Unpacked South Dakota State Mathematics Standards: DONE

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: Expressions and Equations	**Grade Level: 8**

8.EE.C Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Analyze, solve, and interpret linear equations and systems of linear equations.

****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.*

8.EE.7 Solve linear equations in one variable.

- **a.** Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x= a, a= a, or a= b results (where a and b are different numbers).
- **b.** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms.

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

- **a.** Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
- **b.** Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For an inspection example, 3x+ 2y = 5 and 3x+ 2y= 6 have no solution because 3x+ 2y cannot simultaneously be 5 and 6.
- **c.** Solve real-world and mathematical problems involving leading to two linear equations in one and/or two variables.

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

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand the types of solution of a linear equation [x = a (one solution), a = b (no solutions), a = a (infinitely many solutions)]. **(8.EE.7a)** Understand how to use inverse operations to solve linear equations **(8.EE.7b)**	Solve linear equations involving rational coefficients using inverse operations, distributive property, and combining like terms. **(8.EE.7b)**	
Understand the solution to a system is an ordered pair that makes both equations true. **(8.EE.8a)** Understand the types of solutions to a linear system [intersecting lines (one	Solve linear systems of equations by graphing, elimination, and substitution. **(8.EE.8b)**	Analyze and solve real-world problems involving linear systems of equations. **(8.EE.8c)**

solution), parallel lines (no solution), collinear lines (infinitely many solutions)]. **(8.EE.8b)**		

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

1. **Make sense of problems and persevere in solving them.**
   - Solve real-world systems of linear equations and interpret the results.
2. **Reason abstractly and quantitatively.**
   - Represent a real-world situation by writing a linear equation (or system of linear equations), then interpret the meaning of the solution.
   - Explain the type of solution a system of linear equations will produce (one solution, no solution, or infinitely many solutions) by looking at the graph or system of equations.
3. **Construct viable arguments and critique the reasoning of others.**
   - Justify the most efficient solution method of a system of linear equations.
4. **Model with mathematics.**
   - Write and solve a system of linear equations to determine the solution of a real-world problem.
5. **Use appropriate tools strategically.**
   - Use a graphing calculator and/or graph paper for a coordinate grid to write and solve linear equations and/or a system of linear equations.
6. **Attend to precision.**
   - Appropriately label the solution of a linear equation or a system of linear equations.
7. **Look for and make use of structure.**
   - Apply inverse operations and algebraic reasoning to solve a linear equation or a system of linear equations.
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***
In 6th and 7th grade, learners 1. use variables to write expressions and equations 2. apply the properties of operations to generate equivalent expressions 3. solve equations, including those that involve real-world problems. **Note: 7th graders are expected to solve two-step equations.**	In 8th grade, learners 1. use the equation of a linear model to solve problems in the context of bivariate (two variables) measurement data, interpreting the slope and intercept 2. graph proportional relationships.	In high school, learners 1. will create, solve, and rewrite equations, inequalities, and systems of equations (include equations arising from linear, exponential, and quadratic functions) 2. construct a viable argument to justify a solution method.

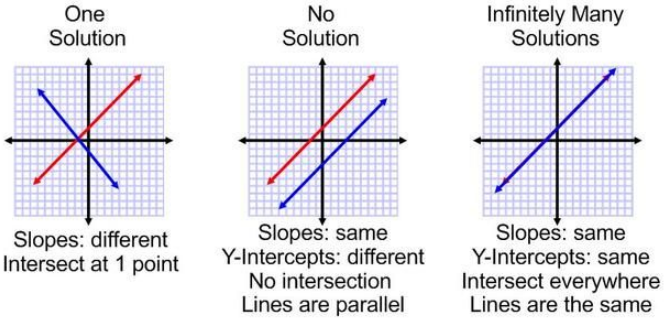
Vocabulary *(Key Terms Used by Teachers and Students in this Cluster):*

● Linear Equations ● Coefficients ● Constants ● Distributive Property	● No Solutions ● Infinitely Many Solutions ● Systems of Linear Equations ● Intersection	● Ordered Pair ● X-Coordinate ● Y-Coordinate ● Solution

Relevance, Explanations, and Examples:

8.EE.7a
One Solution: x = 10
No Solutions: 10 = 11
Infinitely Many Solutions: 10 = 10

8.EE.8b



8.EE.8c
Elimination Method

$$\begin{array}{r} 2x+3y=20 \\ +\ -2x+y=4 \\ \hline 0+4y=24 \end{array}$$

$4y=24$

$y=6$

$-2x+6=4$

$-2x=-2$

$x=1$

$(1,6)$

Substitution Method

$y = 5x-1 \qquad 2y = 3x+12$

$2y = 3x+12$

$2(5x-1) = 3x+12$

$10x-2 = 3x+12$

$-3x \qquad -3x$

$7x-2 = 12$

$+2 \quad +2$

$7x = 14$

$\frac{7x}{7} = \frac{14}{7}$

$x = 2$

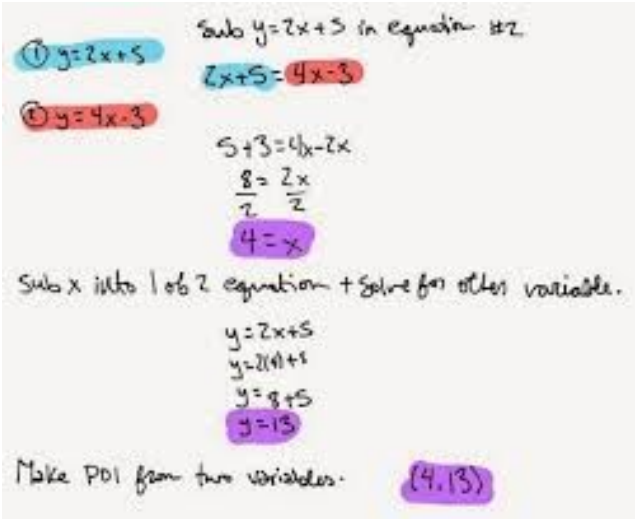
$y = 5x-1$

$y = 5(2)-1$

$y = 9$

Solution: (2, 9)

Substitution Method - setting two equations equal



Achievement Level Descriptors	
Cluster: **Analyze and solve linear equations and pairs of simultaneous linear equations.**	
Concepts and Procedures	***Level 1:*** Students should be able to solve linear equations in one variable with integer coefficients.
	Level 2: Students should be able to analyze and solve systems of linear equations graphically by understanding that the solution of a system of linear equations in two variables corresponds to the point of intersection on a plane. They should be able to solve and produce examples of linear equations in one variable with rational coefficients with one solution, infinitely many solutions,or no solution.
	Level 3: Students should be able to classify systems of linear equations as intersecting, collinear, or parallel; solve linear systems algebraically and estimate solutions using a variety of approaches; and show that a particular linear equation has one solution, no solution, or infinitely many solutions by successively transforming the given equation into simpler forms until an equivalent equation of the form x= a, a=a, or a =b results (where a and b are different numbers). They should be able to solve and produce examples of linear equations in one variable,including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
	Level 4: Students should be able to analyze and solve problems leading to two linear equations in two variables in multiple representations.