

# Unpacked South Dakota State Mathematics Standards

**Purpose:** *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Numbers and Operations - Fractions	Grade Level: 4
<p><b>4.NF.B Cluster: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers</b></p> <p>This cluster continues to develop the understanding of fractions. Learners should understand a fraction as being made up of unit fractions. They extend their understanding that fractions greater than 1 can be expressed as mixed numbers. They will work towards understanding and representing addition and subtraction of fractions with the same denominator as joining or separating parts referring to the same whole. Learners will begin with visual representations and connect these to written equations.</p> <p>This is the first experience learners will have with multiplication of a fraction by a whole number. They will use visual representations, such as area models, fraction strips, and number lines, to build the understanding of multiplying by whole numbers and explain their reasoning to others.</p>	
<p><b>**This is a MAJOR cluster.</b> <i>Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.</i></p>	
<p><b>4.NF.3</b> - Understand a fraction <math>a/b</math> with <math>a &gt; 1</math> as a sum of fractions <math>1/b</math>. For example, <math>4/5 = 1/5 + 1/5 + 1/5 + 1/5</math></p> <ol style="list-style-type: none"><li>Add and subtract of fractions e.g., joining and separating parts referring to the same whole.</li><li>Decompose a fraction into a sum of fractions with like denominators in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.</li><li>Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.</li><li>Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.</li></ol> <p><b>4.NF.4</b> - Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.</p> <ol style="list-style-type: none"><li>Understand a fraction <math>a/b</math> as a multiple of <math>1/b</math>. For example, use a visual fraction model to represent <math>5/4</math> as the product <math>5 \times (1/4)</math>, recording the conclusion by the equation <math>5/4 = 5 \times (1/4)</math>.</li><li>Understand a multiple of <math>a/b</math> as a multiple of <math>1/b</math>, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express <math>3 \times (2/5)</math> as <math>6 \times (1/5)</math>, recognizing this product as <math>6/5</math>. (In general, <math>n \times (a/b) = (n \times a)/b = (n \times a) \times 1/b</math>.)</li><li>Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat <math>3/8</math> of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?</li></ol>	

<b>Aspects of Rigor: (Conceptual, Procedural, and/or Application)</b>		
<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>
<p>Understand a fraction is the sum of multiple fractions. <b>(4.NF.3)</b></p> <p>Understand addition and subtraction of fractions with the same denominator is joining or separating parts referring to the same whole. <b>(4.NF.3a)</b></p> <p>Understand a fraction can be a sum of different like denominator fractions. <b>(4.NF.3b)</b></p> <p>Understand mixed numbers can be added or subtracted. <b>(4.NF.3c)</b></p>	<p>Add fractions with like denominators. <b>(4.NF.3a)</b></p> <p>Subtract fractions with like denominators. <b>(4.NF.3a)</b></p> <p>Write an equation when decomposing fractions. <b>(4.NF.3b)</b></p> <p>Add mixed numbers with like denominators. <b>(4.NF.3c)</b></p> <p>Subtract mixed numbers with like denominators. <b>(4.NF.3c)</b></p>	<p>Solve addition word problems involving fractions with like denominators using models and equations. <b>(4.NF.3d)</b></p> <p>Solve subtraction word problems involving fractions with like denominators using models and equations. <b>(4.NF.3d)</b></p>
<p>Extend the understanding of multiplication to problems that have fractions. <b>(4.NF.4)</b></p> <p>Understand a fraction is a multiple of a unit fraction. <b>(4.NF.4a)</b></p> <p>Understand multiplying a whole number times a fraction can be changed to a whole number times a unit fraction. <b>(4.NF.4b)</b></p>	<p>Multiply a fraction with a whole number. <b>(4.NF.4b)</b></p>	<p>Solve multiplication word problems involving whole numbers and fractions using models and equations. <b>(4.NF.4c)</b></p>
<b>Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices</b>		
<ol style="list-style-type: none"> <li><b>1. Make sense of problems and persevere in solving them.</b> <ul style="list-style-type: none"> <li>• Solve problems that involve adding, subtracting, and multiplying fractions or mixed numbers.</li> </ul> </li> <li><b>2. Reason abstractly and quantitatively.</b> <ul style="list-style-type: none"> <li>• Reason about fractions as whole numbers and understand that fractions represents a “count” of something that is part of a whole.</li> </ul> </li> <li><b>3. Construct viable arguments and critique the reasoning of others.</b> <ul style="list-style-type: none"> <li>• Explain what is happening when learners add and subtract fractions.</li> </ul> </li> <li><b>4. Model with mathematics.</b> <ul style="list-style-type: none"> <li>• Use models including area models, fraction strips, and number lines.</li> </ul> </li> <li><b>5. Use appropriate tools strategically.</b> <ul style="list-style-type: none"> <li>• Use area models, fraction strips, number lines and rulers to appropriately show addition, subtraction and multiplication of fractions.</li> </ul> </li> <li><b>6. Attend to precision.</b> <ul style="list-style-type: none"> <li>• Build on previous understandings of the meaning of numerator and denominator.</li> </ul> </li> <li><b>7. Look for and make use of structure.</b> <ul style="list-style-type: none"> <li>• Use previous understanding of numerators and denominators to see the structure of addition, subtraction and multiplication of fractions.</li> </ul> </li> <li><b>8. Look for and express regularity in repeated reasoning.</b> <ul style="list-style-type: none"> <li>• Use the general method of adding or subtracting numerators, but keep the same denominators when working with like denominators.</li> </ul> </li> </ol>		

