MATHSTICKS

February 2023, Issue 6

Monthly Newsletter dedicated to Primary and Elementary teachers
Mathematics Education Department, SCERT, Haryana

Special Feature of this Newsletter –

- **Learnings from the Research**

New aspects of the research in each issue, to deepen your understanding of Mathematics learning.

- **To do in the Classroom**

Suggestions to improve the maths learning process based on research in each issue.

- **Take the challenge**

Each issue will provide a challenging and exploratory task/ problem that can be attempted by any level of teacher or learner .You can share your solution with us at mathsedu.scert@gmail.com .

- **Learning from the classroom experiences**

You can share your comments/experiences with us at **https://forms.gle/Xdq7zP4UYz2kFBgV7 or mathsedu.scert@gmail.com**

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!! Important Instruction !!

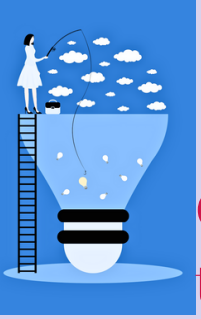
Every week, post at least one challenge/puzzle on your school's notice board.
Encourage children to do these. Let them struggle on their own.
Don't stop their brain growth by telling them the solution.

When you or your students work on these tasks, make sure to share with BRP/ ABRC/ DIET Mentors of your block.

The correct answer doesn't matter here, what matters is, how you did, how was your problem solving journey and what strategies you used?

In this Issue

- What kind of feedback should teachers give to students to encourage growth mindset?
- Challenge - for all levels of teachers and students
- Harbans Puzzles - For Teachers and Students of all levels
- Classroom experiences - A Maths Talk
- Research-Facts about Multiplication- Part-IV



!! MINDSET WORKS !!

Growth Mindset enables students to move forward in their learning process constantly but sometimes students find themselves not succeeding even after trying hard. At such times, the teacher may encourage them in the following ways-

WHICH PARTS OF IT ARE YOU FINDING DIFFICULT? COME LET`S SEE TOGETHER

TELL ME YOUR WAY TO DO THIS TASK

YOU MAY TRY A DIFFERENT METHOD. MAYBE ,YOU FIND IT EASIER

COME LETS SOLVE THIS TOGETHER

YOU ARE ON IT. A LITTLE MORE ACCURACY IS NEEDED

LET ME INTRODUCE THIS PROBLEM IN DIFFERENT MANNER

In the next issue, we will talk about what you can say to your students to keep their spirits up when they are doing well with the growth mindset.

Harbans Puzzle

You all must have heard about Harbans Puzzle. If not, then click on the link and learn to play with this puzzle.

Click here to watch how Harbans Puzzle is played

Solve this puzzle by using $1/x$, x, x^2

any 3 multiples of 3/4

15/4+ a	3+ b	c
d	9/2+ e	f
3/4 – g	h	i

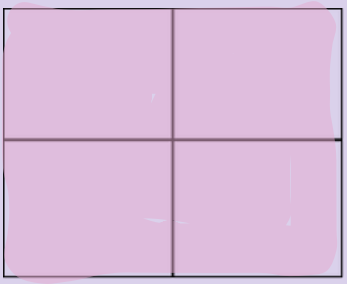
1. How many steps were involved in solving the puzzle ?
2. What could be the minimum number of steps to solve the puzzle ?
3. Can there be more than one solution to this puzzle?
4. could you think of more than one ways for a solution ?

Such mathematical puzzles are not only interesting for students but also help in growth of mathematical investigation and logical reasoning.

Click here to read the article on Harbans Puzzle.

Take The Challenge

Here is a grid of four "boxes"



You have to choose four different numbers from 1–9 and put one number in each cell. For example -

4	2
1	8

This problem challenges students' understanding of place value and is a good way to think and use in written addition.

SUGGESTED METHOD

It would be a good idea to start with a grid on the board and have the teacher explain the challenge orally to the group. You can use the example in the problem itself so that the task is clear.
Ask the children themselves for suggestions. How can they start? Give students some time to think individually, then share their thoughts with a partner. later,reveal it to the whole class so that some groups/pairs can share their ideas with everyone.

Let the children work together on the problem in pairs. After some time, let the whole class discuss the ideas that groups/pairs have come up with. Some groups may have thought about the cells in the grid that make up the four-numbered units digit, others may have focused on the cells that contribute to the ten's place.

Encourage them to share their observations and what digits are working smoothly.
You could give each group some time to make a poster showing how they arrived at the solution.

This is making four, two digit numbers -

42 (First Row)
18 (Second Row)
41 (Left Column)
28 (Right Column)
The total of these four numbers is 129.

You may try some more examples. Is there some quick way to find whether the total would be odd or even?
Your Challenge is- Find out four such numbers that give four 2-digit number and sum total of 100.

Let's see how many ways can you explore to solve the above-mentioned problem?

MAJOR QUESTIONS

FROM WHERE YOU CAN START?

HOW DO THE FOUR DIGITS YOU CHOOSE CONTRIBUTE TO THE ZERO IN THE UNITS PLACE OF 100?

WHAT CAN YOU SAY ABOUT THE NUMBERS IN THE TOP LEFT BOX?

WHAT IS THE SMALLEST SUM (ADDITION) YOU CAN MAKE? WHAT CAN BE THE BIGGEST SUM (ADDITION)?

CAN YOU MAKE ALL THE SUM (ADDITION) BETWEEN THEM?

