◀استوانہ کے ضوابط کی مدد سے مخروط کے ضوابط
◀مخروط کے ضوابط کی مدد سے کرہ کے ضوابط اخذ کروانا

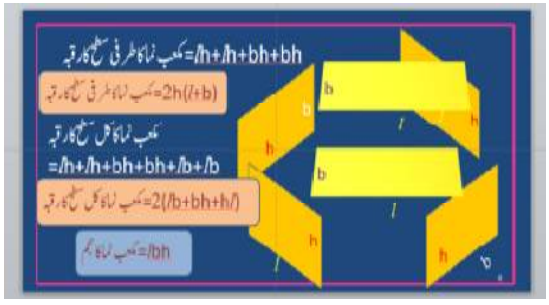
کی تضصیل اختراع (Description of the Innovation)

ہم جانتے ہیں کہ مستطیل کا رقبہ = $l \times b$
مستطیل کا احاطہ $= 2(l + b)$

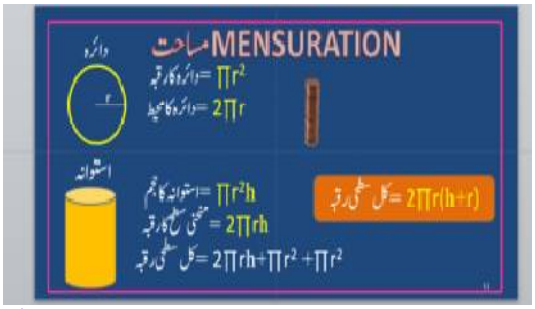
ہم جانتے ہیں کہ مربع $S \times S$ **کا رقبہ =**
مربع کا احاطہ $= 4S$

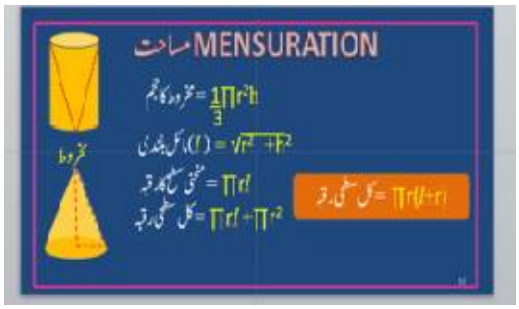
ہم جانتے ہیں کہ دائرے کا رقبہ $= \prod r^2$
دائرے کا محیط $= 2\prod r$



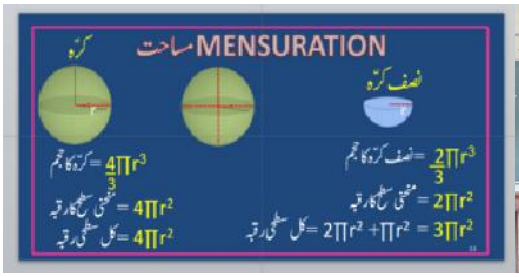


مان لیجئےکہ ایک روپیے کا سکہ کا دائروی شکل میں ہے ۔ اگر ہم سکہ پر سکہ جماتے جائیں گے اندرونی گھیرا ہوا حصہ اس $\prod r^2h$ تو ہمیں استوانہ نما شکل حاصل ہوتی ہے ۔ اس استوانہ نما کا ہوگا۔ کا حجم کہلاتاہے۔ دائرے کا رقبہ ، استوانہ کا حجم بن جاتا ہے جو بلندی بھی رکھتا ہے ۔ اس طرح استوانہ کا حجم

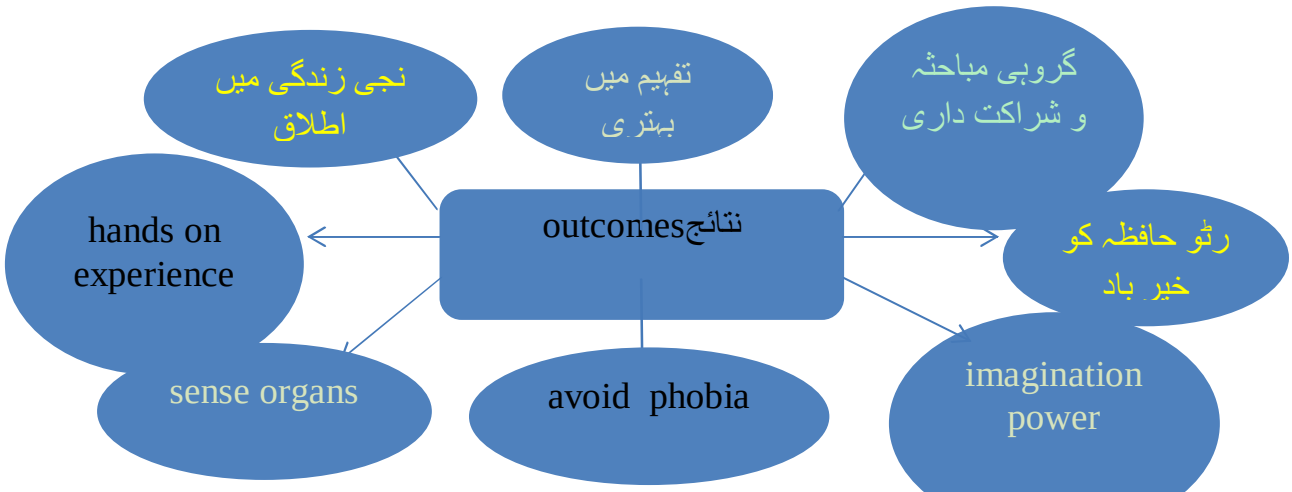




ہم مشاہدہ کرتے ہیں کہ ایک استوانہ کو تین مساوی مخروط میں تقسیم کیا جاسکتاہے جیسے کہ شکل میں دکھایا گیا ہے۔ استوانہ کا حجم کا ایک تہائی حصہ مخروط کا حجم ہوگا۔اس رشتہ کو ہم مشغلہ کے ذریعہ بھی پیش کرسکتے ہیں۔اسی طرح ایک کرہ کو چار مساوی مخروط میں تقسیم کیا جاسکتا ہے ۔ جس سے کرہ کا حجم کا ضابطہ اخذ کیا جاسکتا ہے۔ اس طرح ضوابط کو اخذ کروانے سےریاضی کے تئیں بچوں کی دلچسپی کو بڑھایا جاسکتا ہے اور ریاضی کے تئیں خوف کو دور کیاجاسکتاہے۔



اختراع کے نتائج (Outcomes of the Innovation):-



مضمرات (Implications):-

◄ ایک ریاضی کے معلم کو چاہئے کہ وہ ممکنہ حد تک ریاضیاتی تصورات کوٹھوس سے نیم ٹھوس ، پھر نیم ٹھوس سے مجرد کی طرف پیش کرے۔

◄جیومٹری کے تصورات کو رسمی انداز کے علاوہ اختراعی انداز میں پیش کرنے کی کوشش کرے۔
◄ریاضی کے ضوابط کو رسمی انداز میں پیش کرنے کے بجائے ان کو اخذکرواکر بتلائے۔
◄مشغلاتی طریقہ تدریس میں بچوں کی شراکت داری کو یقینی بنائیں۔

اختتام (Conclusion):-

ہر اسکول میں ایک ریاضی تجربہ گاہ (Maths Lab) کو قائم کیا جائے جو بچوں کی دسترس میں ہونی چاہئے۔ ایسے تصورات جوروزمرہ زندگی سے جڑے ہوتے ہیں ، ان کو مشغلاتی طریقوں سے پیش کیا جائے۔ بچوں میں ریاضیاتی سوچ ، اندازہ لگانے کی صلاحیت ، منطقی سوچ، convergent thinking, divergent thinking کو ابھارنے کے لیے ریاضی لیب کا سہارا لیاجائے۔ ریاضی کو ایک جاندار اور دلچسپ مضمون بنایا جائے۔

حوالہ جات (References):-

My classroom Practices

STATE LEVEL MATHEMATICS SEMINAR 2022

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Qualifications : M.A, B.Ed.

Theme

Way forward towards innovation in mathematics teaching

Sub Theme

Innovative strategies in teaching Mathematics to create students interest towards Mathematics.

Title of the paper

" పోటీ పరీక్షల అధారిత తరగతి గదిలతో గణిత భోధన ".

పరిచయము

ఈ పద్ధతుల్లో గణిత భోధన చేస్తే తరగతిలో పాఠ్య పుస్తకములో విద్యా ప్రమాణాలతో పాటుగా నిజ జీవితంలో గణితం ఆవశ్యకత తెలుసుకొని, ఆస్వయించుకుంటూ వివిధ పోటీ పరీక్షలలో పాల్గొనాలనే ఉత్సహం, విద్యార్థులలో కల్పించవచ్చు, అలాగే సృజనాత్మకమకత, ఆలోచనా విధానం, సమస్యా పరిష్కారం అనే నిత్య నైపుణ్యాలు విద్యార్థులు పెపొందించుకుంటారు.

లక్ష్యాలు

గణితమును వినూత్న పద్ధతిలో భోధించడం ద్వారా విద్యార్థులలో ఉన్న సృజనాత్మకథను వెలికితీసి వారిని వివిధ గణిత పోటీ పరీక్షలలో అనగా ఒలంపియాడ్ గణిత పరీక్షలు వ్రాయించి, విజయం సాధించేటట్లు గణితంలో అంశాల వారిగా సులభ పద్ధతులు నేర్పించడం.
ఉదా॥ నిష్పత్తి – అనుపాతము
ఈ అంశంలో విద్యార్థులకు నిష్పత్తి సులభ పద్ధతిలో నేర్పించడం చేశాను.

Title of the paper : **"పోటీ పరీక్షల ఆధారిత తరగతి గదిలో భోధన"**

Detailed information of the topic.

వినూత్న పద్ధతిలో గణిత భోదన

తరగతి గదిలో భోధించే గణితం ఒక్కటే విద్యార్థులకు చాలదు. పోటీ పరీక్షలలో నిలదొక్కుకోవాలంటే విద్యార్థులకు ముఖ్యంగా తార్కిక ఆలోచన, సంశ్లేషణ సృజనాత్మకత, సహనం మరియు సమస్యా పరిష్కారం ఈ నైపుణ్యాలన్నీ విద్యార్థులకు ఉంటేనే తరగతులకు వారు తరువాతి అభివృద్ధిలో ముందుకు వెళ్తారని అందరికీ తెలిసిన విషయము. విద్యార్థులకు గణిత భోదన చాలా పాఠశాలల్లో పాఠ్య పుస్తకం ఆధారంగానే జరుగుతుంది. అసలు అందరిలో అంటే విద్యాపరంగా చూసినట్లయితే గణితం చాలా కఠినమైనది, అన్నీ స్తాయిలకు తగినట్లు లేదని బావిస్తున్నారు. కాని, సులభ పద్ధతుల్లో టెక్నిక్‌లు ఉపయోగించి మరియు తరగతి వారిగా ఉన్న నైపుణ్యాలు సాధించేటట్లు ఉపాద్యాయు భోదన చేస్తే విద్యార్తులకు గణితం సులభతరం అవుతుంది.

గణితంలో ఏలాంటి ఇబ్బందులు లేకుండా ముందుకు సాగాలంటే విద్యార్థులు ప్రతి రోజు పాఠశాలకు హాజరు కావాలి. అలాగే ఉపాద్యాయుడు ప్రత్యక్ష భోదన ద్వారా గణితం నేర్పించడం విద్యార్థులు కూడా ఏ తరగతిలో ఉన్నా ఆ విద్యాప్రమాణాలు అదే తరగతిలో నేర్చుకొని సాధించడం, తరగతి గదిలో వచ్చిన సందేహాలను ఉపాద్యాయుడిచే ప్రతిరోజు నివృత్తి చేసుకోవడం చేయాలి. ఉపాద్యాయుడు గణిత భోదన ఆకర్షనీయంగా మరియు విద్యార్థులకు అర్థము అయ్యే టట్లు నిత్య జీవితంలో గణితం అన్వయించు కుంటూ సమస్యలు సాదించేటట్లు నేర్పించాలి.

గణిత భోదనలలో కొత్త వ్యూహాలను ఉపయోగించి నేర్పించం

గణితం అంటేనే మొదట విద్యార్థులు భయపడతారు, గణిత భోదన వినూత్న పద్ధతిలో ఎలా చేస్తే విద్యార్థులు పోటీ పరీక్షలలో గాని, గణిత నైపుణ్యాలు సాధించడంలో పట్టు సాధిస్తారో తెలుసుకొని, నేను కూడా నా ఈ వృత్తిలో గణితం అంటేనే ఈజీగా విద్యార్థులకు అర్థము అయ్యే రీతిలో భోదించాలని గణిత పరంగా మా విద్యార్థులను అన్ని రంగాలలో ముందుచాలని అనుకొని, ఈ వృత్తిలో గౌరవ ప్రదంగా కొనసాగాలని గణిత భోదనను కొత్త వ్యూహాలతో భోదించాలని, అనుకున్నాను. అలా తరగతి గదిలో గణిత భోదన ఒక సవాలుగా స్వీకరించాను. ప్రతి రోజు గణితంలో నూతన పోకడలకు అనుగుణంగా నేను నేర్చుకుంటూ విద్యార్థులకు నేర్పించడం మొదలు పెట్టాను.

- ప్రతిభావంతమైన మరియు ఆకర్షనీయమైనది ఉపయోగకరమైన గణిత భోదనోపకరణాలను తయారు చేసి వాటి ద్వారా ప్రయోగాత్మకంగా భోధన కొనసాగించాను.
- గణిత సూత్రాలను మరియు జామితీయ భావనలను సవివరంగా వివరించి, చెప్పడం మరియు ప్రయోగాత్మకంగా నమూనాలు తయారు చేసి వాటి నిరూపణలు ప్రయోగాత్మకంగా చూపడం ఆరంబించాను
- చాలా సంక్లిష్టమైన గణిత పద సమస్యలు పరిష్కరిస్తూ నిజ జీవితంలో గణితం అన్వయించు కుంటూ గణిత చిక్కుముడులు కనుక్కోవడం లాంటివి నేర్పించాను. ఇక్కడ ఏ పోటీ పరీక్షలలో పాల్గొనాలన్న ఆంగ్ల భాష ముఖ్య దానికోసం నేను మరియు మా విద్యార్థులు ఆంగ్ల బాష నేర్చుకొని గణితంలో ముందుకు నడిచాము.

- తరగతిలో ప్రత్యక్ష భోధనలతో పాటు విద్యార్థులకు గణితం అంటే భయం పోగొట్టే విధంగా ఆట పాటలతో గణితం నేర్పిస్తూ, భోదనోపకరణాలను ఉపయోగిస్తూ, తరగతి గదిలో విద్యార్థులను అధికంగా పాల్గొనేటట్లు చేయడం మరియు కృత్యాధార భోదన కొనసాగించాను.
- నా ఈ ప్రయత్నంలో వేద గణితం రాష్ట్ర, జిల్లా రిసోర్స్ పర్సన్‌గా ఎన్నికై హైద్రాబాదు ఉస్మానియా యూనివర్సిటీలో నేర్చుకోవడం జరిగింది. అలాగే ఆన్‌లైన్ ద్వారా ఒలంపియాడు గణితం నేర్చుకొని ఉన్నాను. ప్రతి వారంలో రెండు ఉదయం మరియు సాయంత్రం అధనంగా ఒక గంట సమయం ఒలంపియాడ్ గణితం మరియు వేద గణితం ప్రత్య భోధన ద్వారా పాఠశాలలోని విద్యార్థులందరికీ నేర్పిచడం ప్రారంభించాను.
- అంటే తరగదిలో భోబించే పాఠ్య పుస్తకం ఆదారంగా గణితం కాకుండా కొత్త పద్దతిలో వినూత్నంగా గణిత సామర్థ్యాలఆదారంగా సులభంగా అర్థము అయ్యేట్లు గణిత భోదన చేయడం చేశాను.
- గణితం పోటీ పరీక్షలలో ఒక సమస్యను ఏలా వేగంగా చేయవచ్చు, విభిన్న పద్దతుల్లో సమస్యలు సాధించే విధంగా నేర్పించుతూ, ఒక విషయానికి సంబంధించిన ప్రశ్నను ఎన్ని రకాలుగా ఎలా తయరు చేయవచ్చు, దాన్ని మనం తక్కువ సమయంలో ఎలా సాధించ వచ్చు అనే విషయాలు విద్యార్థులకు నేర్పించి ప్రయోగాత్మకంగా నేర్పించడం మొదలుపెట్టాను.
- నా ఈ ప్రయత్నంలో వేద గణితం జిల్లా రిసోర్స్‌పర్సన్స్‌గా ఎన్నికై హైద్రాబాదు ఉస్మానియా యూనివర్సిటీలో నేర్చుకోవడం జరిగింది. అలాగే అన్‌లైన్ ద్వారా ఒలంపియాడ్ గణితం నేర్చుకొని ఉన్నాను. ప్రతి వారంలో రెండు రోజులు ఉదయం మరియు సాయంత్రం అధనంగా ఒక గంట సమయం ఒలంపియాడ్ గణితం మరియు వేద గణితం ప్రత్యక్ష భోధన ద్వారా భోధించడం మొదలు పెట్టాను.
- అంటే తరగతి గదిలో భోధించే గణితమే కాకుండా కొత్త పద్దతిలో వినూత్నంగా గణిత సామర్థ్య ఆధారంగా సులభంగా అర్థమయే విధంగా గణిత భోదన చేయడం ప్రారంభించాను.
- గణితం ఒక సమస్యను ఏలా వేగంగా చేయవచ్చు, విభిన్న పద్దతులలో సమస్యలు సాధించే విధంగా నేర్పించుతూ, ఒక విషయానికి సంబధించిన ప్రశ్న ఎన్ని రకాలుగా ఎలా తయారు చేయవచ్చు, ఎలా అడుగుతారు దాన్ని మనం తక్కువ సమయంలో ఎలా సాధించ వచ్చు అనే విషయాలను విద్యార్థులకు నేర్పించి ప్రయోగాత్మకంగా చేయించడం మొదలు పెట్టాను.
- గణిత మేళాలు, గణిత ప్రశ్నల తయారీ ఫజిల్స్ లాంటివి, క్విజు మరియు కబుత్యాధార భోధనకు ఉపయోగపడే వీడియోలు విద్యార్థులచే నిర్వహింప చేసి వారిని అన్ని రంగాలలో ముందుడేటట్లు ప్రోత్సహించడం జరిగింది. అలా చేసిన విద్యార్థులకు అభినందనలు, బహుమతులు అందజేసి గణిత పరంగా ప్రోత్సహించడం జరిగినది.
- మా పాఠశాల విద్యారులు ఇలా గణితం పరంగా చాలా మెలకువలు నేర్చుకొని, ఉత్సాహంగా "గణితం లేనిదే మేము లేము – మేమే గణితం, గణితంలో మేము" అన్నట్లు తయారు చేశాను. 2013 సం॥ నుండి ఏ గణిత పోటీ పరీక్షలు ఎక్కడ నిర్వహించినా మా పాఠశాల పిల్లలను పాల్గొనే విధంగా ప్రోత్సహించి, అన్నీ పోటీ పరీక్షలలో పాల్గొనేటట్లు తీసుకువెళ్లేదాన్ని, అలా మండల స్తాయిలో, జిల్లా స్తాయిలో, రాష్ట్ర స్తాయిలో మరియు జాతీయ స్తాయిలో గణిత పోటీ పరీక్షలలో విద్యార్తులు పాల్గొని ఎన్నో అవార్డులు, మరియు రివార్డులు స్కాలర్‌షిప్ నగదుగా పురస్కారాలు, బంగారు పథకాలు, సాధించారు.
- కరోనా సమయంలో కూడా టెక్నాలజీని ఉపయోగించి, వినూత్నంగా జూం ద్వారా గణిత భోధన మరియు క్విజు లాంటివి నిర్వహించాను, డిజిటలు కాటెంటు రూపొందించి పాఠశాలలో టి.వి. ద్వారా లేదా ప్రొజెక్ట ద్వారా వివరణ చేసి చెప్పడం జరిగింది. యూ-ట్యూబ్ ద్వారా చిన్న చిన్న విడియోలు చేసి విద్యార్థులు కూడా టాపిక్కు ఎంచుకొని, వీడియోలు చేసి ప్రదర్వన చేయించేదాన్ని ఇలా విద్యార్థులను గణిత పరంగా చాలా ముందుకు తీసుకువెళ్లగలిగాను.
- 2013 సం॥ నుండి 2022 సం॥ వరకు జిల్లా స్తాయిలో ఏ గణిత పోటీ పరీక్షలోనైనా మొదటి స్థానంలో నిలిచేవారు. అలాగే ఇండియను లాటెంటు టెస్టు ముంబయి వారి ఒలంపియాడ్ గణిత పోటీ పరీక్షలలో పాల్గొని 6వ తరగతి నుండి 10తరగతి వరకు విద్యార్థులు రాష్ట్ర స్థాయి ర్యాంకులు, మరియు 1 నుండి 10వ ర్యాంకు లోపల ప్రతి సం॥ము ముగ్గురు లేదా నలుగురు ఎంపికై బంగారు పథకాలు సాధించారు. అలాగే 2018 సం॥ నుండి 2022 సం॥ వరకు ఇండియను టాలెంటు టెస్టు ముంబయి వారు జాతీయ స్తాయిలో గోల్డన్ స్కూల్ అవార్డు మరియు ఉత్తమ ఇన్స్పైర్ గణిత ఉపాధ్యాయు అవార్డు ఎంపిక చేసి. అందజేశారు.

వివిధ పోటీ పరీక్షలలో మా విద్యార్థుల ప్రతిభ

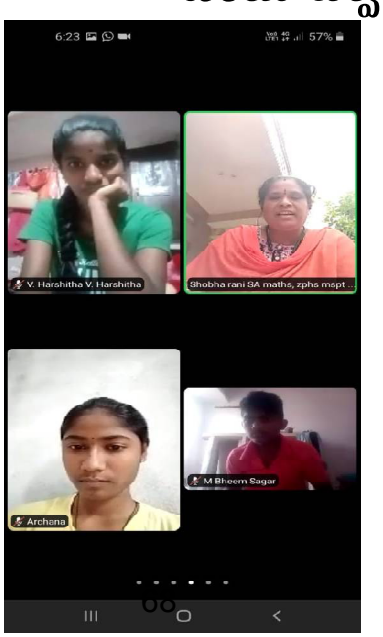
- ఇండియను టాలెంట్ టెస్టు మరియు తెలంగాణ గణిత ఫోరం ఆధ్వర్యంలో రాష్ట్ర స్థాయిలో జరిగే గణిత ప్రతిభా పరీక్షలలో మరియు ఆర్యా సొసైటీ, వరంగల్లు వారు నిర్వహించు గణిత పోటీ పరీక్షలో ఉత్తమ ప్రతిభ కనబరచిన మా విద్యార్థులను మరియు గణిత ఉపాధ్యాయులను, రాష్ట్ర మంత్రివర్యులు, డా॥ వి. శ్రీనివాసు గౌడను, జిల్లా కలెక్టరు, జిల్లా విద్యాశాఖాధికారి, మా విద్యార్థులను ప్రశంసించి, ఉపాధ్యాయులను అభినందించి, బహుమతులు అందజేయడం జరిగింది.
- జాతీయ గణిత దినోత్సవం సందర్భముగా 2019 సం॥లో మా పాఠశాల రాష్ట్ర స్థాయిలో SCERT నుండి గణిత సంబంధాలకు ఎంపిక కాబడి నగదు పురస్కారం అందజేసి గణిత దినోత్సవం గణంగా జరుపుకోవడానికి అవకాశం కల్పించారు.
- ఈ విధంగా ఏ పోటీ పరీక్షలలోనైనా జడ్.పి.హెచ్.ఎస్. ముసాపేట్ పాఠశాల విద్యార్థులు గణిత పరంగా ప్రతిభను చాటుతూ ముందుకు దూసుకువెళ్లారు.






జాతీయ గణిత దినోత్సవము – 2019
SCERT వారిచే ఎన్నిక కాబడిన పాఠశాల గణిత సంబరాలు

జూమ్ ద్వారా బోధన



గణిత భోధనలో ఉపయోగించిన వ్యూహాలతో పాటు వినూత్నంగా ఇంకా భవిష్యత్తులో గణితాన్ని భోధించడం.

- విద్యార్థులకు ఉపాధ్యాయుడు గణితం ఎక్కువగా ప్రత్యక్ష భోధనలో నేర్పిస్తేనే ఫలితం, నేను కూడా ఈ పద్ధతిలోనే నేర్పించుతాను.
- విద్యార్థి ఒక తరగతి నుండి మరొక తరగతికి వచ్చిన మొదట్లో గణిత సామర్థ్యాల ఆధారంగా ముందుకు వెళ్లేటట్లు బ్రిడ్జి కోర్సుగా గణితాన్ని నేర్పించుకొని, చతుర్విద ప్రక్రియలలో ముందుడేటట్లు చేసి గణిత పాఠ్య పుస్తకం భోదన కొనసాగిస్తాను.
- డిజిటల పరంగా కాననటెంట్లను తయారు చేసి ప్రతి రోజు ఒక విషయాన్ని వీడియో రూపంలో విద్యార్థులకు అందజేసి వారానికి ఒక సారి ఆన్‌లైన్ ద్వారా క్విజ్ నిర్వహించడం విద్యార్థులను పాల్గొనే విదంగా ప్రోత్సహించడం గెలుపొందిన వారికి బహుమతులు అందజేయడం చేస్తాను.
- వేద గణితం, ఒలంపియాడ్ గణితం ఇంకా పూర్తి స్థాయిలలో విద్యార్థులకు నేర్పించుతూ గణిత పాఠ్యపుస్తకం ఆధారంగా వర్క్‌బుక్కు తయారి చేసుకొని, విద్యార్థులందరికీ అందజేస్తూ, పూర్తి చేయించడం చేస్తాను.
- విద్యార్థులకు ఉపాధ్యాయుడు గణితం ఎక్కువగా ప్రత్యక్ష భోధనలో నేర్పిస్తేనే ఫలితం, నేను కూడా ఈ పద్ధతిలోనే నేర్పించుతాను.

ప్రస్తుతం నేను నా పాఠశాలలో చేయు విధానం.