## Vertical and Horizontal Coherence and Learning Progressions

<u><a href="#">Previous Learning Connections</a></u>	<u><a href="#">Current Learning Connections</a></u>	<u><a href="#">Future Learning Connections</a></u>
<p>Understand a unit fraction is a fraction with a numerator of 1 <b>(3.NF.1)</b></p> <p>Understand equivalent fractions <b>(3.NF.3)</b></p> <p>Represent a fraction on a number line <b>(3.NF.2)</b></p> <p>Interpret the products of whole numbers as the total number of objects in all groups <b>(3.OA.1)</b></p> <p>Determine the unknown whole number in a multiplication or division problem <b>(3.OA.4)</b></p>	<p>Recognize and generate equivalent fractions <b>(4.NF.1)</b></p> <p>Multiply a fraction by a whole number <b>(4.NF.4)</b></p> <p>Add fractions with denominators of 10 and 100 <b>(4.NF.5)</b></p> <p>Solve word problems with fraction and decimal numbers <b>(4.MD.2)</b></p> <p>Make a line plot with measurements in fraction units <b>(4.MD.4)</b></p> <p>Utilize benchmark fractions to check for reasonableness of an answer <b>(4.NF.2)</b></p> <p>Understand any fraction with a numerator greater than one is the sum of unit fractions <b>(4.NF.3)</b></p> <p>Use multiplication to solve word problems using measurement <b>(4.MD.2)</b></p>	<p>Use equivalent fractions as a strategy to add and subtract fractions <b>(5.NF.1)</b> <b>(5.NF.2)</b></p> <p>Solve real-world and mathematical problems by writing and solving equations of the form <math>x + a = b</math> for cases in which a, b and x are all non-negative rational numbers <b>(6.EE.7)</b></p> <p>Apply and extend previous understandings of numbers to the system of rational numbers <b>(6.NS.2–4)</b></p> <p>Multiply a fraction by a whole number or fraction <b>(5.NF.4)</b></p> <p>Solve real-world fraction multiplication problems <b>(5.NF.6)</b></p> <p>Divide unit fractions by whole numbers and whole numbers by unit fractions <b>(5.NF.7)</b></p>

