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: Operations and Algebraic Thinking	Grade Level: 4

4.OA.A Cluster: Use the four operations with whole numbers to solve problems.

This cluster focuses on building an understanding of multiplication as a comparison and using this understanding to solve real world problems. Learners are applying their knowledge of the four operations to solve problems that involve multiple steps.

**This is a MAJOR cluster. *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.*

4.OA.1 - Use and interpret multiplicative equations.
  a. Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 × 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal or written statements of multiplicative comparisons as multiplication equations. Example: Tom has 7 toy cars; Joe has 5 times as many. How many toy cars does Joe have? Answer: 35, because $7 × 5 = 35$ or $5 × 7 = 35$.
  b. Know from memory (quick effortless recall of facts) all products of two one-digit numbers.

4.OA.2 - Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem), and distinguish multiplicative comparison from additive comparison.

4.OA.3 - Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Aspects of Rigor for Students: (Conceptual, Procedural, and/or Application)

Conceptual Understanding	*Procedural Fluency*	*Application*
Understand two different sets of numbers are being compared using multiplication **(4.OA.1a)**	Quickly and effortlessly recall all multiplication facts of two one-digit numbers **(4.OA.1b)**	
Interpret a comparison word problem as multiplication or division **(4.OA.2)** Distinguish the difference between multiplicative comparison and additive comparison **(4.OA.2)**	Use symbols for unknown numbers to determine comparisons in multiplication and division **(4.OA.2)**	Solve contextual (real world) word problems using comparison multiplication and division **(4.OA.2)**

Determine which operations are needed when solving multistep word problems **(4.OA.3)** Identify the meaning of the remainder in a story problem **(4.OA.3)** Reflect on answers to determine if they are reasonable using estimations and mental computations **(4.OA.3)**	Use numbers and symbols (+, -, x, ÷,=) to represent word problems including a letter for the unknown **(4.OA.3)**	Solve multistep word problems using contextual (real world) situations and reason and reflect on solutions **(4.OA.3)**

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
   - Think about solutions in terms of reasonableness "does that make sense"?
2. **Reason abstractly and quantitatively.**
   - Solve single and multistep problems that include all four operations
3. **Construct viable arguments and critique the reasoning of others.**
   - Learners explain their thinking and listen to the reasoning of others and look for similarities and differences in strategies.
4. **Model with mathematics.**
   - Solve single and multistep problems that include all four operations using models, pictures, words, and numbers.
5. **Use appropriate tools strategically.**
   - Learners ask whether a task can most efficiently completed by mental computation, estimation, or paper and pencil. For more complex situations they may use a calculator.
6. **Attend to precision.**
   - Use appropriate mathematical vocabulary and accurate unit of measure
7. **Look for and make use of structure.**
   - Use properties of operations to explain calculations
8. **Look for and express regularity in repeated reasoning.**
   - Look for and extend mathematical patterns in a variety of situations and connect those patterns to the properties.

Vertical and Horizontal Coherence and Learning Progressions

Previous Learning Connections	*Current Learning Connections*	*Future Learning Connections*
Learners have already been taught how to represent and solve problems involving addition and subtraction using multiple strategies. **(2.OA.2)(3.OA.8)** Learners have already been taught how to represent and solve problems involving multiplication and division using multiple strategies. **(3.OA.3)**	Learners will develop understanding and fluency with multi-digit multiplication, and develop understanding of dividing to find quotients involving multi-digit dividends. **(4.NBT.5)(4.NBT.6)** Learners develop an understanding of fraction equivalence, addition and subtraction of like denominators, and multiplication of fractions by whole numbers. **(4.NF.4)**	Learners are using knowledge of parentheses as a building block for order of operations. **(5.OA.1)** Learners will interpret a fraction as division of the numerator by the denominator. **(5.NF.3)** Learners will apply and extend previous understandings of multiplication and division to multiply a fraction by a whole number by a fraction. (**5.NF.4)(5.NF.5)** Learners will understand the concept of a ratio. **(6.RP.1)**

Relevance, Explanations, and Examples:

Fourth grade is the first time learners will be exposed to multiplicative comparisons. Multiplicative comparisons go beyond equal groups and arrays, and must be distinguished from additive comparison problems. **(4.OA.1, 4.OA.2)**

Kenzie reads for 5 minutes. Max read for 15 minutes. How much longer does Max read than Kenzie?
5 + r = 15
(Additive Comparison)
(4.OA.2)

Kenzie reads for five minutes. Max reads for 15 minutes. How many times longer does Max read than Kenzie?
g x 5 = 15
(Multiplicative Comparison)
(4.OA.2)

	Unknown Product	*Group Size Unknown* *(How many in each group?)*	*Number of Groups Unknown* *(How many groups?)*
Multiplicative Comparison	*Blueberries cost $6. Raspberries cost three times as much as blueberries. What is the cost of the raspberries?*	*Raspberries cost 3 times as much as the blueberries. Raspberries cost $18. How much do blueberries cost?*	*Raspberries cost $18 and blueberries cost $6. How many times as much do raspberries cost as blueberries?*
Diagram	 $3 \times 6 = ?$	 $3 \times ? = 18$ $18 \div 3 = ?$	 $? \times 6 = 18$ $18 \div 6 = ?$
Equation	$a \times b = ?$	$a \times ? = p,$ and $p \div a = ?$	$? \times b = p,$ and $p \div b = ?$

Achievement Level Descriptors

Cluster: **Use the four operations with whole numbers to solve problems.**

Concepts and Procedures	**Level 1:** Students should be able to use the four operations (add, subtract, multiply, and divide) to solve one-step problems involving equal groups and arrays.
	Level 2: Students should be able to use the four operations to solve one-step

	problems involving an unknown number. They should be able to realize that it is appropriate to multiply or divide in order to solve familiar multiplicative comparison problems.
	Level 3: Students should be able to use the four operations (add, subtract, multiply, and divide) to solve one-step problems involving equal groups and arrays, including problems where the remainder must be interpreted. They should be able to find an unknown number and represent problems using equations with a symbol representing the unknown quantity.
	Level 4: Students should be able to assess the reasonableness of answers using mental computation and estimation strategies, including rounding.