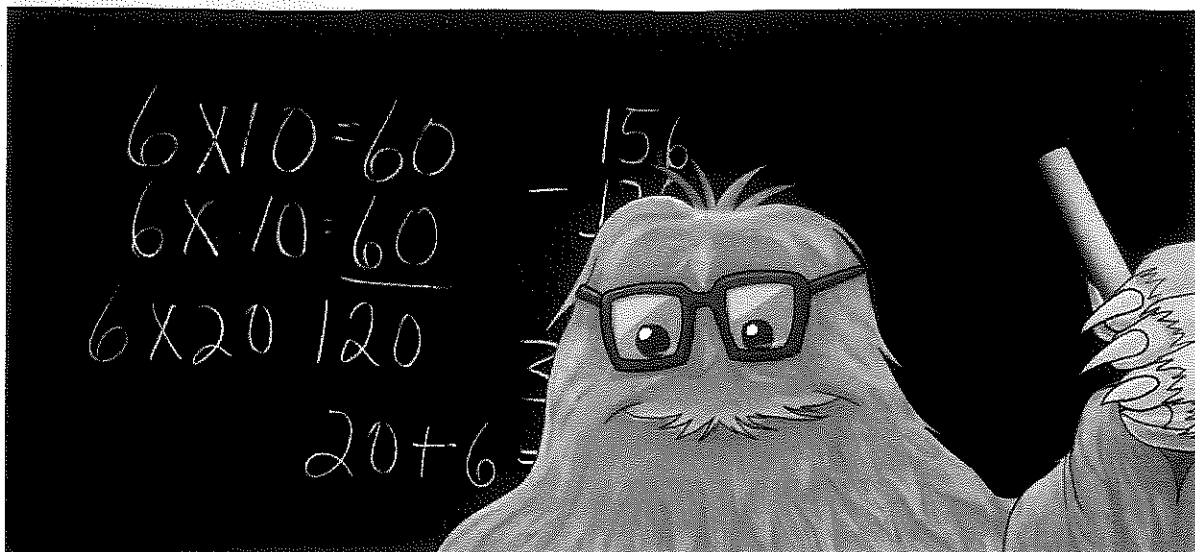# Number Strings

A number string is a set of related math problems. Strings are often used in the earlier grades, but can be used in any grade, and the benefits of the strings are everlasting. Students work to solve strings using mental math strategies and then share their strategies with the class after being given time to sit and think about the problem. Each problem in the string is revealed one after the other, but it is extremely important to keep each problem (and its solutions) visible.

Here is an example of a string.

19 x 10 =
19 x 2 =
19 x 12 =
19 x 20 =
19 x 19 =
19 x 21 =

When doing a string, I would pose the first problem and then tell students to think about how to figure it out and answer it. It is important for students to be asked for a strategy along with a solution. I would ask them to put their thumb on their desk when they are ready. I make sure the give students plenty of "think time" for the string and stress putting the thumb on the desk instead of raising their hand so that people who haven't had enough time feel like they can still take the time to think.

Benefits of this string:

Doubling: students can double the solution from 19 x 10 to arrive at the solution for 19 x 20.

Adding on: students can add an additional set of 19 to the solution from 19 x 20 to arrive at the solution to 19 x 21.

Chunking/Distributive property: 19 x 19 could be broken into (19 x 10) + (19 x 9). Similarly, 19 x 12 can be seen as the sum of 19 x 10 and 19 x 2.

Proportional thinking: this goes along with both the idea of doubling and chunking. Students start to see that when one factor increases by 1, the solution increases by "a set of 19".

Besides the specific benefits listed above, strings, in general, have myriad advantages. Strings improve students' flexibility in thinking and expose them to multiple methods/strategies for one problem. This flexibility allows students to build their fluency and confidence. The format of the strings allows quieter or slower students time to process and share their ideas or build on the ideas of their classmates. Since strings are related problems, they are designed to help students see, identify, and use patterns. This lets students use what they already know to move forward and solve different problems. Additionally, strings help model student thinking and, since the model is shown to all students, the strings help students fluidly use models to problem solve.

Additional resources for number strings:

Websites:
http://numberstrings.com

Books:

http://www.heinemann.com/products/E04804.aspx

	Intervention: Support students in using geoboards; students may need help with understanding pairs of parallel sides and types of angles specifically. **Enrichment:** Students create their own polygon riddles for each other.
Center 2 **Core Teacher 2**	**Center 2: Number Strings (20-25 minutes)** **Objective:** MWBAT analyze patterns in a string of problems to help us solve problems by using mental math. **(Kid Friendly Objective):** We can use patterns from the previous math problems to help us figure out how to solve the next math problem, using mental math. **Materials:** -class whiteboard for teacher -dry erase markers for teacher **Intro:** Revisit your number strings chart with the students & go over it together: • **Solve the problem in our head** • **Think about How We Solved it** • **Look for Patterns in the Problems or Answers** • **Are Ready to Share Strategies** • **Listen to other mathematician's thinking & are ready to respond back.** *Remember that this set of problems are called number strings. Each problem is related somehow to the next problem and we can use the pattern to help us solve it!* **The problems in bold below, are the problems to write on the board. The equations beneath are the possible strategies students may go for in order to solve. If you have called on three students, and the strategies below have not be shown, go ahead and show the strategies to the students.** **14 x 2 =** 14 + 14 = 28 **14 x 3 =** 28 + 14 = 42 **14 x 5 =** 28 + 42 = 70 **140 x 2 =** 140 + 140 = 280 Or 28 x 10

140 x 3 =
280 + 140 = 420
Or
42 x 10 = 420

140 x 5 =
280 + 420 = 700
Or
70 x 10 = 700c

Determine if kids are doing well on "140." If they are, continue with "140" with below problems. If not, return to 14.

140 x 10 =
700 + 700 = 1400
Or
14 x 100 = 1400

140 x 12 =
1400 + 28 = 1680

14 x 15 =
140 + 70 = 210

14 x 14 =
210 - 14 = 196

14 x 20 =
210 + 70 = 280

Write 14 x 2 on the board. Ask students to solve using mental math. And have them put their thumb in front of their chest when they have finished solving.

Let's write all the answers we think could go here. T calls on a student to state his/her answer (28). T writes 28 on the board, and asks students if they agree or disagree. T asks same student what his/her strategy was & writes the strategy on the board. *Are there any other answers?*

Did anyone solve this a different way? T then calls on student to share strategy, until all (or at most 3) strategies have been shared and all have been written on the board. Record the different strategies in different colors.

Questions to ask to help students clarify their strategy:

Why did you solve it that way?
How did you know that doubling/counting/multiplying would help you find the answer?

Continue going through the string of problems until you run out time