- మా పాఠశాలలో బీద విద్యార్థులకు నోటుబుక్కులు మరియు గణిత సామాగ్రి ఇప్పించడం 10వ తరగతి విద్యార్థులకు యూనిట్టు వారిగా 1, 2, 4 మార్కుల ప్రశ్నలు, బహుళైశ్చిక ప్రశ్నలు తయారు చేసి టైపుసెట్టింగు చేయించి అందరికి అందించడం జరుగుతుంది.
- పోటీ పరీక్షలకు అనుగుణంగా 6వ నుండి 10వ తరగతి విద్యార్థులకు గణిత విషయాల వారిగా ప్రశ్నల తయారీ జవాబులు నోట్సు ఇవ్వడం జరుగుతుంది.

లక్ష్యాలు వివరణ

- గణితమును వినూత్న పద్ధతిలో మరియు సులభ పద్ధతిలో భోధించుటకు నేను ఒక అంశముగా నిష్పత్తి అనుపాతం అనే అంశాన్ని తీసుకున్నాను.

  ఈ అంశంలో సులభంగా నిష్పత్తిని కనుగొనే విధానం క్రింది విధంగా నేర్పించాను.

  ఉదా॥ A:B = 5:6, B:C = 3:4 అయిన A:B:C నిష్పతిని కొనుగొనండి.

  దీనిని ఈక్రింది రెండు పద్ధతుల ద్వారా సులభంగా కొనుగొనవచ్చు.

  పద్ధతి 1 :

  A:B = 5:6

  B:C= 3:4 అయిన A:B:C నిష్పతిని కొనుగొనండి.

  A:B:C = 15:18:24

  దీని నుండి A:C కూడా కనుగొనవచ్చునని నేర్పించితిని.

  A:C = 15:24

  పద్ధతి 2 :

  A:B = 5:6

  B:C= 3:4 అయిన A:B:C నిష్పతిని ఇంకో పద్ధతిలో ఇలా [illegible]

  A:B= 5 : 6 6

  B:C=3 3 : 4

  A:B:C = 15:18:24

దీని నుండి A:C కూడా కనుగొనవచ్చునని నేర్పించితిని.

A:C = 15:24

మరొక ఉదా॥

P:Q = 3:5, Q:R = 7:2 అయిన P:R మరియు P:Q:R నిష్పత్తులు కొనుగొనండి.

P:Q = 3:5→5

Q 7: 2←

P:Q:R = 21:35:10

P:R = 21:10 లేదా

P:Q= 3:5

Q:R= 7:2

P:Q:R = 21:35:10

P:R = 21:10 ఇలా సులభంగా నేర్పించాను.

అలాగే మూడు నిష్పత్తులు ఇచ్చినపుడు, ఈక్రింది విధంగా కనుగొనవచ్చు.

ఉదా॥ M:S = 3:2, S:R = 5:6, R:N=4:7 అయిన

M:S:R:N=4:7 కనుగొనండి

M:S= 3 : 2→2 2

S:R= 5 : 6→6

R:N= 4 : 7

M:S:R:N=60:40:48:84

దీనిని సూక్ష్మపద్ధతిలో వ్రాయగా M:S:R:N=15:10:12:21 ద్వారా M:R = 15:12 మరియు M:N = 15:21 ఇలా సులభంగా నిష్పత్తులను నేర్పించడం జరిగింది. ఈ అంశంలో నిష్పత్తిని సులభంగా చేయడం నేర్చుకొని, పోటీ పరీక్షలలో ఖచ్చితంగా వేగంగా చేసి విద్యార్థులు విజయం సాధిస్తున్నారు.

చిక్కులు (Implications)

- గణితం బోధించే టప్పుడు క్రింది అంశాలపై దృష్టి పెట్టాలి.
- తరగతి ప్రారంభించే ముందు ఆహ్లాదకరమైన వాతావరణం కోసం విద్యార్థులతో సంభాషించాలి.
- వారానికి ఒకసారి విద్యార్థులు మరియు తల్లిదండ్రులతో ప్రత్యక్ష పద్ధతి ద్వారా సమావేశం తరగతి గదిలో నిర్వహించాలి. దాని ద్వారా పిల్లల సమస్యలను చర్చించడానికి, మరియు వారు తమ ఆలోచనలను పంచుకోవడానికి ఈ కార్యక్రమం సహాయ పడుతుంది.
- విద్యార్థులు తమ ఆలోచనలను వ్యక్తీకరించడానికి మరియు పరిస్థితులను స్వేచ్ఛగా అన్వేశించడానికి విద్యార్థులను అనుమతించాలి.

సూచనలు (References)

- ఇంటర్నెట్ వనరులు
- నా విద్యార్థులు, సహ ఉపాధ్యాయులు, తల్లిదండ్రులకు బోధించే ఆచనాత్మక పరిస్థితి.
- యూట్యూబ్ దారా చిన్న చిన్న వీడియోలు అందించడం.

STATE LEVEL MATHEMATICS SEMINAR 2022

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SUB THEME:

Innovative strategies in teaching mathematics to create students interest towards Mathematics.

TITLE:

FACTORIZATION OF QUADRATIC EQUATIONS (roots of quadratic equation) - Proportionately Method

INTRODUCTION:

Factorization is just reverse of multiplication in the sense that algebraic expression of product of two or more factors are to be found, i.e., Multiplicand and Multiplier.

OBJECTIVES: -

To promote the professional development of the Mathematics teachers.
To enable the teachers relate Mathematics with changing times.
To encourage teachers to come out with innovative ideas in Mathematics to meet the aspirations and challenges of developing India.

PRESENTATION: -

The factors of a trinomial expression have two binomial expressions.

CONVENTIONAL METHOD

Example: - $4x^2 + 21x + 20$

Product of co-efficient of x^2 and constant term is 4x20 = 80

The possible factors are 1x80, 2x40, 4x20, 5x16 and 8x10.

By observing these factors, we can select 5x16 as 5+16 = 21.

$$4x^2 + 21x + 20$$

$$= 4x^2 + 16x + 5x + 20$$

$$= 4x(x + 4) + 5(x + 4)$$

$$= (x + 4)(4x + 5)$$

Instead of this, we can use the **PROPORTIONATELY METHOD** to find the factors in just two steps!

$4x^2 + 21x + 20$

16 5

4:16:: 5:20 = 1:4

First factor is $\boldsymbol{x + 4}$

Second factor is $\frac{4x^2}{x} + \frac{20}{4} = \boldsymbol{4x + 5}$

$$4x^2 + 21x + 20 = (x + 4)(4x + 5)$$

STEPS FOR PROPORTIONATELY METHOD –

To spilt the coefficient of the middle term in two parts such that ratio of coefficient of 1st term of expression with 1st part of middle term coefficient must be equal to ratio of 2nd part of middle term coefficient to be 3rd term coefficient of an expression as well as product of two parts of middle term coefficient must equal to 3rd term of expression.

$$\frac{\textbf{coefficient of first term}}{\textbf{1st part of middle term coefficient}} = \frac{\textbf{2nd part of middle term coefficient}}{\textbf{3rd term coefficient of expression}}$$

Ex:- $x^2 + 10x + 16$

2 8

1. The middle term coefficient is split into 2 and 8. Now, the ratio of 1st term to 1st part (1:2) is same (proportionate) as the ratio of 2nd part to third term coefficient. (8:16 = 1:2)

This ratio gives the coefficients of one of the factors which is $1x + 2$, i.e., $x + 2$

2. For the second factor, we use "**The First by the First and the Last by the Last**" policy. This means, divide the first term of the expression by first term of the factor obtained before and divide the last term of the expression by last term of the factor obtained.

$$\frac{x^2}{x} + \frac{16}{2} = x + 8$$

Hence, the second factor is $x + 8$

Therefore, the factors are $x + 2$ and $x + 8$

Here are few more examples –

1. $x^2 + 21x + 90$

By proportionality, $21x = 15x + 6x$ so that 1:15 = 6:90

$\therefore x + 15$ is a factor

(First by first, last by last) $\rightarrow \frac{x^2}{x} = x$ and $\frac{90}{15} = 6$

Therefore, $x + 6$ is the second factor

$$x^2 + 21x + 90 = (x + 15)(x + 6)$$

2. $3x^2 + 8x + 5$

   Here, $8x = 3x + 5x$ so that 3:3 = 5:5 = 1:1

   $\therefore x + 1$ is a factor.

   $\frac{3x^2}{x} + \frac{5}{1} = 3x + 5$ Therefore, second factor is $3x + 5$

$$3x^2 + 8x + 5 = (x + 1)(3x + 5)$$

3. $5m^2 - 12mn - 9n^2$

   $-12mn = -15mn + 3mn \rightarrow$ 5: -15 = 3: -9 = 1: -3

   $m - 3n$ is a factor.

   $\frac{5m^2}{m} + \left(\frac{-9n^2}{-3n}\right) = 5m + 3n$ Therefore, second factor is $5m - 3n$

$$5m^2 - 12mn - 9n^2 = (m - 3n)(5m + 3n)$$

4. $7p^2 + 20pq - 3q^2$

   7:21 = -1: -3 = 1:3

   $\frac{7p^2}{p} + \frac{-3q^2}{3q} = 7p - q$

$$7p^2 + 20pq - 3q^2 = (p + 3q)(7p - q)$$

With little regular practice, student can easily split the middle term proportionately; apply the policy mentally to get the factors of any given quadratic expressions orally.

Here is another method to find the factors of the quadratic expression –

1. Divide the middle term coefficient by 2.
   Eg: - $3x^2 + 8x + 5$ The middle term coefficient is "8"
   $$\frac{8}{2} = 4$$
2. Find the square of the obtained value.
   $$4^2 = 16$$
3. Subtract the value of product of 1st term coefficient and 3rd term coefficient.

In the above equation, 1st term coefficient is "3" and 3rd term coefficient is "5". Their product is 15.

$$\therefore 16 - 15 = 1$$

4. Find the square root of the obtained value.

$$\sqrt{1} = 1$$

5. Therefore, the factors of the given quadratic expression are the sum and difference of the value obtained in the first step and previous step.
   Here, the value obtained in the first step is 4. Hence, the root values are $4 - 1 = 3\ and\ 4 + 1 = 5$. Therefore, the factors are $(x + 3)\ and\ (x + 5)$

A few more examples –

1. $\boldsymbol{x^2 - 80x + 1564 = 0}$
   Middle term coefficient = 80
   Divided by 2 = 40
   Squaring 40 = 1600
   Subtracting 1564 = $1600 - 1564 = 36$
   Square root of 36 = 6
   Therefore, root values are $40 - 6 = 34\ and\ 40 + 6 = 46$
   As the middle term has a minus sign, the root values will be $-34\ and\ -46$.

2. $\boldsymbol{x^2 + 4x - 6720 = 0}$
   $\frac{4}{2} = 2$
   Squaring 2 = 4
   Subtracting $-6720 = 4 - (-6720) = 6724$
   Square root of 6724 = 82
   Therefore, the root values are $82 + 2 = 84\ and\ 82 - 2 = 80$
   As the middle term coefficient is 4, the factors are $(x + 84)\ and\ (x - 80)$

3. $\boldsymbol{3x^2 - 4x + 10 = 0}$
   $\frac{4}{2} = 2$
   Squaring 2 = 4
   Subtracting 30 = $4 - 30 = -28$

*In this process, if we get a negative value or if we don't get a perfect square, then that equation has IMAGINARY ROOTS.

This process is used to obtain roots of quadratic expressions which have high value of coefficients within seconds.

OUTCOMES: -

With this, they can solve second degree expressions in just few seconds.
Students can improve their mental ability and logical reasoning skills.
As they will be able to solve the expressions easily, they start developing interest towards the subject.

REFERENCES: - SCERT Text book and Vedic Book

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STATE LEVEL MATHEMATICS SEMINAR 2022

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Title of the topic:

"WAY FORWARD TOWARDS INNOVATION IN MATHEMATICS TEACHING"

Sub Theme:

"Innovative strategies in teaching mathematics to create students' interest towards mathematics"

Introduction:

"Mathematics is the gateway and key to all sciences." "Mathematics is the queen of sciences and arithmetic is queen of all Mathematics."

Mathematics is not only a subject, it is a thinking, it is an idea, it is the brain. In my observation that most of the students do not take interest in learning mathematics and feel that it is a difficult subject. Even some parents and teachers also very much concern about it.

The subject is being taught and learnt in an unrealistic and mechanical manner. The way it is being taught, does not help the students to acquire basic skills and basic concepts of the subject.

At present, there is an utmost need to change the methods of teaching Mathematics specially at primary and upper-primary levels so that the students take interest in its learning and do not feel that it is a dull and dry subject.

I have tried to present some of the topics in Mathematics through activity methods and using some IT tools explained the concepts and some example problems how to understand more clearly. The efforts have been made to ensure that the materials or the tools or applications suggested to perform the activitiesand tools used are open free and easily available.

Objectives:

- ✓ Main objective is to teach the student effectively.
- ✓ Explain the abstract topics more easily by using relevant online tools

- ✓ Over come the gap in basic Maths skills which are abstract to understand
- ✓ Virtually connect the students and maintain e class rooms instead of direct classes
- ✓ Only open free tools and software should be used and the same is promoted
- ✓ To promote the professional development of Mathematics teacher
- ✓ Learning by doing is the main motto to prepare and suggest the activities

Presentation:

Mathematics is a reasoning subject. Although it seems that there are abstract concepts internally, they can be simplified by using proper teaching methods, new innovative methods and ideas in teaching. Here some of the maths concepts in higher classes, their difficulty, the difficulties faced by the students in learning the topics, learning gaps etc. And the explanations made by me in an innovative way and various new digital tools have been explained.

We as Maths teachers prepared digital content and presented to the students through online platforms like Zoom App or Google Meet or Ciscowebx and other tools. Some of the tools or Applications used to prepare digital content are:

- ❖ Geo Gebra
- ❖ Robo Compass
- ❖ Power point presentations
- ❖ Mathematics websites
- ❖ SCERT/NCERT and other official websites
- ❖ Zoom/Meet virtual platforms
- ❖ Mobile/Android tools

The use of ICT in teaching learning process is a rapidly emerging phenomenon and it has been the educational researchers focus

Today, information and communication technology (ICT) is of first race in the education systems, particularly in the field of education, science, engineering, medical development processes

ICT provides a collection of powerful tools that can help in transforming the present sheltered, teacher centred and text-bound classrooms into technology enriched, student-focused and interactive knowledge environments

ICT plays a major role in creating the pleasant classroom environment in the present scenario.

Nowadays the dropouts in school as well as higher education are on the fear of the subject like mathematics.

In order to create interest in mathematics subject and reduce the dropout level ICT plays a major role in create the learning environment in mathematics

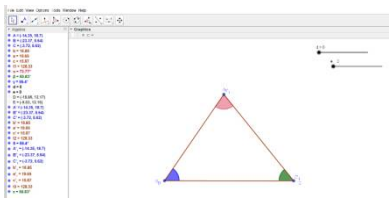
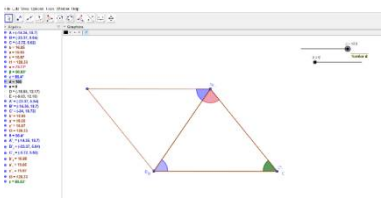
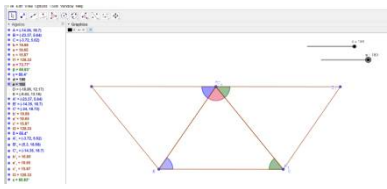
ICT tools like Robocompass, Geogebra, Desmos plays a precious role to develop the mathematical skill among the students and it is used to improve the skill for slow learners.

Concept/Example1:

The concept of "The sum of three angles in a triangle is equal to 180^0 "

in text book it is given the activity that cut the three angles from the corners or at the vertices and paste them on one line they show the straight line, which is straight angle equal to 180^0. This same thing I have prepared using geogebra application. The images are shown here and the file link is presenting with you. This is the openfree software and easily the concepts can be understood by the students.

The most important feature of this application is that students can have hands on experience and they can check the result by themselves.

Geogebra file link of above example

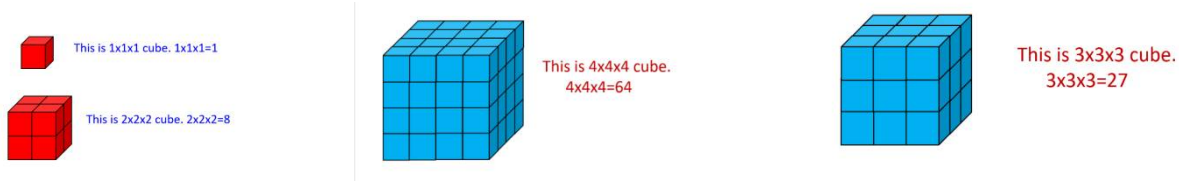
https://drive.google.com/file/d/1EKvJRh5pdKaIsAH7NuTq1YnvydTvq0Pr/view?usp=share_link

Video file link of above example

https://drive.google.com/file/d/1bK1anCA739fUtzjIaj7CAaCo55L8Inkc/view?usp=share_link

Concept/Example 2:

Explaining the cubes of natural numbers 1^3, 2^3, 3^3, 4^3, …. by showing unit cubes diagrams as shown below



The number of cubes as well as their volume also can be explained by these slides...

These cubical figures are shown with animations that one-by-one fly on to count and also to measure total volume

Next level they need to answer 5x5x5, 6x6x6, 7x7x7….

PPT of the above example is given below

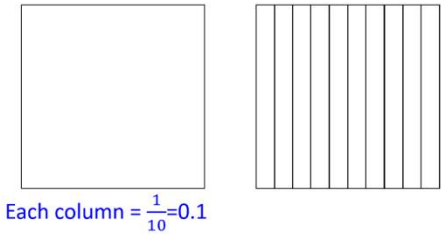
https://docs.google.com/presentation/d/1FpHy7WahXPRB7QGYtMeIJ5kQxdAGccjh/edit?usp=share_link&ouid=107840955933273339253&rtpof=true&sd=true

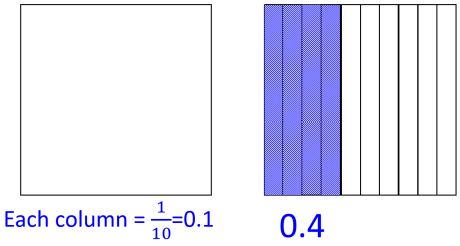
Video link of the above example

https://drive.google.com/file/d/1IJNFXrvLwiTONxtqreCTJenwOUd5l79l/view?usp=share_link

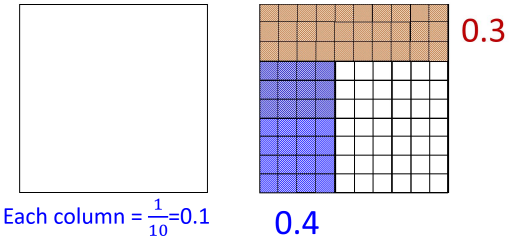
Concept/Example 3:

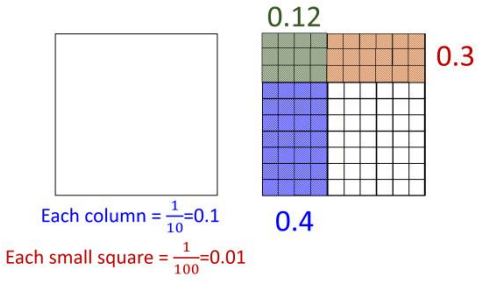
Multiplication of decimals through power point presentation and activity to make the students better understand. The following pictures explains the process of multiplication of decimal numbers.





PPT link of above example

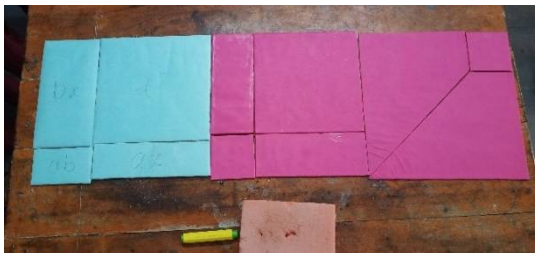




https://docs.google.com/presentation/d/1FpHy7WahXPRB7QGYtMeIJ5kQxdAGccjh/edit?usp=share_link&ouid=107840955933273339253&rtpof=true&sd=true

video link of the above example

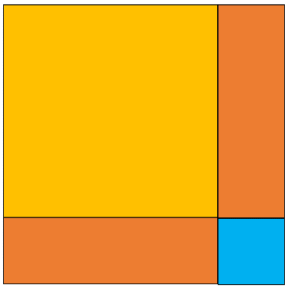
https://drive.google.com/file/d/1lUWTiuZ6lRR7R-NRG6WHKFe8yPGbSUOn/view?usp=share_link

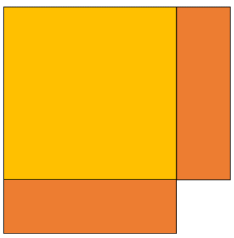


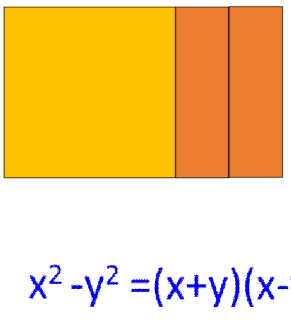
Concept/ Example 4:

Geometrical proof of algebraic identities.

$x^2 - y^2 = (x+y)(x-y)$







Video link of above example

https://drive.google.com/file/d/1SQSq8X1LPs4v0ZOGlkthQ3x0hWa4mTc4/view?usp=share_link

PPT link of above example

https://docs.google.com/presentation/d/1FpHy7WahXPRB7QGYtMeIJ5kQxdAGccjh/edit?usp=share_link&ouid=107840955933273339253&rtpof=true&sd=true

Here we have another method that proving algebraic identities geometrically. The following pics explains the formula geometrical proof

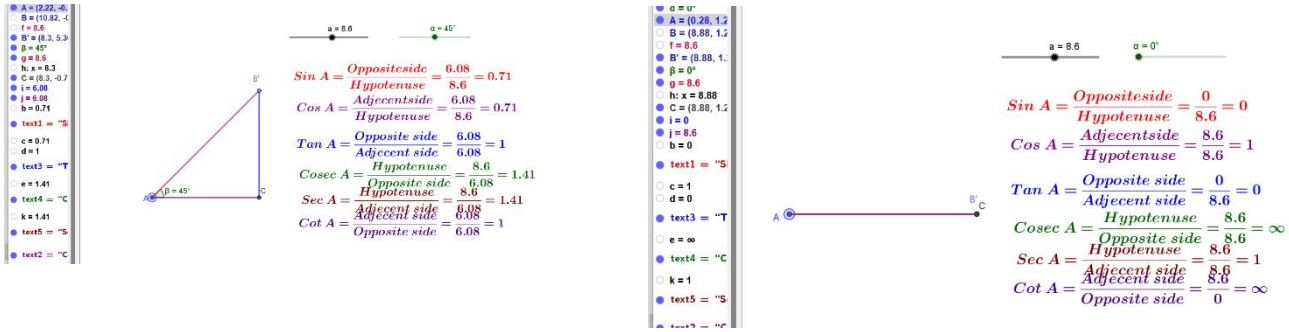
Video link

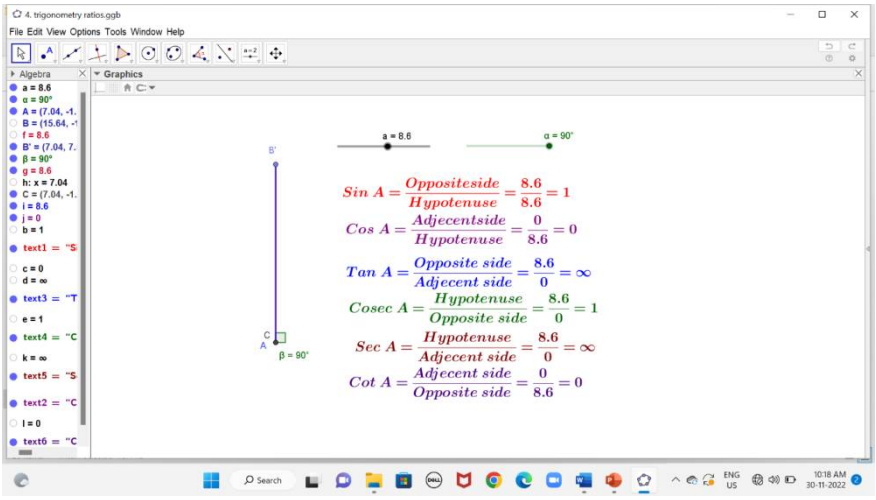
https://drive.google.com/file/d/1WeQGMPrMS1zsRl_8lZBDb9RoO6gJ9By6/view?usp=share_link

Concept/Example 5:

Trigonometric ratios of 0^0 and 90^0 are not understand easily by the students, that they should imagine the triangle without three sides and only one line will be formed. When angle is 0^0 opposite side becomes zero and when angle is 90^0 then adjacent side becomes zero

This can be explained easily by animations of geogebra application. With the help of the animations, we can explain all trigonometric ratios easily.





Geogebra file link of above example

https://drive.google.com/file/d/1IrraxRNCBeqL7TCdWTVEw2uhza7ZS6Uv/view?usp=share_link

Video link

https://drive.google.com/file/d/18KxzD2g0RkaPG5er8Sb4J-EhC7qooOk-/view?usp=share_link

Now a days Mathematics teaching become very dry and especially in our govt schools' children are not instructing to practice the concepts at their homes.

Class room teaching is not enough for mathematics ability, in home parents should take care

The website of GeoGebra is www.geogebra.orgwe can download material and resources from this open free website and all cc-files of GeoGebra.

Example file prepared by me is given by my drive link here https://drive.google.com/file/d/1DpaMgRdmw3uVKAiEYrXnu-52itFLSOMt/view?usp=sharingx

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Some of the animations used and prepared in GeoGebra by me to explain to my students in my school are shown below.

- This GeoGebra file explains the ratios of all trigonometric ratios and the special angles also.

