

# Number Lines Throughout the Curriculum

## Grade 2

- *Represent whole numbers on a number line with a consistent unit length*
- Numbers are represented by line segments that begin at zero, while the end of the segment is the location of the number on the number line
- Each number is represented by a unique place on the number line
- Students can find unlabelled points using unit lengths
- *Sums of numbers are represented by placing their line segments end to end on a number line*
- *Represent addition and subtraction of whole numbers within 100 on a number line*
- *Generate data by making whole number measurements of objects (or repeated measurements of the same object) and creating a line plot*
  - Measure attributes such as temperature, length, and liquid volume
  - Find least and greatest values in a set of numbers in order to create the extremes of a line plot
  - Mark off equal spaces for intervening values for which there is no data
- Create bar graphs and picture graphs by counting objects in different categories
  - Use single unit scales for bar graphs and picture graphs
  - Use grid paper to help students draw equal segments for the vertical axis of a bar graph or picture graph
  - Know that the distance on a vertical scale corresponds to the top of an “x”, the top of a bar, or the top of a picture in bar graphs and picture graphs
- Use bar graphs to answer questions about sums and differences and to represent these sums and differences on a number line
- Compare bar graph scales to line plot scales
  - The order of categories of a bar graph does not matter while the order of a line plot does
  - Bar graphs and picture graphs have a vertical scale while the line plot scale is implied by the number of x’s over the number



## Grade 3

- Use a number line to show addition and subtraction of time in minutes
- Represent fractions on the number line
  - Students partition units on a number line into equal parts based on the denominator of a fraction
  - Mark off equal lengths on a number line to find a proper or improper fraction using line segments
  - Know that the end of a line segment represents the location of a fraction on a number line
  - Many fractions can name the same point on a number line—same as equivalent fractions name the same point on a number line
  - Students can see that whole numbers can be written as fractions and represent this on a number line
- Students can compare two fractions by plotting them on a number line
- Generate data by measuring objects using halves and fourths and create line plots with halves and fourths
- Note similarities between a line plot with fourths and halves compared to a ruler
- Read number line measurement scales (including vertical scales) for liquid volume and mass using grams, kilograms, liters, and milliliters and represent them with drawings
- Use non-unit scales (count by 2s, 5s...) to create a vertical axis for bar graphs and picture graphs and connect this reading of graphs with these scales to students' developing knowledge of multiplication



## **Grade 4**

- Partition equal fractional segments of a number line into smaller equal portions to demonstrate equivalent fractions
- Represent on a number line the sum of unit fractions on a number line to total to a fraction with the same denominator and a numerator  $> 1$
- Represent measurement quantities (distances, intervals of time, liquid volumes, masses of objects, and money) using number lines. Include simple fractions and decimals.
- Create line plots using halves, fourths, and eighths

## **Grade 5**

- Represent multiplying fractions on a number line
- Divide whole numbers by unit fractions and represent on a number line
- Divide unit fractions by counting numbers and represent on a number line
- Perpendicular number lines become the first quadrant of the coordinate plane

## **Grade 6**

- Represent division of fractions by fractions using a number line
- Extend the number line to include negative numbers
  - Illustrate temperature and altitude problems (using horizontal and vertical scales) to illustrate the real-life use of negative numbers
  - Represent opposites on a number line
  - Represent absolute values of a number as distance on a number line
  - Create a Cartesian coordinate plane to locate and plot points in all four quadrants using ordered pairs



- Use the number line to order integers and then rational numbers
- Use the number line to reason abstractly about numbers and operations
- Graph “a” and the opposite of “a” on a number line ♦ Graph “-a” and the opposite of “-a” on a number line
- Represent solutions to inequalities on number lines
- Use a number line to display data using dot plots, histograms, and box plots
- Use double number lines to solve problems and reason about proportional relationships including those with fractions and decimals
- Use double number lines to solve problems and reason about percents

## **Grade 7**

- Students use directed line segment models of addition using number lines
- Use the number line to reason abstractly about numbers and operations, specifically:
  - $a + -a = 0$
  - $p + q$  is the distance of  $|q|$  from  $p$  in the direction of the sign of  $q$
  - $p - q = p + (-q)$

## **Grade 8**

- Use coordinate grid to create scatter plots for bivariate data
- Locate irrational numbers on a number line