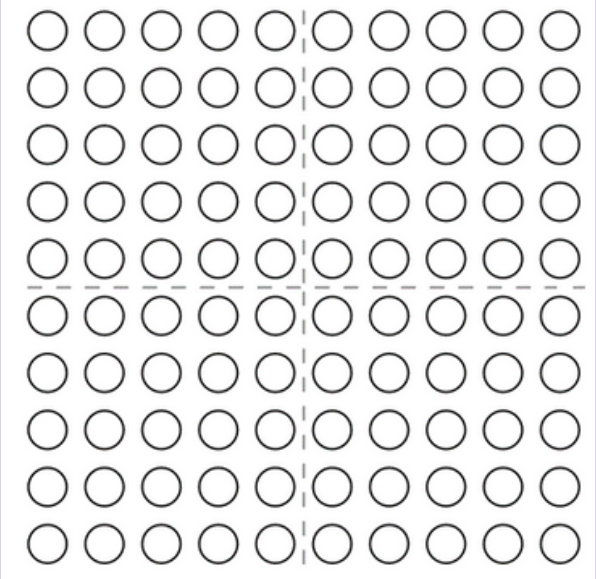
Troubling Tables – Part 4
Fluency with Numbers Using Flexibility

In the previous issue, we discussed the use of table of 9 as a reasoning strategy and the patterns hidden in it to find multiplication facts. In this issue, we will discuss how to find unknown multiplication facts using known facts that can be used as a reasoning strategy and children naturally use these strategies when given the opportunity.

Using known facts to deduce other facts

×	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3				9	12		18	21	24	
4				12	16		24	28	32	
5										
6				18	24		36	42	48	
7				21	28		42	49	56	
8				24	32		48	56	64	
9										

These 25 facts can be easily learned by making connections with other facts (already known facts). For example, to find 3 × 8, first calculate, 2 × 8 (double 8) and then 8 more, that is, 16+8= 16+5+3= 21+3=24. Similarly other facts can be obtained from × 5 and × 2 facts.



A very important tool for children to use thinking strategies is the dot table. It is a 10 × 10 dot table partitioned by dotted line after 5 dots. It helps to discover and see the relationship with known facts.
For example, if children take the help of a dot table to find the fact of 7×7,
They will be able to see that 7×7 is made up of 5×5 , 2×5 , 2×5 , 2×2 i.e. 25+20 +4= 49 , Some children may also see that , 5×7 = 35 and twice of 7 or 35 + 14 i.e. 35+10=45 , 45 +4=49

Reasoning strategies used by a child to find 4×8
2×8 = 16 Now he had to double 16. For this he first doubled 15. 15 + 15 = 30 and then added 2 to it. 30 + 2 = 32

What reasoning strategy would you or your students use for 6×8?

Note: All children can make dot tables and use them.

In the next issue, we will discuss what kind of games can be played to use the facts of multiplication in fluency in children and what should not be done in its teaching.

Learnings from the classroom experiences

A MATHS TALK

In this issue, some extracts of the conversation between the children and the teacher taking place in a third grade classroom are being shared with you.

On this day, the teacher started the class by asking the children about a conversation they had in the previous class. In the previous class, they talked about even and odd numbers. A few minutes into the discussion, a boy named Shabeer (changed name) made the observation that even numbers can be "made up" of two other even numbers, such as 4+4 or 6+6. The teacher then asked if anyone had any other comments. He saw a boy named Rohit (Changed Name) with his hand raised. When the teacher called on him, Rohit said that he has noticed something special about the number six, which he claims can be both an odd and an even number.

Rohit: I was just thinking about six. I was thinking that this one... It might as well be an odd number 'cause it might have -two, four, six, and two, three, which makes six.

Teacher: Hmmm, So you mean that the two things you put together are odd like three and three, each odd?

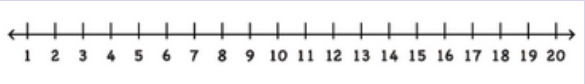
Rohit: Hmm, but I think -- there were pairs of two and that is an even number.

Teacher: I think you are trying to say something like what Shabeer was saying about all even numbers, that some even numbers, like six, are made up of two odd numbers as you just suggested.
Any comments/suggestions on this? Ok! Reena (Changed Name), what do you want to say?

Reena: I disagree with Rohit when he said that six can be an odd number. I think six can't be an odd number because- look- (gets up and goes to the board) Six can't be an odd number because (pointing to the number line drawn on the board and starts from zero)
Even, odd, even, odd, even, odd, even. How can it be an odd number?

Rohit: Because there can be three pairs of something to make a six, and three of something is kind of odd. Like you can make a six, three two makes it, and two-three makes it.

Hina: So it doesn't mean that six is odd. If two odd numbers are needed to make an even number, it doesn't mean that it has to be odd. Do you understand what I mean?



Teacher: Rohit, what is our working definition of an even number?

Rohit: I forgot.

Teacher: Can someone help us with this?
Does our whole group know which working definition are we using?
(The teacher felt that Rohit was confused about the definition of even numbers. She thought that once the definition was discussed, Rohit would understand that six fits the definition and is therefore even. Soon the children settled on the definition of an even number. Together they decided that if a number is divided into two parts exactly without halving any number, then it will be an even number.)

Working definition here means the definition that the children have made together (even if its language is not completely mathematical. It may also be not completely abstract).

Teacher: Rohit, have you noticed that you can divide six equally into two parts without dividing one thing in half?

Rohit: Yes, Teacher.

Teacher: So this is fitting inti our working definition, so six is an even number.

Rohit: Okay. If it fits the definition, we'd call it even, but I think it's also an odd number because it is made up of three twos.

(Now the teacher realized that the matter was more complicated than she had thought.)

How did you feel after reading this discussion? Do you think that, in your class, are children given opportunities to express themselves in this way?
Why did the teacher feel that the matter was more complicated than she thought?
What special had Rohit noticed about number six?
The discussion went on for a long time, what happened next, will be shared in the next issue.