IES Institute of Education Sciences

Regional Educational Laboratory Midwest

at American Institutes for Research

Teaching Fractions Toolkit

Professional development for grade 6 teachers: Glossary

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Contents

Introduction

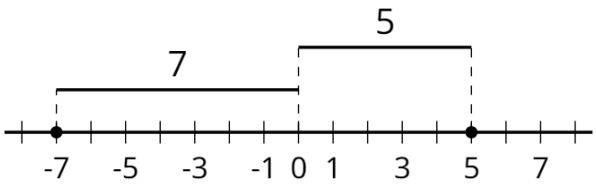
This glossary is a resource to go with the Teaching Fractions Toolkit professional development modules that are based on the recommendations of the What Works Clearinghouse practice guide *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade*.

The glossary includes definitions and other information to help understand terms used across the six Teaching Fractions Toolkit professional development modules Terms in this glossary that are also included in the practice guide glossary or text are double underlined in orange.

Glossary

A

Absolute value - The absolute value of a number is its distance from 0 on the number line.



The absolute value of -7 is 7, because it is 7 units away from 0. The absolute value of 5 is 5, because it is 5 units away from 0.

App - A computer application for performing a specific task. Also sometimes referred to in the Teaching Fractions Toolkit materials as an "online app."

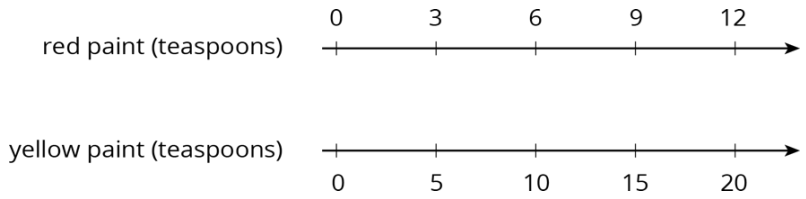
C

Cross multiplication - A procedure used to compare two fractions or find equivalent ratios by rewriting an equation from $\frac{a}{b} = \frac{c}{d}$ to $ad = bc$. If $ad = bc$ is a true statement, then the fractions are equivalent. The procedure is also used to create equivalent ratios by starting with two equal fractions, then multiplying each fraction by a unit fraction that is equivalent to the denominator of the other fraction being multiplied and simplifying. (For more information, see page 39 of the practice guide.)

D

Denominator - The number in a fraction located below the line for any fraction $\frac{a}{b}$ represents the total number of equal parts in a whole or the divisor in a division problem. For example, for the fraction $\frac{2}{3}$, the denominator 3 refers to a whole divided into three parts.

Double number line - A pair of parallel number lines with hash marks that show equivalent ratios. The locations of the hash marks align on both number lines so that the respective pairs of numbers are equivalent ratios. The hash marks labeled 0 line up. In the example that follows, the ratio is 3 to 5. Equivalent ratios are 6 to 10, 9 to 15, and 12 to 20.



E

Equivalent fractions - Fractions that represent the same numerical value; equal fractions. For example, $\frac{2}{4}$ and $\frac{4}{8}$ are both equal to $\frac{1}{2}$; therefore $\frac{2}{4}$, $\frac{4}{8}$, and $\frac{1}{2}$ are equivalent fractions.

F

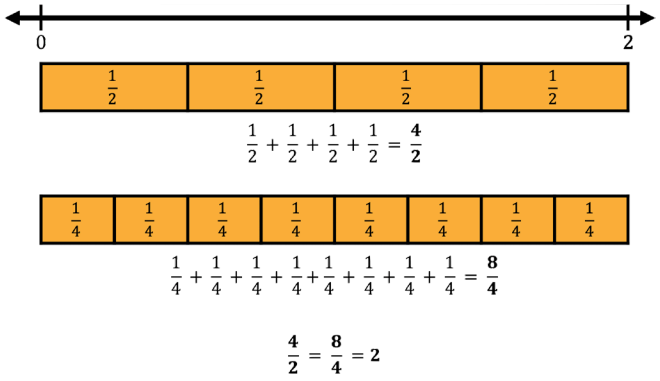
Fraction bar - See "Fraction strips."

Fraction density - The concept that between any two fractions there is another fraction. For example, the fraction $\frac{1}{4}$ is between 0 and $\frac{1}{2}$; the fraction $\frac{1}{8}$ is between 0 and $\frac{1}{4}$; and the fraction $\frac{1}{16}$ is between 0 and $\frac{1}{8}$. One consequence of this fact is that between any two fractions, there are an infinite number of fractions.

Fraction equivalence - See "Equivalent fractions."

Fraction magnitude - The idea that fractions have numerical values that can be either ordered or considered equivalent. Many common misunderstandings—for example, that two fractions should be added by adding the numerators and then adding the denominators—stem from not understanding that fractions are numbers with magnitudes.

Fraction strips - Length models that allow students to measure objects using fractional parts and reinforce the idea that fractions can be used to represent quantities. Students also may use the models to compare fractions; for example, how many one fourths are in one half?



Fractions - In the context of this practice guide and the Teaching Fractions Toolkit, refer to the full range of ways of expressing rational numbers, including decimals, percentages, and negative fractions. The practice guide makes recommendations on this full range of rational numbers because students' understanding of them is critical to their use of fractions in context.

