Algorithms in *Everyday Mathematics*

What is an algorithm?

An algorithm is a well-defined procedure or set of rules guaranteed to achieve a certain objective. You use an algorithm every time you follow the directions to put together a new toy, use a recipe to make cookies, or defrost something in the microwave.

In mathematics, an algorithm is a specific series of steps that will give you the correct answer every time. For example, in grade school, you and your classmates probably learned and memorized a certain algorithm for multiplying. Chances are, no one knew why it worked, but it did!

In *Everyday Mathematics*, students first learn to understand the mathematics behind the problems they solve. Then, quite often, they come up with their own unique working algorithms that prove that they "get it." Through this process, they discover that there is more than one algorithm for computing answers to addition, subtraction, multiplication, and division problems. Having students become comfortable with algorithms is essential to their growth and development as problem solvers.

How do students learn to use algorithms for computation?

Ideally, students should develop a variety of computational methods and the flexibility to choose the procedure that is most appropriate in a given situation. *Everyday Mathematics* includes a variety of standard computational algorithms, as well as students' invented procedures. The program leads students through three phases as they learn each mathematical operation (addition, subtraction, multiplication, and division).

Algorithm Invention

In the early phases of learning an operation, students are encouraged to invent their own methods for solving problems. This approach requires students to focus on the meaning of the operation. They learn to think and use their common sense, as well as new skills and knowledge. Students who invent their own procedures:

- learn that their intuitive methods are valid and that mathematics makes sense.
- become more proficient with mental arithmetic.
- are motivated because they understand their own methods, as opposed to learning by rote.
- become skilled at representing ideas with objects, words, pictures, and symbols.
- develop persistence and confidence in dealing with challenging problems.

Alternative Algorithms

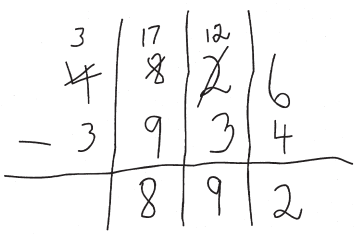
After students have had many opportunities to experiment with their own computational strategies, they are introduced to several algorithms for each operation. Some of these algorithms may be the same or similar to the methods students have already invented on their own. Others are traditional algorithms which have commonly been taught in the U.S. or simplifications of those algorithms. And others are entirely new algorithms that have significant advantages in today's technological world.

Students are encouraged to experiment with various algorithms and to become proficient with at least one.

Demonstrating Proficiency

For each operation, the program designates one alternative algorithm as a "focus" algorithm. Focus algorithms are powerful, relatively efficient, and easy to understand and learn. They also provide common and consistent language, terminology, and support across grade levels of the curriculum.

All students are expected to learn and demonstrate proficiency with the focus algorithm. Once they can reliably use the focus algorithm, students may use it or any alternative they prefer when solving problems. The aim of this approach is to promote flexibility while ensuring that all students know at least one reliable method for each operation.



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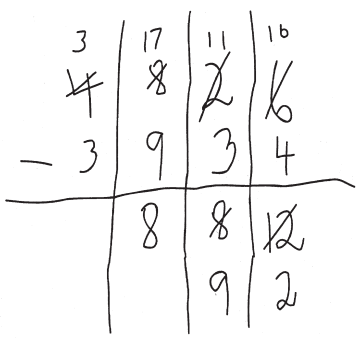

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