SD Common Core State Standards Disaggregated Math Template

Domain:	Expressions and Equations	**Cluster:**	Work with radicals and integer exponents	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.NS.2 Apply and extend previous understanding of multiplication and division and of fractions to multiply and divide rational numbers.	8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 3^2 × 3^(–5) = 3^(–3) = 1/(3^3) = 1/27.	9-12.A-SSE.1 - 4 Interpret the structure of expressions. Write expressions in equivalent forms to solve problems.

Student Friendly Language:

I can use the properties of integer exponents to write equivalent numerical expressions.
I can multiply and divide numerical expressions with integer exponents.
I can explain the difference between a positive and negative exponent.
I can simplify an expression so that it does not contain negative exponents.
I can represent a real world situation using integer exponents.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Positive exponents • Negative exponents • Product of Powers Rule • Power of Powers Rule • Quotient of Powers Rule • Properties of integer exponents • Equivalent numerical expressions • Simplified expression	Positive exponents are repeated multiplication. Negative exponents are repeated division. Rewriting a numerical expression using the properties of integer exponents does not change its value. A simplified expression will not contain negative exponents.	Apply the properties of powers. Write equivalent numerical expressions. Identify equivalent expressions containing integer exponents. Write repeated multiplication/division expressions using powers. Write powers using repeated multiplication/division expressions. Apply the properties of integer exponents to simplify expressions. Recognize incorrect use of integer exponents. Represent real world situations using integer exponents.

Key Vocabulary:

Base Negative exponents Negative integers Numerical expressions Numerator Positive exponents Positive integers Product of Powers Rule Integer Properties of integer exponents Powers Quotient of Powers Rule Denominator Rational numbers Reciprocal Square Cube Equivalent Estimate Expression Exponents

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

Exponential Growth: Apply integer exponents to represent the growth of various organisms and insects that affect the productivity of farm land.

Science: Represent and compare interplanetary distances using exponents. Represent and compare the size of microscopic organisms. Radioactive decay in the nuclear power plants affected by the Japanese Tsunami

Calculating compound interest

Population grown: birth of 7 billionth person on earth based on an exponential growth model, bacteria, cold virus

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Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
None	8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form x^2 = p and x^3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.	9-12.N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 5^(1/3) to be the cube root of 5 because we want [5^(1/3)]^3 = 5^[(1/3) x 3] to hold, so [5^(1/3)]^3 must equal 5. A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see x^4 – y^4 as (x^2)^2 – (y^2)^2, thus recognizing it as a difference of squares that can be factored as (x^2 – y^2)(x^2 + y^2).

Student Friendly Language:

I can use square root symbols to write and solve equations. $x^2 = p$ (p is a positive number) $x^2=64$
I can use cube root symbols to write and solve equations. $x^3 = p$ (p is a positive number) $x^3 = 8$
I can evaluate square roots of perfect squares. $\sqrt{25} = 5$
I can evaluate cube roots of perfect cubes. $\sqrt[3]{27} = 3$
I can describe irrational numbers. $\sqrt{2}$, $\sqrt{31}$, $\sqrt{42}$

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
● Perfect Cube ● Square Root ● Cube Root ● Irrational Numbers ● Perfect Squares ● Radical	Square roots and raising a number to the second power are inverse operations. Irrational numbers cannot be written in the form of a/b. Rational numbers can be written in the form of a/b. There is a possibility of 2 roots for every square root. (one positive & one negative) There is a relationship between square roots and perfect squares. There is a relationship between cube roots and perfect cubes. Cube roots and raising the number to the third power are inverse operations.	Solve equations of cube roots. Solve equations of square roots. Explain the relationship between perfect squares and square roots. Classify numbers as rational or irrational. Draw a square to show that the area of squaring an integer is the inverse of taking the square root. Model with the use of base ten blocks the fact that volume of a cube can help you find the length of a side of cube by taking the cube root. Evaluate equations using variables that are squared or cubed by taking the square root or cube root.

