

Cluster 5: Using Models to Add and Subtract Decimals and Fractions

Duration: 4-5 weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note strikethroughs and recommendations in the Important Considerations section for more information.

NC.5.NF.1

Add and subtract fractions, including mixed numbers, with unlike denominators using related fractions: halves, fourths and eighths; thirds, sixths, and twelfths; fifths, tenths, and hundredths.

- Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.
- Solve one- and two-step word problems in context using area and length models to develop the algorithm. Represent the word problem in an equation

NC.5.NBT.7

Compute and solve real-world problems with multi-digit whole numbers and decimal numbers.

- Add and subtract decimals to thousandths using models, drawings or strategies based on place value.
- ~~Multiply decimals with a product to thousandths using models, drawings, or strategies based on place value.~~
- ~~Divide a whole number by a decimal and divide a decimal by a whole number, using repeated subtraction or area models. Decimals should be limited to hundredths.~~
- Use estimation strategies to assess reasonableness of answers.

NC.5.OA.2

Write, explain, and evaluate numerical expressions involving the four operations to solve up to two-step problems. Include expressions involving:

- Parentheses, using the order of operations.
- Commutative, associative and distributive properties.

Mathematical Practices:

- 1. Make sense of problems and persevere in solving them**
- 2. Reason abstractly and quantitatively**
- 3. Construct viable arguments and critique the reasoning of others**
- 4. Model with mathematics**
- 5. Use appropriate tools strategically**
- 6. Attend to precision**
- 7. Look for and make use of structure.**
- 8. Look for and express regularity in repeated reasoning.**

What is the mathematics?

- This cluster continues the natural progression from place value to decimal computation. Students use the same length and area models to add and subtract decimals within real-world and word problem contexts, developing an understanding that the meaning of addition and subtraction do not change simply because the numbers are decimals and fractions rather than whole numbers. They continue to explore addition and subtraction as inverse operations.
- Students deepen their understanding of equivalent fractions by using relational thinking to build on the grade four work where they decomposed fractions (ex. $2 \times \frac{1}{3} = \underline{\quad} \times \frac{1}{6}$) and the work in Cluster 3 where they solved fair-sharing problems (ex. In the problem 6 children share 4 brownies, how many brownies does each child have?; At the big table, 10 children

are sharing 8 brownies so they all get the same amount. How many brownies should the teacher give the small table where 5 people are sitting so that each person at the small table has the same amount as each person at the big table?)

- Students equivalent fractions to add and subtract fractions with unlike denominators. They connect area models, length models, and other drawings to equations and discuss which strategies are efficient in different contexts. Through these discussions and connections of representations, they begin to develop the standard algorithm for adding and subtracting fractions by understanding the process as expressing both fractions in terms of the same unit fraction.
- Students understand that quantities can be named in different ways (ex. decimal, fraction, mixed number).
- Students use benchmark fractions to estimate and assess the reasonableness of solutions.

Important Considerations:

- Students use models, drawings or strategies based on place value to add and subtract decimals. They explore addition and subtraction of fractions by connecting their knowledge of decimals.
- Students need ample opportunities to explore concepts with concrete models to build a strong conceptual understanding of addition and subtraction of decimals and fractions.
- Students work with fractions within related groups: halves, fourths and eighths; thirds, sixths, and twelfths; fifths, tenths, and hundredths. When adding and subtracting fractions with unlike denominators they first begin with situations where one denominator is a divisor of the other so that only one fraction needs to be changed (ex. $\frac{1}{3} + \frac{1}{6}$). In sixth grade, they then extend the same reasoning to situations in which both fractions need to be expressed in terms of a new, common denominator ($\frac{1}{2} + \frac{1}{3}$). Although students begin to develop the standard algorithm by exploring finding equivalent fractions by multiplying by one to get a common denominator, this algorithm does not need to be mastered until grade six.
- As students write equations to connect to their models, they continue to use of Order of Operations appropriately.