Richmond Public Schools

Curriculum Framework

Algebra 1

Strand: Expressions and Operations
A.1 The student will **a. represent verbal quantitative situations algebraically; and** **b. evaluate algebraic expressions for given replacement values of the variables.**    EOC Algebra I assessments will include a Desmos Calculator
Suggested Pacing
First Nine Weeks –Translation/Evaluation Unit A.1a 3 blocks A.1b 2 blocks
Related Standards
Spiral Down **7.1** The student will a) Compare and order rational numbers; b) Identify and describe absolute value of rational numbers. **8.1** The student will compare and order real numbers. **8.2** The student will describe the relationships between the subsets of the real number system. **8.14** The student will a) Evaluate an algebraic expression for given replacement values of the variables; and b) Simplify algebraic expressions in one variable.

Essential Questions	Common Misconceptions
A.1a ● **Why do we use variables in algebra?**	● Algebra is a tool for reasoning about quantitative situations so that relationships become apparent.

Variables have no numerical value until they are given and are used as a numerical placeholder in formulas and equations.

- **Why is it important to be able to write verbal expressions as algebraic expressions and sentences as equations and vice versa?**
  Verbal expressions are equations written in word form in stories, problems, etc. Verbal expressions are translated into algebraic form so the solution to the problem may be found. Algebraic expressions are equations that are written with letters and numbers to be solved. Algebraic expressions are written in verbal form to create word problems, etc. to show an understanding equation can be used for others to read.

A.1b

- **Why is order of operations important?**
  The order of operations is important because it is a step by step guide in solving equations accurately.
- **How is a variable used in an algebraic expression?**
  A variable is a letter that has no value unless give. It is used as a placeholder until a value is given to that variable and it can be replace.
- **How are algebraic expressions modeled?**
  Algebraic expressions can be modeled with manipulatives like algeblocks, etc.
- **What is the difference between an expression and an equation?**
  Expressions are mathematical sentences that do not have an equal sign. Equations are mathematical sentences that have an equal sign and something is being evaluated or solved for.
- **How are order of operations applied when simplifying and evaluating expressions?**
    - **Example**
        - When translating verbal expressions into algebraic expressions, include the following concepts:
            - square root vs. squared
            - cube root vs. cubed
            - "turn around" phrases that include the word **than**
                - **Example**
                    - "Less than" : students writing expressions in the wrong order "7 less than a number" should be "x – 7"
                    - "More than" : students writing expressions in the wrong order "7 more than a number" should be "x + 7"

- When to use parentheses with "difference of" and "sum of"; and when parentheses are not needed
- When evaluating expressions, include the following concepts
    - Location of symbols in the calculator
    - Input values using ()

A.1a Sample Assignment: Tricky Translation

- **Example**
    - When using the calculator, if you substitute a negative number raised to a power, you must use parentheses:

Order of operations is a road map when simplifying or evaluating expressions. The road map starts outside and works its way in from Grouping, to Exponents, then Multiply, and/or Divide, lastly Add, and/or Subtract. ● **What are the four basic operations and their symbols?** *Multiply (x, or ·), Division (/, or ÷), Add (+), and Subtract (-)* ● **What is the function of () in algebra?** *The () is used for grouping signs and keeps terms together.* ● **How do we separate terms?** *Terms are separated by operations symbols.*	x = - 5 -5^2 (students forget the parentheses or include the exponent inside of the parentheses $(-5)^2$) ○ Students take square root 125 instead of taking the cube root. Also students often fail to not close the radicand and take the cube root of *x* and don't include y .) ■ $\sqrt[3]{x+y}$ where x = 125 and y = -12. ○ Students often cube the 8 and take the square root of *x*.) ■ $8\sqrt[3]{x} - \sqrt{y}$ *where* $x = 64$ *and* $y = 81$
Understanding the Standard	**Essential Knowledge and Skills**
● Mathematical modeling involves creating algebraic representations of quantitative practical situations. ● The numerical value of an expression depends upon the values of the replacement set for the variables. ● There are a variety of ways to compute the value of a numerical expression and evaluate an algebraic expression using order of operations. ● The operations and the magnitude of the numbers in an expression affect the choice of an appropriate computational technique (e.g., mental mathematics, calculator, paper and pencil).	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** ● Translate between verbal quantitative situations and algebraic expressions and equations. (A.1a) ● Represent practical situations with algebraic expressions in a variety of representations (e.g., concrete, pictorial, symbolic, verbal). (A.1a) ● Evaluate algebraic expressions, using the order of operations, which include absolute value, square roots, and cube roots for given replacement values to include rational numbers, without rationalizing the denominator. (A.1b)