Here I am sending the link of my prepared GeoGebra file from my google account.

https://drive.google.com/file/d/1TXuz2Ty3AOinZkaAkLFMl4-vpmmcAGvI/view?usp=sharing

- Here this file explains the sin and cos values from 0 deg to 360 deg. Students are able to understand clearly by the animation part

https://drive.google.com/file/d/1DGdancyLUgnpnPYL5QU4oNb6Hzcwft8Y/view?usp=sharing

GeoGebra provides different Views for mathematical objects:

Each View offers its own Toolbar that contains a selection of Tools and range of Commands as well as Predefined Functions and Operators that allow us to create dynamic constructions with different representations of mathematical objects.

- This is the animated explanation of Curved Surface area of Cylinder, with this, children can understand easily by opening the net diagram of cylinder

https://drive.google.com/file/d/1vuvPdYJ1N3RI8iDP5wXEnluAJgDhOWzj/view?usp=sharing

- How do we get Π (pi) value as irrational number up to ten decimal places is explained in this geo geogebra file.

https://drive.google.com/file/d/1xjCM_DIdIzdnLQV4xqOf7uCiqsA8qgeG/view?usp=sharing

Besides Geometric Objects GeoGebra can also handle

- Numbers and Angles
- Complex Numbers
- Boolean values
- Lists
- Matrices
- Texts
- Images

Challenges of innovative/online classes in my school:

- All the teachers are not aware of the tools used
- Electric supply is not in proper way to show digitally
- Internet facility is not available in most of the schools
- Lack of sources to the parents and they may not show interest on home tasks given by the teachers
- Parenting is not up to the mark, and students they don't follow daily home works given by the teachers
- Resources like internet, mobile is not used by the students for education only, they are using these resources for other things only

Conclusion:

- Teaching mathematics is not difficult. It should be changed according to the levels of the students and atmosphere in the school or village
- Using different strategies is must. We should attract the students by several methods

References:

- SCERT/NCERT websites
- www.geogebra.org
- www.robocompass.org
- https://worldofteaching.com/mathspowerpoints
- Online open-source materials

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STATE LEVEL MATHEMATICS SEMINAR 2022

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THEME: "Way Forward towards Innovation in Mathematics Teaching".

SUB-THEME: Innovative strategies in teaching mathematics to create students interest towards mathematics.

INTRODUCTION: Mathematics is an important knowledge base. Learning Math not only helps children develop knowledge, logical thinking, analysis but also creativity and imagination. These skills are all very important in a child's learning and life. It is common knowledge that many people are not big fans of math. This anxiety begins at an early age, creating lasting feelings of frustration with the subject. In most cases, this is caused by a lack of understanding of the main concepts. Our children constantly complain about how 'boring and dull' the mathematics classes are and for the right reasons. It is ironic that we are supposed to be teaching them mathematics as it is 'useful'! Many students feel that, in any case, mathematics will never be useful in their lives. The biggest challenge for any teacher is capturing each student's attention, and conveying ideas effectively enough to create a lasting impression. As a teacher, to tackle these challenges effectively, we should implement innovative ideas that make the classroom experience much more lovable for our students. So innovative ideas and strategies will help us reinvent our teaching methods and make our classes more interesting. The teaching and learning of mathematics is a complex activity and many factors determine the success of this activity. The nature and quality of instructional material, the presentation of content, the pedagogic skills of the teacher, the learning environment, the motivation of the students are all important and must be kept in view in any effort to ensure quality in teaching-learning of mathematics education.

Motivating students to be enthusiastically receptive is one of the most important aspects of mathematics instruction and a critical aspect of any curriculum. If we understand its importance and the critical role of its applications in life, we can use it in the right ways that will contribute to the scientific and technical progress of our nation. Teachers should pay careful attention to the strategies applied in teaching mathematics after taking into consideration the existing obstacles,

the needs of students, and the objectives that have to be to fulfilled, since "teaching strategies are tools that the teacher uses to **create interest,** achieve the objectives, mainly the intellectual development of the students. It is essential for the teacher, to pay attention not only to the topics that must be included in the syllabus and that should be addressed in class, but also, and simultaneously, in the manner in which it can be considered more convenient for those topics to be worked on by the students. It is important to bring their **attraction** to mathematics. This urges teachers to implement various strategies that have proved to be efficient and to employ technological innovation and creativity while teaching mathematics.

OBJECTIVES: The objectives of this seminar paper, based on the above purpose, are as follows

1) To create interest in students towards learning mathematics.

2) To study the different strategies and teaching practices in Mathematics education.

3) To study the need of development of innovative Mathematics teaching – learning resources.

4) To apply the Mathematical knowledge and skills to solve real life problems by developing ability to think, analyze and articulate logically.

5) Develop interest in Mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc.

6)Develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

7)The specific objectives of the study focused on the impact of the initiative in promoting interest in mathematics, assessing the contribution of the initiative to students' achievements and investigating challenges encountered by the initiative.

DESIGN OF THE INNOVATION: The study used a case study design with a mixed-method approach. Students of secondary school were involved. Data collection involved documentary review, observation. Data analysis employed both content analysis and a dependent test to determine the effect size of the initiative.

PRESENTATION: Teaching mathematics is a very challenging process because of the abstract nature of theoretical formulations. Many students find abstract thinking difficult. Therefore, teaching methods must provoke the interest of students in order to overcome their feeling of anxiety. Mathematics is an abstract subject; hence, it causes many students to lose interest, thus resulting in low achievement. Apart from an abstraction of mathematics causing low interest in students, experiencing anxiety about learning mathematics also has contributed to disliking the subject. This paper explores the contribution of pedagogical innovation in promoting students' interest in learning mathematics hence improving achievement. Lack of interest in learning mathematics results in low achievement. Interest is one of the Attitudinal and influential variables that are predictors of students' achievement in learning Or avoidance of learning mathematics . Studies have shown the trend of Poor performance in mathematics in many parts of the world. The trend of poor performance is associated With students' low interest in studying mathematics.

Hence the following strategies are required to adopt in teaching mathematics to create interest in students.

Motivational Strategy: Students' performance in mathematics begins with students' interest in liking the subject. Students' interest is an internal aspect that develops in a given environmental setting. Motivation has also been considered an essential factor in promoting students' interest in learning mathematics. A low level of motivation results in low interest in learning mathematics and hence low achievement. Three aspects indicate students' interest in the subject: attitude, initiative and confidence. They further describe that students' liking of the subject significantly influences their attitudes. The initiative is from participating voluntarily in mathematics activities even beyond class hours. Confidence is the ability to ask questions or request the teacher to re-explain concepts during the lesson. Confidence is central to enhancing students' interest in learning and improving the subject's achievement. Self-confidence enhances students' interest, whereby self-confidence depends on the perceived usefulness of the content, background knowledge and the level of anxiety among students. In this regard, promoting students 'interest in learning mathematics depends on students' internal factors. We can use motivation strategies such as rewards, recognition, encouragement and praise to boost students' interest in learning mathematics**.** Counselling, consultations and assessment results identify students with challenges and take time to understand them to help identify internal factors and use them in assisting. The external factors may include rewards, recognitions, remedial classes and praise. This strategy bears a solid contribution to promoting students 'studying interests. When students are confident about their ability to do mathematics, they are motivated to explore new concepts even if they are not immediately successful. As self-efficacy wanes, so does motivation. If the mathematics doesn't make sense to students, they often get frustrated and lose interest. Motivation can be intrinsic — we do something because we want to do it. Young children are naturally curious about the world. When this curiosity is encouraged and students have the opportunity to explore mathematics in the context of their world, they are interested and want to learn. Motivated students are persistent. They stick with a task, trying various approaches and strategies, asking themselves and others questions until they reach a solution that they find acceptable, whether it is correct or incorrect. When necessary, they return to the task willing to rethink their solution process until they reach an accurate solution.

The understanding and proper use of motivational techniques brings interest, good morale, effective learning and sense of achievement in classroom. Students can be motivated through several ways some of which are as follows:

Teacher's Personality: When a student identifies the learning with a person he/she admires, this creates interest in what is being done. Therefore, teachers in mathematics should make themselves role model. Their personality in no small way facilitates students' interest in the learning of mathematics. There is a common erroneous belief that mathematics Teachers are always confused, rough, and dress carelessly. Until the teachers discourage these beliefs and create hope in the minds of the learners by their attitudes or personality, this will continue to

contribute in discouraging students' interest in mathematics as a subject. They should also be friendly to the students and have interest in what they teach.

Feedback : This is a way of reporting progress of performance of students. Making students know about their progress of performance gives them hope in the subject and it creates interest in what they do in mathematics class. Work done, be it class-work or tests should be marked and be returned to the students without delay by the teacher.

Rewards (Award): Rewards create learning interest in students. Rewards of various kinds should be used in such a way that students can be motivated. The use of positive reinforcement of various kind which can be in form of material reward, symbolic and/or psychological should be employed because they help in creating self concept in the learning of mathematics. The teacher must however be cautious such that the reward does not become an end in itself but means to create learning desire in the learner.

Mathematics Club: Students can be encouraged to have interest in mathematics by the teacher through recreational and mathematics Clubs which can be formed in the school. The mathematics club plays an important role in creating interest in mathematics in schools. This helps the students in having an idea of the practical utility of mathematics in addition to creating their interest in mathematics. It can serve a number of purposes; mathematics club is useful in arousing and maintaining interest in mathematics. gifted students get an opportunity to satisfy their needs and interest by actively participating in the activities of mathematics club. The student gets an opportunity of mathematical hobbies, recreational mathematics, mathematical projects, mathematics games, mathematical discussions, and debates and mathematical innovations. It provides an opportunity of leadership, cooperation, joint responsibility active participation and organizing programmes.

Application of Technology to the Teaching Process: Technology is a key factor for the effective teaching and learning process. The application of a variety of ICT tools enhances the students' **interest** towards the mathematics. There are at least five hierarchical levels at which technologies may be used: presentation, demonstration, drill and practice, interaction, and collaboration. The potential for interactive and collaborative learning can be best achieved by networked computers and connectivity to the World wide Web. Online educational frameworks can be used even for performing exams and quizzes. The application of a variety of ICT tools enhances the students' interest, learning experience as well as their IT skills. It has a positive influence even on teachers. Using Concept Maps we present the information visually –by charts, graphic organizers, tables, flowcharts, Venn Diagrams, etc. Concept maps help also to analyze and compare the information. Teachers nowadays have to consider the student's interest in the digital world and must connect the process of education to this world. The mobile technologies provide downloading, uploading and online working via wireless or mobile networks. The main platforms for such connectivity include smart phones, PDAs, MP3/MP4 players, tablets, mini notebooks, gaming devices, etc. They are accessible and easy to use by students. Consider Integrating Technology in the Math Classroom

Working on a computer One thing that students have in common is their love for all things technological. A lot of educational technology tools allow people to practise their math skills, and just the simple fact it's online could make math fun.

By using online-based resources, your students are likely to be more engaged and may end up paying more attention to your lessons. **This will surely increase their Interest and rate of comprehension!**

We can go through the following digital tools

GeoGebra, Geometry Pad, Photomath, Khan Academy, Shapes 3D,CK 12,Buzzmath, Cuethink, LFluidmath, Rocket Math, Desmos Book widgets, Bingo, Mathalicious, Prodigy ,Math Game, Mathspace ,Math Board, Virtual Nerd, Mangahigh ,Brainily ,Maths Chase, Mathway, Pattern Shapes, Configure Geometry

Kahoot : Create a fun learning game in minutes – called 'Kahoots'. You can make a series of multiple-choice questions or try a Jumble. The format and number of questions are entirely up to you. Add videos, images and diagrams to your questions to amplify engagement.

Encourage Maths Talk: We all know that children love to talk. So, use this to make them more comfortable and eager to learn math. Create an open atmosphere that encourages meaningful conversation about math. You can even use math jokes or math puns for kids to brighten up the kids mood. This will help them dive more enthusiastically into learning mathematical concepts. This will help the students to develop their mental abilities and skills. This will also give them a whole new learning and thinking process. They will be able todescribe and solve a problem in their own certain way.

Math Games: Games will also encourage active engagement and participation.

There are many math games available on phones and computers. It will promote their strategic mathematical thinking, computational fluency, and understanding of operations.

Creating Culture for Mathematics Learning: Share and showcase the work being done in the schools to develop positive culture for Learning Mathematics •Take back concrete ideas to encourage, motivate and excite students to learn Mathematics.

Maths Newsletter: Students can be assigned task to create topic based monthly or twice in a term newsletter for the respective classes. This will encourage students to work in collaboration and research a topic beyond the textbook concepts and bring out creativity in students. Some suggested topics are: Maths in Nature, Patterns in Numbers, History of Mathematics, Mathematics in Architecture etc.

Maths Fair: A carnival setup may be created to give students a chance to apply logic, Mathematical skills, and problem-solving ability to interact and play with Mathematical Games. Encourage students to create original games based on mathematical concepts Suitable for the age of students who will be invited to play the games. For example, Class IX can create and setup games for Classes VI to VIII to play.

Intra-class and Inter- class Maths Quiz: Use multiple rounds e.g. Tangram puzzles, identify the mathematician, estimation, some quick calculations etc.

Maths Day:A day dedicated to Maths is always a great way to create a school with excitement for Maths. All members of school are to be involved in different activities with the day starting with Mathematics Assembly presented by students. Some of the
possible activities are: Lectures by experts, group work on creating mathematical
models; fun activities for junior classes may include Rangoli with geometrical shapes, T-shirt painting with mathematical quotations or artwork.

Mathematics Corner/Play Room: A space dedicated to Maths may be created in
school where students can interact with mathematical displays, interactive games
and explore mathematics in a non-formal setting. This space may be part of school
library or a common area of the school.

Mathematics Assembly : Once a month student can organize Maths Assembly.
mathematical play, songs, information on history of mathematics can be some of
the possible ideas.

Recreational Mathematics: Recreational Mathematics is Mathematics that is fun and used as either as a diversion from serious Mathematics or as a way of making serious Mathematics understandable. It is a term referring to Mathematical puzzles, games, riddles and fun-filled activities. Mathematics puzzles and riddles are fun and interesting, and they help improve Problem solving skills and thinking capacity. Puzzles and riddles are also an important Area of research for many mathematicians.

Example: We can also give examples of the following : Polyominoes •Tangrams •Fractals •Platonic Solids •Soma Cube •Rubik Cube •Magic Squares •Fibonacci Numbers •Paper Folding •Sudoku •Tower of Hanoi •Shapes and Symmetry •Mobius Strip.

Read Maths Stories: In recent years there has been a renewed interest in the role of stories inMathematics education, both as a means of disseminating knowledge, and as a cognitive tool for understanding mathematicsstories can also be used to introduce a mathematical idea or concept. “Origin stories” are commonly used to introduce new topics and answer the question of how the mathematician came to work on the material and how the ideas were **originated.**

There are many stories that can be used to introduce rich mathematical content and that will engage the imaginations of students. **History of Mathematicians** should be taught.

Real life situations: Teaching real-life applications provides students with meaning and context for their learning. By using real-life math applications, students can make connections between math and everyday life. An active learning happens in Maths through real life applications. They really show the interest and concentration towards the subject.

Ask Interesting Math Questions: Question and answer sessions are a great way to help children learn math easily. Quiz children on their math lessons and help them arrive at the answer. Give them enough time to think and respond to your question without fear and hesitation. It’s ok if they get it wrong, you can ask more leading questions to help them arrive at the solution on their own.

Introduce the topics using multiple examples: Mathematics is a subject which could actually be visualized and compared to practical life. Therefore, teachers can come up with creative ways

like images or videos to teach maths in an interesting way to students. We can illustrate the problem sets by making a child visualize the practical side of what is mentioned in the problem.

Making interdisciplinary connections. Mathematics is not a field that exists in isolation. Students learn best when they connect mathematics to other disciplines, including art, Architecture, science, health, and literature. Using literature as a springboard for mathematical investigation is a useful tool that teachers can use to introduce problem solving situations that could have "messy" results. Such connections help students develop an understanding of the academic vocabulary required to "do mathematics" and connect the language of mathematical ideas with numerical representations.

Activity Bases Strategy: Activity based method plays a vital role in creating interest of students towards learning mathematics. The Laboratory approach or "learning by doing" is used to build readiness for the development of more abstract concepts. For example, teaching theoretical concepts of mathematics, combined with laboratory experience of numerical methods and programming or physical experiments illustrates the material taught and makes it more accessible to students. In the field of informatics, the approach of "learning by doing" is very well accepted by the students.

Investigation Strategy: Applying this method, the students define the problems, set the procedures and try to solve them. This provides an opportunity to develop students' creative abilities and leads to improving their adaptive capabilities. Such makes the teaching process very effective and applicable to the real life. This method **highly Motivates the students** and leads to their satisfaction. They develop their own spirit of inquiry. Investigation is oriented to the highest level of the Bloom's taxonomy pyramid – "Create – produce new Or original work". It can be combined with the Method of co-operative learning.

Outcomes:* Take back concrete ideas to encourage, motivate and excite students to learn Mathematics.

*Teachers and students will get the knowledge of different types of strategies.

*Teachers will come to know how to create interest and drag the attention of students.

*Teachers identify online tools for teaching and learning mathematics. Share various online resources to the group.

*Design strategies for creating interest in students through peer group discussion.

*Share the innovative practices adopted in teaching Mathematics in the classrooms.

*Appreciate the scope and possibilities of innovations in Mathematics classroom.

Implications: There are many positive effects from above said innovative teaching strategies

***Students develop interest in mathematics.

***Knowledge of mathematics is developed through various innovative teaching methods.

*Different types of Innovative teaching strategies help students to overcome misconceptions and fear of mathematics.

*Listening to a variety of different teaching strategies help students develop skills in mathematics.

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STATE LEVEL MATHEMATICS SEMINAR - 2022

I. PERSONAL DETAILS:

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II.SUB-THEME:

"Innovative strategies' in teaching mathematics to create students' interest towards mathematics."

III.TITLE OF THE TOPIC:

"TO CREATE INTEREST TOWARDS MATHEMATICS IN UPPER PRIMARY LEVEL STUDENTS BY INTRODUCING EXPLODING DOT METHOD IN LONG DIVISONS.

IV.INTRODUCTION:

Now a days Even 8^{th} class students are unable to perform the four fundamental operations of the mathematics, especially Divisions. It is so horrible situation for the Maths Teacher to achieve the Learning Outcomes of concerned class. But as a Teacher we have to focus on developing the fundamental operations and as well as regular syllabus also. For this purpose, Teacher has to adopt **New Strategies** in Teaching Learning Process. We have to create interest towards Mathematics. Learning by doing and joyful atmosphere will make the children to learn new concepts/Subject. Children has to participate in all activities in the class room and Teacher role must be a facilitator here.

V.OBJECTIVES:

1. We can develop curiosity to learn Mathematics.
2. Children will enjoy the mathematics in "Learning by Doing and Learning by visualizing".
3. We can eradicate Math's phobia among the children.
4. Children will apply the Exploding dot method in division in solving problems in Polynomials.

VI.DESIGN OF THE INNOVATION:

Exploding dot Method is an array of boxes, any of which may contain a number of dots ,plus a rule that describe how to move dots between the boxes.In this method we represent the digits of devidend and devisor with dots.

VII.DESCRIPTION OF THE INNOVATION/PRESENTATION:

Let us Consider the Problem 2086÷2,

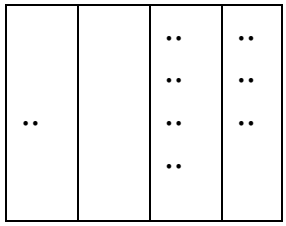
We know that in 2086 ,there are 2 Thouands, 0 2 0 8 6

Hundrends, 8 tens and 6 ones are there.

Here denoting the 2086 with dots we get

Now we have to hunt or made group of

two dots in 2086.in 1st box we have 1 group and in 2nd box

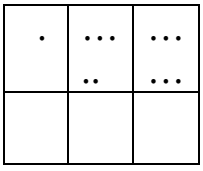


we have no dots to group it so here we have 0 groups and similarly in 3rd& 4th box we have 4 and 3 groups of dots.**So** 2086÷2 will be 1043

Let us consider another Example156÷12

Representing 156 in dots we get

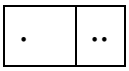
1 5 6



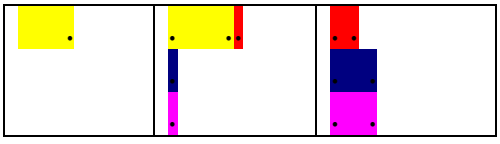
In this we have to make groups of 12 dots.By observing the hundreds place there is 1 hundred and by exploding this dot to the tenths place we will get 10 tens here.

Now lets de note 12 with dots, it looks like

1 2



Now we have to connect 1 dot with 2 dots. Then we will get



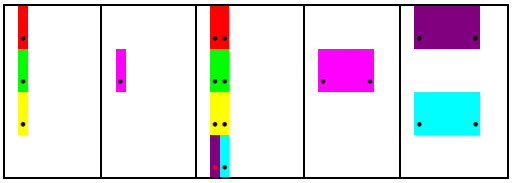
Here we have connected 1 dot in thousands place with 2 dots in Hundreds place. And 1 dot in Hundreds place with 2 dots in units place.Like this we have connected 3 times. So now 1 loop was ended in Tens place and 3 loops were ended in units place. Totally 13 groups of 12 are there in 156.

Therefore 156÷12 =13

Ex.3 **31824 ÷ 102**

Here representing 31824 with dots we get

3 1 8 2 4



And representing 102 in dots ,we get

1 0 2

Now we have to connect or draw a pattern of 1—0—2 in 31824, So we can Connect 1 dot from ten thousands place and can leave in thousands palce and again connect in Hundreds place. Like this we get 3 loops which can end in hundreds place. Next we can take 1 dot from Thousands place and can leave in Hundreds place and again can connect with 2 dots in tens place. Now there 2 dots remained in hundreds place which can be connected with 4 dots in units place by leaving tens place. From this totally we have

3 loops in Hundreds place ,1 loop in Tens place and 2 loops in units place

So total groups were 312

Therefore **31824 ÷ 102 = 312**

VIII.OUTCOMES OF THE INNOVATION :

1.Student can establish a relationship between Exploding dot method and Regular division

2.These type of Learning by Doing and Learning by Visualizing activities gives motivation

To children and Develops the logical reasoning, creativity among the children.

3. Establishing these type of relations may leads the children to become a

Mathematical Scientist in the future.

IX .IMPLICATIONS:

1) This type of findings or Estabishments of Relations may encourage the children to go for further research.
2) This learning by Doing and Learning by Visualizing activity may develop interest and curiosity towards Mathematics subject and eradicates Maths Phobia.

X.REFERENCES:

1. 10^{th} Class Maths Text book of TS SCERT.

2. Knowledge gained by Attending Some State and National seminors.

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STATE LEVEL MATHEMATICS SEMINAR 2022

1. Personal details :

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2. Theme:

"Way forward towards Innovation in Mathematics Teaching"

3. Sub Theme:

"*Innovative strategies in teaching mathematics to create students interest towards mathematics*."

4. Title of the Topic:

"**Connecting Mathematics with Natural Geometrical structures and patterns, Using generalizations for getting solutions for difficult problems – Creating interest among students towards Mathematics**"

Introduction:

Though the teaching, usage of mathematics has evolved over the years, it is still considered a tough subject. It is a known fact that when we ask students about their favourite subject most of the students do not choose Mathematics. There could be many reasons; it could be the unimaginative abstract facts based textbook that only has numbers and symbols which do not help the students to visualize the abstract concepts that they are studying. Or it could be the pedagogy (students are not encouraged to think), or the rigorous drill and practice for getting better scores in assessment. Their learning is not connected with life and, in addition to this, the cultural inheritance of fear associated with the subject does not help the students. More over most of the parents and community inculcate the wrong notation to their children and to the school going kids that among all the academics Mathematics is hard subject. This wrong notation creates a negative impact on learning Mathematics. According to psychologists around 70% wrong notations will be imparted to each and every kid during their childhood. This has to be minimized. I quote *Today's Children are Tomorrow's Citizens* in the same line ***Today's Negative impact on Mathematics Leads to Tomorrow's Phobia***

towards King of all Sciences. As we belong to the Mathematics teaching family it is our duty to reduce the negative impact and as well phobia towards our subject. Thus we can build a strong and well structured society.

Objectives:

1. By using simple and logically proven Vedic Mathematics methods to solve the problems in an easy way to minimize phobia towards Mathematics
2. Linking natural structures to mathematics
3. Before the introduction of each and every chapter utility value of that should be discussed in an elaborate manner.
4. How the different technological tools are helpful to minimize the toughness of learning mathematics.
5. Promoting joyful and play way method of learning mathematics
6. Making aware of ancient Indian Sages how they became versatile. How they became good at all walks of life.

Steps taken to create interest among students towards Mathematics:

1. Using Vedic Mathematics Sutras:

Our ancient scriptures like Vedas, Ithihasa, Puranas are very valuable source of Mathematics. They have encrypted many formulas in the form of Sutras. They have been formulated after very rigorous steps. Thus they are very helpful to solve many complicated and lengthy problems with a n ease. If we incorporate these things in routine teaching learning process, the learners will be attracted to our subject and also we are able to ignite their minds.

In my school I have been using Vedic maths sutras to make the students joyful. If we talk about facts most of the middle and secondary level students are poor in basic fundamental operations. This is because of carry forward in addition, borrowing in subtraction, multiple times and multiple place value levels of multiplication, and the division is going to be a big hurdle to learn. All these can be minimized by using different Vedic maths sutras such as **" Friends – Best Friends, All from Nine and Last from Ten, Cross Wise**.,etc. I have a very wonderful experience while teaching the square numbers, I used **Base Method**. After a elaborate explanation and practice the students came to a stage that they were answering the squares of very big number with using pen and paper. More over I had seen magical sparks on their faces. The following are a few examples which can make the learners happy to learn and as well create interest among the students to learn Mathematics.

