Number strings

Factsheet

What are number strings?

Number strings (or problem strings) involve a series or string of related number problems that support the development of a targeted mental computation strategy and develop understanding of the properties of operations. Problems are worked through one at a time across a short 10–15-minute routine. Generally, teachers begin by presenting a low-threshold problem that all students can access. Subsequent problems are purposefully sequenced to build on the mathematical thinking required in the previous problems. Teachers facilitate class discussion after each problem to foster reasoning, reflection and the development of key mathematical strategies based on number relationships.

Why it matters

The engagement of students in number strings is aimed at building their capacity to choose and use an efficient computation strategy within a given context. Number strings are also powerful tools for:

- supporting mathematical reasoning through focused class discussions
- enhancing number sense through
  - a focus on number relationships and connections
  - fostering flexible thinking
  - making connections through visual representations of strategies
- encouraging students to work as a community of learners.

Sequencing problems in a number string

Problems within a string are purposefully sequenced to support sense making and the development of a targeted mental computation strategy. Most follow a similar general sequence:

- entry problem — a low-threshold problem that facilitates access for all students
- helper problems — draw on number relationships to help develop understanding of the targeted strategy
- challenge problem — provides an opportunity for students to demonstrate the use of the strategy developed through the previous problems in the string.

Conducting a number string

Pose each problem horizontally on the board or screen one at a time.

1. Invite students to solve the problem mentally (have physical materials available for optional use).
2. Give thinking time and ask students to hold their answer until they are called on.
3. Ask a student to explain the thinking behind their approach to the problem (invite multiple strategies for a single problem).
4. Use visual representations to model students' strategies and make their thinking visible to all students.
5. Guide the discussion towards the efficient strategy you have planned to develop.
6. Leave all questions and representations of thinking based on the targeted strategy on the board for support.

Use questioning to assist students in making connections between problems in the string. Occasionally ask students to turn to a partner and explain their strategy and how they could represent their thinking. Review the targeted strategy and the reasoning behind it to conclude the session.

Example 1

Addition: Counting on within a decade

Number string		Possible teaching sequence and examples
Entry problem	**5 + 2**	Ask students what they could do if they didn't know this fact. Model the process on a hundreds board, counting on from 5.
Helper problems	**15 + 2**	Highlight the relationships within the numbers — 15 has 1 ten more than 5. Drawing on the previous fact, the answer would be 1 ten more than 7, which is 17. Highlight these connections on a hundreds board.
	25 + 2	Use question prompts to focus on number relationships, e.g. 'To help solve this problem, can you use or build on the strategy from the last problem?'
	65 + 2	Ask students to turn to a partner to explain their strategy and how they could represent their thinking on a hundreds board.
Challenge problem	**34 + 3**	Present the final challenge problem. Use question prompts such as: 'How is this problem like the last one?' 'How is it different?' Highlight these connections on a hundreds board.

Example 2

Multiplication: Compensation strategy

Number string		Possible teaching sequence and examples
Entry problem	**7 × 6**	Ask students what information they could use if they didn't know this fact. Illustrate how known facts can be used by partitioning it into the familiar facts 5 × 6 and 2 × 6.
Helper problem	**7 × 60**	Highlight the relationships within the numbers — there are 7 tens and so drawing on the previous fact, the answer would be 42 tens or 420.
Challenge problem	**7 × 59**	Focus discussion around 59 being 1 less than 60. Therefore, the answer would be one lot of 7 less than 7 × 60. Model the process for students with an open-area model to make the connection explicit.
Entry problem	**8 × 6**	The next 3 problems build on the initial string of problems and use a similar sequence to promote the use of similar strategies.
Helper problem	**8 × 60**	
Challenge problem	**8 × 59**	
Final challenge problem	**6 × 78**	Present a final challenge problem. Highlight that the two problem sets students have worked through included helper problems. These assisted in the solving of the third problem. Ask students to think of helper problems for 6 × 78. Encourage student explanations supported by visuals to demonstrate how this could be solved. Draw on student ideas to highlight the targeted compensation strategy.

References

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