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Curriculum Framework

Algebra 1

Vocabulary	Instructional Activities Organized by Learning Objective
ACADEMIC identify, demonstrate, apply, analyze, differentiate, use, develop, calculate, create, describe, recognize, repeat **CONTENT** Absolute Value Algebraic Expression Cube Root Negative Root Positive Root Square Root Variable Replacement Set Substitution Variable Verbal Expression Algebraic Expression Equation Inequality Addition: more than, increased by, etc. Subtraction: difference, decreased by, etc. Multiplication: product, of, twice, etc. Division, quotient: part, split evenly, etc. Grouping symbols: "....the sum of", "...the difference of", etc.	**A.1a** **Understand**: I can **translate** between verbal quantitative situations and algebraic expressions and equations. **Apply**: I can **represent** practical situations with algebraic expressions in a variety of representations. **A.1b** **Apply**: I can **evaluate** algebraic expressions, using order of operations, including absolute value, square roots, and cube roots for given replacement values. **Virginia Department of Education** **Textbook** ● **Eureka** **Eureka - (Insert Lesson Title)** **Eureka Grade** | **Module** | **Topic** | **Lesson(s)** | | | | ● **Glencoe** Virginia Glencoe, Algebra I, ©2012, Carter, et al, McGraw-Hill School Education Group, page(s) 5 – 15 (variables and expressions, order of operations), pgs. 31 - 37
Assessment	
Mastery check: Translation A Translation B	

Translation C
Translation D

Mastery check:
Evaluation A
Evaluation B
Evaluation C
Evaluation D

2016 A.1 These items are from released tests and correspond to A.1 which is covered in Unit 1 Algebra.

Student Performance Analysis Slides 2-6

(evaluating expressions and equations), pgs. 75 - 80
(translating verbal expressions to algebraic expressions)

Notes

- Using Depths of Knowledge (DOK)
- Powerpoint
  - Translation
  - Evaluation

Resources

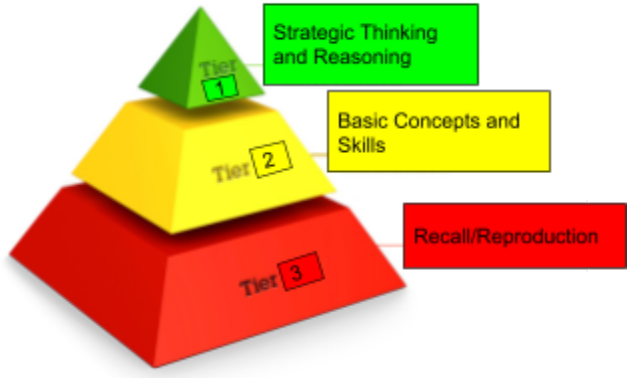
- **Print**
  - *Virginia End-of-Course Coach*, © 2012, Triumph Learning, Algebra I, page(s) 45-53
- **Technology-Based**
  - Virtual Nerd
    - Translation
    - Evaluation
  - Quizziz
    - Translate Verbal Expressions
    - Evaluation

Station Activities

Station 1: Students will Evaluate expressions using Candy

Station 2: Students will use Evaluation Card Sort: Desmo Activity Builder to evaluate expressions: Teacher Guide: Worksheet

Station 3: Teacher will create task cards for students to complete a graphic organizer of operational words for

	addition, subtraction, multiplication, division, turn around words, and parenthesis words.
Cross-Curricular Connections	**Tiered Differentiation**
English- <u>TRANSLATING ENGLISH PHRASES INTO ALGEBRAIC EXPRESSIONS</u>	 **Tier 3 Activity: Recall and Reproduction** ***<u>Translating Key Words</u>*** - Students sort cards with key words for the basic mathematical operations and then use a graphic organizer to record the operations. **Tier 3 Activity:Recall and Reproduction** ***Evaluation-*** Students will be given task cards to evaluate in groups of 3. **Tier 2 Activity: Basic Concepts and Skills** ***Cooperative Translating*** - Using groups of three or four, have **each** student pick a mathematical expression. Pass the expressions to the right and have each student translate the expression in words differently on the back of the card. Have the last student translate the words back to the expression.

	Compare the initial on the front and final expressions on the back. If they differ, discuss each step to determine what was done incorrectly. **Tier 2 Activity: Basic Concepts and Skills** ***Evaluation with Candy*** Separate your bag of candy into color sets designated with the following variables. Record the number in each set to find the values of each variable. Evaluate each expression for the replacement values given task cards. **Tier 1 Activity: Strategic Thinking and Reasoning** **Writing Prompt-** Compare and determine the correct translation of a given expression verbal or algebraically. **Tier 1 Activity: Strategic Thinking and Reasoning** ***Translating with Evaluation*** Give students task cards to translate and evaluate an expression that represents real life word problems.