1 (i) Addition and Subtraction using Friends and Best Friends:

Ex: 735 + 438 = 1173

12897 + 37854 = 4 9 ^{1}6 ^{1}4 ^{1}1 = 50751

Ex: 90000

(-) 72894

17106

Ex: 89057

(-) 63485

25572

1 (ii) Multiplication:

By Working Base:

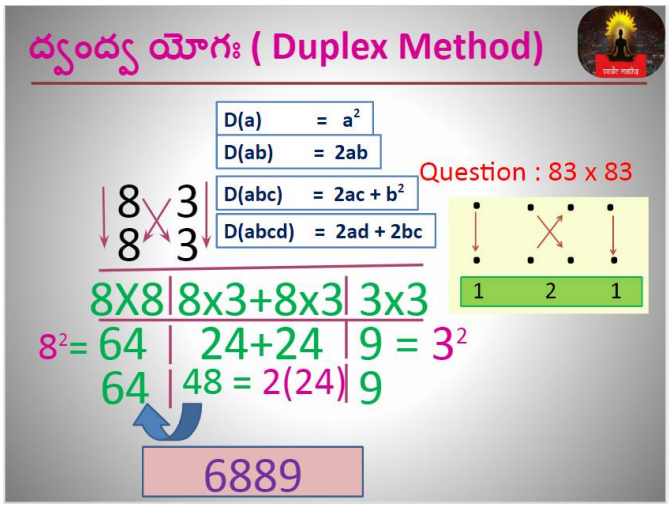
Ex: 2007 × 2009 =? **Base 100** **Working Base 2 × 100 = 200**

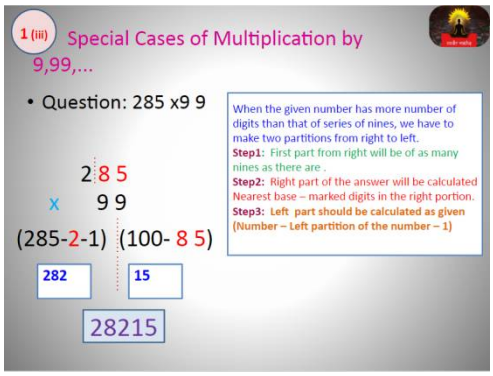
2007	**7**
2009	**9**
(2007 + 9)	**7 × 9**
2016	**63**
2(2016)	**063**

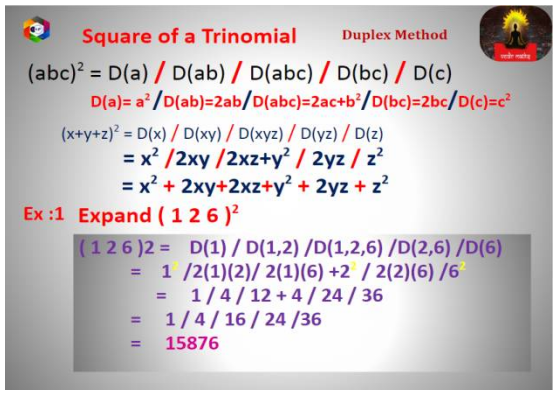
4032063

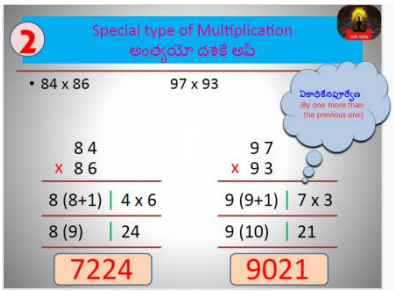
∴ 2007 × 2009 = 4032063

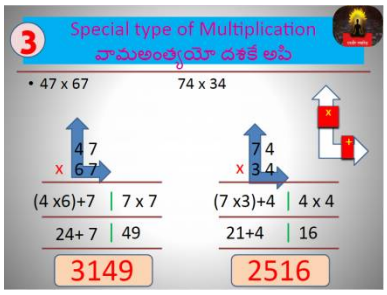
Besides this base method (Theoretical and Working base) there are many other methods for making the students attracted to performing multiplication with an ease. Some of them are as below. These can be used for numerals and as well algebra too.

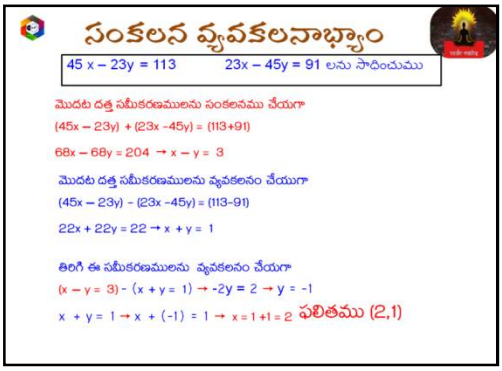












1 (iii) Division:

Division also can be made easy by using different Vedic Methods such as **Nikhilam, Dhwajank Methods**. At the first instance they seem to be very confusing but if we make them familiar the students will feel very comfortable. How these methods are logically correct are explained with the following example.

1. Dhvjanka method :

The dividend 43852 can be written algebraically as $43x^3 + 8x^2 + 5x + 2$ and 54 as $5x + 4$

Since $x3 = 10^3 = 1000$, $x^2 = 10^2 = 100$.

$5x + 4) 43x^3 + 8x^2 + 5x + 2 (8x^2 + x + 2$ Quotient

$40x^3 + 32x^2$

$3x^3 – 24x^2 = \{30 x^2 – 24x^2 = 6x^2$ ($3x^3 = 3. x. x^2 = 3.10. x^2 = 30 x^2$}

$6x^2 + 5x$

$5x^2 + 4x$

$x^2 + x = \{ (x^2 = x. x = 10x) = 10x + x = 11x\}$

$11x + 2$
$10x + 8$

x – 6 { x – 6 = 10-6 = 4}

4 (Remainder)

Dividend: $43x^3 + 8x^2 + 5x + 2 = 43582$

Divisor: 5x + 4 = 54

Quotient: $8x^2 + x + 2$ = 812

Remainder: 4 = 4

One more method for doing division is Base Method. By using this, we can easily divide not only the numerals but also algebraic expressions. The method is explained in this following link https://youtu.be/YFZ727BswYA.

By using the above different Vedic mathematical Sutras / Methods we can pave the fundamental steps towards positive mind set on Mathematics learning.

We can utilize the Vedic Maths Sutras/ Methods in different branches to make the learning atmosphere more comfortable and joyful.

1 (iv) Factorization of quadratic Equations by using Vedic Mathematics Sutras:

Anurupyena & Adyamadyenantyamantya (ఆనురూప్యేణ & ఆద్యం ఆద్యేన అంత్యం అన్త్యేన)

We start by finding numbers p, q that add to b and multiply to ac. The constants p, q must form the proportion a : p = q : c. Then, we simplify any one of the ratios by reducing it to lowest terms. This ratio provides the linear coefficient and constant for the first factor. The process is called **Anurupyena** Sutra

We obtain the linear coefficient of the second factor by dividing a by that of the first factor and get the constant of the second factor by dividing c by the constant in the first factor. The process is known as **Adyamadyenantyamantya** The Vedic Mathematics1 method results in a clever way of indirectly factorizing the quadratic by observing the ratios between its coefficients.

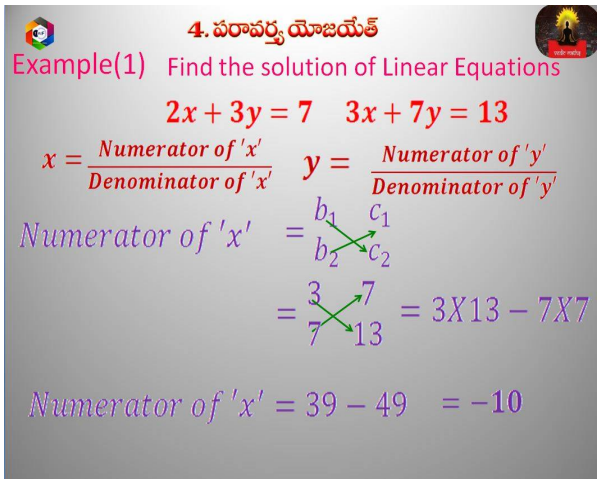
Example: Factorize Solution: We look for two constants that multiply to give ac = 120 and add to give b = 26; we find that they are 20 and 6. Setting up our ratio, we get

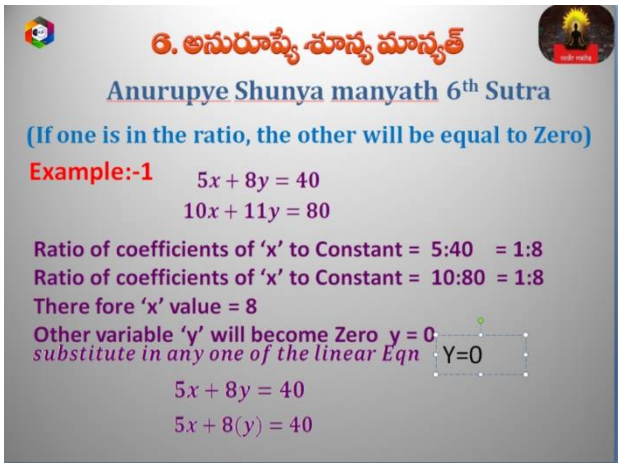
$$\frac{15}{20} = \frac{6}{8} = \frac{3}{4}$$

Anurupyena gives us the first factor: (3x + 4).

Next, we perform Aadyamaadyenaantyamatyena. Dividing 15 by 3 gives 5, and dividing 8 by 4 gives 2; so we obtain the second factor: (5x + 2). Therefore, $15x^2 + 26x + 8.$ can be factorized as (3x + 4) (5x + 2) using the Vedic Method.

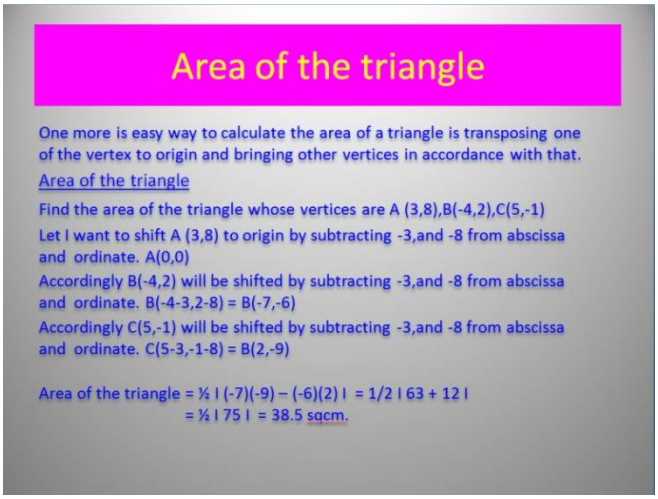
$\therefore$ $15x^2 + 26x + 8. =$ (3x + 4) (5x + 2)

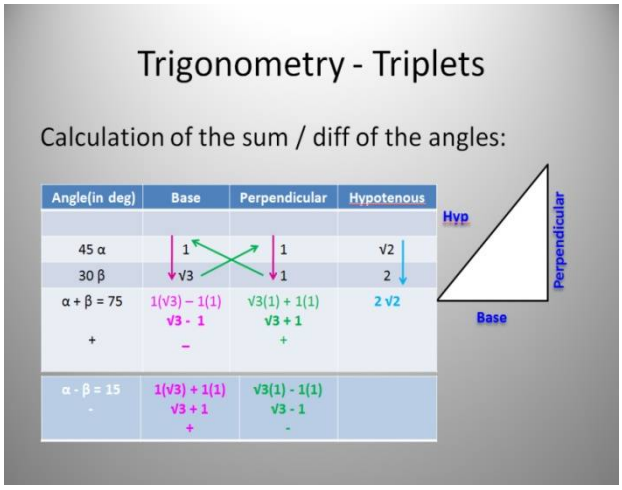




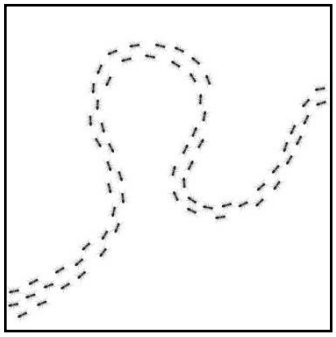
Vedic maths Sutras are not only useful for basic fundamental operations but also every branch of it. It is useful and as well minimize the labour, lengthy and time consuming nature of conventional methods. Thus these methods are very useful to create interest among towards learning Mathematics. Here are some more areas where we can use Vedic Sutras.

Sl No	Area of Mathematics	Which Vedic sutra is useful
1	Conversion of Recuuring Decimals into p/q	Vilokanam
2	Divisibility Rules	Osculation
3	Squares	Yavadoonam Taavadooni Yaavadadhikam - Taavadadhiki
4	Trigonometry	Unit Circle
5	Coordinate Geometry - Area of Triangle	Transposing one of the vertex to Origin and remaining all the vertices in accordance to that.
6	Differentiation	Gunaka Samchhayam
7	Calculus	Kalana Kalanaabhyaam





2. Linking Natural Structures, Patterns /Phenomenon to Mathematics:

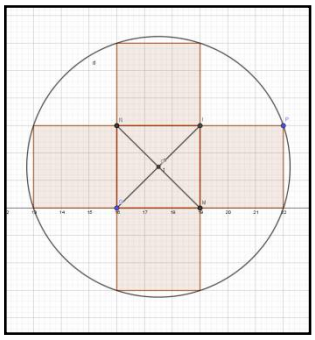


2 (i) I asked the students to look at the picture. Then I asked them to come up with their opinions about the picture. From their points I concluded that a very small insect is doing so many Mathematical magic's why don't we!

2 (ii) On another day I asked them to watch the video through this lik.
Why do honeybees love hexagons? – TED Ed talk.

The video explains that bees want to store their food (honey) in appropriately sized cells and that wax -the thing that makes the cells- is quite 'expensive' for bees to create. So the bees want to choose an efficient cell shape. What would be the most efficient one? The video continues to explain that a circle is the most efficient shape since it needs the shortest length to enclose a certain size area. But because circles cannot tile a plane, we have to choose a tiling shape.

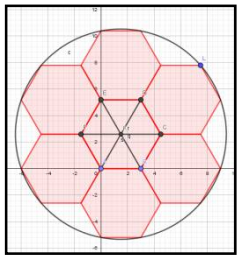
The main claim of the video is that hexagons (as opposed to squares or triangles) are the most efficient shape for bees to use, because they use less wax to store the same amount of honey. This is definitely true if we are talking about a single cell. A square of 1 unit area has a side of 1 unit length, and a total perimeter of 4 units length, while the equivalent regular hexagon of 1 unit area has a side of $\sqrt{}\approx 0.62233\approx 0.62$ and total perimeter length of 6(0.62) = 3.72 units. So we need less length (wax) to enclose the same area (honey). The same was explained practically by using Geogebra.



Area covered by hexagons is 7 x 23.38 =163.66 sq cm. Area covered by square is 5x 9 =45.00 sq cm.

Whereas encompassed circle area is 197.65 sq cm. Where as encompassed circle area is 70.69 sq cm.

Open area is 197.65 - 163.66 =33.99 sq cm Open area is 70.69 - 36.00 = 34.69 sq cm



Ratio between Open area = $\frac{33.99}{34.69}$ =0.97

The ratio is always less than 1 (so hexagonal is always more efficient).

For example, the cells of the beehive have a hexagonal shape, as does the molecular structure of Carbon.

If a series of circles were packed on top of each other, there would be empty spaces in between them. But these empty spaces can be avoided by changing the shape to a hexagon. So, the hexagon allows the bees to pack the most cells in the smallest space. Thus the Hexagon has packing efficiency.

In one experiment, the Researchers at the Technical University of Denmark in Lyngby created several shapes by spinning water at different speeds. They poured water into the bucket and set the bucket to spin. At lower speeds, the first shape that appeared was a triangle. With increased speeds, the triangle changed into a square and then to a pentagon. . But at the highest speeds, the resultant shape was of a hexagon

Dragonfly Eyes A tourist spot in Ireland shaped in Heagonal Rocks

Source: Mcamcamca/Flickr

Source: Chmee2/Wikimedia Commons

Hexagonal Shaped Football is the only shape that resembles a circle that also allows for close packing without leaving out any waste space.

The hexagonal shaped tool edges find it much easier to grip the hexagonal-edged bolt.

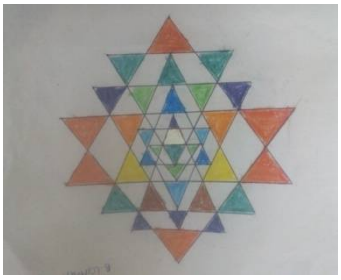
The Hexagonal shape of pencil gives maximum holding comfort and to enable better packing when they are packaged in boxes.

Thus I explained the students about how Mathematics is involved in each and every aspect of Natural Structures Patterns and as well as Phenomenon in flowers, leaves, and why the rain drops

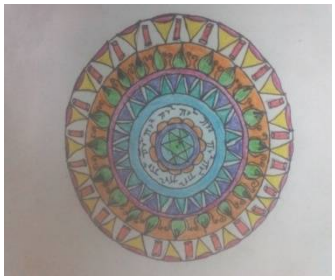
takes the shape of sphere. Could we find a relationship with Mathematics?

Here are some more areas where mathematics is involved in nature.

When I have observed that the students were delighted to look at all these.In addition to this a bright spark and as well as positive approach was noted. I asked them to come up with some more examples where we can see mathematics in our daily life.



- ✓ They came up not only with answers but also some designs
- ✓ Rangoli
- ✓ Decorative articles such as hangings
- ✓ Designs
- ✓ Some have given the designs of Bridges too.
- ✓ Some of my students drawings after inspired by the above discussion.



3. Before the introduction of each and every chapter utility value of that should be discussed in an elaborate manner:

Utility value of each and every concept of Matheamtics has an important role.When we are introducing a new concept we should focus on utility of that particular concept in our daily life.I have observed a positive impact of focusing this particular point.

When I teach the Number system concepts, The rational and Irratioal numbers are very useful in moulding the designs especially in preparing gates,etc.Logarithmns and Exponents are very helpful in managing with large quatities operations.Sets are useful in logical thinking and in decision making.Algebra in solving generalized patterns/puzzels.While teaching geometry I focus on how one can become reputable in the society,by giving suggestions/calculations on land bifurcation issues.(Unofficial Land Surveyor).How can we become good designer/architect.Geometry will aim at improving logical thinking abilities.Data handling is also useful in every walks of life.During these chapters I will focus on how data handling can influence markets,bussiness,playing strategies,and what not.

3 (i) Impact of storytelling on creating interests in mathematics learning:

Sometime story telling is also a good tool to encourage and to attract the children to learn Mathematics in a friendly and fearless atmosphere.If we look back Panchatantra,the epics Ramayana and Mahabharatha have given a large space for stories to educate. While teaching centroid in Coordinate Geometry how it was used by Lord Krishna in lifting Govardhana Giri. By this way my students became attentive and showed interest on the topic.They did the related problems in a joyful manner.

While teaching the Arthimetic Mean I narrated a real life children experience – One day my school children went outside for getting berries,They planned in such a way that one has to bend the branches.Second one has to direct which branch has many a number of berries.Third one has to colect the fallen berries.At the end I posed a question how would you share the berries.Then they replied without any hesitation that we would share them equally.This is nothing but Arthimetic Mean.Then they astonished at this.

One of my friend has adopted a link between the evolution of human being to types of quadrilateral to make a better understanding of the concept.And she got the expected result with an ease.

Most of the times storytelling will increase the mathematics vocabulary, communication relevence between the words and symbols.

I happened to use these as well as several books that are based on Math such as 'Mathematwist: Number Tales from Around The World,' by T.V. Padma, 'Tales from the history of Mathematics' written by Archana Sarat and stories published by Pratham.

3 (ii) Art integration - Creating interest in mathematics learning:

If we ask the students to draw rangolis /Mehandi designs, wall hangings , and paper cuttings they will learn mathematical concepts such as symmetry, tessalations,and dialations, etc. in an informal way. It will increase the creativity and diversified thinking.Which will in turn create interest of learning maths.

4. How the different technological tools are helpful to minimize the toughness of learning mathematics.

During the COVID pandaemic period I have browsed so many platforms such as Geogebra, Robo compass, Turtle sugar labs, Turtle blocks, Clixs OER. From all these I have preapred some digital content.I made them accessible to all. It helps the students to reuse, revise, and check the steps by viewing the steps of construction. When ever they need a revision, recaptualisation, practice making use of them and becoming good at those concepts. Nature of the quadratic equations and relationship with the coefficient made easily understandable.

- https://www.geogebra.org/classroom/ecq7hf5p
- Diiferent types of Pair of Linear equations and relationship with the coefficients
- How trigonometric ratios are related to angle but not to the length of the sides.
- Construction of similar triangles
- http://www.robocompass.com/share?id=1iyna6e83cdo6
- http://www.robocompass.com/share?id=qxl0qbiaisl3
- https://www.geogebra.org/classroom/tbr8j3u3
- https://www.geogebra.org/classroom/kus3mgsw

- Drawing the tangents to a Circle
- Nine point Circle
- Centroid of a triangle

5. Promoting joyful and play way method of learning mathematics

Our school is one among the prestigious TATA Clix school our students are familiar with the Turtle Blocks, Turtle sugar labs, Police Squad game and many other interactive games. At the same time both State and Central governments have explored new methods and ways and to release different platforms for digital education such as DEEKSHA, etc. I will make use of these platforms to learn in a joyful environment.

Besides these I make use of interactive evaluation platforms such as learningapp.org, Forms app,That Quiz, Live worksheets App. Here are the following links through I evaluated.

- https://www.liveworksheets.com/rn2105754pb
- https://quizzory.in/id/637e51fc1e1a800bf4c80b06

6. Making aware of ancient Indian Sages how they became versatile. How they became good at all walks of life.

When we discuss about any ancient Indian well versed person (Sage) in any walks of field, at the end we will conclude that the person is not only gifted in that particular area but also he was multifaceted. For example if we discuss about Bhaskaracharya, he was not only Astronomer but also a great Mathematician and more over he was proficient in different branches of Mathematics. He wrote Leelavati Ganitham, which was dealt with Algebra. I quote "In other of his works, notably Siddhāntaśiromaṇi ("Head Jewel of Accuracy") and *Karaṇakutūhala* ("Calculation of Astronomical Wonders"), he wrote on his astronomical observationsof planetary positions, conjunctions, eclipses, cosmography, geography, and the mathematical techniques and astronomical equipment used in these studies." From such examples we can conclude that if a person is good at Mathematics, obviously he would become mastery over all walks of life.

Mahabharatha has given sound foundation for mathematics for number system like very large numbers ***paryaaptam, aparyaaptam.*** We had paved a sound and concrete foundation for number system by giving not only "0" but also dealing with very huge numbers such as ***koti, samudram, asmkhyakam***.If we make them aware of, surely the students will be attracted and tend to learn our subject.

When we think about this phenomenon, in ancient days the inter relationship between the different fields of educations are inter linked. The holistic approach helped a lot. Ancient scriptures have an abundant source of knowledge. Basic fundamentals and as well as our cultural aspects have to be incorporated along with the scientific reasoning. Owning

the ancient proven formulas and facts will help the learners to become proud and loyal to our country.

Advantages of adopting all the above strategies:

- Vedic mathematics sutras are very effective for creating interest towards learning mathematics.
- It will bring positive atmosphere in the class room
- Phobia towards mathematics will be replaced by joyful learning
- When we bring the natural structures/patterns/phenomenon into the mathematics class room the target will be delighted how mathematics involved all around
- It will bring an opportunity for informal way of learning
- Besides all these, how the designing/construction is related with Mathematics.
- Focus on Utility value of each and every chapter will makes the students feel free and increases the confidence levels of them in solving the similar problems/situation at real life.
- Technological tools have its own quality of R's (Reuse, Revise).Thus it is a boon to learn the facts at their convenient time.
- It gives a large scope for practice. It offers flexibility and brings education at learners' door step.
- The digital content has an advantage of reuse, easily copied and modified for the other circumstances.
- It helped in connecting people across the globe. This resulted in the q uality of learning/teaching.
- Interactive gaming platforms, Apps will make the learners engaged in Mathematics TLP
- Story telling has a wide range of advantages such as reduces monotony of teachers.
- It will break the teacher centered style.
- Increases the creativity, problem solving capacity, diversified thinking, communication skills
- If we incorporate the success stories of great Indian mathematicians the students will become loyal to our country
- It will improves the confidence levels of the learners as their ancestors done a lot for the development of Mathematics.
- How our cultural, spiritual, historical aspects are inter related to the pedagogy of Mathematics.

Outcomes/Implications:

- Parents, society and teachers should not comment that mathematics is a tough subject to learn.
- Vedic Mathematics sutras are not familiar to all the mathematics teaching fraternity.
- More over there is a misconception that these methods are not logical.

- ❖ Owing to so many reasons the utility value of the concepts/chapters is not elaborately discussed
- ❖ Link between the natural structures, patterns, phenomenon found around is neglected rather incorporated in TLP, to create interest among the students.
- ❖ Most of the times Mathematics is treated as scoring subject rather than Queen of all Sciences.
- ❖ While using the technical/online platforms there may be a chance of misuse and time wasting.
- ❖ The impact of storytelling strategy should be discussed widely.
- ❖ Art integration also has to be familiarized.
- ❖ Our own great mathematician's works should be studied.

Conclusion:

If we look back, during the pandemic period most of the teaching fraternity self motivated and self guided to explore each and every opportunity to learn ET hence engage their students in online mode of learning. This has opened new horizons.That made those hard times manageable. Undoubtedly it has to be appreciable.

In the same way as we are the mathematics teachers' it is our primary responsibility to create interest towards mathematics among the students. We should adopt the following.

- ✓ Every teacher has to make use of Vedic Mathematics sutras in routine teaching learning process. I am sure that it will make the students feel comfortable in learning mathematics.
- ✓ At the beginning adoption of this new method seems to be trouble, as the days go on we will become well versed.
- ✓ I appeal to the higher official that when a student solves a problem in SSC PE by using Vedic Maths, he has to be awarded with full marks.(Principles of Evaluation have to be modified accordingly)
- ✓ I quote, "Well begin is half done." This would become appropriate if we begin with Vedic Maths.
- ✓ To create interest natural structures, patterns, phenomenon should be discussed very frequently in the class room. So that inquest of mathematics will be developed among students.
- ✓ Emphasize should be given to the strategy of storytelling, as it is a part and partial of every ones' childhood. I am sure that it will bring a lot of positive change in students mind set.
- ✓ Right from our childhood we have come across that, if we have assigned a work to complete, we will expect something special from him. This culture well mixed in our blood. In the same line the student will think if we learn this new concept/chapter in what way is it going to be useful? So we should focus on the utility value of that particular concept/chapter with wide range of real life situations.We should focus on professional development.

