

# Quick Reference Guide: Fractions Learning Progression in Grades 3–5

Most students come to school with some personal experience with fractions (halves, sharing equally). While these experiences can help initially, students must advance their understanding of fractions in a formal mathematical sense.

This guide summarizes the progression of standards related to fractions in the [Massachusetts Curriculum Framework for Mathematics](#) for students in grades 3–5. Accompanying examples of fraction models illustrate how educators can help students deepen conceptual understanding of fractions that will serve them well in real-world problem solving and when they move on to ratios, rates, and proportional reasoning in the middle grades.

## Grade 3: Getting to Know Fractions

A formal introduction to fractions begins in Grade 3, where the Number and Operations—Fractions domain first appears in the mathematics standards. Students begin with the concept of unit fractions (3.NF.A.1). They learn that fractions are numbers on a number line and that they partition the whole into parts (3.NF.A.2.a). They also relate fractions to length measurement (3.NF.A.2.b). Third graders can explain equivalence of fractions and whole numbers by size and location on the number line (3.NF.A.3.a) as well as recognize and generate equivalent fractions using visual fraction models (3.NF.A.3.b). Finally, third graders compare fractions, looking at the numerators and denominators, and recognize that comparisons are valid only when they refer to the same whole (3.NF.A.3.d).

## Grade 4: Decimals and Operations with Fractions

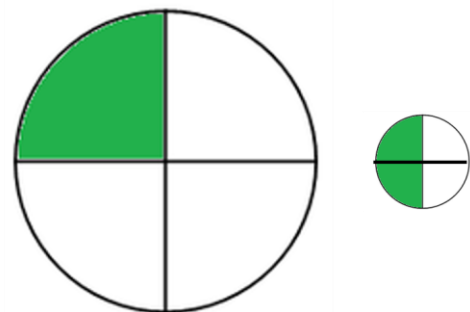
Grade 4 students continue to explore equivalence by using visual fraction models (4.NF.A.2.a) and common numerators, denominators, and benchmark fractions to compare fractions (4.NF.A.2). Students also learn that the whole can refer to a set of objects (4.NF.B.3.a). Fourth graders understand that addition and subtraction of fractions is joining and separating parts of the same whole (4.NF.B.3.a and b). They also begin to perform formal operations (addition, subtraction, and multiplication) with fractions and

**Fraction:** A number expressible in the form  $a/b$  where  $a$  is a whole number and  $b$  is a positive whole number.

In the MA math curriculum framework, *fraction* always refers to a non-negative number.

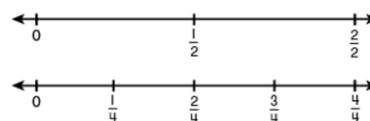


The whole must be specified to determine the shaded area. If the left square is the whole, the fraction is  $\frac{3}{2}$ . If the entire rectangle is the whole, the fraction is  $\frac{3}{4}$ .

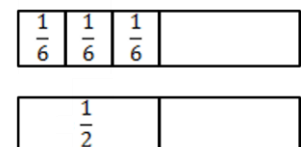


To compare two fractions, they must refer to the same whole. For example, in the diagram above,  $\frac{1}{4}$  of the left circle is greater than  $\frac{1}{2}$  of the right circle. Since each fraction refers to a different whole, a student may incorrectly state that  $\frac{1}{4} > \frac{1}{2}$ .

Using a number line and fraction strips to show equivalence.



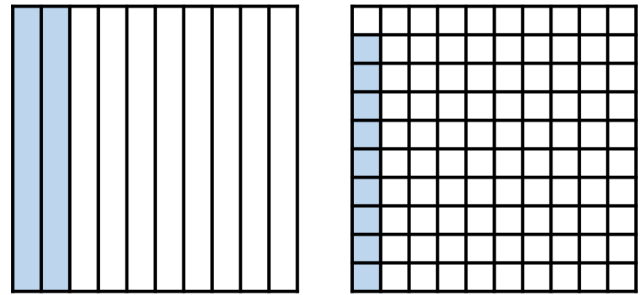
$$\frac{2}{2} = \frac{4}{4} = 1$$



$$\frac{3}{6} = \frac{1}{2}$$

mixed numbers (4.NF.B.3.c and 4.NF.B.4). Students use drawings, visual models, and equations to solve word problems using fractions (4.NF.B.3.d and 4.NF.B.4).

In addition, Grade 4 students begin their study of decimal fractions as a special case of fractions with denominators that are powers of 10 (4.NF.C.5, 4.NF.C.6, and 4.NF.C.7). The Measurement and Data domain of the standards also includes the use of measurement units expressed as fractions and decimals (4.MD.A.2 and 4.MD.B.4).

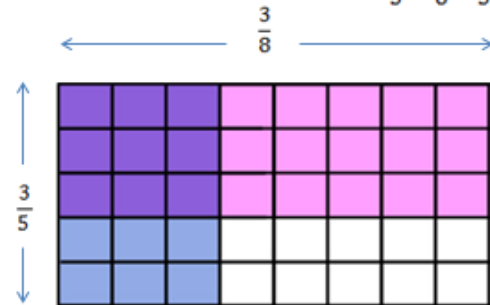


Using a visual fraction model to show that 0.2 (or  $\frac{2}{10}$ ) is greater than 0.09 (or  $\frac{9}{100}$ )

## Grade 5: Unlike Denominators

In Grade 5 students begin adding and subtracting fractions with unlike denominators (5.NF.A.1) and progress to solving application problems involving all operations (5.NF.A.2, 5.NF.B.3, 5.NF.B.6, 5.NF.B.7.b). Students continue to use drawings, visual fraction models, place value understanding, and equations to explain their reasoning. Fifth graders begin to interpret multiplication as scaling (5.NF.B.5). Students also apply their knowledge of division to divide unit fractions by whole numbers and whole numbers by fractions, though division of a fraction by a fraction is not a requirement at this grade (5.NF.B.7). Grade 5 students also use all operations in their work with decimals (5.NBT.B.7), using both models and equations.

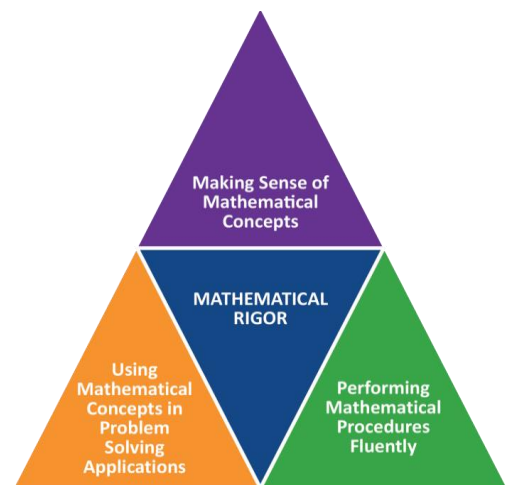
Using an area model to show that  $\frac{3}{5} \times \frac{3}{8} = \frac{3 \times 3}{5 \times 8} = \frac{9}{40}$



### Balanced Mathematical Instruction

To achieve mathematical understanding, students should be actively engaged in **meaningful mathematics**. The standards focus on developing students' conceptual understanding, procedural fluency, and problem solving applications.

When students understand fractions conceptually, they are better equipped to make sense of and solve application problems. Using conceptual models such as number lines and area models helps students understand how fractions and their operations fit into the real number system.



#### Check It Out!

[Illustrative Mathematics Fractions Progression Model](#)