6th Grade Math

ELG 6.5: Apply and extend previous understandings of arithmetic to algebraic expressions

Vertical Progression:

5th Grade	**5.OA.A Write and interpret numerical expressions.** o **5.OA.1** Use parentheses, brackets, or braces in numerical expressions and evaluate expressions with these symbols. o **5.OA.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
6th Grade	**ELG 6.5 Apply and extend previous understandings of arithmetic to algebraic expressions** o **6.EE.A.1** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. o **6.EE.A.2** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. o **6.EE.A.2a** Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite. o **6.EE.A.2b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. o **6.EE.A.2c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. o **6.EE.A.3** Understand ordering and absolute value of rational numbers. o **6.EE.A.4** Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
7th Grade	**ELG 7.3 Use properties of operations to generate equivalent expressions.** o **7.EE.A.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. o **7.EE.A.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."* **ELG 7.4 Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** o **7.EE.B.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. o **7.EE.B.4.a** 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. o **7.EE.B.4.b** Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

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Students will demonstrate command of the ELG by:

- Explaining what an exponent is and how it is used.
- Writing and evaluating a numerical expression using whole number exponents.
- Applying order of operations when evaluating expressions using whole number exponents.
- Writing an expression using the relevant information.
- Identifying parts of an expression using mathematical terms.
- Evaluating an expression or formula for various numerical values.
- Demonstrating the use of the distributive property, associative property, and commutative property showing that two different expressions are equivalent.
- Rewriting an algebraic expression in multiple ways to form equivalent algebraic expressions in multiple ways.
- Explaining why two expressions are equivalent using pictures, tiles, diagrams, and algebraic expressions.

Vocabulary:

- algebraic expression
- associative property
- base
- coefficient
- commutative property
- constant
- cubed
- distributive property
- equivalent expression
- evaluate
- exponents
- factor
- like term
- numerical expression
- order of operations
- parentheses
- power
- properties of operations
- squared
- substitute
- term
- unknown
- value
- variable

Sample Instructional/Assessment Tasks:

1) **Standard(s):** 6.EE.A.4

Source: www.illustrativemathematics.org

Item Prompt:

Which of the following expressions are equivalent? Why? If an expression has no match, write 2 equivalent expressions to match it.

a. $2(x+4)$

b. $8+2x$

c. $2x+4$

d. $3(x+4)-(4+x)$

e. $x+4$

Correct Answer:

a, b, and d are equivalent

for c, $2(x + 2)$ and $4 + x + x$ are examples of equivalent expressions

for e, $2x – x + 4$ and $2(x + 1) + 2$ are examples of equivalent expressions

2) **Standard(s):** 6.EE.A.1

Source: www.illustrativemathematics.org

Item Prompt:

After opening an ancient bottle you find on the beach, a Djinni appears. In payment for his freedom, he gives you a choice of either 50,000 gold coins or one magical gold coin. The magic coin will turn into two gold coins on the first day. The two coins will turn into four coins total at the end of two days. By the end or the third day there will be eight gold coins total. The Djinni explains that the magic coins will continue this pattern of doubling each day for one moon cycle, 28 days. Which prize do you choose?
When you have made your choice, answer these questions:

- The number of coins on the third day will be 2×2×2. Can you write another expression using exponents for the number of coins there will be on the third day?
- Write an expression for the number of coins there will be on the 28th day. Is this more or less than a million coins?

Solution:

One magical gold coin; 2^3; 2^{28}; over a million