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STATE LEVEL MATHEMATICS SEMINAR 2022

I). PERSONAL DETAILS :

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II). THEME : **"Way Forward towards Innovation in Mathematics."**

III). SUB THEME : "Innovative Strategies in Teaching Mathematics to create students interest towards Mathematics"

IV). TITLE OF THE TOPIC : " TEACHING MATHEMATICS WITH SELFMADE LOWCOST/NOCOST TLM - MAKING LEARNING MATHEMATICS AS ENJOYABLE ACTIVITY"

V). OBJECTIVES :

1). Creating interest among the children towards Mathematics subject.

2). Make the students to feel free and AVOIDING students FEAR about Mathematics.

3). To make the student to understand the subject through HANDS ON EXPERIENCE.

4). To make the student as ACTIVELEARNER.

5). Explaining ABSTRACT ideas in the form of CONCRETE.

6). To maximise the ENJOYMENT from LEARNING Mathematics..

VI). PRESENTATION OF THE TOPIC:

INTRODUCTION:

Mathematics is the most important subject in the school curriculum. It improves the

logical thinking, creativity, reasoning ability among the students. This Mathematics subject gives exercise to the brain and sharpens it. Mathematics has its applications in each and every subject areas like physics, chemistry, engineering and technology etc. So, the subject should be understood with comprehension for applying knowledge of Maths in other fields. That is why teaching of Mathematics has to be done with the help of TLM to **get hands on experience** for understanding perfectly , especially low cost/no cost material saves money and time. Students may also prepare these TLM on their own with available material around them.

How Low cost/ No cost material help for students:

"What I hear I forget, what I see I remember, what I do I understand"

- Confucius.

As conficius quote learning by doing plays vital role in understanding Maths subject instead of listening lectures, watching ppts. when a student learn the subject with the help of touching and verifying knowledge with the help of Low cost/No cost TLM deeper understanding takes place.

ICT V/S LOWCOST/NOCOST MATERIAL: For teaching some of the Maths topics ITC is more powerful tool but sometimes this gives only the experience of listening and watching but **not doing,** that is why Low cost/No cost material substitutes it. I observed that most of the teachers nowadays restricted for using of ICT which are prepared by somebody or self but they do not give hands on experience. So, I am using ICT besides self made low cost material for teaching to fill the gap which is not fulfilled by ICT only.

HOW I AM USING LOW COST / NO COST MATERIAL: I am preparing and using Low cost/No cost material in the presence of students and making them to prepare. They are also using themselves and understanding the concepts on their own also. Performance of the students in the exams and homework also increased with these materials.

Advantages of Low cost/ No cost material :

1). They are self prepared so they are much interesting.

2). They consume less/no money and time.

3). Creativity of the students is increased.

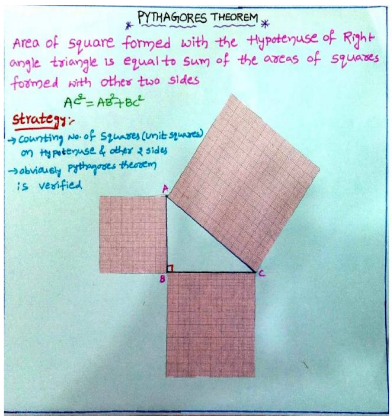
4). Students can prepare, exhibit them and get direct experience and better understanding the Maths concepts.

5). It leads to self paced learning also.

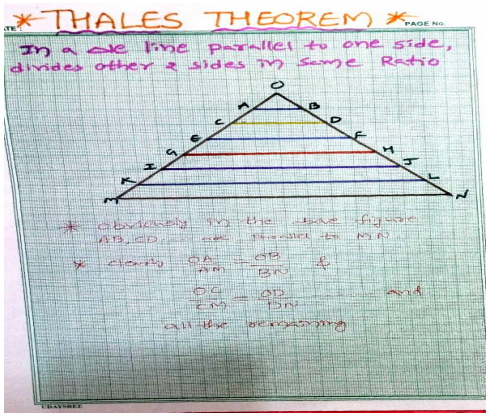
Some of the Low cost/ No cost material, I am using in teaching Geometry chapter in class room transaction:

Material used for these TLM : Colour charts, Colour pens, Geometrical instruments, Broom sticks, Gum and Graph paper. All are paper cuttings movable and explainable by Providing hands on experience.

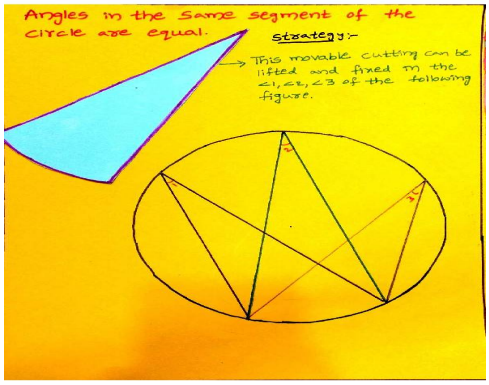
1) **PYTHAGORES THEOREM**:



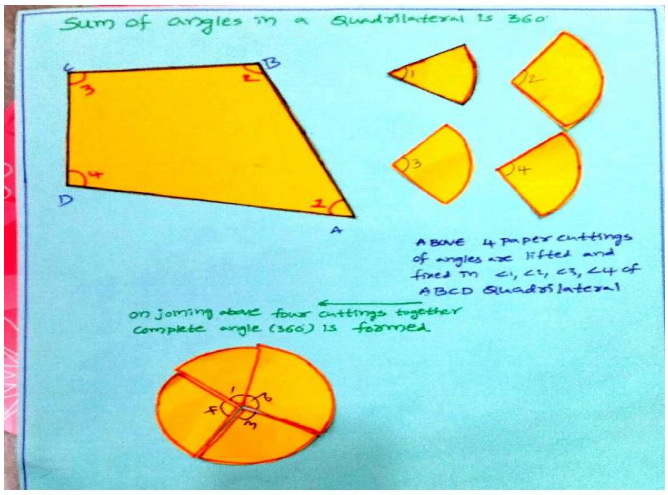
2). **THALES THEOREM**:



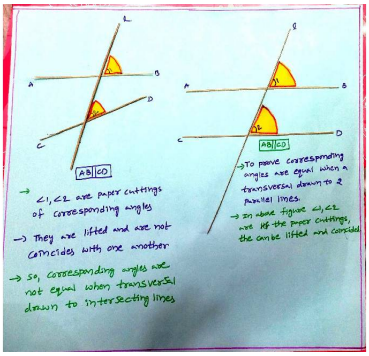
3**). ANGLES IN THE SAME SEGMENT OF CIRCLE**:



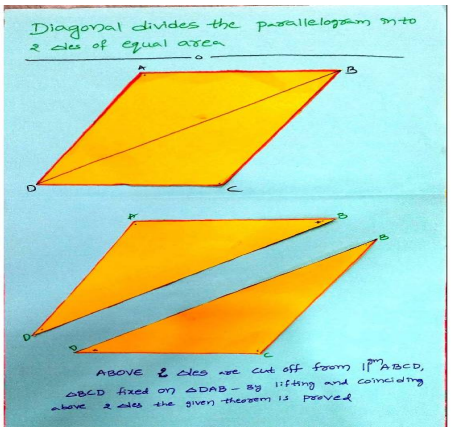
4).**SUM OF ANGLES IN A QUADRILATERAL**:



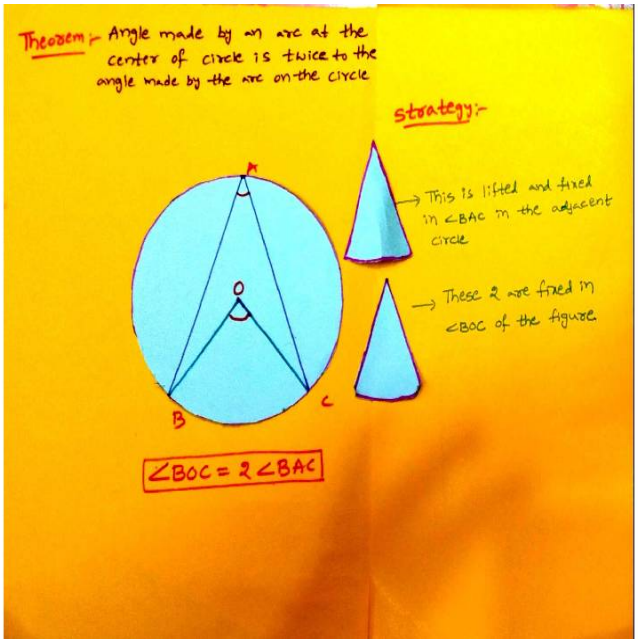
5). **RELATION BETWEEN ANGLES WHEN TRANSVERSAL IS DRAWN TO PARALLEL LINES:**



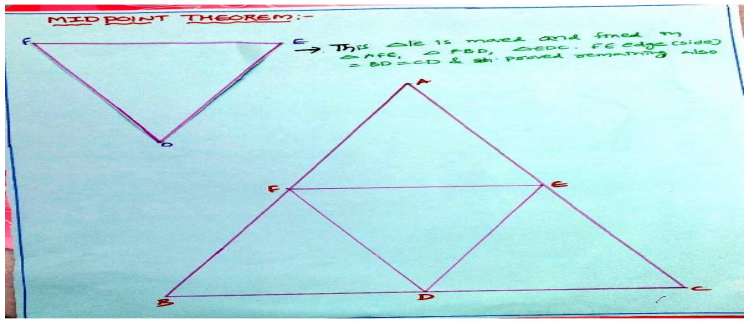
6). <u>DIAGONAL DIVIDES PARALLELOGRAM INTO 2 CONGRUENT TRIANGLES</u>
:



7). <u>RELATION BETWEEN ANGLE MADE BY ARC AT CENTER OF CIRCLE AND POINT ON CIRCLE:</u>



8). <u>MID POINT THEOREM</u> :



Above are only for sample, almost all topics of Geometrical concepts are proved with paper cuttings and pastings.

RECOMMENDATIONS:

1). Low cost and No cost material like paper cuttings as shown above may be used for other chapters like Fractions, Arithmetic, Mensuration etc.

2). I request the government and Dept. Of Education to conduct workshops and trainings for teachers to prepare all possible Low cost/No cost TLM to cover all the chapters of Maths subject.

3). Govt officials should look into forming Maths labs in schools.

4).For better result all teachers can put efforts in preparing Low cost/No cost TLM.

REFERENCES:

1). New education policy-2020 document by MHRD Govt of India.

2). “Low cost/ NO COST Teaching aids” By KHITISHCHATTERJEE.

3). SCERT, TELANGANA Text books from VI TO X CLASSES.

4).EDUSURE e-magazine by SCERT.

5). wesite: swayam.gov.in.

STATE LEVEL MATHEMATIC SEMINAR - 2022

Personal detail

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Theme : "Way Forward towards Innovation in Mathematics Teaching"

Sub Theme : "Innovative strategies in teaching mathematics to create students' interest towards mathematics".

Title of the Topic : "Using Games for Learning Math Basics"

Objectives :

(i) To inculcate / to improve higher order thinking skills, math basics through using games among students.

(ii) Instructional games to understand concepts behind math problems finding creative solutions and accelerating our own learning cooperatively work and checking each other's mathematics.

Introduction:

"Play is the highest expression of human development in childhood, for it alone is the free expression of what is in a child's soul."

-Friedrich Froebel

"Sometimes people forget that play is learning and learning is play."

-Peter Dixon

All ages like playing games that are entertaining and inspiring. Students can learn about basic number concepts including the counting sequence, one-to-one correspondence, and computation techniques through games. Playing fun math games can motivate kids to investigate number patterns, place value, and other crucial mathematical ideas. They also give students the chance to develop their mathematical reasoning and knowledge. Teachers should provide kids plenty of opportunities to play

games repeatedly, then watch as they discover new patterns, linkages, and tactics.
In math classes in elementary school, games are a crucial teaching technique.

Outcome of Innovation :

A good way to introduce a game to the class is for the teacher to play the game against the class. After briefly explaining the rules, ask students to make the class's next move. Teachers may also want to model their strategy by talking aloud for students to hear his or her thinking. While playing games, have students record mathematical equations or representations of the mathematical tasks. This yields data for students and teachers to revisit to examine their mathematical understanding. Learning math basic concepts thoroughly.

After playing a game, have students reflect on the game by asking them to discuss questions orally or write about them in a mathematics notebook.

Presentation:

The following games represents the situation when you need to think deductively to solve the problem. It also improves the logical thinking of students.

Math game 1.

Up and down Game

Purpose behind the development :

The sign of addition/subtraction of two integers is decided on the basis of signs of the integers many children get confusion on this sign like why the sum of negative positive integers is positive /negative understanding of this abstract idea through this "Up and Down Game Toy" help children compasses further learning of mathematics. The sign of addition/subtraction of two integers is decided on the basis of signs of the integers many children get confusion on this sign like why sum of two integers is positive/negative understanding of this abstract idea through this "Up and Down Game Toy" help children compasses further learning of mathematical and science.

Construction of exhibit:

Learning anything with games will be remembered for a long time.

Now let's learn about the "up and down" game.

I made this game is based on "PATCHISU" that was very famous in ancient times.

In this toy a printed sheet pasted on cardboard, 2 dice, 6 coins taken from a chess board. Two teams can play this game; each team has one or more players. Each team has three coins. These 3 coins are kept at the start position.

Material Used :

In this toy 15" X 20"inches cardboard, a printed sheet pasted on a cardboard, 2 dice, 6 coins taken from a chess board.

Procedure :

Two teams can play this game; each team has one or more players. Each team has three coins. These 3 coins are kept at the start position.

Two dice, one marked black dots and one marked red dots black represent positive numbers and red represent negative numbers.

First team "A" throw the dice

3 black dots 5 red dots means+3-5=-2

means one coin moves 2 steps downwards.

Let's play the other team +5-2=3 means move upwards 3 steps. Finally whose 3 coins go to home point they can win the game

Uses of the Game:

It is very useful for learning integer addition and subtractions.

Illustration*:*

Math game 2

Multiplication Game

Purpose behind the development :

Learning times tables help children understand other mathematical concepts, percentages and fractions. Visual representations of times tables (such as counters) can help children to visualise the role of sequences. Children increase confidence Perhaps most importantly, learning tables will give confidence in their own skills.

This confidence will help them ultimately in their secondary education.

Construction of exhibit:

In this toy a printed 1 to 81 numbers sheet pasted on cardboard, 2 movable pointers, 40 round blue star tokens,40 round red star tokens.

Procedure*:*

Two teams can play this game; each team has one or more players . Each team has 40 blue/red star counters. These 40 counters are used for hide the numbers.

* Moving Arrows are two.

If the first player moves A, the second player to moves B

* First both Arrows should be kept at 1.

* A should move an arrow and read 1 table and hide the result number on board with a blue star counter.Suppose A kep arrow at 3 (1x3=3) hides the number 3 with a blue star counter.

*Next B should move an arrow and read the 3rd table and hide the result number on board with a red star counter.Suppose B kept the arrow at 8 (3x8=24) hide number 24 with a red star counter.

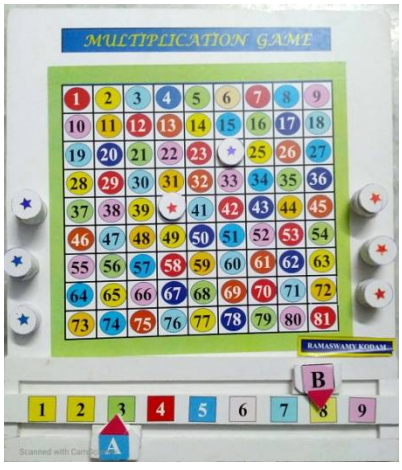
Continue the game similarly one by one.

One who gets three star counters in a row gets an extra moving chance.

At last who put maximum star counters on board. He/she wins the game.

Uses of the Game:

It is very useful for learning multiplication tables 1 to 9 .



Math game 3

Raise 10 and Reach 100

Purpose behind the development :

Children can learn special sequences or patterns of numbers to reach 100.

Construction of exhibit:

I made this game based on "logic".

In this toy a printed sheet pasted on cardboard, 2 coins taken from a chessboard. Two teams can play this game; each team has one or more players . Each team has one coin. These 2 coins are kept at the start position.

***Procedure**:*

Two teams can play this game; each team has one or more players

Yash and Shiva are playing the game. First they both kept the coins at 0. Then they start playing in the following order. Yash is first and then Shiva, at each turning the player has to add a number 1 to 10 steps to the number and move the coin. The player who first obtains a number 100 wins.

Is there a winning strategy for any of the players?

The Winning Strategy is as follows:

Supposing that it is the first player's turn and the first player has 89 to add to then he loses whatever number he puts down. In this case the second player wins as the coin is at more than 89 and less than 100 and it is his turn to add and to exceed 99 obtaining a number 100 first. Thinking in this way the second player has the winning strategy if he adds numbers chosen by the first player to 10 or its multiples. In the following game we represent the abstract concept of matrices in a form of a game.

Implications :

The final outcome of the above presentation "Using games in math learning" is mainly intended to develop the thought provoking nature, interest towards Mathematics and understand concepts behind math problems finding creative solutions and accelerating our own learning creativity and independence.Improves Basic Skills enhances number and operation sense, encourages strategic thinking,promotes Mathematical communication and positive attitudes toward Mathematics.

Reference :

NCERT Manual of upper primary maths kit. NCERT Manual of Secondary level maths kit. NCERT Maths laboratory manuals. Toys from trash Arvind Gupta. Math text books 6 to 10.

Acknowledgement :

I thank the Maths Department for giving me this opportunity to present this article on this occasion.

STATE LEVEL MATHEMATICS SEMINAR-2022

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SUB THEME :

Innovative strategies in teaching mathematics to create students interest towards mathematics.

TITLE OF THE TOPIC :

FOUNDATIONAL LITERACY AND NUMERACY (FLN) - CONCRETE-PICTORIAL-ABSTRACT (CPA) APPROACH

Everyone who works with children should always do what is best for the child (Article 3)
Every child has the right to an education (Article 28) UN Convention on the Rights of the Child

As we know that in national achievement survey-2021 the minimum learning competencies among the children were not on expected lines in the state and hence Tholimettu, a Foundational Literacy and Numeracy (FLN) programme was being implemented in the state. Under FLN the development of basic understanding and competencies related to numeracy and other concepts related to it should be done in such a way that a child relates its outside school experience with the classroom learning to understand in a better way.

Problems in teaching mathematics at Primary level FLN

From the field survey and observations it was found that teachers had been facing problems related to construction of teaching materials, related to selection of teaching, materials, Problems related to use of teaching materials and methods and Problems related to use of lesson plans and class room instruction during the course of teaching

mathematics at Primary level FLN. More interestingly, it is found that necessary teaching materials are not available and teachers are not using available teaching materials too. According to teachers, we cannot use teaching materials because of crowded class, large number of students, multi-grade teaching, inappropriate school environment and pressure in the sense that the course must be completed in time at any cost. Lack of proper teaching materials and methods, unavailability of math lab and lack of ICT training for the teachers, lack of implementation of training skills in real classroom teaching, weak school administration are burning problems faced by mathematics teachers of primary level. Next, negative attitude towards mathematics and taking it as a difficult subject is a major psychological problem for teachers.

I tried to find the best way to help teachers to teach mathematics at primary level. By the systematic review and study through internet, research journals I found an approach for the Teaching of Mathematics at Primary Level FLN

What is the CPA approach?

The Concrete-Pictorial-Abstract (CPA) is also referred to as Concrete-Representational-Abstract (CRA) or Concrete-Semi Concrete-Abstract (CSA). The idea was developed by Jerome Bruner in 1960. It is a three-stage learning process where students learn through physical manipulation of concrete objects, followed by learning through pictorial representations of the concrete manipulations, and then solving problems using abstract notation.

In the **Concrete stage**, the teacher begins instruction by modelling each mathematical concept with concrete materials (e.g. chips, cubes, base ten blocks, fraction bars etc).

In the **Pictorial stage**, the teacher transforms the concrete model into a representational (pictorial) level, which may involve drawing pictures; using circles, dots, bars, a number line etc.

The **Abstract stage** uses abstract symbols to model problems. At this stage, the teacher helps to develop the mathematical concept at a symbolic level, using numbers, notation, and mathematical symbols to represent the number algorithm.

Learning Process and its corresponding teaching sequence

Bruner Learning Process	CPA Teaching Action
Enactive (involves the physical manipulation of objects to explore structure)	Selection of concrete objects to be manipulated and Facilitation of the act of manipulating

Iconic (use of images to represent the concrete situation enacted in the first stage)	Facilitation of making connections of iconic form and mathematical idea
Symbolic (use of words and symbols to communicate)	Facilitation of making a connection to the abstract mathematical symbol

Concrete/Pictorial/Abstract Approach

a) Concrete Phase

- Students are provided or create their own manipulative objects associated with the concept to be studied
- Teachers give verbal explanations and questions with demonstrations
- Students began tinkering with manipulative object

b) Pictorial Phase

- Students make representations involving geometric drawings, graphs, charts or stake that could represent a previously used manipulative object
- Students are given a series questions relating to the form of representation of objects manipulative

c) Abstract Phase

- Students find a rule form a concept learned using symbols or abstract mathematical language
- Students are given the questions exercises to practice their math skills using abstract symbols in solving problems.

Steps of learning by the Concrete-Pictorial-Abstract approach as follows;

1. Teach the math concept using manipulatives (concrete level).
2. Allow ample opportunities for students to practice the concept using various manipulatives.
3. Make sure students understand the concept at the concrete level before moving on to the representational level.
4. Introduce pictures to represent objects (representational level). Model the concept.
5. Provide plenty of time for students to practice the concept using drawn or virtual images.
6. Check student understanding. Do not move to the abstract if students haven't mastered the representational level.
7. Teach students the math concept using only numbers and symbols (abstract level). Model the concept.

8. Provide plenty of opportunities for students to practice using only numbers and symbols.
9. Check student understanding. If students are struggling, go back to the concrete and representational levels.
10. Once the concept is mastered at the abstract level, periodically bring back the concept for students to practice and keep their skills fresh.

- Remember that modeling the concept and providing lots of opportunities to practice is extremely important at all three levels. Also, do not rush through the levels. Students need time to make connections and build on what they already know. Give them time to process the information before moving on to the next level.

Concrete Manipulative Examples:

- colored chips
- beans
- unifix cubes
- candy (ex. Skittles)
- popsicle sticks
- fraction blocks
- fraction pizzas / cakes

Representational Examples:

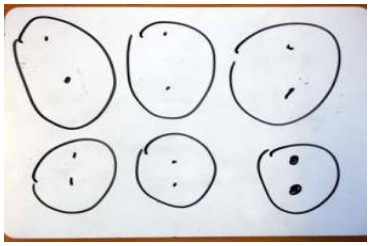
- tally marks
- dots
- circles
- pictures of objects

Concrete representation

The children are first introduced to an idea or a skill by acting it out with real objects. In division, for example, this might be done by separating apples into groups of red ones and green ones or by sharing 12 biscuits amongst 6 children. This is a 'hands on' approach using real objects and it is the basis for conceptual understanding. Concrete apparatus such as numicon, double sided counters, base 10 apparatus and place value counters are used widely across school.

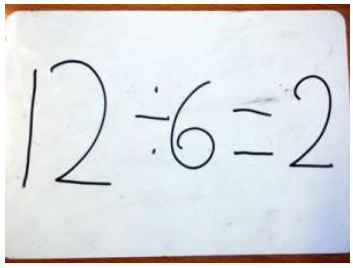
Pictorial representation

This is used when a child has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or picture of the problem. In the case of division this could be the action of circling objects.



Abstract representation

The symbolic stage – a student is now capable of representing problems by using mathematical notation, for example: 12 ÷ 6 = 2. This is clearly the more confusing and mysterious of the three and without the 'hands on' and pictorial steps can be tricky for children to understand.



Conclusion

The purpose of learning mathematics by the Concrete-Pictorial-Abstract approach are students (a) can develop a real understand of the math concepts or skills they learn (b) are able to use this foundation and add their conceptual understanding to abstract problems and learning (c) Having deeper understanding of mathematical concept and idea, and provide an excellent foundational strategy for problem-solving in other areas in the future.

Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of math for pupils. Often referred to as the concrete, representational, abstract framework that was developed by American psychologist Jerome Bruner. This activity-based approach is about learning by doing. It is particularly effective for teaching mathematical concepts and skills at primary and lower secondary levels, but is also effective at higher levels. Although the CPA sequence has been shown to be primarily effective for teaching early numeracy and has limitless potential for learners in Mathematics, it is also effective for more complete Mathematical processes.Learning by the Concrete-Pictorial-Abstract approach gives beneficial to students with difficulties in mathematics learning because this approach is started by using the concrete materials, followed by learning through pictorial or representations and ending with using the abstract notation .

Tholimettu programme implemented by the State education department would greatly help to improve basic competencies among the students at primary level. It is suggested that literacy and numeracy teaching and learning should go hand in hand. Both should be amalgamated for better learning by using mathematical terminology as a part of daily language

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STATE LEVEL MATHEMATICS SEMINAR 2022

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SUB-THEME : Innovative Strategies In Teaching Mathematics To Create Students Interest Towards Mathematics.

TITLE OF THE TOPIC : Adopting Innovative teaching strategies like 3-D Animation using GEOGEBRA (open source software) in Mathematics class room teaching..

OBJECTIVES :

- To enable the teachers relate mathematics with changing times.
- To encourage teachers come out with innovative ideas in Mathematics meet the aspirations and challenges of Developing India.

DESIGN OF THE INNOVATION :

In this session, I would like to elaborate – Adopting Innovative methods of teaching mathematics in classroom environment. Innovate means to make changes or do something a new way. Actually Innovative teaching is the process of proactively introducing new teaching strategies and methods into the classroom.

Increased access to technology for mathematics allows for a more customized learning experience. A great example of how technology empowers learners is the phenomenon of Khan Academy.

Technology, which provides additional opportunities for learners (teachers and students) and it guides decisions on how resources are to be used to meet mathematical objectives.

