IES Institute of Education Sciences

Developing effective fractions instruction for kindergarten through 8th grade

Fractions content progression

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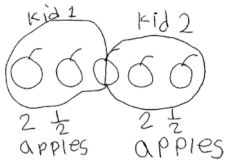
This review of how fractions content builds across grade levels is based on a What Works Clearinghouse practice guide: *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade*. Leaders can use knowledge of the four stages to plan grade-specific support for teachers.

1. Basic fractions concepts: sharing objects and equivalent proportions

Students come to kindergarten with an informal understanding of basic fraction concepts. They can share a set of objects equally among a group of people and identify equivalent portions of common shapes. Preschool and kindergarten experiences with sharing introduce children to the basic interpretations of fractions. Sharing can be presented in terms of division—such as partitioning 12 objects into three groups, each with four objects. Sharing also can be presented as a relationship; for example, if two children are sharing three pencils, the relationship is three pencils for every two children.

Example: Three children want to share 12 cookies so that each child receives the same number of cookies. How many cookies should each child get?

Example: Two children want to share five apples that are the same size so that both have the same amount to eat. Draw a picture to show what each child should receive.

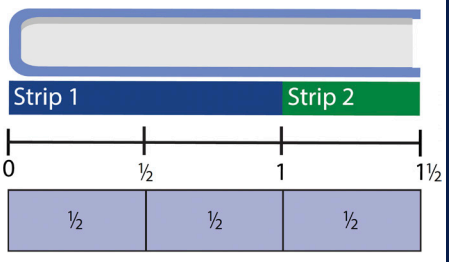


2. Formal understanding of fractions: parts of a whole and numbers with magnitudes

In grades 1 and 2, fraction instruction focuses on the idea that fractions represent parts of a whole (for example, one-third is the same as one part of a whole with three equal parts).

In grades 3–5, students learn that fractions are numbers with magnitudes (values) that can be ordered or considered equivalent. Number lines are an effective way to develop students' understanding of fractions as numbers with magnitudes.

Example: Use fraction strips of different lengths and a number line to measure classroom books.



3. Fraction computation

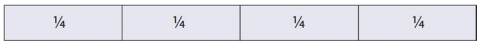
Students in grades 4 and 5 and middle school draw on their conceptual understanding of fractions as they develop fraction computation skills. Teachers should emphasize the meaning behind fraction computation procedures, focusing on both conceptual understanding and procedural fluency. It is important to explain how or why the procedures work to transform fractions and to emphasize the connection between conceptual understanding and the procedures. Setting problems in real-world contexts and addressing students' misunderstandings also can contribute to improved understanding.

Using visual representations and estimation when solving problems with fractions helps reinforce conceptual understanding. Area models, number lines, and other visual representations can improve students' understanding of computational procedures. For example, using ribbons or fraction strips can help students model the practice of dividing fractions.

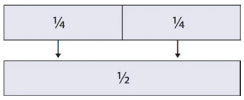
Example: Use ribbons to solve $\frac{1}{2} \div \frac{1}{4}$.

Step 1. Divide one ribbon into halves.

Step 2. Divide another ribbon of the same length into fourths.



Step 3. Find out how many fourths of a ribbon can fit into one half of a ribbon.



Two fourths fit into one half of the ribbon, so $\frac{1}{2} \div \frac{1}{4} = 2$.

4. Using fraction computation in ratio, rate, and proportion contexts

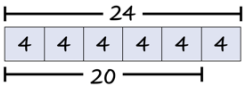
Students in later elementary grades and middle school apply their understanding of fractions and fraction computation in ratio, rate, and proportion contexts.

Proportional reasoning often is necessary in everyday contexts, such as adjusting recipes; thus, proportional reasoning problems provide opportunities to illustrate the value of learning about fractions.

The practice guide suggests that teachers develop students' proportional reasoning prior to teaching the cross-multiplication algorithm, using a progression of problems that builds on their informal reasoning strategies and includes visual representations. Teachers then demonstrate connections between students' informal reasoning strategies and the cross-multiplication strategy.

In the following example, the student uses the unit ratio strategy to solve a problem. The cost to buy 5 balloons can be determined by finding the cost of one balloon (by dividing 24 by 6) and then multiplying the unit cost by 5.

Example: Yukari bought six balloons for $24. How much does it cost to buy five balloons?



24 ÷ 6 = 4 → 1 balloon costs $4

$4 × 5 = $20 → 5 balloons cost $20

The complete practice guide and a related document with instructional tips for educators is available on the What Works Clearinghouse website: https://ies.ed.gov/ncee/wwc/PracticeGuide/15