



Fluency with Arithmetic Operations and Automaticity with Basic Arithmetic Facts

Throughout this document, benchmark expectations regarding arithmetic operations within the Number Sense and Operations (NSO) strand have been developed with a hierarchy in mind consisting of three stages: exploration, procedural reliability and procedural fluency. Students will first explore arithmetic operations with no fluency expectations, then will be able to show procedural reliability and finally they will carry out these operations with procedural fluency. Interwoven into this hierarchy is the development of direct recall of basic arithmetic facts. Basic arithmetic facts are first derived, then utilized while becoming procedurally reliable or fluent and finally recalled with automaticity. Refer to [Appendix B: Proficiency and Procedural Fluency Chart](#).

Stage 1: Exploration

The expectation is to develop understanding through the use of manipulatives, visual models, discussions, estimation and drawings. An example of an “exploration” benchmark is shown below.

MA.1.NSO.2.4 Explore the addition of a two-digit number and a one-digit number with sums to 100.

Benchmark Clarifications:

Clarification 1: Instruction focuses on combining ones and tens and composing new tens from ones, when needed.

Clarification 2: Instruction includes the use of manipulatives, number lines, drawings or models.

Stage 2: Procedural reliability

The expectation is to utilize skills from the exploration stage to develop an accurate, reliable method that aligns with the student’s understanding and learning style. Students may need the teacher’s help to choose a method, and they will learn how to use a method without help. An example of a “procedural reliability” benchmark is shown below.

MA.2.NSO.2.3 Add two whole numbers with sums up to 100 with procedural reliability.
Subtract a whole number from a whole number, each no larger than 100, with procedural reliability.

Example: The sum $41 + 23$ can be found by using a number line and “jumping up” by two tens and then by three ones to “land” at 64.

Example: The difference $87 - 25$ can be found by subtracting 20 from 80 to get 60 and then 5 from 7 to get 2. Then add 60 and 2 to obtain 62.

Benchmark Clarifications:

Clarification 1: Instruction focuses on helping a student choose a method they can use reliably.

***Stage 3: Procedural fluency***

The expectation is to utilize skills from the procedural reliability stage to become fluent with an efficient and accurate procedure, including a standard algorithm. An example of a “procedural fluency” benchmark is shown below.

MA.3.NSO.2.1 Add and subtract multi-digit whole numbers including using a standard algorithm with procedural fluency.

Embedded within Stage 1 – Stage 3: Automaticity

The expectation is to directly recall basic arithmetic facts from memory. Automaticity is the ability to act according to an automatic response which is easily retrieved from long-term memory. It usually results from repetition and practice. An example of an “automaticity” benchmark is shown below.

MA.2.NSO.2.1 Recall addition facts with sums up to 20 and related subtraction facts with automaticity.