Key Vocabulary:

Prime factorization	Factorization	Perfect square	Square root	Perfect cube	Cube root
Rational numbers	Irrational numbers	Integer	Whole number	Inverse operation	Radical sign

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Find the side length of a cube.

Find how many small cubic boxes can fit into a larger box

How many square foot tiles would be needed to cover a 9 ft by 9 ft room?

You have 64 square feet of carpet, what are the possible dimensions of the square room?

Scale models in architecture.

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Correlating Standard in Previous Year	**Number Sequence & Standard**	**Correlating Standard in Following Year**
Introduction	8.EE.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.	Terminates

Student Friendly Language:

I can write numbers in scientific notation.

I can estimate very large or very small quantities using scientific notation.

I can compare numbers written in scientific notation.

I can convert decimal numbers into scientific notation or scientific notation into decimal numbers

Know (Factual)	**Understand (Conceptual) The students will understand that:**	**Do (Procedural, Application, Extended Thinking)**
• Scientific notation • Positive exponents • Negative exponents • Multiply by power of 10	Very small or very large numbers can be written using scientific notation. Numbers written in scientific notation represent real values that can be compared to one another. A negative exponent in a power of ten means to move the decimal point to the left that number of decimal places. A positive exponent in a power of ten means to move the decimal point to the right that number of decimal places.	Write very large or very small numbers in scientific notation. Estimate very large numbers using positive exponents in scientific notation. Estimate very small numbers using negative exponents in scientific notation. Estimate how many times larger one number is versus a second number.

Key Vocabulary:

Estimate Power of 10 Positive exponents Negative exponents Integer Scientific notation

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Science applications: distance between planets, diameter of nucleus, size of neutrino, speed of sound

Population comparisons. Estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.

The chart shows estimates of computer storage. A CD-ROM holds 700 MB of data. A DVD-ROM holds 4.7 GB. Estimate how many times more storage is in the DVD than a CD. Explain how you got your answer.

1 KB = 1000 bytes
1 MB = 1 million bytes
1 GB = 1 billion bytes

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7.EE.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."	8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	9-12.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling.

Student Friendly Language:

I can perform operations with numbers expressed in scientific notation.

I can solve problems where decimals and scientific notation are used.

I can use scientific notation and choose units of appropriate size for measurement.

I can interpret the answer from a technology tool if it is given in scientific notation.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Scientific Notation • Measurements using scientific notation • Conversions between scientific notation and decimal notation. • Properties of integer exponents	Exponents must be the same when adding and subtracting scientific notation. You add exponents when you multiply powers. You subtract exponents when you divide powers. You can convert decimals to scientific notation before evaluating. Technology devices may display scientific notation in a different format. When a number is very large choosing the larger unit of measure is more meaningful and when the number is very small the smaller unit of measure is more meaningful.	Analyze a number to make sure that it is written appropriately in scientific notation. Apply properties of integer exponents when adding, subtracting, multiplying, and dividing numbers that are in scientific notation. Perform operations with numbers where both decimal and scientific notations are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.

Key Vocabulary:

Scientific notation Rules of powers Measurement labels Sum Difference
Product Quotient Technology notation Exponents

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Correlate with Science class. Given the distance from the sun to a planet, write that number in scientific notation. What would be an appropriate unit of measurement?

What does 3.4 EE -6 mean when displayed on your calculator?

$\frac{3.8 \times 10^8}{2.9 \times 10^3}$ $29{,}300{,}000 + 8.9 \times 10^7$

In July 2010 there were approximately 500 million facebook users. In July 2011 there were approximately 750 million facebook users. How many more users were there in 2011. Write your answer in scientific notation.

Solution: Subtract the two numbers: 750,000,000 - 500,000,000 = 250,000,000 2.5 x 10^8

Subtract the two numbers: 750,000,000 - 500,000,000 = 250,000,000 2.5 x 10^8

The speed of light is 3 x 10^ 8 meters/second. If the sun is 1.5x 10^11 meters from earth, how many seconds does it take light to reach the earth? Express your answer in scientific notation.

