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: Measurement and Data	Grade Level: 4

4.MD.A Cluster: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

This cluster focuses on understanding and using the measurement units for measuring conversion. Learners will also demonstrate understanding of distance, time, liquid volume, masses, money, area, and perimeter in word problems.

This is a SUPPORTING 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.MD.1 - Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36).

4.MD.2 - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving 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 diagrams that feature a measurement scale.

4.MD.3 - Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

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

Conceptual Understanding	*Procedural Fluency*	*Application*
Understand there are two systems of measurement (US Standard and Metric systems of measurement) **(4.MD.1)**	Know relative sizes of measurement and convert measurements within a single measurement system **(4.MD.1)** Record measurement equivalencies using a table **(4.MD.1)**	
Understand distances, interval of time, liquid volumes, masses of objects, and money to solve real world problems **(4.MD.2)**		Solve real problems using concepts of measurement (distance, time, liquid volumes, mass of objects) **(4.MD.2)** Solve problems that involve fractions and decimals and represent these quantities using diagrams, such as a number line **(4.MD.2)**

	Find the area and perimeter using the given formulas **(4.MD.3)**	Solve real world word problems using area and perimeter formulas **(4.MD.3)**

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

1. **Make sense of problems and persevere in solving them.**
   - Solve problems involving measurement and the conversion of measurements from a larger unit to a smaller unit
2. **Reason abstractly and quantitatively.**
   - Recognize angle measure as an additive
3. **Construct viable arguments and critique the reasoning of others.**
   - Construct and critique arguments relating to relative size of measurement units with everyday objects
4. **Model with mathematics.**
   - Construct line plots to display data of measurements in fraction of a unit
5. **Use appropriate tools strategically.**
   - Select and use rulers, balances, graduated cylinders, angle rulers, and protractors to measure.
6. **Attend to precision.**
   - Specify units of measure and state the meaning of the symbols used.
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

| *Previous Learning Connections*	*Current Learning Connections*	*Future Learning Connections*
Learners measure lengths with halves and fourths of an inch. **(3.MD.4)** Learners estimate, measure, add, and subtract lengths using inches, feet, yards, centimeters, and meters. **(2.MD.1-6)** Learners measure and estimate masses of objects using grams and kilograms and liquid volumes using milliliters and liters. **(3.MD.2)** Learners measure and estimate; add, subtract, multiply, or divide to solve one-step word problems given the same units. **(3.MD.2)** Learners tell and write time to the nearest minute. Add and subtract time intervals in minutes using number line diagrams and tell and write time to the nearest 5 minutes using a.m. and p.m. **(2.MD.7)**	Learners interpret a multiplication equation as a comparison. **(4.OA.1)** Learners multiply to solve word problems involving multiplicative comparison. **(4.OA.2)**	Learners use unit conversions in solving multi-step, real world problems. **(5.MD.1)** Learners use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. **(6.RP.3.d)**

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

- Capacity
- Conversion
- Distance
- Formula
- Mass

- Measure
- Measurement
- Perimeter
- Square unit
- Volume

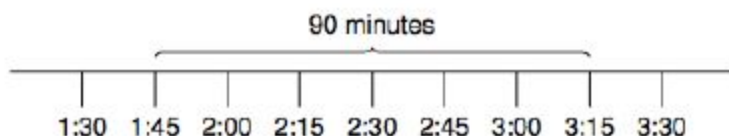- Customary measurement
- Metric measurement

Relevance, Explanations, and Examples:	

Use number line diagrams to solve word problems

Juan spent 1/4 of his money on a game.
The game cost $20. How much money did
he have at first?
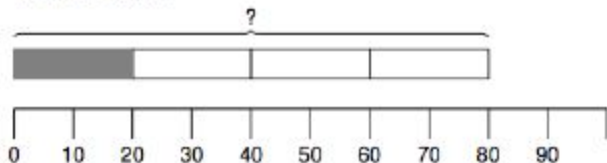
What time does Marla have to leave to be
at her friend's house by a quarter after 3 if
the trip takes 90 minutes?

Using a number line diagram to represent time is easier if students think of digital clocks rather than round clocks. In the latter case, placing the numbers on the number line involves considering movements of the hour and minute hands.

Jackson ran for 7 yards, 3 feet, and 4 inches. His sister Jackie ran for 36 feet, and 2 inches. Who ran farther? Explain.

Achievement Level Descriptors

Cluster: **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit**

Concepts and Procedures	**Level 1:** Students should be able to know relative sizes of measurement units within one system of units, including km, m, cm; kg, g; lb, oz; l, ml; and hr, min, sec.
	Level 2: Students should be able to express measurements in a larger unit in terms of a smaller unit within a single system of measurement, record measurement equivalents in a two-column table, and apply the perimeter formula to rectangles in mathematical problems.
	Level 3: Students should be able to use the four operations to solve 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 diagrams that feature a measurement scale; and apply the area formula to rectangles in mathematical problems.
	Level 4: Students should be able to apply the perimeter and area formulas to rectangles in word problems.