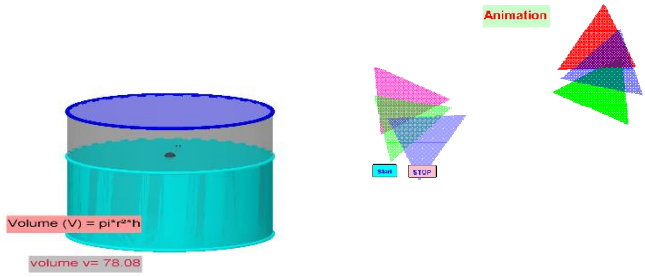
In the class room environment, I implemented the Technology which plays a vital role in child's learning process. It helps student-skills such as problem solving,logicalreasoning and cognitive skills to develop a growth mind set to understand mathematics in easy way. It also maximize access to information and turning students into innovators.

In this scenario I chosennew teaching strategy like 3-D Animation using GEOGEBRA Tool, that can create hands on models and animated pictures.Using this tool Teachers can improve their academic outcomes,and students can improve their critical thinking ,mathematical abilities to solve their real time challenges.

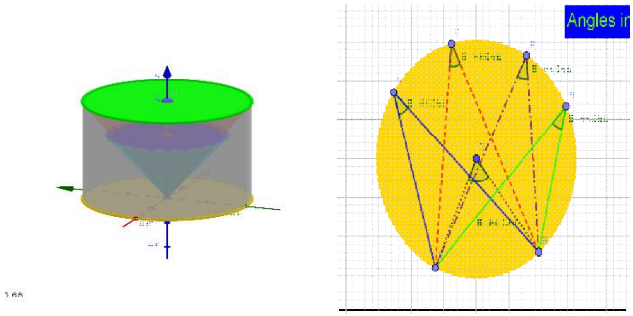
DESCRIPTION OF THE INNOVATION :

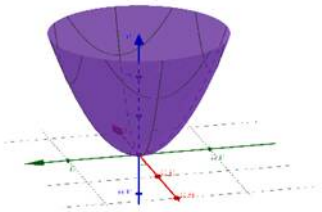
This GEOGEBRA is a computerbased program to support teaching and learning mathematics- especiallyGeometry, Algebra,Statistics and Graphing . This is a dynamic mathematics software for all levels of teaching that brings together all these digital resources. These digital resources can be easily shared through our collaboration using Geogebra platform where it is an open source software, easy to use interface. It also helps to visualize abstract geometric objects quickly, accurately and efficiently.

For this I selected 3-D animation tool to prepare 3-D models for introducing basic concepts in Geometry, Trigonometry for preparing different shapes and easy to explain the variations in 2-D, 3-D models, how the angles differentiated.



I prepared more than (20) 3-D models for 6th to 10th class students especially for students who are not able to understand the basic concepts in Trigonometry in 10th class, Mensuration in 9th class, graphical representation, 2-D,3-D representations for circles, square, rectangles, cube etc…





OUTCOMES OF THE INNOVATION :

Increased access to technology for mathematics allows for a more customized learning experience. A great example of how technology empowers learners is the phenomenon of Khan Academy.

I hope this 3-D animation tool provides teachers with more knowledge in basic concepts,to support students.

Students involves in active participation in learning maths, make maths with fun and teacher-student interaction will be increased in class-room environment.

Teachers who become experts can advance their skills. By using this tool students are able to enhance their learning and cognitive skills, which helps them to improve their academic performance.

IMPLICATIONS :

The use of this innovation leads to co-operation among students within and beyond the school, and more interactive relationship between students and teachers.

It makes easier to find related information quickly and accurately.

REFERENCES:

- Telangana State SCERT 6^{th} to 10^{th} TextBooks.
- My class room Practices.
- Some more websites from internet like www.teachthought.com, www.waldenu.com

STATE LEVEL MATHEMATICS SEMINAR 2022

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Qualifications : M.Sc., M.Ed., MPhil., Ph.D.

Sub Topic :

Innovative Strategies in teaching Mathematics to create students interest towards Mathematics.

Title of the Topic :

చిహ్నాలు, గుర్తులను ఉపయోగిస్తూ బోధించడం ద్వారా విద్యార్థులలో గణితం పట్ల ఆసక్తిని, వేగాన్ని పెంపొందింపచేయటం.

" జీవితంలో ఎదగాలంటే కాలంలోని ప్రతిక్షణాన్ని వినియోగించుకోవాలి "

(II) Objectives :

- విద్యార్థులు భిన్నాలు - చతుర్విద ప్రక్రియలు చిహ్నాల ద్వారా సులభంగా, ఆహ్లాదకరంగా సమస్యాసాధన చేస్తారు.
- విద్యార్థులు తక్కువ సమయంలో, ఎక్కువ సామర్థ్యాలను వ్యక్తపరుస్తారు.
- విద్యార్థులలో గణిత పట్ల ఆసక్తిని, ఉత్తేజాన్ని పెంపొందించగలము.
- విద్యార్థులు వ్యక్తిగతంగా, గ్రూపులలో చర్చ ద్వారా సమస్యాసాధన చేయటం వలన స్నేహభావాన్ని, సహాయ సహకారాల గురించి అర్థం చేసుకుంటారు.

(III) Introduction :

గణితము సకల శాస్త్రాలకు రాణి వంటిది. ఉపాధ్యాయులు గణితము వలన కలిగే ప్రయోజనాలను, నిజజీవిత వినియోగాలను తెలియజేయాలి. చిన్న చిన్న కథల ద్వారా ప్రతి ఒక్కరిలో నిగూఢమై ఉన్న గణిత చతురతను వెలికితీసి, సృజనాత్మక ఆలోచనను విద్యార్థులలో పెంపొందించాలి.

గణిత ఉపాధ్యాయులు విద్యార్థులకు తార్కికఆలోచన మరియు కొన్ని గుర్తులు, భావనలు, సులభపద్ధతులు గణిత బోధనలో ఉపయోగిస్తూ, గణితం పట్ల ఆసక్తిని, ఉత్తేజాన్ని ప్రేరేపించాలి. గణిత శాస్త్రజ్ఞులు జీవితచరిత్రలు, వారి ఆవిష్కరణలు గురించి తెలియజేస్తూ, మట్టిలో నుండి మాణిక్యాలు పుడతారని తెలియజేయాలి.

గణితంలో భిన్నాల భావనలు పటరూపంలో చూపటం సులభంగా విద్యార్థులు అవగాహన చేసుకుంటారు. కాని భిన్నాలలో చతుర్విద ప్రక్రియలు వినూత్నంగా గుర్తులు, భావనలతో పరిచయం చేస్తూ తక్కువ సమయంలో అవగాహన కల్గించాలి. తద్వారా గుర్తులు అనేవి సైకలాజికల్‌గా మేధస్సులో స్మృతి చిహ్నాలుగా గుర్తించబడి ఉత్తేజాన్ని కలిగిస్తాయి. కావున గణిత బోధనలో చిహ్నాలు ఉపయోగించటం అనేది బోధనా పద్ధతి.

(Symbolic Teaching method or Strategy)

PRESENTATION

భిన్నాలు - చతుర్విధప్రక్రియలు :

(1) భిన్నాల కూడిక :

(a) $\frac{3}{5} \xrightarrow{+} \frac{2}{7} = \frac{\_\_}{35}$

(b) $\frac{3}{5} \searrow^{+} \frac{2}{7} = \frac{21}{35}$

(c) $\frac{3}{5} \nearrow^{+} \frac{2}{7} = \frac{21+10}{35} = \frac{31}{35}$

(2) భిన్నాల తీసివేత :

(a) $\frac{3}{5} \xrightarrow{-} \frac{2}{7} = \frac{\_\_}{35}$

(b) $\frac{3}{5} \searrow^{-} \frac{2}{7} = \frac{21}{35}$

(c) $\frac{3}{5} \nearrow^{-} \frac{2}{7} = \frac{21+10}{35} = \frac{31}{35}$

(3) భిన్నాల గుణకారం :

$$\frac{3}{5} \overset{\xrightarrow{\quad}}{\underset{\xrightarrow{\quad}}{\times}} \frac{2}{7} = \frac{3x2}{5x7} = \frac{6}{35}$$

(4) భిన్నాల భాగహారం :

$$\frac{3}{5} \div \frac{2}{7} = \frac{3 \times 7}{5 \times 2}$$

$$\frac{3}{5} \overset{\xrightarrow{\quad}}{\underset{\xrightarrow{\quad}}{\times}} \frac{7}{2} = \frac{21}{10}$$

(1) భిన్నాల కూడిక :

$$\frac{3}{5} \overset{+}{\underset{\searrow \nearrow}{\times}} \frac{2}{7}$$

(a) మొదటి స్థానంలో $\xrightarrow{\quad}$ గుర్తు ద్వారా హారాల గుణకారం.

(b) $\searrow$ గుర్తు ద్వారా మొదటి భిన్నంలో లవం రెండవ భిన్నంలోని హారంతో గుణించడం.

(c) $\nearrow$ మొదటి భిన్నంలోని హారం రెండవ భిన్నంలోని లవంతో గుణించడం.

(2) భిన్నాల తీసివేత :

(a) మొదటి స్థానంలో $\xrightarrow{\quad}$ హారాల గుణకారం చేయుట.

(b) $\searrow$ ద్వారా మొదటి భిన్నంలో లవం రెండవ భిన్నంలోని హారంతో గుణించడం.

(c) $\nearrow$ గుర్తు ద్వారా మొదటి భిన్నంతో హారం, రెండవ భిన్నంలోని లవంతో గుణకారం చేసి వ్రాయలి. చివరగా లవాల తీసివేత ద్వారా భిన్నాల తీసేవేత జవాబు వస్తుంది.

(3) భిన్నాల గుణకారం : లవాల లబ్దం మరియు హారాల లబ్దం చేసి భిన్నాల గుణకారం చేయాలి.

$\frac{3}{5} \times \frac{7}{2}$

(4) భిన్నాల భాగహారం : గుర్తుల ద్వారా లవం హారం గాను హారం లవము గాను మార్పుచేసి గుణించటం ద్వారా భిన్నాలు భాగహారము చేయవచ్చును.

$\frac{3}{5} \div \frac{7}{2}$ $\quad \frac{3}{5} \times \frac{7}{2}$

(IV) OUTCOMES :

- గణితం పట్ల విద్యార్థులకు అభిరుచి ఆసక్తి పెంపొంది వేగంగా సమస్యసాధన చేయగలుగుతారు.
- విద్యార్థులకు గణిత సమస్యలు స్వంతంగా చేయటం వల్లన Self Confidence పెరుగుతుంది. నూతన సమస్యలు రూపొందించగలుగతారు.
- గణిత శాస్త్రవేత్తలు వారి అవిష్కరణలు, కృషి గురించి తెలుసుకునేందుకు ఉత్సాహన్ని చూపుతారు.
- ఉపాధ్యాయులు.

(V) IMPLICATIONS :

- గణిత పుస్తకంలో భిన్నాలు- చతుర్విద ప్రక్రియలకు సంబంధి సమస్యలు పరిమితంగా ఉండటం.
- VII తరగతిలో ఇంకా అభ్యాసాలు భిన్నాలు, కూడికలు, తీసివేతలు, గుణకారాలు, భాగహారాల గురించి విస్తారంగా ఉంటే బాగుంటుంది.
- విద్యార్థులకు ఎక్కాలు, గుణకారాలు చేయటం తెలిసి ఉండాలి.

(VI) References :

SCERT, TS. 6th, 7th Class Text Book
EDUTRACKS

STATE LEVEL MATHEMATICS SEMINAR - 2022

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Sub Theme

Innovative strategies in teaching mathematics to create students interest towards mathematics

Title of the Paper

Student friendly mathematics class room

Introduction: Mathematics, being an important subject and occupying a central position since the ancient period till date, has not been of interest to many students. The reason is mainly because there is aspiration but it is hard to achieve. Being highly abstract, it is concerned with ideas, which are interrelated, and with the manipulation of symbols. Teaching of mathematics is not only concerned with the computational know-how of the subject but is also concerned with the selection of the mathematical content and communication leading to its understanding and application. So while teaching mathematics one should use the teaching methods, strategies and pedagogic resources that are much more fruitful in gaining adequate responses from the students. Teaching and learning mathematics involves complexities which can be overcome if certain rules are followed. The nature and quality of instructional material, the presentation of content, the pedagogic skills of the teacher, the learning environment, the motivation of the students are all important and must be kept in view in any effort to ensure quality in teaching-learning of mathematics. Mathematics has a key role to play in many different fields: innovations in medicine, digital encryption, communication technology, modeling real life phenomena,

predicting disasters, organisation of enterprises, business and transport to name a few. As Mathematics is one of the pillars of Basic Sciences, one of the solutions is to remove the mathematics phobia that has been cribbing into the minds of the students. In this paper, we focus on the problems, objectives, needs and on the innovative methods of teaching and attracting students to this subject.

Objectives: To help students to learn how to recognize and solve problems, comprehend new phenomena, construct mental models of those phenomena and given a new situation, set goals and regulate their own learning methods.

The following are some of the innovative methods that we can adopt in class room.

A) Promote asking questions - Using some questions in every topic we teach.

1) Why

Eg: Why $\sqrt{2}$ is irrational?

2) What if not...?

Eg: What if not two numbers are equal?"

3) Under what conditions.

Eg: Under what condition $ax + by + c = 0$ is a Linear equation?

4) Is it possible...?

Eg: Is it possible that two rectangles are always similar?

5) What's the largest/smallest..

Eg: Which is largest 4/5 or 5/4?

6) What are the properties of...?

Eg: What are the properties of two similar triangles?

7) How did you know...?

Eg How do you know that The sum of two even numbers is again even?

8) What other...?

Eg: What other examples you can cite on that concept.

Out Comes: Students can experience mathematics as a process of finding and connecting ideas so that justifying ideas and problem solving become more important than the actual solutions; The teacher spends time in planning and thinking of how students might address the problem

under investigation and The teacher leads students to know that the thinking and problem-solving skills they develop can serve them in all aspects of their lives.

B) E-D-I-P-T for Innovative mathematics class room

The five stages of EDIPT are:

Empathise Develop empathy, and find out the needs for the solutions.

Define-Define issues and the potential of addressing them.

Ideate-Think and generate new, creative ideas.

Prototype-Make a draft or sample of the solutions to explore the ideas further.

Test-Test the solutions, evaluate and gather feedback.

C) Encouraging open end questions

Eg1: Pick a number which you feel is not fit among the 4 numbers and give reason.

Number **Reason**

1.---------- ----------

9	**25**
16	**43**

2. ---------- ----------

Eg2: guess the position of 5/3 on the number line.

1_____2_____3_____

Eg3: What method you follow while calculating 1) 24+59 2) 567-64 3) 56 X 45

Eg4: Relational thinking concepts like

1) _____ + _____ = 230 2) 7433 + ____ = 7439 + 6994

Eg5: As close as it get type of questions like

What is the closest natural number to 10/9 + 7/4

Eg6: Relating math with real life example will create interest towards the subject and then students can think of their own and try to give as many examples as they can give.

1. While teaching Quadratic equations we can give example of Motion of Rocket.
2. While teaching symmetry we can give example of Charminar.
3. While teaching Mode we can give example of foot wear shop.
   Always encourage the students to think in innovative way and let them generalize the topic to their day to day life.

Are we really ever going to use this in real life?" is a common phrase heard in many math classrooms. To help students understand the benefits and wonder of math, relate what they're learning to the real world! Have students research different career paths that use the concepts they're learning, or invite members of the community to speak about how they use math in their jobs. Call some engineers to the class and let the students interact with them. Let them teach some daily life situations where math is useful to them. Who knows where in life it could lead our students?

D) Play way method of teaching

This is one of the best method of learning not only mathematics but also almost all subjects. In this method the students actually don't know that they are learning. He will be involved in game mood but he learns.

For example, if we ask a first grader or a second grader **what is one billion plus 2 billions?**

Can we expect the answer? He finds it difficult. But if we teach them in a play way manner like

What is one apple plus one apple?

What is 2 bananas plus 3 bananas?

They can answer above questions easily. Now ask them what is one billion plus one billion they will say two billion this is the magic of play way method of teaching.

Now you can even ask then what is one third plus one third they will answer. **Here we created a mathematical language which is important.**

Conclusion: 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 also a failure of the teacher. An effective teacher is who always learn, passionate towards experimentation and keen on student development.

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STATE LEVEL MATHEMATICS SEMINAR – 2022

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ప్రధాన అంశం: గణిత బోధనలో ఆవిష్కరణ దిశగా ముందుకు సాగండి.

ఉప అంశం: సెకండరీ స్థాయిలో గణితాన్ని బోధించుటలో జోక్యాలు మరియు ఆవిష్కరణలు.

సమర్పణ: మన దైనందిన జీవితం ప్రతీక్షణం గణితంతో మమేకం. సంక్లిష్ట సమస్యలను సరళతరం చేయటం గణిత లక్షణం.

గణిత విభాగాలలో అంకగణిత ప్రాధాన్యత చాలా ఉంది.

జాతీయ గణిత దినోత్సవం సందర్భంగా పరిశోధనా పత్రం.

టాపిక్ శీర్షిక: ప్రధాన కారణాంక పద్ధతిలో రెండు లేదా మూడు సంఖ్యల క.సా.గు(కనిష్ట సామాన్య గుణిజం) మరియు గ.సా.కా(గరిష్ట సామాన్య కారణాంకం) లను కనుగొనుటలో ఆవిష్కరణ.

లక్ష్యాలు: 1) ప్రతీ విద్యార్థి సులభంగా క.సా.గు మరియు గ.సా.కా లను కనుగొంటారు.

2) విద్యార్థి క.సా.గు మరియు గ.సా.కా లను పోల్చును.

3) ఈ సమస్యలను సాధించుట ద్వారా గణితం పై ఆసక్తిని పెంపొందించుకుంటాడు.

ఆవిష్కరణ రూపకల్పన:

ఆవిష్కరణ వివరణ: 1) మొదట 14,24 మరియు 36 లను ప్రధాన కారణాంకాల లబ్ధంగా రాయాలి.

2) తరువాత వీటన్ని ంటిలో సామాన్య ప్రధానాంకాలు ఉండేలా అనగా$14=2^1\times7^1$ లో 3^0 ఈ లబ్ధంలో రాయడం. ఇదే విధంగా

$24=2^3\times3^1$ లో7^0ను మరియు $36=2^2\times3^2$ లో 7^0 రాయడం.

క.సా.గు అనగా $2^1,2^3,2^2$లలో గరిష్టం అనగా 2^3

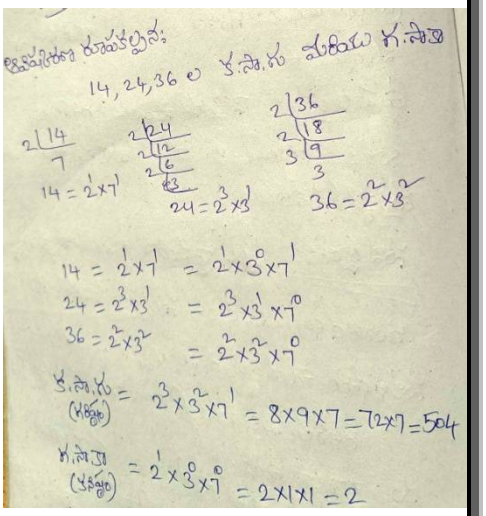
మరియు $3^0,3^1, 3^2$ లలో గరిష్టం అనగా 3^2

$7^1,7^0,7^0$ లలో గరిష్టం 7^0 లను గుణించాలి.

క.సా.గు$=2^3\times3^2\times7^1 = 504$

ఇదే విధంగా గ.సా.కా అనగా కనిష్టంలను తీసుకొని గుణించాలి.

గ.సా.కా $=2^1\times3^0\times7^0= 2$



ఆవిష్కరణ ఫలితం: విద్యార్థి ఎలాంటి సందేహానికి తావు లేకుండా సులభంగా క.సా.గు మరియు గ.సా.కాలను కనుగొంటాడు.

చిక్కులు: 1)ఇచ్చిన సంఖ్యలను ప్రధాన కారణాంకాల లబ్ధంగా రాసేటప్పుడు సంయుక్త సంఖ్యలను తీసుకునే అవకాశం ఉంది.

2) సమస్యలు చిన్న పొరపాటు జరిగిన గణితం అంటే భయం ఏర్పడే అవకాశం ఉంది.

ప్రస్తావనలు: NCERT MATHEMATICS TEXT BOOKS

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STATE LEVEL MATHEMATICS SEMINAR 2022

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Qualifications : M. Sc. MATHEMATICS, M. Sc. PHYSICS, B. Ed (Mathematics & Physical Science).

THEME :

WAY FORWARD TOWARDS INNOVATION IN MATHEMATICS TEACHING

SUBTHEME :

INNOVATIVE STRATEGIES IN TEACHING MATHEMATICS TO CREATE STUDENTS INTEREST TOWARDS MATHEMATICS.

TITLE OF THE TOPIC :

JOYFUL LEARNING BY MATHS GAMES USING INNOVATIVE IDEAS.

INTRODUCTION :

- Introducing interesting graph games to avoid difficulties to identify coordinates, quadrants on graphs and to drawvarious types of graphs.
- Introducing a different way to do calculations of additions ,subtractions very speed and to identify decimals on number line easily.
- Identifying square root numbers on number line easily using handmade antique work.

OBJECTIVE :

- Students can draw various types of graphs easily by playing graph games .
- Students can do speed calculations of addition , subtraction and they can identify decimals on number line easily .
- Identification of square root numbers on number line easily.

PRESENTATION (Design & Description of the Innovation) :

Students have been facing difficulties to identify the coordinates on the graph , quadrants of the graph and to draw various graphs also.

Toavoid such typeof hurdles ,I introduced and designed two types of interesting graph games.

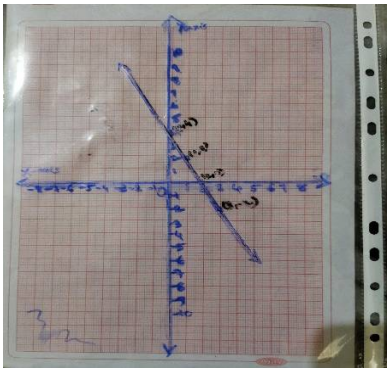
Required material :

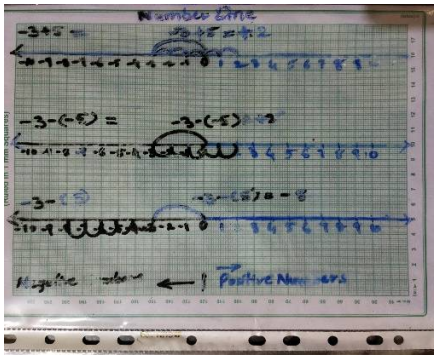
We required a graph Flexi / graph floor , graph papers ,stiff charts , lamination covers, colour ribbons, coins, woollen thread.

I have taken a 10 ×10 size graph flexi to explain 9thand 10th maths chapters related to graph (If graph Flexi is not available then we can use checks tiles floor in the classroom as a graph).

I sticked a transparent cello tape on x-axis and y- axis to write different scale values using marker and also we can remove and rewrite the values on it according to graph.

Every student can take a graph paper and stick it to stiff chart and cover by a transparent sheet to write, remove and rewrite the values according to graph on that transparent sheet by using sketches . Now it is ready to use like a graph slate. And we can draw co-ordinate plane and Plot the points on it.





Some of the students of the class play on the graph floor , while remaining students observe them and practice on their graph slates simultaneously.

POINTS CHAARPATTHA :

In this game four students will be there , each of them stands on the four different quadrants on the graph with having one coin each. And one more student stands on the origin and moves on the X-axis and Y-axis.

This middle one asks others to put their coins on a particular point which ever given by him, and he tries to stop them to put their coins on that given point . But that four students have to reach that particular point and put their coins on it by escaping from middle one. If middle one catches

any student from that four members , then the new one acts like middle one and another four members play the game continuous like that.

By this process everyone knows identification of points and they identify the quadrant of given point easily .And remaining students of the class also practice the plotting points on their graph slates.

Ex : identify the point (5 , 3) and it's quadrant?

- **TAKKAR MAAR – PLOT A POINT :**

I haveintroducedone moreinteresting graph game called **Takkar Maar plot a point.** In this game , two students stand at origin . One of them moves on the X-axisand indicates abscissaof given coordinate and other moves on the y-axis to indicate ordinate of given coordinates on the graph floor. Then they turns 90 degrees and moves on the straight lines to TAKKAR(meet) at a point .That point is our required point. Like this we can plot so many points on graph floor and draw various types of graphs by joining the points on the graph.

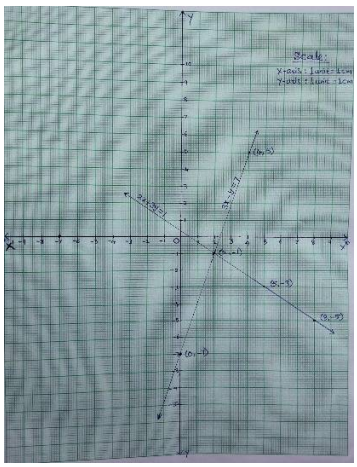
Ex : To plot a point (-3 ,5) .

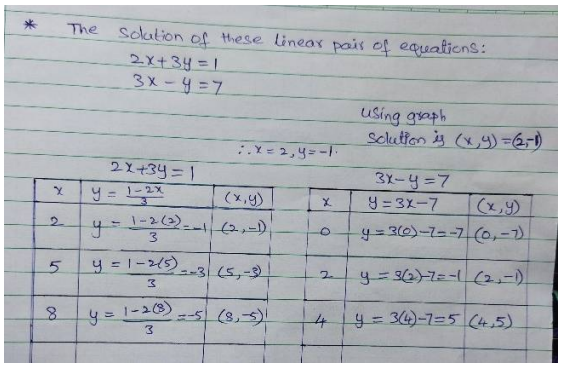
One student starts from origin and he jumps 3 times on the X axis towards left side of the origin to reach the point - 3 and another one also starts from origin and he moves on the Y axis towards front side of the origin by jumping five times to reach the point 5 . Then they turns 90 ° and move to Takkar(Intersects) at a point in a quadrant, that is our required point.

By playing this game students identify the co-ordinates and quadrants very easily.

Example : Find the solutionof these linear pair of equations by using graph

2x + 3y = 1 ; 3x – y = 7 .