8 meters/second. If the sun is 1.5x 10^11 meters from earth, how many seconds does it take light to reach the earth? Express your answer in scientific notation.

SD Common Core State Standards Disaggregated Math Template

Domain:	Expressions and Equations	**Cluster:**	Understand the connections between proportional relationships, lines, and linear equations	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities; 7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.s, areas, and other quantities measured in like or different units.; 7.RP.2 Recognize and represent proportional relationships between quantities.	8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	9-12.FLE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.; A-CED.2.Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. F-IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

Student Friendly Language:

I can graph proportional relationships.

I can determine and describe the unit rate as the slope of the graph.

I can compare two different proportional relationships using different models such as graphs, equations, or tables.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Proportional relationships • Slope of the graph • Unit rate as the slope	Proportional relationships can be represented using graphs, tables, or equations. Proportional relationships starts at the origin (0,0). Slope represents the rate of change of one variable with respect to another. Interpret the slope in terms of the context of the situation. Unit rate is the slope of the line. Unit rate is a coefficient of x.	Graph the proportional relationships using tables, or equations. Find the slope given a set of information (i.e. graphs, tables, or equations.) Read the graph to determine how to label the slope. Compare the unit rate of proportional relationships.

Key Vocabulary:

Proportional relationships	Slope (m)	Line	Graph	Rate of change
Origin	Equation	Unit rate	Tables	Coefficient

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

There will always be times that a concrete number answer will give you the best comparison between two different events. Sometimes graphical representations are the best tool to compare and visualize two or more situations.

If I tilled a field at 3 mph and tilled another of equal size at the rate of 5 mph what is the difference in time spent tilling the field? What is the difference in diesel expense between the two if you burn fuel at 4 gallons per hour or 5 gallons per hour? Create a graph representing the different relationships.

`SD Common Core State Standards Disaggregated Math Template

Domain:	Expressions and Equations	**Cluster:**	Understand the connections between proportional relationships, lines, and linear equations	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.RP.2 Recognize and represent proportional relationships between quantities. 7.G.1 Solve problems involving scale drawings of geometric figures.	8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y =mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.	9-12.A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales 9-12.F-LE.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another 9-12.F-LE.2 Construct linear functions including arithmetic and geometric sequences, given a graph, description of a relationship, or two input-output pairs (including reading these from a table) 9-12.G-GPE5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems(e.g. find the equation of a line parallel or perpendicular to a given line that passes through a given point)

Student Friendly Language:

I can use similar triangles to explain why the slope (m) is the same between any two points on a non-vertical line.

I can create the equation y=mx for a line through the origin.

I can create the equation y=mx+b for a line that passes through the y axis at b [b represents the ordered pair (0,b)].

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Relationship between similar triangles and slope • Zero slope • Undefined slope • Equation y=mx • Equation y=mx+b • Non-vertical • Vertical lines	Similar triangles can be used to find the slope of a line. A zero slope is a horizontal line. An undefined slope is a vertical line. The equation y=mx passes through the origin. The equation y=mx+b passes through the y axis at b. Non-vertical lines can be written in the form y=mx or y=mx+b. Vertical lines have no slope and cannot be written using these equations.	Draw similar triangles on a non-vertical line to show that the slope of the line is constant. Explain the difference between a zero slope and an undefined slope. Derive an equation for y=mx. Derive an equation for y=mx+b. Understand the difference between the slope of a non-vertical and vertical line.

Key Vocabulary:

Similar triangles Slope Pitch Non-vertical line Vertical axis Equation Distinct points
Vertical line Horizontal line Origin Slope intercept form (y=mx+b) Zero slope Undefined slope

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Extending the length of an existing skateboard ramp

Pitch of a roof

Road construction – road grades and bridges

Surveyors

Business plan (when you would break even and begin to earn)

Staircase - distance up against span

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Domain:	Expressions and Equations	**Cluster:**	Analyze and solve linear equations and pairs of simultaneous linear equations	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. 7.EE1, 4a 1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. 4a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*	8.EE.7 Solve linear equations in one variable. ● 8.EE.7a- 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). ● 8.EE.7b- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	9-12.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. 9-12.A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Student Friendly Language:

I can solve linear equations in one variable by using inverse operations, the distributive property, and combining like terms.

