

Richmond Public Schools
Curriculum Framework
7th Grade Math

Strand: Patterns, Functions, and Algebra	
7.11 The student will evaluate algebraic expressions for given replacement values of the variables.	
Suggested Pacing	
First Nine Weeks- 8 Instructional Days	
Spiraling Standards	
<p>Spiraling Down:</p> <p>6.13 The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable.</p> <p>6.6 The student will c) simplify numerical expressions involving integers.</p> <p>6.4 The student will recognize and represent patterns with whole number exponents and perfect squares.</p> <p>5.7 The student will simplify whole number numerical expressions using the order of operations.</p>	<p>Spiraling Up:</p> <p>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.</p>
Essential Questions	Common Misconceptions
<p>How is a variable used in an algebraic expression? <i>Variables are used to represent an unknown quantity.</i></p>	<ul style="list-style-type: none"> ● Students may not rewrite the expression with the replacement value. This can cause confusion with applying order of operations. ● Students misinterpret the order of operations.

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How is order of operations applied when simplifying and evaluating expressions with parentheses and brackets?
You should work inside and work your way out, repeating the steps in GEMDAS.

What is the role of the order of operations when evaluating expressions?
The order of operations ensures only one correct answer for an expression.

- Make sure to use “GEMDAS” instead of “PEMDAS” to avoid confusion with absolute value and brackets.
- Students often confuse absolute value and brackets.
- Students do not understand that variables can represent numerous values.
- When substituting a negative number students forget to put parentheses around the number and end up subtracting instead of multiplying (ex. $3a$; when $a = -2$. Students write $3 - 2$ when correct substitution is $3(-2)$).
- Students may improperly apply the distributive property.
- Students have trouble with the inverse property of multiplication. Students think the inverse is to change the sign as it is with inverse of addition.

Understanding the Standard

Essential Knowledge and Skills

- To evaluate an algebraic expression, substitute a given replacement value for a variable and apply the order of operations. For example, if $a = 3$ and $b = -2$ then $5a + b$ can be evaluated as: $5(3) + (-2)$ and simplified using the order of operations to equal $15 + (-2)$ which equals 13.
- Expressions are simplified by using the order of operations.
- The order of operations is a convention that defines the computation order to follow in simplifying an expression. It

- The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to**
- Represent algebraic expressions using concrete materials and pictorial representations. Concrete materials may include colored chips or algebra tiles.
 - Use the order of operations and apply the properties of real numbers to evaluate expressions for given replacement values of the variables. Exponents are limited to 1, 2, 3, or 4 and bases are limited to positive integers. Expressions should not include braces $\{ \}$ but

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ensures that there is only one correct value. The order of operations is as follows:

- First, complete all operations within grouping symbols¹. If there are grouping symbols within other grouping symbols, do the innermost operations first.
- Second, evaluate all exponential expressions.
- Third, multiply and /or divide in order from left to right.
- Fourth, add and /or subtract in order from left to right.

¹ Parentheses (), brackets [], and the division bar should be treated as grouping symbols.

- Expressions are simplified using the order of operations and applying the properties of real numbers.
- Expressions are simplified using the order of operations and applying the properties of real numbers. Students should use the following properties, where appropriate, to further develop flexibility and fluency in problem solving (limitations may exist for the values of a , b , or c in this standard).
 - Commutative property of addition: $a + b = b + a$.
 - Commutative property of multiplication: $a \cdot b = b \cdot a$.
 - Associative property of addition: $(a+b)+c=a+(b+c)$.
 - Associative property of multiplication: $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.
 - Subtraction and division are neither commutative nor associative.
 - Distributive property (over addition/subtraction):
 $a \cdot (b+c) = a \cdot b + a \cdot c$ and $a \cdot (b-c) = a \cdot b - a \cdot c$.
 - The additive identity is zero (0) because any number added to zero is the number. The multiplicative identity is one (1)

may include brackets [] and absolute value | |. Square roots are limited to perfect squares. Limit the number of replacements to no more than three per expression.

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because any number multiplied by one is the number. There are no identity elements for subtraction and division.

- Identity property of addition (additive identity property):

$$a + 0 = a \text{ and } 0 + a = a.$$

- Identity property of multiplication (multiplicative identity property): $a \cdot 1 = a$ and $1 \cdot a = a$.

- Inverses are numbers that combine with other numbers and result in identity elements

$$\text{(e.g., } 5 + (-5) = 0; \frac{1}{5} \cdot 5 = 1).$$

- Inverse property of addition (additive inverse property):

$$a + (-a) = 0 \text{ and } (-a) + a = 0.$$

- Inverse property of multiplication (multiplicative inverse property):

$$a \cdot \frac{1}{a} = 1 \text{ and } \frac{1}{a} \cdot a = 1.$$

- Zero has no multiplicative inverse.
- Multiplicative property of zero: $a \cdot 0 = 0$ and $0 \cdot a = 0$.
- Division by zero is not a possible mathematical operation. It is undefined.
- Substitution property: If $a = b$, then b can be substituted for a in any expression, equation, or inequality.

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Vocabulary	Instructional Activities Organized by Learning Objective
Simplify Evaluate Grouping Symbols Exponents Properties of Real Numbers Zero Pairs Commutative Property of Addition Commutative Property of Multiplication Associative Property of Addition Associative Property of Multiplication Distributive Property (over addition/subtraction) Additive Identity Multiplicative Identity Identity Property of Addition (Additive Identity Property) Identity Property of Multiplication (Multiplicative identity property) Inverse Property of Addition (Additive inverse property) Inverse Property of Multiplication (Multiplicative inverse property) Multiplicative Property of Zero Substitution Property Expression Equations Order of Operations Rational Numbers Brackets Absolute Value Square root Terms Variable	<p>Virginia Department of Education Lesson on Writing and Evaluating Expressions(Evaluating Expressions with Candy only) Evaluate Algebraic Expressions Lesson on Identifying and Applying Properties (VDOE)</p> <p>Textbook Virginia Math Connects, Course 2, ©2012, Glencoe/McGraw-Hill page(s) 33-37, 38 - 40.</p> <p>Notes Notes on Variables and Expressions (Glencoe)(#1-9) Example and Video on Evaluating Expressions</p> <p>Resources</p> <ul style="list-style-type: none"> ● Print <ul style="list-style-type: none"> ○ Virginia Coach, New SOL Edition, Math 7, @2018, Triumph Learning, LLC. pgs 172 - 179. ● Technology-based <ul style="list-style-type: none"> ○ Quia <ul style="list-style-type: none"> ■ Order of Operations Game ■ Order of Operations - Rags to Riches ○ AAAMath.com <ul style="list-style-type: none"> ■ Evaluating Expressions <p>Station Activities Evaluating Expressions Partner Match</p>
Assessment	

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<u>Power School Assessment 7.11</u>	<u>Evaluating Expressions Task 1-3</u>
Cross-Curricular Connections	Tiered Differentiations
<p>English – Have students explain, in words, what process was applied when evaluating the expressions. Students should explain why they were allowed to perform each operation using the Properties of Real Numbers as justification.</p>	<p>Evaluating Expressions (Tier 1) Students simplify expression with one variable and identify properties used prior to replacing the value given for the expression. (Tier 2) Students are given algebraic expressions with 2 and 3 variables and substitute values in for the variable using the same color coded system. Students will identify the (2) properties used when simplifying the expression. (Tier 3) Students are given algebraic expressions with one variable and begin by substituting in given values using a color coded system. Students will label the order of operations before simplifying the expression.</p>

End of first nine weeks