This time we divide the students into two groups. From first group each student walks on the graph Flexi / graph floor and put a coin at the given points on the graph . Similarly from second group each student walks on the graph and put a coin at the givenpoints. After plotting the points, first group students join their points with a colour ribbon and second group students join their points with another Colour Ribbon . Then we get two lines and also we can find that the lines intersect with each other at a point . That point is required solution. By this way of practicing the graph , students will enjoy the graph problems and remembers for a long time . It is easy to understand the below average students also.

I found that , teaching the graph by this playing method, I got 99% positive results from the students . Below average students also shows interest to participate in this type of games and they will be free from maths phobia and they get interest to study Mathematics.

Number line :

Students can learn addition, subtraction and multiplication very easily by using number line Flexi . We can cover so many problems from 6th to 10^{th} class by simple understanding.

Herefor

Positive numbers - move Right hand side,

Negative numbers - move Left hand side,

Addition - move front (forward) side,

Subtraction - move back (backward) side.

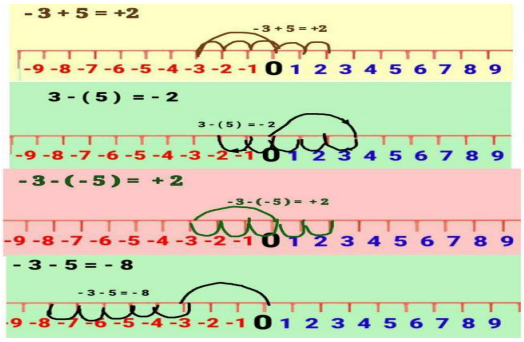
We can observe the below examples

Ex : - 3 + 5 = + 2

First the student turns left hand side of " 0 " jumps on -3 , then turns right hand side and goes to 5 steps forward then he can reach + 2.

3 – (5) = - 2

The student turns right side of the zero then jumps on 3 and then goes to five steps back without turning then he can reach- 2.



-3 – (- 5) = + 2

The student turns left side of the zero then jumps on -3 and without turning(stays left side face) he goes back to 5 steps , then he can reach " +2 ".

-3 – 5 = - 8

The student turn left side of the zero then he jumps on -3 and turns right side then goes back to 5 steps then he can reach " – 8 "

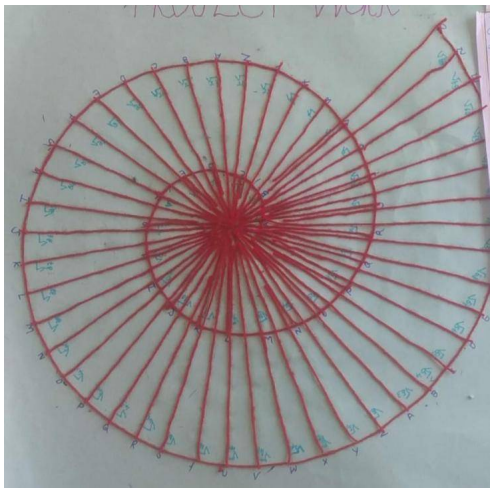
IDENTIFICATION OF DECIMALS ON NUMBER LINE :

We can identify decimal numbers on number line very easily using this number line charts or flexi .By dividing each unit into 10 equal partitions ,we can take separate charts and draw a line and divide into 10 equal partitions and show decimal numbers on it.

Show 8.359 on number line.

SQUARE ROOT SPIRAL :

Students can identify √2 , √3, √4, √5, √6, √7…etc on the number line easily by preparing this teaching learning material . That is a woollen thread knitted square root spiral on the cloth with handmade antique work to attract students to observe and learn the concept interestingly.



OUTCOMES & IMPLICATIONS :

- All of the students in the class involved in graph games activities and gain the knowledge about graph easily.
- Real time practical knowledge helps to remember forever .
- Students drawn various graphs easily on the graph Floor by playing graph games .
- Students done speed calculations of addition, subtraction and multiplication very easily using number line .And known about identification of decimals on the number line.
- Students identify easily the square root numbers on the number line by using attractive teaching learning material . i.e. woollenknitted square root spiral on the cloth .
- students are happy to learn new things by playing various games related to mathematics subject .

I have experienced that most of the students understand easily , and I got good result from students using above teaching methods

REFERENCES :

SCERT TELANGANA MATHEMATICS SEMINARS.

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STATE LEVEL MATHEMATICS SEMINAR - 2022

I) PERSONAL DETAILS

Name of the Teacher : MITTI.BALA CHANDAR

Qualifications : a) Academic: M.Sc. (Organic Chemistry)

b) Professional: B.Ed. (Physical Science & Mathematics)

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II) SUB THEME:

Innovative strategies in teaching mathematics to create students interest towards mathematics.

TITLE OF THE TOPIC:

Innovative strategies in teaching mathematics.

III) OBJECTIVES

- The activities are pave way for the students to observe, brainstorm, think, question, explore and finally discover the concepts involved.
- Building the Mathematical concept among the students.
- By doing group activities, students develop leadership capabilities.
- Encourage the student to apply the Mathematical concepts in real life situations.
- To reduce dropouts and irregular students.
- To motivate the students to choose Maths as career.

IV) INTRODUCTION

COVID-19 has effected the whole world. Many of the people suffered with adverse effect of this Pandemic Period. Lots of people lost their beloved, and some of them are losttheir health and wealth.Due to COVID-19, many of them became unemployed, some of them were starved, some of them became orphans and alone. It effected the physical and mental health.

DESCRIPTION OF THE PRESENTATION

Our school studies can be divided into three stages.

1) Before COVID-19
2) During COVID-19
3) After COVID-19

Now we are in 3rd stage that is after COVID-19. Students are changed in various aspects such as retention and attention towards the study and towards the school.It is become very difficult to make the student to sit and concentrate on the study, they are not able to understand what the teachers are teaching. Even it is become more difficult to maths teacher to make the student to do the problems.

To overcome this, we need to change our teaching strategies, which are used before COVID-19 and during COVID-19. We have to make the students to involve in the maths. we have to use playway method to overcome this.

Here I am presenting some activities which are used in my school.

ACTIVITY:1

I took some chairs and wrote place values on them. I distributed 1 to 9 digits to student and ask to sit on the chairs, after occupying the chair, other student has to give place value to them and they have to tell the number.

ACTIVITY:2

In this activity, a student with a digit 1 to 9 will sit in one chair with place value on it then he will move to the other chair with another place value, remaining student has to give the value of him.Students will understand how the value of digit changes from one chair to another chair?

ACTIVITY:3

Tables by cutting the lady finger or beans. Student able to learn the tables when their mother cutting the vegetables like lady finger or beans. By placing beans or lady fingers count 1 to10,

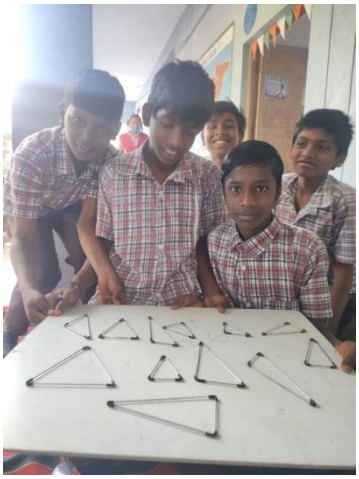
we can learn tables.

I gave advice to parents in PTM to make the students learn table in home, even though parents are illiterates but they have knowledge of numbers and tables.

ACTIVITY:4

Fractions with student's names, Students have to write fractions Vowels to consonant letters present in their names.

Ex:



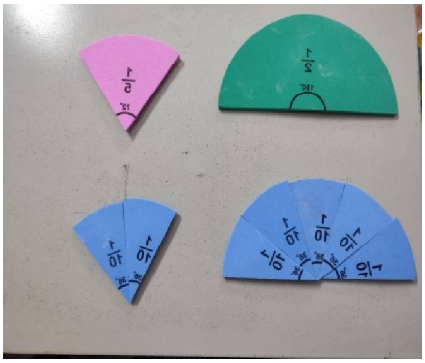
Vowels ratio in English alphabets is 5/26.

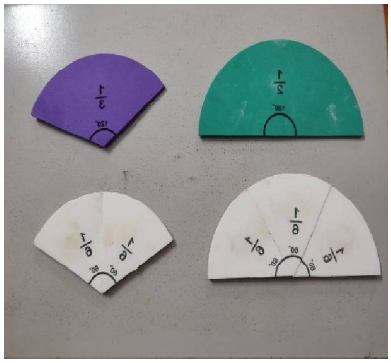
In BALA CHANDAR Vowels ratio is 4/11.

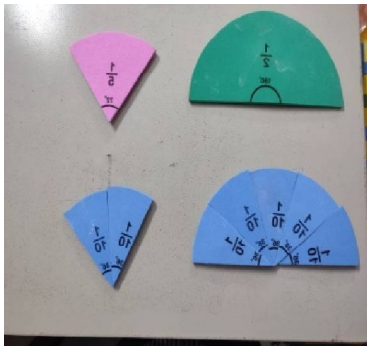
In MATHEMATICS Vowels ratio is 4/11.

ACTIVITY:5

With iron spokes and rubber tubes we can demonstrate different triangle such as Equilateral, isosceles, scalene, acute, right angled and obtuse angled Triangle.

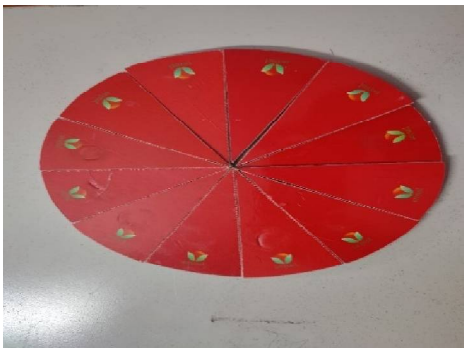






ACTIVITY:6

Using form sheets to explain mathematics concepts such as unlike fractions additions and areas of different shapes.



Some group activities for maths in 3rd week of every month in our school.

CODUCTING MATHEMATICS DAY IN SCHOOL

Every year 22 December we are celebrating National Mathematics day too by displaying all mathematical instruments.

I) CONCLUSION AND IMPLICATIONS

By adopting the new approach strategies in teaching-learning processes, the studentwill be attracted toward learning process. These approaches give make it hands-on, Usevisuals and images. Find opportunities to differentiate learning. Ask students to explain theirideas. ...

Incorporate storytelling to make connections to real-world scenarios. Show and tell newconcepts. Let your students regularly know how they're doing. The use of the e-learningmethod has a positive influence on motivation, autonomy, participation, mathematicalconcepts, results and grades. These strategies help students to learn much better thanbefore.

REFERENCES

- 6th, 7th , 8thclass Telangana Mathematics text book
- SCERT manualshttps://scert.telangana.gov.in/

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STATE LEVEL MATHEMATICS SEMINAR 2022

Personal details :

Name of the teachers : VAGDEVI SATTIRAJU

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Qualifications : M.Sc (Applied Mathematics); M.Ed; UGC NET (Education) Qualified.

Theme: "Way forward towards Innovation in Mathematics teaching"

Sub-Theme: Innovative strategies in teaching Mathematics to create students interest towards mathematics.

Title of the topic : To study the impact of the Innovative strategy of "Interactive Simulations" in teaching mathematics to middle school students, on their academic achievement.

Objectives of the study :

1. To develop an innovative strategy module for teaching Mathematics to middle school students.
2. To study the impact of interactive simulations in the teaching of mathematics on the academic achievement of middle school students.

Hypothesis of the study:

- There is a significant difference between the pre-test and post-test scores of the experimental group for academic achievement before and after the Intervention.

Introduction:

Mathematics is not just a series of rote exercises performed in a classroom. Mathematics is something built into the fabric of reality: a collection of shapes, patterns, numbers and Mathematics is a living feature of the world we live in. The teacher should not just directly transact the knowledge to the learners, instead should focus on **Cueing** or **nudging** the children to discover the answers themselves - the role of a teacher being a facilitator. Emphasis should be on WHY, the reason behind the WHAT- posing open-ended questions and respecting all their ideas and appreciating them.

In order to sustain the interest of students to learn Mathematics, we need to strategise our teaching using innovative techniques like flipped classroom, collaborative learning,

activity-based learning etc. by incorporating technology wherever possible. NEP 2020 emphasised on conceptual understanding rather than rote learning and learning -for-exams.

- I chose to take up the innovative strategy **" Interactive Simulations**" which I thought, would be very useful for the present generation students to learn mathematics with more interest, enthusiasm and appreciation for the subject.

Design of the innovation :

The design adopted for the study is **Single group Quasi-experimental design.**
Test/Intervention/Retest design was employed to see whether teaching Mathematics using Interactive Simulations helped in boosting the academic achievement of middle school students.
This design aims to establish a cause and effect relationship between independent and dependent variables.
Independent Variable -Interactive Simulations
Dependent Variable - Academic achievement
The sample comprised of 20 students from Class 7of St. Ann's School who were administered an intervention module of Interactive Simulations. Initially a pre-test was conducted for them and the question paper followed Bloom's Taxonomy. Then the intervention module of Interactive Simulations was administered for 10 days.

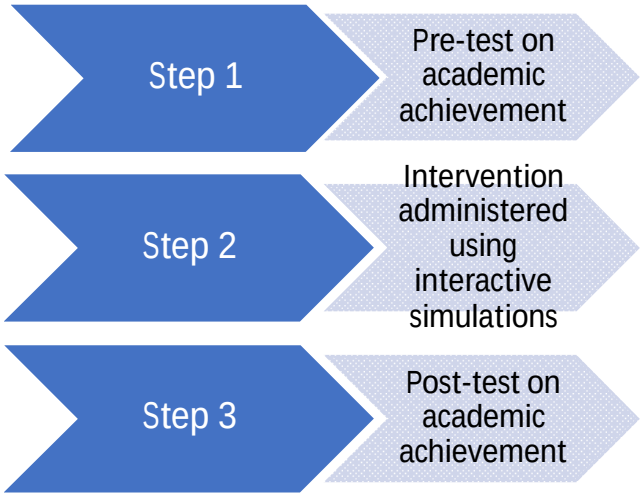

Fig 1 :Design of the study
The day-wise intervention topics were as follows :

Day 1 : Concepts of Area and Perimeter
Day 2 : Perimeters of Square and Rectangle
Day 3 : Areas of Square and Rectangle
Day 4 : What are integers ?
Day 5 :What are rational numbers ?
Day 6 :Number line operations on integers
Day 7 : Understanding 3D shapes
Day 8 : Dynamic illustrator- plotting points
Day 9 : Some more problems on areas
Day10 : Math magic problems on these topics
After 3 weeks, a parallel form of pre-testwasadministered as post-test on the same group of students to know the impact of this innovation on their academics. The quantitative change in their test scores was determined.

Description of the innovation:

- Interactive Simulations (Sims) are excellent tools to help support student learning. They are created to visualize math ideas. It makes students to easily understand the concepts and learn with interest.
- They are easy to access. Sims may facilitate the use of multiple representations, support students' efforts to construct their own knowledge, focus student attention on conceptual ideas, and allow immediate feedback. Though Sims offer great potential to benefit mathematics classrooms, it is how the teacher integrates this tool that will determine its effectiveness.
- These simulations and resources are generally available free. We can either create them or can use the readily available resources with various websites what they have already created.

Analysis and Interpretation :

Description	Sample size	Mean	Standard deviation	t-value	Df	Significance level
Pre-set	20	3.25	2.14905	5.82	19	Significant at 0.05 level
Post-test	20	5.8	2.54641			

From the above table, the mean value obtained for the post-test (5.8) is greater than the mean value(3.25)obtained for the pre-test. The post-test SD (2.54641) is greater than the pre-test SD(2.14905). The obtained t-value (df=19) 5.82 is greater than the t table value=2.093. Therefore the hypothesis of the study is accepted and null hypothesis is rejected. Therefore, there is a significant difference between the pre-test and post-test scores for academic achievement before and after administering the intervention.

Outcome of the innovation :

After the study, it was clear that there was a significant improvement in the test scores after administering the interactive simulations in teaching mathematics.

Implications :

- The study helps in encouraging mathematics teachers to come out with innovative ideas to be incorporated in their teaching.
- The study showed that students enjoy learning Mathematics with more liking, interest and readiness by using innovative teaching strategies rather than the traditional teaching methods.
- The learners, for sure, taste the essence and beauty of Mathematics
- Children would be surprised to know about how Mathematics is everywhere around and how it plays a superior role over all other disciplines as Simulations promote the use of critical and evaluative thinking.
- It helps students develop logical reasoning, decision-making, critical thinking and problem-solving skills, which in turn help them to handle problematic situations in real life too, and lead a balanced life.
- The study promotes professional development of mathematics teachers.

Scope for further study :

The study can be extended to the students of high school, higher secondary and university level students.

Efforts should also be put in training the teachers as to how to use these innovative teaching strategies based on technology.

Conclusion :

As it is clearly evident from the study that teaching mathematics through interactive simulations enhances the interest of the learners towards Mathematics and keeps them engaged, it is highly recommended that every mathematics teacher should get updated with the changing times and make a move forward to develop great learners for a future Transformed India.

References :Webology

- https:// files.eric.ed.gov
- https:// phet.colorado.edu
- https:// www.geogebra.org
- https:// www.olabs.edu.in

*****

STATE LEVEL MATHEMATICS SEMINAR - 2022

PERSONAL DETAILS :

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Peddapalli District, Telangana State

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Mobile Number : 8309467283.

Theme:

Way Forward towards Innovation in Mathematics Teaching

Sub-Theme:

Innovative Strategies in teaching mathematics to create students interest towards mathematics.

Title of the Paper:

JOYFUL WAY OF TEACHING MATHEMATICS TO THE PRESENT GENERATION

Abstract and Keywords

ABSTRACT: Paper presentation for the *State Seminar on Mathematics Education* held *on 22nd December 2022* as organized by DEPARTMENT OF MATHEMATICS AND SCIENCE, SCERT-HYDERABAD, TELANGANA with a Main theme of "Way Forward towards Innovation in Mathematics Teaching " and with a sub – theme of "Innovative Strategies in teaching mathematics to create students interest towards Mathematics".

Teaching of mathematics is not only concerned with the computational knowledge of the subject but it also concerned with the mathematical content and communication leading to its understanding and application.

One of the greatest problems in the present generation of School students is Fear of Mathematics. It is a challenging subject to LEARN and TEACH. If we can't built the primary concepts perfectly then we can't move ahead in the higher Classes.

As per research done by various organisations 3 out of 4 children have fear in Mathematics Subject. But Math plays a vital role in nurturing ones essential abilities. Since maths is every corner of life from Birth to Death.

In this presentation, I've expressed some strategies how to Joyful way Teaching Mathematicsto the Present Generation during the class. It depends upon the situations, we may modify as per our situations for the benefit of fruitful results and Moreover we make a holistic life for everyone.

Finally, I will conclude with a quote "Working for Success will make you a Master, but Working for Internal Satisfaction will make you a legend " Like IIT Legend Mr. Chukka Ramaiah.

KEYWORDS: Communication, Nurturing, Math Fear and Joy

1.Introduction

Teaching of mathematics is not only concerned with the computational knowledge of the subject but it also concerned of the mathematical content and communication leading to its understanding and application.

.

2. Objective

a) To promote collaborative learning among students.
b) Education is imparted for achieving certain ends and goals.
c) To develop scientific attitude and power of decision making
d) To develop mathematical skills like speed, accuracy, neatness, brevity, estimation etc.
e) To develop heuristic attitude and to discover solutions and proofs with the own independent efforts.
f) I hear I forget, I see and believe, I do and I understand.

3. Detailed information of the topic

One of the greatest problems in the present generation of School students is Fear of Mathematics. It is a challenging subject to LEARN and TEACH. If we can't built the primary concepts perfectly then we can't move ahead in the higher Classes.

As per research done by various organisations 3 out of 4 children have fear in Mathematics Subject. But Math plays a vital role in nurturing ones essential abilities. Since maths is every corner of life from Birth to Death.

Now an important Question arises in everyone's mind. That is

- ✓ How to resolve this problem?
- ✓ Is there any innovative strategy to solve this problem?

My answer is "YES", it can be solve by creating an INTEREST on the Subject Teacher as well as subject with support of Subject Experts along with the Management and Parents.

How to arise interest in the subject among students?.

When students are involved in the activity based learning or by practical experience teaching of the content, the problem of inattentiveness in classroom will be solved easily.

✓ Interest is considered to be a powerful "DICTATOR", "INSPIROR" and a "MOTIVATOR".

By practicing innovation strategy of teaching mathematics in the classroom by gifting them Math Subject.

AS PER NATIONAL CURRICULUM FRAME WORK 2005 MATHEMATICS IS

The emphasis for learning mathematics is that all students can learn the need to learn mathematics.

Pedagogy and learning environment have to be made favourable for students to develop interest by going far beyond basic skills and include variety of mathematics loving models by pedagogy which devotes a greater percentage of instructional time to problem solving and active learning.

Mathematics makes learner systematic, confidential, and self-evaluated, self-esteem, self-reliable etc.

1. Children learn to enjoy Mathematics rather than fear it.
2. Children learn "important" Mathematics which is more than formulas and mechanical procedures.
3. Children see Mathematics as something to talk about, to communicate through, to discuss among them, to work together on.
4. Children pose and solve meaningful problems.
5. Children use abstractions to perceive relationships, to see structures, to reason out things, to argue the truth or falsity of statements.
6. Children understand the basic structure of Mathematics: arithmetic, algebra, geometry and trigonometry, the basic content areas of school Mathematics, all of which offer a methodology for abstraction, structuration and generalization.
7. Teachers are expected to engage every child in class with the conviction that everyone can learn Mathematics.

The teaching strategies that can affect learning process:

Different types of teaching strategies can help the students to understand and retain the information to develop problem solving skills, to develop critical thinking and to become more engaged in the learning process.

So here Iam sharing some teaching strategies to increase the problem solving and logical reasoning skills of children. Using a variety of teaching strategies can also help to create more positivity and supportive learning environment for all students.

A. OPEN ENDED PROBLEMS:

Open ended problems help learners to increase problem solving Skills.
For example a closed ended question be like what is sum of 20 plus 50 ?
The related open ended question be like the sum is 70, what could be addends be?
This provide students many opportunities for math discussions and incredibly engaging.

B. TO CREATE OWN PROBLEMS:

For this activity students are asked to create as many as questions relate to the daily life situations.

For example, in prayer how many rows are there for boys and girls?

Like this question create your own one. So with this students will observe the world around them to create their own problems.

C. REDUCE ANXIETY THROUGH MATH GAMES:

Anxiousness is a natural feeling. Most of the Children like games by encouraging them to play math related game is a great way to reduce anxiety. While playing games students work in teams and learn to achieve team goals.

D. BUILDING DIVERGENT THINKING SKILLS:

Mathematical problems that challenge students to think divergently. For example,

If our room is in the Spherical instead of a cuboidal shape then what happen ?

Justify your Answers?

E. MATHEMATICAL MODELING METHOD:

Mathematical modeling Method refers to the process of creating a mathematical representation of a real world scenario to make a prediction or provide insight.

Few Components of Math Modeling are

1. Defining the problem 2.Making assumptions 3.Defining Variables
4. Getting a solution 5.Analysis and Model Assessment 6.Reporting the Results

F. STORY TELLING:

Make the problem more real by bringing it into real life with role play. Stories can help to humanize Mathematics and to develop conceptual understanding. It also improve math vocabulary and make Mathematics more enjoyable and we can engage all the students in this activity.

With this tool students develop their skills and understand the problem that comes in their way.

4. Related Photographs

5. Implications

Concentrate on the following points while teaching

1. Before Starting of the class interact with the students for the joyful environment.

2. Most of the children are very much found of virtual classes. So, in our opinion just allow the students to keep the virtual classes. So, that they feel happy and all sessions will be very fun and creative with interactive.

3. If possible during the sessions apply project based learning by dividing the children into different groups so that they don't feel lonely and they together do the activities assigned to them.

4. Make a time for conversation that means divide the 40 minutes session into time breaks for introduction, time for the topic explanation, for the interaction. So, that the students may easily understand the whole at a flash.

5. Make a good communication with the parents, this may be helpful for us to understand the students mental and physical status. By friendly atmosphere of teacher and parent relationship, the students will feel happy and the parents also come to know, What is happening during and after the classes.

6. Once in a week, plan a class for interactive open session by the teachers with the students and parents. So that, this maybe helpful to discuss the problems of children and they can share their thoughts.

7. Allow the children to express their thoughts and allow them to explore the situations freely.

6. Conclusion

In this presentation, I've expressed some strategies how to Joyful way Teaching Mathematics to the Present Generation during the class. It depends upon the situations, we may modify as per our situations for the benefit of fruitful results and Moreover we make a holistic life for everyone.

Finally, I will conclude with a quote "Working for Success will make you a Master, but Working for Internal Satisfaction will make you a legend " Like IIT Legend Mr. Chukka Ramaiah.

7. References

- Internet Resources
- Practically situation of teaching my students, Co-teachers and Parents.

STATE LEVEL MATHEMATICS SEMINAR 2022

PERSONAL DETAILS

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Theme of the Seminar:

Way forward towards Innovation in Mathematics teaching.

Sub Theme of the Seminar:

Innovative strategies in teaching mathematics to create students' interest towards mathematics.

Title of the Topic:

Learning mathematics in simple and interesting ways.

Objectives :1) To create interest among students towards learning mathematics.

2) To enable the students to understand mathematics rather than just techniques.

Design of the innovation: InMany schools mathematics is generally taught as a technique to solve problems using formulae and some thumb rules. But the beauty of mathematics and the conceptual clarity are not properly transmitted to the students in the regular methods.

So, teaching mathematics through following strategies whenever possible will not only create interest amongstudents towards mathematics but also gives them at least a bit more conceptual clarity. The strategies that are discussed in this paper are

- Songs
- Stories
- Activities
- Analogies

Description of the innovation; Theexamples of the techniques mentioned above broadly cover the following spectrum of areas. Namely

1) Number system

2) Algebra
3) Data handling

1) Number system through song and activity.

Generally, children learn counting even before they join formal School. If we teach them addition, we can make them generate tables on their own bypassing the rote learning. Encouraging them to write tables by adding the same number each time gives confidence and interest among slow learners that they can write tables on their own.