I can give examples of equations in one variable that have one solution, no solutions, or infinitely many solutions.

I can solve equations that have rational coefficients (integers, fractions, or decimals).

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
● Solving linear equations ● Solutions of linear equations ● Rational coefficients	Linear equations can be solved by using inverse operations. Linear equations can be solved using the distributive property. Linear equations can be solved by combining like terms. Linear equations in one variable can have one solution, infinitely many solutions, or no solution. Rational coefficients include integers, fractions, and decimals.	Apply inverse operations to solve linear equations Apply the distributive property to solve linear equations. Combine like terms to solve linear equations. Give examples of equations with one solution, infinitely many solutions, and no solutions. Solve linear equations that have rational coefficients.

Key Vocabulary:

Linear equation	Variable	Coefficient	Like terms	Distributive property
Inverse operations	Rational numbers	Infinitely many solutions	Simplest form	Equivalent equations

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Students could compare two payment plans for cell phone service or movie/media services. The distributive property could be illustrated through an example of purchasing items and sales tax.

An example of an equation in which there are infinitely many solutions would be an age puzzle. One puzzle would be if you start with your age, multiply by two, add eight, divide by two, and then subtract 4, you will end up with your age as an answer.

An example of an equation in which there is no solution would be the question "My brother was born two years before me. When we will be the same age?" (x = x +2)

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Domain:	Expressions and Equations	**Cluster Heading:**	Analyze and solve linear equations and pairs of simultaneous linear equations	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
None	8.EE.8 Analyze and solve pairs of simultaneous linear equations. • 8.EE.8a- 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. • 8.EE.8b- Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations.Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* • 8.EE.8c- Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*	9-12.A-REI.5-10 Solve systems of equations.

Student Friendly Language:

I can solve a linear system by graphing.

I can solve a linear system by using algebra.

I can check the algebraic solution by graphing the two linear equations.

I can show that there are systems of equations that have one solution, no solutions, or an infinite number of solutions.

I can apply my knowledge of systems of equations to real world situations.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Solving a linear system by graphing • Solving a linear system by using algebra • Estimate solutions • Solutions of a linear system • Solve real world problems	The intersection point of two lines in a coordinate plane is the solution to the system of linear equations. A system of linear equations can be solved algebraically, using elimination or substitution. The algebraic solution of the linear system can be estimated by graphing. A system of linear equations can have one solution, infinitely many solutions, or no solutions. A linear system can represent a real world problem.	Graph a system of two linear equations. Find the point of intersection of the two linear equations. Solve a linear system using elimination or substitution. Estimate the algebraic solution by graphing. Determine how many solutions there are to a linear system. Write and solve a system of linear equations to model a real world situation.

Key Vocabulary:

Algebraically	Coordinate	Coordinate plane	Coincide	Elimination method
Estimate, graphs	Infinite many solutions	Intersection	Linear equation	No solution
Number of solution	Ordered pair	Parallel lines	Simultaneous	Slope-intercept
Solution of linear equations	Substitution method	System of linear equations	Vriables	

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Compare Payment Plans: Determine which company has the better deal if one company offers a cell phone plan with a $49.99 monthly fee for 400 minutes and charges $0.03 per minute over 400 minutes or a second company that offers a cell phone plan with a $69.99 monthly fee for 700 minutes and charges $0.05 per minute over 700 minutes. Or compare two different rates for a cab ride.

Exchange Rates: Examine the exchange rates between two different monetary systems.

Fuel Efficiency: Compare graph of gas usage in town to gas usage on highway; Compare fuel efficiency of different types of vehicles for example a car compared to a truck

Expense –Income Graphs: find the point at which a business breaks even