

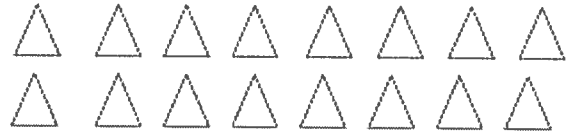
Solve using a visual fraction model. Give a context for the problem.



$$\frac{2}{3} \div \frac{3}{4}$$




Why do we invert and multiply when dividing fractions?

Much unfinished learning from earlier grades can be managed best inside _____ when the _____ are used to understand student thinking.

$$\frac{3}{8}$$

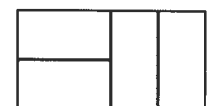


If  = 1,  = _____

If  +  = 1, what is  ?

If  +  = 2/3, what is 1?

Which of the following show fourths? Why?



Which is greater? Why?

- a. $\frac{2}{7}$ or $\frac{3}{7}$
- b. $\frac{4}{5}$ or $\frac{4}{7}$
- c. $\frac{4}{3}$ or $\frac{5}{8}$
- d. $\frac{3}{5}$ or $\frac{2}{7}$
- e. $\frac{5}{6}$ or $\frac{9}{10}$

Ashley bought 6 pounds of candy. She put the candy into bags that each hold $\frac{3}{4}$ pound. How many bags of candy did she fill?

Review of Recommendations

Recommendation 1.

Build on students' informal understanding of sharing and proportionality to develop initial fraction concepts.

- Use equal-sharing activities to introduce the concept of fractions. Use sharing activities that involve dividing sets of objects as well as single whole objects.
- Extend equal-sharing activities to develop students' understanding of ordering and equivalence of fractions.
- Build on students' informal understanding to develop more advanced understanding of proportional reasoning concepts. Begin with activities that involve similar proportions, and progress to activities that involve ordering different proportions.

Recommendation 2.

Help students recognize that fractions are numbers and that they expand the number system beyond whole numbers. Use number lines as a central representational tool in teaching this and other fraction concepts from the early grades onward.

- Use measurement activities and number lines to help students understand that fractions are numbers, with all the properties that numbers share.
- Provide opportunities for students to locate and compare fractions on number lines.
- Use number lines to improve students' understanding of fraction equivalence, fraction density (the concept that there are an infinite number of fractions between any two fractions), and negative fractions.
- Help students understand that fractions can be represented as common fractions, decimals, and percentages, and develop students' ability to translate among these forms.

Recommendation 3.

Help students understand why procedures for computations with fractions make sense.

- Use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures.
- Provide opportunities for students to use estimation to predict or judge the reasonableness of answers to problems involving computation with fractions.
- Address common misconceptions regarding computational procedures with fractions.
- Present real-world contexts with plausible numbers for problems that involve computing with fractions.

Recommendation 4.

Develop students' conceptual understanding of strategies for solving ratio, rate, and proportion problems before exposing them to cross-multiplication as a procedure to use to solve such problems.

- Develop students' understanding of proportional relations before teaching computational procedures that are conceptually difficult to understand (e.g., cross-multiplication). Build on students' developing strategies for solving ratio, rate, and proportion problems.
- Encourage students to use visual representations to solve ratio, rate, and proportion problems.
- Provide opportunities for students to use and discuss alternative strategies for solving ratio, rate, and proportion problems.

Recommendation 5.

Professional development programs should place a high priority on improving teachers' understanding of fractions and of how to teach them.

- Build teachers' depth of understanding of fractions and computational procedures involving fractions.
- Prepare teachers to use varied pictorial and concrete representations of fractions and fraction operations.
- Develop teachers' ability to assess students' understandings and misunderstandings of fractions.

Siegler, R., Carpenter, T., Fennell, F., Geary, D., Lewis, J., Okamoto, Y., Thompson, L., & Wray, J. (2010). *Developing effective fractions instruction for kindergarten through 8th grade: A practice guide* (NCEE #2010-4039). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from whatworks.ed.gov/publications/practiceguides.