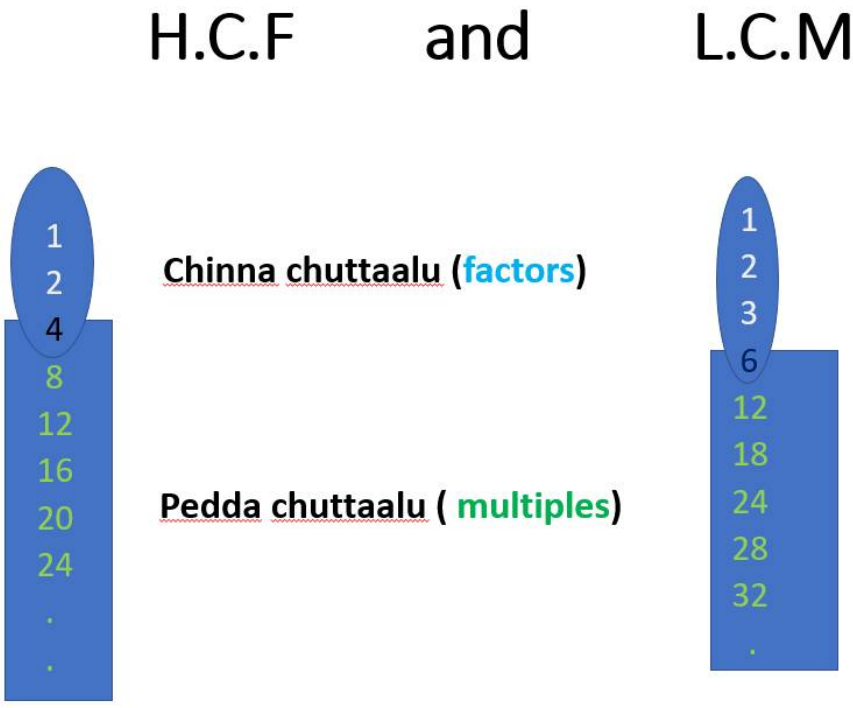
A song is created in our school in this regard to attract children towards mathematics. The concept of power and coefficient is also introduced to the students in the song. The link of the song is given below

https://youtu.be/mWlP1MNfIag

ii)Activity

Chinnachuttaalu(youngerrelatives) andpeddachuttaalu(elder relatives) to understand H.C.F andL.C.M.

Since the children are introduced to tables and became familiar enough with them the following activity can be done in classroom in a known to unknown teaching method.Every number have relatives.Some are younger relatives and some are elder relatives.For example numbers 4 and 6 both have youngerrelatives (chinnachuttaalu) and elderrelatives(peddachuttalu) as shown below



4 comes in the tables of 1 ,2,4 so 1, 2, 4 are factors of 4.And if we multiply 4 we get multiples they are 4,8,12,16,20,24….Similarly 6 have factors and multiples. Students are asked to find if any common factors for 4 and 6. when they find 1 and 2 are common factors, we teach them that highest common factor here is 2. which means H.C.F of 4 and 6 is = 2.
Similarly, students find common multiples are 12,24,36…and the least among them is 12. We teach them that least common multiple or L.C.M of 4 and 6 is = 12.

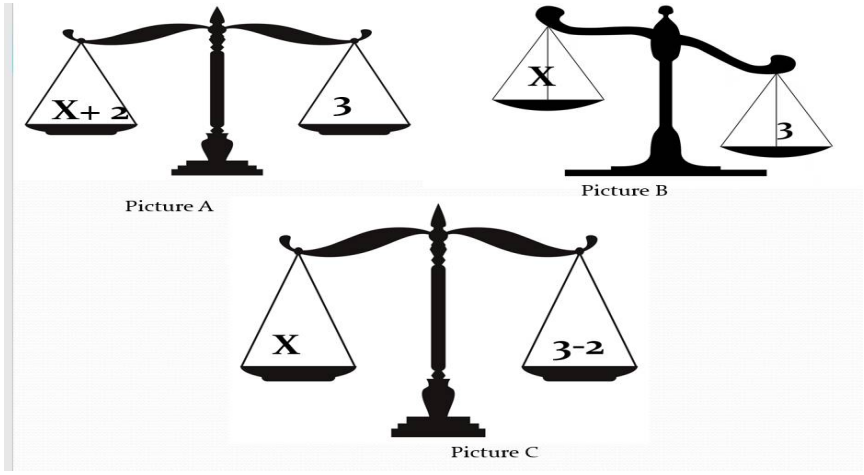
2) Algebra through analogies
In Algebra variable and equation can be introduced through an example given below.

ii) **balancing an equation with simple balance**

students are asked to find the money in the dabba (piggy Bank). But the little girl does not tell the amount in that box directly and gives the following clue.

If I add two more rupees into the dabba (piggybank) then the total amount in it will be 3 rupees. Which means $\square + 2 = 3$

Students using their common Sense can answer that the money already in the dabba(box) is equal to 1Or $\square = 1$ Then students are asked to put any letter like x in the place of the box then it becomes**x**+ 2 = 3.This is an **equation** (can be confirmed by the equal symbol) and **x** =1 is a solution. And the letter used **x**is called **variable.**



In picture A the equation is balanced as there is equal weight in both the pans.If we remove 2 from left pan then as the right pan becomes heavieir the balance losses as shown inin picture B .to counter this we need to subtract equal weight from the right pan as well then it is balanced again as shown in picture C. The students will get the clarity on taking the numbers to the other side of the equation and the logic behind addition becomimg subtration ,multiplication becoming division and vice versa.

iii)**Multiplication of binomial terms through shake hands..**

3) Data handling through story: the concept of average can be taught in a story.Three lovely brothers in a village, who respect their mother so much, go to earn money in the morning and when they return in the evening all there will give their money to their mother who pools the money in a box and distributes equally among them.An example is shown in the picture here.

Big brother's income = 7rupees

Younger brother's income = 6 rupees

Youngest brother's income = 2 rupees

Total money their mother will get = 15 rupees. If equally distributed each will get

5 rupees = **Average** income of them.

Outcome: The following table shows the increase in percentage of students who can understand tables, factors, multiples and HCF and LCM on their own from June (pre-test) to September (post-test) in our school.

Time line	Class	Total number of students	Number of students who understand tables	Percentage of students who achieved	Number of students who can find HCF and LCM	percentage
June	6^{th}	65	13	20%	0	0%
September	6^{th}	65	60	92%	40	61%

Implications:

With the changing times and the entry of electronic devices like smart phones mathematics teaching methods are also to be fine-tuned. To create interest towards mathematics among the students more appealing strategies like songs, stories and activities are useful in achieving the desired learning outcomes which can move up the learning curve in teaching learning process.

References: 1)Image source www.google.com

2) Music for the song from the movie warrior.

3) 8^{th} class maths text book BSE (erstwhile)A.P.

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STATE LEVEL MATHEMATICS SEMINAR 2022

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Sub theme :

Innovative strategies in teaching Mathematics to create students interest towards mathematics

Title of the topic:

Card Game As Reinforcement Tool

INTRODUCTION

A general talk among the teachers and the parents is that the primary school students are unable to perform the four fundamental mathematical operations speedily and accurately. Most of the National surveys and State surveys also observed the similar phenomena. Every teacher tries to explain the mathematical concepts in a detailed manner with a good number of examples. After his/her teaching, practice in the form of sums takes place, in a routine manner. If the teacher adopts mathematical games or play way techniques in the classroom, practice of the students becomes more interesting.

Math games are an effective instructional strategy for reviewing math skills. Unlike drills, games allow opportunities for repeated practice in a non-threatening manner. It is more informal because it is perceived as a fun activity plus it gives students another chance to review important math skills.

Working with peers helps improve interpersonal skills (communicating, being a team player, problem-solving, etc.). Children enjoy playing games. So, this love of play is to be used to foster a positive attitude about math.

Engaging students with math games based upon **play with a deck of cards** is considered in this project. The major advantages of using card games are laws of

exercise and reinforcement. Repetition of this play with peer group and family members develops positive attitude towards mathematics as well as satisfying the recreational aspect.

As soon as the rules of the game are understood, students often require little teacher input, making games an ideal learning activity at home. It strengthens the school-home relationship.

The deck of cards considered is **MULTIVISION-66**. It is developed by our resource person **Dr. PRAKHYA SATYANARAYANA SARMA**. We experimented this Game at our school SRI PRATHIBHA HIGH SCHOOL, Nookapally,Jagtial and found an excellent positive change towards mathematics in our children.

MULTIVISION-66

DESIGN OF THE GAME

It is a card game designed for **Multi**plication and Di**vision** to Preparatory and Middle Phase school students. It gives a practice for framing multiplication statements and division statements. The division statements are with 0 remainder and also a non zero remainder.

This deck consists of **66 cards** formed by

- Cards numbered **1 to 10 each thrice** i.e. **30** cards**.**
- Cards numbered **11to100**, after excluding prime numbers and their multiples, the remaining numbers taken **each one time** i.e.12,14,15,16,18,20,21,24,…..,98and100,i.e.,**36** cards.
- Excluded cards are 11, 22, …….99; 13,26,39,….; 17,34,…… **Note:** The Inclusion of these cards makes a deck of 120 cards. It makes the game passive and also inconvenient to handle the deck. So the exclusion takes place. Further the prime numbers and multiples have less frequency in the process of game.

A valid set for multiplications i.e **multiplication statement** i s a set of **three cards,** ex: (2, 3, 6) expressing 2x 3=3x2=6,

i.e. **multiplicand** x **multiplier=product.**

The same can be treated as a **valid set for division i.e division statement.**

6÷2 gives 3 as quotient or 6÷3 gives 2 as quotient, leaving **no remainder**.

A valid set for division is a set of **four cards, ex:** (2, 15, 7, 1) expressing d**ivision statement, dividend = divisor x quotient + remainder.**

The cards 15, 2, 7, and 1 imply 15÷2 gives 7 as quotient and remainder 1or 15÷ 7 gives quotient 2 and remainder 1.

GAME PROCEDURE:

1. Placing of numbers on cards, shuffling of deck, distribution of cards, taking and discarding of cards, playing procedure and display of cards as "show" follow more or less the usual process of **Indian standard card game.**
2. It can be played by two to four members. It would be convenient to play with three. Let A, B, and C be the players. The deck is mixed well by A. He starts distribution of cards to B right to him, then to C and himself, each one card at a time in an anti-clockwise manner. The distribution of cards is continued until each player gets 9 cards. The immediate 28^{th} card from the pile of the deck will be kept open. The remaining closed pile will be kept a side for further play.

3. Every player checks the received 9 cards and tries to make three **valid** sets.
4. A player, who made three valid sets first, displays for verification. A valid show will become the "**show**". Otherwise, the game continues until any player makes a successful show.
5. The other two non-winning players **'invalid sets** total will be the **gain point** for the winner of that instant. **Ex:** A is the winner with three valid sets, (2, 4, 8);(6, 7, 42); and (9, 9, 81). B makes only one valid set, (5, 3, 15) and the remaining cards are 8, 4, 64, 7, 10, and 35. C makes two valid sets (2, 14, 28) and (1, 3, 3) and remaining cards are 5, 20, and 40. So, the invalid sets are 2 from B and 1 from C, i.e., 2+1=3are the **gain points for the winner** at that instant.
6. Now it is the turn of B to continue the play, and then C till one of them gets Pre determined gain points say 10. (It may be changed according to the time available.)
7. After assessing skills, the game can be continued by distributing **10 cards** to each player and with the condition-each player tries to make two valid multiplication fact sets each with three cards and one valid division fact set with four cards.
8. The scoring of the gain points are based on the number of invalid sets, but not the numbers on the cards or number of cards, at each instant.

OTHER USES OF THE DECK:

A. The same deck can be used for the concept of **Highest Common Factor(H.C.F)** as follows:

1. Two separate teams A and B will be given each one set. The teacher or a senior student may ask A to show down all the **factor cards** (factors) of 18 (say). So A shows down the cards1,18,2,9,3,and 6.Similarly. B has been asked for 24 for which, cards 1, 24, 2, 12, 3, 8, 4, and 6 are shown. Now, they are asked to pick the common cards i.e.,1,2,3,and 6.From these they identify the highest of the common cards i.e.,6 as the H.C.F.
2. The experiment can be continued for other teams and selected pair of numbers.
3. With three teams the H.C.F of 3numbers can also be arrived at.

B. By using the cards the basic concepts in Set Theory like Union of sets Intersection of sets, Difference of sets, Symmetric difference, Complement etc., can be better demonstrated and understood.

STATE LEVEL MATHEMATICS SEMINAR - 2022

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Theme of the Seminar:

Way Forward towards Innovation in Mathematics teaching.

Sub-Theme of the Seminar:

Innovative strategies in teaching Mathematics to create students interest towards mathematics.

Title of the Topic:

Adopting cutting-edge applications makes mathematics teaching more engaging.

Objective(s):

- ✓ To help students develop conceptual understanding and solve problems while studying mathematics.
- ✓ To encourages pupils to adopt a positive outlook in order to flourish in their mathematical aptitude skills.
- ✓ To promote the use of open source tools and software from the elementary to secondary levels.
- ✓ To empower the professional development of mathematics teachers

Introduction:

An intentional use of problem is mathematics. Additionally, one of the major subjects in our lives is mathematics. Whatever calling or field you choose to work in, its application is widespread. It is crucial to have a solid understanding of the subject because of this. Even though the basics are taught in school, we continue to apply math concepts well into adulthood, so it is safe to say that math has taken on a crucial role in society.

In the pedagogy of teaching-learning process of mathematics, the purpose of this study is to employ free and open - source mathematics software like GeoGebra, Maxima, Sagemath, Sci-lab, MATLAB, SpeQ be treated as best mathematical application software whereas R-programming and SPSS are considered to be the greatest statistics tool software. Even Wolfrom-math package also enables to empower the elementary level to secondary level mathematical topics of algebras,

geometraical concepts of 3D, plotting graphs, functions, trigonometry and statistical concepts gives huge impact to get excel by visualising, undersatndablewith more productive and informative.

Emphasis is made on Geogebra and Wolfrom-alpha package as a teaching tool makes learning mathematical concepts like Algebra, Trigonometry, Geometry (3D), plotting graphs, Calculus and statistical concepts of probaliity,frequency distribution, etc., can becomes easier and more effective. It can also be beneficial in the next level of advancement learning.

The practice of technology in the pedagogical process in teaching mathematics is expanding at an incredible rate. Education experts now recognise how critical, it is to include technology into students' mathematics activities. Overall, this perception has received a lot of attention and has been put into practise everywhere from elementary school to secondary stage in making of best comprehension of school mathematical subjects all the whole from algebra, analysis, geometry, trigonometry, statistics, etc. This paper will primarily describe the benefits of Geo-Gebraand worldfrom – math packages act as a teaching aid for educators in order to enrich the teaching of mathematics, more specifically to make Geometrical concepts 2D/3D, graphs, solving linear algebras, etc., to attain problem solving abilities with more fascinating and high efficiency rate.

Design of Innovation:

The quick advancement of technology necessitates constant adjustments in schooling to raise standards. These expectations have an impact on the field of education; it requires innovation and creativity on the part of teachers to implement learning by creating a technology-based, student-centered learning system and meeting student needs. The fact is that students' mathematical learning outcomes are not ideal, therefore it is possible to use technological advancement to improve learning outcomes. In this situation, a computer with various web-based, relevant software, or applications can be used.,

Description of Innovation:

In the following sections, atfirst, we briefly discussed each mention mathematical software packages *viz*., maxima, sagemath, Sci-lab, MATLAB, SPeQ mathematics,robocompass, R-programming, SPSS, etc., and then we further emphasis on the significant role of Geogebra and Wolfrom-math packages.

Maxima:

This is a free, open source computer algebra system (CAS) for symbolic computation that runs on multiple operating systems (Windows, Mac, and Linux) and covers a wide range of mathematical and graphical capabilities. These include polynomials, calculus methods, matrix equations, differential equations, number theory, combinatorics, hypergeometric functions, tensors, gravitational physics, PDEs, nonlinear systems, and 2-D/3-D plotting and animation. There is plenty of help to get up the learning curve with a large and responsive user community, and with an active developer base, Maxima and its ecosystem continue to gain capability (check out the web interface for Maxima by Omega-Math/Vroom-Labs). As a result, students, programmers, engineers, scientists, and mathematicians now have access to a powerful and versatile mathematical computing package.

Sagemath:

It is a computer algebra system (CAS) with features encompassing many areas of mathematics, such as algebra, combinatorics, graph theory, numerical analysis, number theory, calculus, and statistics. SageMath was formerly known as Sage or SAGE, "System for Algebra and Geometry Experimentation." This is simple to use and extremely effective.

Sci-lab:

This is essentially a numerically oriented high-level programming language. Matrixes are the primary data type in the language's interpreted programming environment. It will be essential for students upto secondary level can have its exposure at suitable situations and highly recommended at higher education.

It's an open-source data analysis and computation programme. It is also a viable alternative to MATLAB, which is not open-source. Users can use it to execute numerical computing operations across apps and test methods. A wide range of capabilities are available, including data visualisation, profiling, algorithm development, debugging, animation, and more.

MATLAB:

Compared to other approaches or languages, it has a number of benefits: The matrix is its fundamental data component. A simple number is seen as a one-row, one-column matrix. The MATLAB environment has a number of built-in mathematical operations that operate on arrays or matrices. Vast applications are there though is not a open source but higly appreciate with benefits such as, ones algorithms are simple to implement and test. It is simple to create the computational codes,Simple to debug, make extensive use of a database of integrated algorithms, easily generate simulation videos from still photos processed in this manner, Calculation with symbols is simple to do, analyze and visualise data in great detail and enable to create applications with a graphical user interface.

SPeQ mathematics:

A compact, comprehensive mathematics programme with an easy-to-use interface is called SpeQ. A spreadsheet is used to record all calculations. You are free to add, update, and carry out calculations there. All typical functions, constants, and units are supported by SpeQ. Additionally, you can create unique variables, functions, and graphs using your own functions.

The alternate of it, Desktop calculator Qalculate! is multifunctional and cross-platform. Although it is easy to use, it has the variety and capability typically only seen in more complex math applications. It also includes practical tools for daily needs like percent computation and currency conversion. Which is very much fruitful for Elementary grade students in studying the concepts of profit and loss concepts.

RoboCompass:

By using this tool to learn the most challenging geometry and trigonometry concepts, students from elementary school through secondary school demonstrate a great deal of interest and active participation. They learn by visualising, engaging in hands-on learning, achieving, and exploring through the best practise, and they excel in the most challenging mathematics topics.

R-programming and SPSS:

The most widely used computer language for statistical analysis and modelling is R. R has benefits and drawbacks, just as other programming languages.We can do a variety of machine learning operations with R, including classification and regression.R is primarily used to create statistical tools and is more popular than other programming languages in this regard.

The most popular statistical analysis programme is SPSS (Statistical Package for the Social Sciences). Market researchers, health researchers, survey firms, the government, academics studying education. Moreover, It enables the students to wise study of statistical concepts from the use of quantitative techniques in drawing conclusions.These two are the best practice software for the statistical concepts that enables the high recommendation.

GeoGebra:

A computer mathematical software called Geogebra helps teachers and students of mathematics, particularly those studying geometry, algebra, and statistics.

It is a computer mathematical application software that is used as a learning medium in schools. Geogebra software allows you to visualise and manipulate abstract Geometric objects quickly, accurately, and efficiently.

GeoGebra is interactive mathematics software that unifies geometry, algebra, spreadsheets, graphing, statistics, and calculus in a single, user-friendly application. It is designed for usage at all educational levels. Millions of users from virtually every nation make up the fast growing GeoGebra community. As the world's top supplier of dynamic mathematics software, GeoGebra now supports STEM (science, technology, engineering, and math) education as well as new approaches to teaching and learning across the globe.

GeoGebra is a revolutionary tool in mathematics that enables visualisation and manipulation for students. a programme that is open source and has a thriving developer community. Accessible to all high school students can be explore and achieved best practice and results using any source medium of technology like cellular phones, tablets or by any desktop computer, laptops.

Wolfromalpha - Math packages:

The upper primary to secondary grades, particularly those studying arithmetic concepts, elementary concepts, geometry, algebra, calculus, and statistics, benefit from a mathematical package known as Wolfrom-alpha computerised well educated software.

Evenit comes to arithmetic, Wolfram-alpha has extensive knowledge and strong computational capabilities. Wolfram-Alpha is capable of solving any problem, whether it involves math, algebra, calculus, differential equations, analysis or anything in between. Find information on mathematical issues and topics, solve specific math problems, or get assistance with your math assignments.

As an example, for the elementary class students to the secondary grade student may encounter an error while understanding or solving a problem, they may be able to resolve it. Instead of simply sitting idle and wait for someone else to solve the problem, students may be able to contribute to the solution by themselves. Nowadays, we encourage students to be "active learners," "discovery-based

learners," and so on. A student discovering a bug, realising it is a bug, and attempting to fix it is very much in the spirit of these schools of thought.

Once students will have a visionary exposure to higher education or a similar scale environment in the teaching-learning process, they will be able to know, learn, achieve, and explore to the best of their abilities in gaining advanced level mathematics aptitude skills.

Conclusions:

Concerning the issues and difficulties in teaching mathematics, it is possible to make things easier by allowing various computer mathematical software or mathematical applications to be used to aid in the learning of mathematics. The most important aspect is that teachers have enough knowledge and skills to use the software. They can choose enough software to support their instruction.

Outcomes:

1. Enhances students' interest in effective learning.
2. Adopts modern teaching tools to make it easier and more efficient.
3. Demonstrate an interest in problem mathematics problem-solving as well as skill development.
4. Improves understanding level of all students by acquiring new technology.
5. Confusion is resolved when they operate new technology.

Implications:

1. An online educational teaching aids helps children visualise subject concepts.
2. The concept's retention improves.
3. Use of mathematical knowledge to improve knowledge in other optional subjects.

References:

- SCERT/NCERT websites
- www.geogebra.org
- www.robocompass.org

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STATE LEVEL MATHEMATICS SEMINAR 2022

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Sub-theme: Innovative strategies in teaching mathematics to studentsand create intrest towards mathematics.

Title of the topic:**Easy way to practice four mathematical operations at primary level.**

Introduction: Mathematics is the science that takes human intelligence to the highest level and is not a superpower. An educated or an illiterate cannot go through a single day of his life without using mathematics. Any profession useful for human life involves the use of mathematical knowledge.

Through learning mathematics, children should be able to develop confidence, creativity, solve problems, express mathematical concepts, use mathematical concepts and symbols on their own. It is more important for elementary level children to have mathematical attitudes rather than acquiring skills and concepts in solving mathematical problems. Mathematical games, puzzles, and stories are useful for acquiring these attitudes.

School is a place where children learn mathematics systematically. Here, children are presented with mathematical concepts through tangible objects, contextual scenes, and activities. Tangible objects are framed by contextual scenes actions useful for achieving for problems.

Mathematical learning develops children's confidence, creativity, problem solving, expressing mathematical concepts, using mathematical concepts and symbols on their own. can do Mathematical attitudes are more important than acquiring skills and concepts for elementary-level children to solve mathematical problems. Mathematical games, puzzles and stories are useful for getting these attitudes

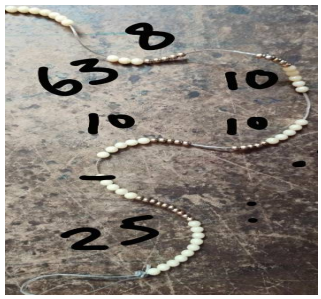
Objectives:

1. To do the all four mathematical operations with ease with beeds below 100.
2. To Count, compare and arrange the numbers with dice.

3. To enhance students intrest in mathematics.

Presentation:

Activity 1:-



We develop number sense by practicing with agarland of 100 beads of different colors.

With this garland we can do addition, subtraction, multiplication and division in an easy way.

- **Addition**: For example:- 25+38=?

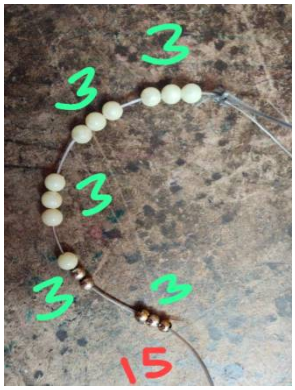
25+10+10+10+8

First we find the 25th bead and add +10+10+10+8 beads, we will get 63.

- **Subtraction**:-
  For example:- 62-27=?

62-10-10-7

Find the 62nd bead and subtracting it backwards for -10-10-7 gives 35.



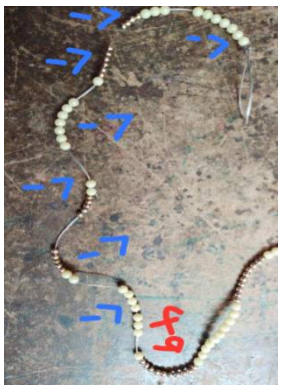
- **Multiplication**:-
  For example:- 5*3=?

If the periodic addition goes on adding 3+3+3+3+3

15 is answer.

- **Division**:-

For example:- 49/7=?



Finding the 49th bead and doing -7-7-7-7-7-7-7

As we go, we will be left with no beads on the other side stating the reminder to be zero and the quotient to be 7.

Thus in primary classes the fourarithmatical operations can easily be taught.

Activity 2:-"Paramapada Sopana" map game with dice



Counting dots on dice while playing can develop number sense, addition and subtraction.

Adding and subtracting concepts such as counting steps up a ladder and counting steps down when a snake swallows can help elementary students gain a better understanding of addition and subtraction concepts.

Using two are more dice to learn addition through adding total dots of the dice.

Playing with dice we can say big number, small number, ascending descending order in an easy to understand.

Making numbers with digits can also be practiced using all the dice with as many digits as we want by changing the position of the dice.

For example:- write as many three digit number as possible from given three digit number and write bigger, smaller, ascending and descending order.

6 4 5

By counting numbers with place value we will find these

654>645>564>546>465>456

Bigger is 654 and smaller is 456

Using the dice of Telugu letters we can also be identified

letters and made words.

Week dice also be used for identification of the day.

Outcomes of the innovation:

Students learn happily and easily understand the four processes.

Students can use variety of strategies in solving problems.

Enhance the students' intrest in mathematics.

Implications:

Teachers should be patient.

Most Primary school teachers teach all subjects with multi class teaching.

Lack of time to develop mathematical skills.

Hard to do ifthere are many students in the class to practice.

References:

1. Telangana state primary text books.
2. My classroom practices.

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