

How Do You Choose Which Lessons To Use?

The Importance Of Reasoning Strategies

Decades of research has clearly and consistently demonstrated that helping children develop reasoning strategies that can be used with addition and subtraction is a major factor in helping them develop flexibility and fluency in solving everyday problems. More specifically, children who use mature reasoning strategies

- learn basic facts more quickly,
- have better retention,
- develop flexibility and fluency in using addition and subtraction,
- develop skills with mental computation and estimation,
- develop confidence in their ability to make sense of math, and
- develop better number sense.

Children who continue to count to solve addition and subtraction problems over an extended time frame,

- often struggle to solve the harder basic facts quickly,
- have difficulty remembering those facts,
- are not able to solve problems with larger numbers efficiently,
- often get frustrated,
- develop a lack confidence in their ability to make sense of math, and
- often develop math anxiety.

Strategies that help children get beyond counting all to solve problems include counting on to add, counting back to subtract, counting up to subtract, using ten to add and subtract, and using known facts to add and subtract. Each of these strategies helps children easily solve a new group of basic facts and develop confidence in their ability to make sense. Each of these strategies can also be used to develop mental computation skills with larger numbers. For example:

- Count on to add is efficient if at least one number is small.
- Count back to subtract is efficient if the number you are subtracting is small.
- Count up to subtract is efficient if the numbers are close.
- Using ten is efficient if you are adding or subtracting beyond the next ten.
- Using known facts is efficient if the unknown fact is related.

Preview Lessons For The Reasoning Strategies

The lessons on this web site are designed to preview what students will need to be successful with school math. For each unit involving addition or subtraction in the school curriculum, decide which reasoning strategies will help children be successful. Plan to teach that strategy, using lessons from this this web site, about a month before students begin that unit in school. One sample plan is shown below.

Step 1: Decide When To Teach Reasoning Strategies

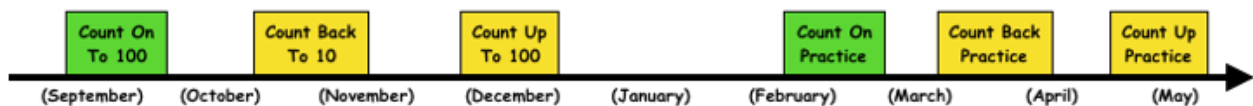
Pre-K



Grade K



Grade 1



Grade 2



- Green regions represent addition reasoning strategies.
- Yellow regions represent subtraction reasoning strategies.

Grade K students are typically introduced to addition and subtraction in the spring semester. Introducing them conceptually to counting on and counting back prior to those units in school math will help prepare them for success with those units in school.

In grade one, students are often expected to master many basic facts. Extending counting on, counting back, and counting up to larger numbers will help students develop flexibility in using these strategies and prepare them for fluency with the strategies as they master these facts.

Mastery of the remaining basic facts is usually expected in grade two. Helping students make sense of using ten and using known facts will greatly increase the probability of their success. These strategies will also enable students to develop skills with mental computation and estimation with larger numbers.

The web-site lessons for each of these reasoning strategies should be used as previews to enable students to use the new thinking as they begin the addition and subtraction units in school math. By spacing instruction for the reasoning strategies and meshing them with units in school math, more students will be prepared for success and fewer students will have difficulties with math.

Expand Conceptual Understanding And Develop Number Sense

The gaps, after planning the lessons to help students make sense of reasoning strategies, should be filled by selecting lessons from counting, numbers & partitions, and explore with word problems under the heading of adding & subtracting. These lessons will expand understanding.

PreK children may need lessons on counting to address common errors or ways to use counting to solve problems. Throughout PreK and the primary grades, students can benefit from making sense of numbers and partitions. This will help them learn to put numbers together and take them apart and develop number sense. From about age five through the primary grades, students need to explore adding and subtracting through word problems. These lessons involve a variety of problem structures and include solving and creating everyday problems.

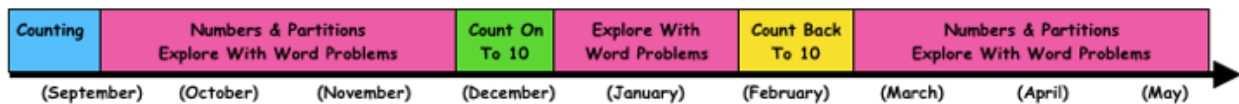
Since each of these lessons is an explore lesson, there is no need to master that content before moving on. By repeatedly experiencing different numbers and their partitions and solving problems with different structures, students gradually develop number sense and a deep understanding of addition and subtraction. A sample plan is shown below.

Step 2: Choose Lessons From Counting, Numbers & Partitions, And Explore With Word Problems

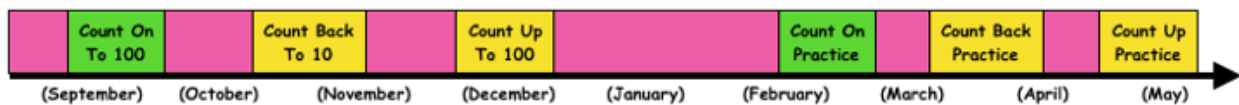
Pre-K



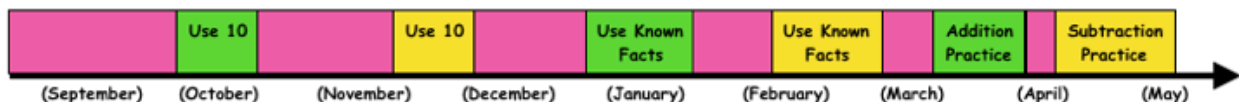
Grade K



Grade 1



Grade 2



Content Outcomes That Can Be Expected

PreK Students Will Have

- made sense of the ten frame,
- explored joining and separating,
- explored parts and the whole,
- used counting on and counting back to solve everyday problems, and
- an excellent preparation for learning addition and subtraction in grade one.

Grade One Students Will Have

- made sense of the number line,
- extended their use of counting on and counting back to larger numbers,
- made sense of counting up to subtract and extended the use to larger numbers,
- explored relating and extending addition and subtraction concepts to other problem structures,
- practiced counting strategies to develop fluency, and
- an excellent preparation for mastering addition and subtraction in grade two.

Grade Two Students Will Have

- made sense of the open number line and tree diagram,
- made sense of all addition and subtraction problem structures,
- made sense of counting and derived fact strategies as ways to solve addition and subtraction problems,
- developed flexibility in the use of reasoning strategies,
- learned when to use these concepts in everyday life,
- developed reasonable fluency with all basic addition and subtraction facts, and
- an excellent preparation for learning addition and subtraction in grade three.

Development Of Attitudes

These lessons are designed to help students develop number sense—not simply getting correct answers to problems. Number sense includes knowledge about understanding numbers, understanding operations, and understanding when and how to use that knowledge in everyday situations. But it also includes the development of attitudes so students

- have confidence,
- have a mindset to make sense,
- persevere,
- monitor their thinking to make sure they are on the right track,
- make strategic choices using strategies that are efficient, given the context and the numbers involved,
- reflect on their answers and judge their reasonableness, and
- develop self-esteem as a critical thinker.