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: 3rd

3.OA.D Cluster: Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Students will recognize patterns to solve two-step word problems using the four operations representing a letter for the unknown quantity.

**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.*

3.OA.8 Solve two-step word problems using the four operations. 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. (This standard is limited to problems posed with whole numbers and having whole number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order [Order of Operations])

3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.

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

Conceptual Understanding	*Procedural Fluency*	*Application*
Learners have had many experiences solving multiplication and division word problems. **(3.OA.8)** Learners use a number line to understand why a number is rounded to the nearest 10 or 100. **(3.OA.8)** ● Round up ● Round down ● Stays the same	Learners use mental computation strategies to solve two step word problems. **(3.OA.8)**	Learners are able to use strategies to help solve two-step real-world word problems. **(3.OA.8)**
Learners need to understand patterns utilizing a 100 chart. **(3.OA.9)** Learners need to recognize patterns in an addition and multiplication table. **(3.OA.9)** Learners need to understand the properties of operations. **(3.OA.9)**		

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

1. **Make sense of problems and persevere in solving them.**
   - Learners demonstrate if the problem makes sense
     - Specifically when performing estimating strategies
2. **Reason abstractly and quantitatively.**
   - Learners perform one- or two-step word problems.
3. **Construct viable arguments and critique the reasoning of others.**
   - Learners will model and defend their reasoning.
     - Using materials, pictures, words and numbers
4. **Model with mathematics.**
   - Learners use models, pictures or representations to deepen their understanding of the operations.
5. **Use appropriate tools strategically.**
   - Learners use concrete materials, graph paper and pictures.
6. **Attend to precision.**
   - Learners decide which method to use to help solve the problem.
     - Math vocabulary
     - Accurate unit measurement (labeling)
7. **Look for and make use of structure.**
   - Learners make sense of operation patterns
   - Connect these patterns to NBT Domain.
   - Learners extend the patterns to tables and properties of operations.
8. **Look for and express regularity in repeated reasoning.**
   - Learners extend the patterns to tables and properties of operations.

Vertical and Horizontal Coherence and Learning Progressions

Previous Learning Connections	*Current Learning Connections*	*Future Learning Connections*
In 2nd grade, learners have had adequate practice with various addition and subtraction problems, skip counting and adding equal groups.	In 3rd grade, learners will demonstrate an understanding of multiplication and division problems using various strategies. They will also use previous knowledge of the 4 operations to work one- or two-step word problems.	In 4th grade, learners will solve multi-step word problems using the four operations. They will be able to generate patterns which follow a given rule.
Learners used addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. **(2.MD.5)**	** Standards have been listed in this column to show progression of learning and how instruction correlates (a mutual relationship or connection, in which one thing affects or depends on another.) with the focus standard which is boldfaced.*	Learners will 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. **(4.OA.3)**
Learners have practiced addition and subtraction within 100 to solve one- and two-step word problems. **(2.OA.1)**	Learners use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. **(3.OA.3)**	Learners will use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line
Learners fluently added and subtracted within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. **(2.NBT.5)**		
Learners determined whether a group of objects (up to 20) has an odd or even number of members, **(2.OA.3)**	Learners understand division as an unknown-factor problem. For example, find $32 \div 8$ by finding the number that makes 32 when	

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Learners have counted within 1000; skip-counting by 5s, 10s, and 100s. **(2.NBT.2)**	multiplied by 8. **(3.OA.6)** Learners solve real world and mathematical problems involving perimeters of polygons, finding total perimeter, finding unknown side lengths, and exhibit rectangles with the same perimeter and different areas or with the same area and different perimeters. **(3.MD.8)** Learners use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. **(3.OA.3**) Learners fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers. **(3.OA.7)** Learners relate area to the operations of multiplication and addition. **(3.MD.7)** Learners apply properties of operations as strategies to multiply and divide. **(3.OA.5)** Learners determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = ? \div 3$, $6 \times 6 = ?$. **(3.OA.4)** **Learners solve two-step word problems using the four operations. 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. (3.OA.8)** Learners identify arithmetic patterns (including patterns in the addition table or multiplication table), and	diagrams that feature a measurement scale. **(4.MD.2)** Learners generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way. **(4.OA.5)**

| | explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends. **(3.OA.9)** | |

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

- Two-step word problem
- Reasonable Estimate: a rough calculation (guess) of the value, number, quantity, or extent of something.
- Reasonableness: the quality of being close (sound judgement)
- Rounding: alter (a number) less exact but more convenient for calculations.

Relevance, Explanations, and Examples:

- Learners need to know rounding concepts in order to help make a reasonable estimate.

Two-Step word problem:

Where's the NEAREST ten?

7   3

20 | | | | | | | | | 30

27
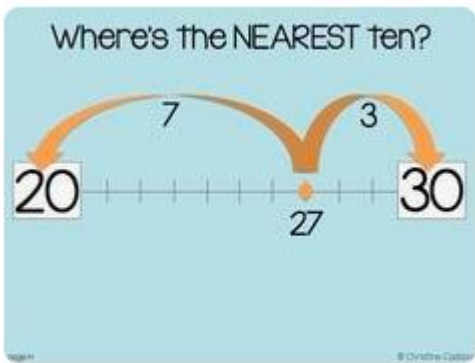
rounding using a number line

Property Examples:
- If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.)
- 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.)
- Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)

Achievement Level Descriptors

Cluster: **Solve problems involving the four operations, and identify and explain patterns in arithmetic.**

Concepts and Procedures	**Level 1***:* Students should be able to represent and solve one-step problems using addition and subtraction within 100 and multiplication and division within the 10 by 10 multiplication table.
	Level 2*:* Students should be able to solve two-step problems using addition and subtraction with numbers larger than 100 and solutions within 1,000; assess the reasonableness of an answer; and identify patterns in the addition table.
	Level 3: Students should be able to solve two-step problems using multiplication and division within the 10 by 10 multiplication table. They should

	be able to represent the problem using equations with a letter or symbol to represent an unknown quantity. They should also be able to explain patterns in the multiplication table.
	Level 4:Students should be able to use the properties of operations to explain arithmetic patterns (including patterns in the addition and multiplication tables).