MATHEMATICS COMMON CORE CURRICULUM UNIT*
North Smithfield Public Schools

TITLE OF UNIT: Unit 2 Expressions and Equations **COURSE OR GRADE : Accelerated Math 7**

DATE PRESENTED: _____DATE DUE: _____ LENGTH OF TIME: 39 days

OVERVIEW OF UNIT:

Students will solve real-life and mathematical problems involving positive and negative numbers in any form. They will be able to rewrite expressions in different forms and recognize how the quantities are related. They will model situations using mathematical symbols, and use those symbols to solve problems.

ESSENTIAL QUESTION, PROMPT, PROBLEM/UNIT
How can modeling real-life situations using algebraic expressions or equations help solve problems?

STANDARDS: Common Core Math Standards – Grade level domains 6-8

Ratios and Proportional Relationships RP	The Number System NS	Expressions and Equations EE	Functions (grade 8) F	Geometry G	Statistics and Probability SP
☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐
☐	☐				
☐	☐				

: Mathematical Practices grades K-12

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics ★
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

FOCUS MATHEMATICS STANDARDS: see curriculum _____ for specific standards, e.g. (CUT AND PASTE FROM MAP)

- Use properties of operations to generate equivalent expressions. 7.EE.1, 2
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations. 7.EE.3, 4

Applied Learning Standards:

problem solving communication critical thinking research reflection/ evaluation

ENDURING UNDERSTANDING: (CUT AND PASTE FROM CURRICULUM – ESSENTIAL KNOWLEDGE)

The students will be able to model real-life situations using mathematical symbols. They will be able to use these models to solve real-world problems.

PRIOR KNOWLEDGE:

- ☐ **Apply and extend previous understandings of arithmetic to algebraic expressions.**
- ☐ **Reason about and solve one-variable equations and inequalities.**
- ☐ **Represent and analyze quantitative relationships between dependent and independent variables.**

*Referenced templates from *Common Core Curriculum Maps, English Language Arts* and *The Understanding By Design Guide to Creating High Quality Units*

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STUDENT OBJECTIVES, SKILLS and/or NEW KNOWLEDGE: (CUT AND PASTE FROM CURRICULUM – ESSENTIAL KNOWLEDGE)

7.EE.1
- Properties of operations can be used to form equivalent forms of linear expressions.

7.EE.2
- Different forms of equivalent expression show different aspects of a problem.
- Expressions and equations can be written in different forms depending on the context of the problem and how the quantities within it are related.

7.EE.3
- Mental math and estimation strategies for calculations in problem solving contexts extend from students' work with whole number operations and are used to check reasonableness of answers.
- Students can fluently move between fractions, decimals and percents in order to solve multi-step real world and mathematical problems.

7.EE.4
- Real-world problems can be represented and solved using visual models, equations or inequalities.
- Real-world situations can be represented and solved using linear equations with rational numbers of the form $px+q = r$ and $p(x+q) = r$.
- Real-world situations can be represented and solved using linear inequalities with rational numbers of the form $px+q < r$ and $p(x+q) > r$.
- Solutions sets for inequalities are graphed on number lines.

8.EE.1
- Know and apply the properties of integer exponents to generate equivalent numerical expressions.

8.EE.3
- Use number 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.*

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)

8.EE.5
- Graph proportional relationships, interpreting the unit rate as the slope of the graph.

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.

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

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 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 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.*

ACTIVITIES, PRODUCTS, PERFORMANCE, and ASSESSMENTS: see curriculum introduction

1. Application to real world problems
2. Creating charts/collecting data
3. Collaboration - interpersonal
4. Conferencing
5. Exhibits
6. Graphic organizers
7. Graphing
8. Interviews
9. Journals
10. KWL charts
11. Mathematical Practices
12. Modeling ★
13. Oral presentations
14. Problem/Performance based/common tasks
15. Real-life applications involving graphing
16. Represent numbers
17. Rubrics/checklists (mathematical practice, modeling)
18. Technology
19. Summarizing and note-taking
20. Tests and quizzes
21. Writing genres Arguments/ opinion Informative

*Referenced templates from *Common Core Curriculum Maps, English Language Arts* and *The Understanding By Design Guide to Creating High Quality Units*