Correlation Between 3-5 Fraction Progression and 6-8 Standards

Fraction Progression	6 th Grade	7 th Grade	8 th Grade
Plan	Teach units in the order below	Remediate in the order of the progression, but don't use that order to structure your year. Embed fractional reasoning where it connects.	
The Meaning of Fractions • Partitioning	Area – 6.G.1 Nets and Surface Area – 6.G.4 Ratios – 6.RP.1	Geometry	Pythagorean Theorem
• Unit Fractions • Models	Unit Rates – 6.RP.2 Ratio Problems – 6.RP.3 Emphasize tape diagrams	Ratios and Proportional Reasoning Emphasize tape diagrams	
• Number Lines	Integers – 6.NS.5 Rational Numbers – 6.NS.6-7 Coordinate Planes – 6.NS.8, 6.G.3	Integers Graphing Proportional Relationships	Irrational Numbers Graphing Equations and Functions Transformations Statistical Graphs
Equivalent Fractions (Area, set, and linear models)	GCF and LCM – 6.NS.4 Expressions – 6.EE.1-4 Equations – 6.EE.5-9	Expressions Equations Slope	Irrational Numbers Exponents Slope Equations
Comparing and Ordering	Inequalities – 6.EE.8	Statistics and Probability	Irrational Numbers
Operations	Volume with Fractional Edges - 6.G.2 Divide Fraction by Fraction - 6.NS.1 Review Expressions, Equations, Integers, and Graphing to include Fractions	All Standards	All Standards

RTI Plan

- Tier 1 – Teach any concept that less than 80% of class understands to the whole class, embedding within the grade level standard.
- Tier 2 – Work in small groups on fraction concepts that less than 20% are struggling with. Focus on the elementary standards until at least 15% are successful.
- Tier 3 - Intensive re-engagement lessons with the 5% or less that need additional support.

Five sixth grade standards don't focus on the progression. These could be taught at any time.

- Divide Multi-Digit – 6.NS.2
- Operations with Decimals – 6.NS.3
- Statistical Variability – 6.SP.1-4 (6.SP.4 reinforces number lines)

Fraction Operations

Students need...

- time to understand each step in the progression
- experience with a variety of models
- contextual situations to help them make sense of the numbers (word problems), both contexts they are given and stories they create
- opportunities to estimate to determine if an answer is reasonable

Grade	Operation	Notes
4		Working only with denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100
4	Add and subtract with like denominators	<ul style="list-style-type: none"> • Addition means “putting together.” • Build up from unit fractions. • Number line model. • Decompose and compose fractions with the same denominator. • Add whole numbers and fractions. • Add mixed numbers. • Use addition to convert improper to mixed numbers.
4	Add and subtract with unlike denominators	<ul style="list-style-type: none"> • One denominator is a divisor of the other. • Fraction strip model.
4	Multiply a fraction by a whole number	<ul style="list-style-type: none"> • Begin with unit fractions and connect to whole number multiplication as repeated addition. • $3 \times \frac{2}{5}$ means 3 groups of $\frac{2}{5}$ or $\frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{3 \times 2}{5}$ • Include word problems and “large” numbers.
4	Decimals	<ul style="list-style-type: none"> • Fractions with denominators of 10 or 100.
5	Add and subtract fractions	<ul style="list-style-type: none"> • Both denominators may need to be changed. • Not necessary to find the LEAST common denominator.
5	Divide whole numbers that yield fractional answers	<ul style="list-style-type: none"> • Connects fractions with division • Connects multiplication and division • Area model
5	Multiply a whole number by a fraction	<ul style="list-style-type: none"> • Fraction strip • Number line
5	Multiply a fraction by a fraction	<ul style="list-style-type: none"> • Fraction strip • Number line • Students develop the standard algorithm by reasoning out many examples. • Area (grid) model
5	Divide a unit fraction by a whole number	<ul style="list-style-type: none"> • Connecting to multiplication. • Division means “how many groups of ___ are in ___.”
5	Multiplication as scaling	<ul style="list-style-type: none"> • $\frac{1}{2}$ times a quantity yields half the size.
6	Divide fraction by fraction	<ul style="list-style-type: none"> • Visual model.