

Using number lines to teach number concepts in the elementary grades

Number lines are a powerful and mathematically accurate tool that sets the stage for success in Algebra. Several studies by Robert Siegler and colleagues have found that students' ability to estimate relative magnitude (value) of numbers (both fractions and whole numbers) in grade 5 predicts how likely they are to succeed in algebra and other advance math courses. Using the number line as you teach the concepts of arithmetic with whole numbers, fractions, decimals, and positive and negative integers helps students generalize arithmetic when learning algebra. Below we present important number principles included in the contemporary state standards for which the number line can be useful tool to build understanding.

Principles of Whole Number

The distance between 1 and 2 is the same as the distance between 4 and 5.

Whole numbers continue to infinity; you can always add one more.

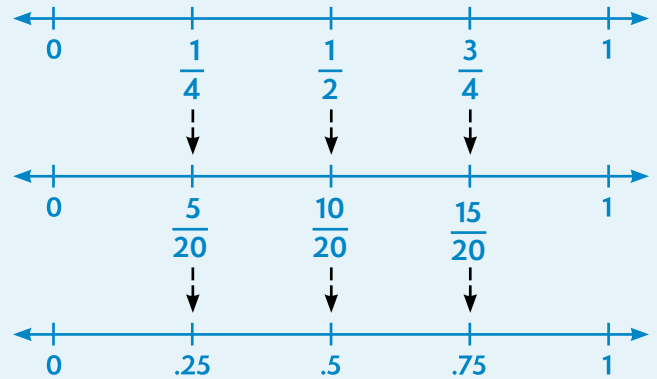
Whole numbers are always in the same predictable sequence.



Principles of Fractions and Decimals

A fraction is one number but can look like two numbers when represented with a numerator and denominator.

A fraction or decimal can be represented using many different numerals and those representations are placed at the same point on the number line. This is most important and demonstrable as students learn about fractions, then decimal notation and then percentage.

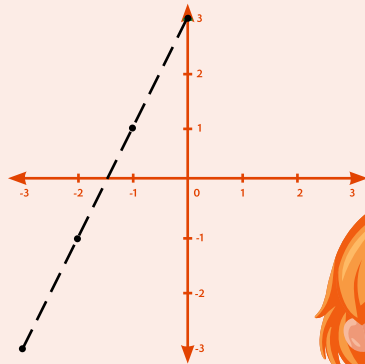


Principles of Linear Equations

Linear equations can be demonstrated on two perpendicular number lines: the x- and y-axis.

Algebraic equations, such as $y = 2x + 3$ can be represented using x- and y-axis number lines.

By repeated work with the number line beginning in the early grades, students should be much more comfortable with seeing them represent algebraic functions.



Lahme, B.L., McLeman, C., Nakamaye, M., & Umland, K. (2019). The Number Line: Unifying the Evolving Definition of Number in K–12 Mathematics. *Notices of the American Mathematical Society*, 66(9), 1465-1470. Retrieved from <https://www.ams.org/journals/notices/201909/moti-p1465.pdf>.

Siegler, R. S. (2016). Magnitude knowledge: The common core of numerical development. *Developmental Science*, 19, 341-361. doi: 10.1111/desc.12395

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