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Lessons	Resources	Timeframe
Order of Operations	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 1 Lesson 1**	**1**
Simplifying Algebraic Expressions	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 7 Lesson 1**	**1**
Translating Words Into Math	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 1 Lesson 4**	**1**
Using Properties With Rational Numbers	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 6 Lesson 3**	**1**
Variables and Algebraic Expressions	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 1 Lesson 3**	**1**
Fractions, Decimals and Percents	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 6 Lesson 1**	**1**
Estimating With Percents	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 6 Lesson 2**	**1**
Comparing and Ordering Rational Numbers	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 2 Lesson 7**	**1**
Unit 2 Quiz 1		**1**
Integer Exponents	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 3 Lesson 1**	**1**
Properties of Exponents	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 3 Lesson 2**	**1**
Scientific Notation	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 3 Lesson 3**	**1**
Operating With Scientific Notation	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 3 Lesson 4**	**1**
Unit 2 Quiz 2		**1**
Solving Equations With Rational Numbers	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 1 Lesson 5 (refer to: Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 2 Lesson 5, Chapter 3 Lesson 5 & 8)**	**1**
Solving Two-Step Equations	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 1 Lesson 6**	**1**
Solving Multi-Step Equations	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 7 Lesson 2**	**2**
Solving Equations With Variables on Both Sides	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 7 Lesson 3**	**2**
Unit 2 Quiz 3		**1**
Inequalities	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 11 Lesson 4**	**1**
Solving Inequalities by Adding or Subtracting	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 11 Lesson 5**	**1**
Solving Inequalities by Multiplying or Dividing	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 11 Lesson 6**	**1**
Solving Multi-Step Inequalities	**Holt McDougall Mathematics *Explorations in Core Math Grade 7* Chapter 11 Lesson 7**	**2**
Unit 2 Quiz 4		**1**
Application: Expressions and Equations	**Jossey-Bass CC *Hands-On Activities* p. 110**	**1**
Ordered Pairs	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 2 Lesson 1**	**1**
Slope of a Line	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 8 Lesson 2**	**1**
Direct Variation	**Holt McDougall Mathematics *Explorations in Core Math Grade 8* Chapter 8 Lesson 5**	**1**
Solving Systems of Equations Graphically	**Continental *Finish Line Grade 8* Unit 4 Lesson 1**	**1**
Solving Systems of Equations by Elimination	**Continental *Finish Line Grade 8* Unit 4 Lesson 2**	**1**
Solving Systems of Equations by Substitution	**Continental *Finish Line Grade 8* Unit 4 Lesson 3**	**1**
Problem Solving With Systems of Equations	**Continental *Finish Line Grade 8* Unit 4 Lesson 4**	**1**
Unit 2 Quiz 5		**1**

*Referenced templates from *Common Core Curriculum Maps, English Language Arts* and *The Understanding By Design Guide to Creating High Quality Units*

Additional Practice and Review		**3**
Unit Assessment		**1**

HIGHER ORDER THINKING SKILLS: Web's Depth of Knowledge 2 – 4 or Bloom's Taxonomy

Web's Depth of Knowledge

- skill/conceptual understanding
- strategic reasoning
- extended reasoning

Bloom's Taxonomy

- apply
- analyze
- synthesize/create
- evaluate

ADDITIONAL RESOURCES: see curriculum for specifics

- Holt McDougall Mathematics *Explorations in Core Math Grade 7*
- Jossey-Bass Teaching the Common Core Math Standards with Hands-On Activities
- Continental *Finish Line Grade 8*
- Holt Course 2
- Holt Course 3
- McDougal Littell Pre-Algebra

VOCABULARY (CUT AND PASTE FROM CURRICULUM)

- Break-even point
- Coefficient, constant term
- Equation of a line
- Function
- Linear function
- Linear relationship
- Point of intersection
- Rise
- Run
- Slope
- Steepness
- X-intercept
- Y-intercept

OBJECTIVES:

Lessons	Objective
Order of Operations	Students will use the order of operations to solve problems.
Simplifying Algebraic Expressions	Students will add, subtract, factor and multiply algebraic expressions.
Translating Words Into Math	Students will write an expression from a given situation.
Using Properties With Rational Numbers	Students will rewrite expressions to help them solve problems.
Variables and Algebraic Expressions	Students will evaluate algebraic expressions.
Fractions, Decimals and Percents	Students will solve problems involving fractions, decimals and percents.
Estimating With Percents	Students will use different methods to estimating percents.
Comparing and Ordering Rational Numbers	Students will compare and order rational numbers.
Unit 2 Quiz 1	
Integer Exponents	Students will evaluate positive and negative exponents.
Properties of Exponents	Students will develop and use the properties of integer exponents.
Scientific Notation	Students will express very large and very small numbers using scientific notation.
Operating With Scientific Notation	Students will add, subtract, multiply and divide using scientific notation.
Unit 2 Quiz 2	
Solving Equations Containing Integers	Students will solve equations containing integers.
Solving Equations Containing Decimals	Students will solve equations containing decimals.
Solving Equations Containing Fractions	Students will solve equations containing fractions.
Solving Two-Step Equations	Students will solve equations that contain two operations.
Solving Multi-Step Equations	Students will solve equations that contain multiple operations.
Solving Equations With Variables on Both Sides	Students will solve equations that contain variables on both sides.
Unit 2 Quiz 3	
Inequalities	Students will learn to read and write inequalities.

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Solving Inequalities by Adding or Subtracting	**Students will solve inequalities involving addition or subtraction.**
Solving Inequalities by Multiplying or Dividing	**Students will solve inequalities involving multiplication or division.**
Solving Multi-Step Inequalities	**Students will solve multi-step inequalities.**
Unit 2 Quiz 4	
Application: Expressions and Equations	**Students will solve real-life and mathematical problems using numerical and algebraic expressions and equations.**
Ordered Pairs	**Students will determine whether an ordered pair is a solution of an equation.**
Slope of a Line	**Students will show that the slope of a line is the same between any two points on the line.**
Direct Variation	**Students will identify a direct variation.**
Solving Systems of Equations Graphically	**Students will graph lines to solve systems of equations.**
Solving Systems of Equations by Elimination	**Students will use eliminations to solve systems of equations.**
Solving Systems of Equations by Substitution	**Students will solve systems of equations by solving for a variable in one equation and substituting that expression into the other equation.**
Problem Solving With Systems of Equations	**Students will use systems of equations to solve real-life problems.**
Unit 2 Quiz 5	
Additional Practice and Review	
Unit Assessment	

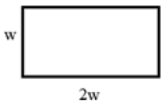
- **Assessments:** see curriculum introduction
  - **Formative**
  - **Summative**

SUGGESTED PROBLEMS: (CUT AND PASTE FROM CURRICULUM TEACHING PROBLEMS OR ASSESSMENTS)

Teaching Problems

7.EE.1

- Suzanne thinks the two expressions 2(3a-2)+4 and 10a – 2 are equivalent? Is she correct? Explain why or why not?
- A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be . Write the expression in two other ways.
- Solution: $6w$ OR $2(w)+2(2w)$.



- An equilateral triangle has a perimeter of 6x+15 . What is the length of each of the sides of the triangle?
- Solution: $3(2x+5)$, therefore each side is $2x+5$ units long.

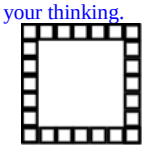
7.EE.2

- Different forms of equivalent expression show different aspects of a problem.
- Expressions and equations can be written in different forms depending on the context of the problem and how the quantities within it are related.

Examples and Explanation

Examples:

- Jamie and Ted both get paid an equal hourly wage of $9 per hour. This week, Ted made an additional $27 dollars in overtime. Write an expression that represents the weekly wages of both if J = the number of hours that Jamie worked this week and T = the number of hours Ted worked this week? Can you write the expression in another way?
- Example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."
  Students may create several different expressions depending upon how they group the quantities in the problem.
  One student might say: To find the total wage, I would first multiply the number of hours Jamie worked by 9. Then I would multiply the number of hours Ted worked by 9. I would add these two values with the $27 overtime to find the total wages for the week. The student would write the expression $9J+9T+27$.
  Another student might say: To find the total wages, I would add the number of hours that Ted and Jamie worked. I would multiply the total number of hours worked by 9. I would then add the overtime to that value to get the total wages for the week. The student would write the expression $9(J+T)+27$
  A third student might say: To find the total wages, I would need to figu much Jamie made and add that to how much Ted made for the week. T Jamie's wages, I would multiply the number of hours she worked by 9. Ted's wages, I would multiply the number of hours he worked by 9 an $27 he earned in overtime. My final step would be to add Jamie and Te week to find their combined total wages. The student would write the e $(9J)+(9T+27)$
- Given a square pool as shown in the picture, write four different expressions to find the total number of tiles in the border. Explain how each of the expressions relates to the diagram and demonstrate that the expressions are equivalent. Which expression do you think is most useful? Explain your thinking.



7.EE.3

- Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations. Estimation strategies include, but are not limited to:
  - Front-end estimation with adjusting (using the highest place value and estimating from the front end making adjustments to the estimate by taking into account the remaining amounts),
  - Clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate),

  - Rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values),
  - Using friendly or compatible numbers such as factors (students seek to fit numbers together - i.e., rounding to factors and grouping numbers together that have round sums like 100 or 1000), and
- Using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate).
- Example:
- The youth group is going on a trip to the state fair. The trip costs $52. Included in that price is $11 for a concert ticket and the cost of 2 passes, one for the rides and one for the game booths. Each of the passes cost the same price. Write an equation representing the cost of the trip and determine the price of one pass.

x	x	11
52		

$2x + 11 = 52$
$2x = 41$
$x = \$20.5$

- If a woman making $25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 $\frac{3}{4}$ inches long in the center of a door that is 27 $\frac{1}{2}$ 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.EE.4

- The sum of three consecutive even numbers is 48. What is the smallest of these numbers?
- Solve: $\frac{5}{4}n + 5 = 20$
- Florencia has at most $60 to spend on clothes. She wants to buy a pair of jeans for $22 dollars and spend the rest on t-shirts. Each t-shirt costs $8. Write an inequality for the number of t-shirts she can purchase.
- Steven has $25 dollars. He spent $10.81, including tax, to buy a new DVD. He needs to set aside $10.00 to pay for his lunch next week. If peanuts cost $0.38 per package including tax, what is the maximum number of packages that Steven can buy?

Write an equation or inequality to model the situation. Explain how you determined whether to write an equation or inequality and the properties of the real number system that you used to find a solution.

- The perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?
- As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

8.EE.1

- Properties of integer exponents are used to simplify and create equivalent forms of numerical expressions.

8.EE.3

- Very large and very small numbers are represented using a single digit times an integer power of 10 (scientific notation).
- Decimal form can be converted to scientific notation and vice-versa.

8.EE.4

- Operations and rules for exponents are used to determine the value and/or compare numbers in both decimal and scientific notation.
- Calculators and computers display scientific notation in different formats.

8.EE.5

- A proportional relationship has a constant rate of change (or unit rate), known as the slope.
- Equations for proportional relationships are linear equations of the form y=mx, where m is the unit rate or slope.
- Linear equations when graphed are straight lines.
- Proportional relationships can be compared using graphs, tables, and equations by analyzing the slopes (unit rates).

8.EE.6

- Proportional relationship when graphed, are straight lines that goes through the origin.
- Equations for linear relationship are of the form y=mx, where m is the unit rate or slope and goes through the origin or y=mx+b for a line intercepting the vertical axis at b.
- Proportional relationships are a special form of a linear relationship.
- The slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. (This is shown using similar triangles.)

8.EE.7

- Linear equations in one variable have one solution, infinitely many solutions or no solutions.
- Linear equations can be expanded and simplified using the distributive property and combining like terms.

8.EE.8

- The solution to a system of linear equations in two variables is the point/ ordered pair on a graph where the two lines will intersect.
- The solution to a system of linear equations in two variables is the point/ ordered pair that satisfies both equations.
- System of linear questions can be solved algebraically to find the point of intersection and then checked graphically.

**** For sample assessment problems, see curriculum document located on NSMS T: drive.**