### **Vocabulary** (Key Terms Used by Teachers and Students in this Cluster):

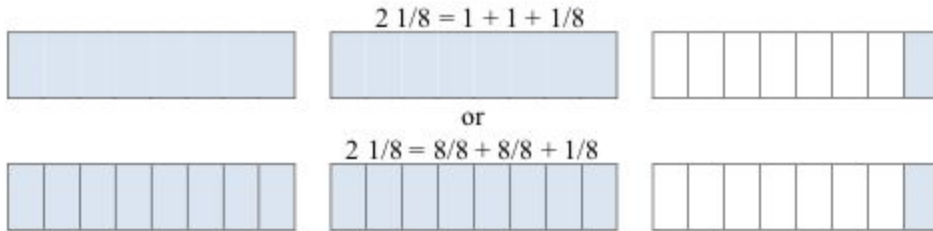
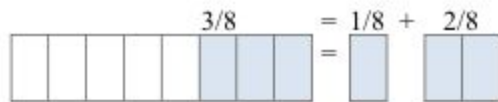
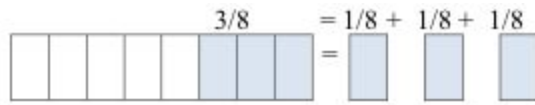
- |                                                                                                                                                                           |                                                                                                                                                  |                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>● Operations</li> <li>● Addition/joining</li> <li>● Subtraction/separating</li> <li>● Fraction</li> <li>● Unit fraction</li> </ul> | <ul style="list-style-type: none"> <li>● Equivalent</li> <li>● Multiple</li> <li>● Reason</li> <li>● Denominator</li> <li>● Numerator</li> </ul> | <ul style="list-style-type: none"> <li>● Decomposing</li> <li>● Mixed number</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|

### **Relevance, Explanations, and Examples:**

#### **4.NF.3**

#### Example:

Five friends ordered 3 large sandwiches. John ate  $\frac{3}{4}$  of a sandwich. Kim ate  $\frac{1}{4}$  of a sandwich. Ron ate  $\frac{3}{4}$  of a sandwich. Sam ate  $\frac{2}{4}$  of a sandwich. How much sandwich is left? Explain your reasoning. (solution  $\frac{3}{4}$  of a sandwich)

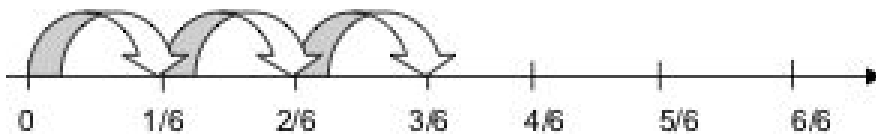


#### 4.NF.4a

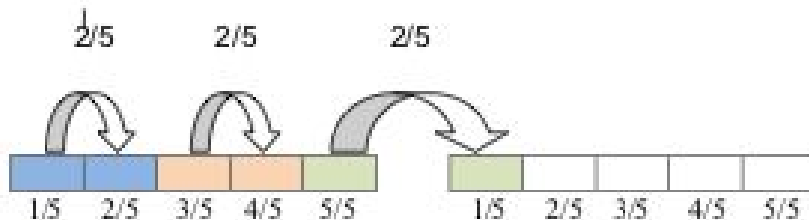
Example:

$$\frac{3}{6} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = 3 \times \left(\frac{1}{6}\right)$$

Number line:



#### 4.NF.4b



$$3 \times \frac{2}{5} \text{ as } \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{3 \times 2}{5} = \frac{6}{5}$$

### Achievement Level Descriptors

**Cluster:** Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers

#### Concepts and Procedures

**Level 1:** Students should be able to understand that a fraction  $a/b$  with  $a > 1$  is the sum of its unit fractional parts by extending previous understandings of addition on whole numbers. They should be able to identify fractions using visual models.

**Level 2:** Students should be able to understand that a fraction  $a/b$  is a multiple of  $1/b$  by extending previous understanding of multiplication on whole numbers;

	solve one-step problems involving addition and subtraction of fractions referring to the same whole with like denominators; and use visual fraction models and/or equations to represent the problem.
	<b>Level 3:</b> Students should be able to identify and generate equivalent forms of a fraction including mixed numbers with like denominators and solve one-step problems involving multiplication of a fraction by a whole number.
	<b>Level 4:</b>