G

GeoGebra - Open-source dynamic mathematics software used to develop the online apps used in the Teaching Fractions Toolkit. The online apps were developed using the GeoGebra Classic 5 version and uploaded to the GeoGebra website to use online.

I

Implementation step - A statement about how to carry out a practice guide recommendation. In the practice guide, it is a numbered step below the recommendation. These steps are supported by the research and the panel's expert advice. Every practice guide recommendation has at least one implementation step. The first implementation step for Recommendation 2 is "Use measurement activities and number lines to help students understand that fractions are numbers, with all the properties that numbers share." A list of the recommendations and their implementation steps is on page 1 of the practice guide.

Institute of Education Sciences (IES) - The statistics, research, and evaluation arm of the U.S. Department of Education. See https://ies.ed.gov/aboutus/.

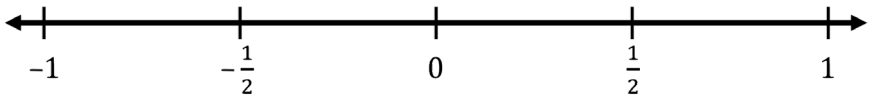
M

Mixed numbers – A fraction written as a whole number and a fraction less than one. Examples of mixed numbers include $1\frac{2}{3}$, $4\frac{3}{8}$, and $-2\frac{5}{6}$.

Multiplicative relationship – A relationship between two quantities in which one quantity can be multiplied by a factor to obtain a second quantity.

N

Number line – A visual representation of real numbers along a straight line. On a horizontal number line, positive numbers are typically to the right of zero and negative numbers are to the left of zero. There is a one-to-one correspondence between the set of real numbers and the locations/points on a number line.



Numerator – For any common fraction $\frac{a}{b}$, the numerator is the number above the line. The numerator represents the dividend of a division problem, or the number of fractional parts represented by a fraction. For example, for the fraction $\frac{2}{3}$, the numerator 2 represents the number of thirds.

P

Plausible numbers – Numbers that make sense in a real-world context.

Proper fraction – A fraction that is less than one where the numerator is less than the denominator. For example, $\frac{2}{3}$ is a proper fraction because the value of the fraction is less than 1, but the fraction $\frac{4}{3}$ would be considered "improper" because the value of the fraction is greater than 1 due to the numerator being greater than the denominator.

Proportion – An expression of two equivalent ratios or fractions. A proportion is an equation written in the form $\frac{a}{b} = \frac{c}{d}$, thus indicating that the two ratios are equivalent.

Proportional reasoning – Understanding and working with the fixed multiplicative relationships found in proportions. Proportional reasoning includes consideration of co-variation (how two quantities change simultaneously in multiplicative situations).

Proportional reasoning is used to determine rates. For example, if I know that it costs $24 to buy 3 movie tickets, I can calculate how much it would cost to buy 5 tickets.

Q

Quotient – The solution to a division problem. For example, 3 is the quotient for the division problem 12 ÷ 4 = 3.

R

Rate – The relation between two quantities measured in different units (for example, distance per unit of time).

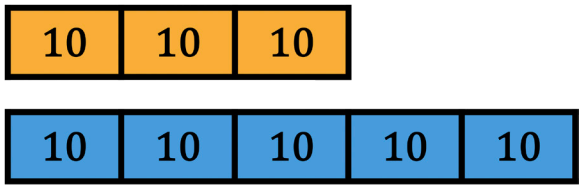
Ratio – The relation between two quantities. For example, the ratio 2:3 might represent the relationship of the number of cats to dogs in an animal shelter, or two cats for every three dogs in the shelter.

Rational number – Any number that can be expressed in the form $\frac{a}{b}$ where a and b are both integers and b does not equal zero. Rational numbers can take many different forms, including common fractions, ratios, decimals, and percentages.

Recommendation – In the Teaching Fractions Toolkit, recommendations refer to evidence-based guidance from the *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade* practice guide from What Works Clearinghouse that addresses the challenges of improving students' understanding of fractions concepts in kindergarten through 8th grade. A list of the recommendations and their implementation steps is on page 1 of the practice guide.

T

Tape diagram – A group of rectangles put together to represent a relationship between quantities. For example, this tape diagram shows a ratio of 30 gallons of orange paint to 50 gallons of blue paint.



If each rectangle were labeled 5 instead of 10, then the same picture could represent the equivalent ratio of 15 gallons of orange paint to 25 gallons of blue paint.

U

Unit fraction – A fraction with a numerator of one (for example, $\frac{1}{3}$ or $\frac{1}{11}$).

Unit ratio – A ratio with a denominator of one (for example, 5:1 or 9:1).

Credits and references

Information is provided about definitions and photos used in the glossary.

Definitions

Definitions provided in this glossary are excerpted and/or adapted from definitions found in the *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade* practice guide glossary and text and from definitions available in the Creative Commons licensed Illustrative Math (IM) Grade 6 materials. IM 6–8 Math was originally developed by Open Up Resources and authored by Illustrative Mathematics® and is copyright 2017–2019 by Open Up Resources. It is licensed under the Creative Commons Attribution 4.0 International License (CC BY 4.0). The IM 6–8 Math Curriculum is available at https://openupresources.org/math-curriculum/.

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