ALGEBRAIC THINKING

PRAXIS FLASHCARD #236 & 248

ALGEBRA

Algebra is the study of numbers, number patterns, and relationships among numbers. Algebra generalizes these numbers, number patterns, and relationships. It is often said that algebraic thinking is the study of number patterns. **Algebraic thinking** is the mathematics we teach and learn to prepare us to understand algebra. In elementary schools, algebraic thinking is the study of our number system, patterns, representations, and mathematical reasoning.

PRAXIS FLASHCARD #184

VARIABLE

A **variable** is used in algebra to represent a value that changes within the parameters of the problem. The opposite of a variable is a constant. Lowercase letters of the alphabet are generally used to denote a variable. There are two types of variables: dependent and independent.

PRAXIS FLASHCARD (REFER TO THE NUMBER THEORY LECTURE NOTES)

NUMBER SETS IN OUR NUMBER SYSTEM & PROPERTIES OF NUMBER SYSTEM OPERATIONS

PRAXIS FLASHCARD #22

ORDER OF OPERATIONS

When you are asked to simplify or evaluate an expression, you must follow the Order of Operations:

1. Simplify inside parentheses or grouping symbols
2. Simplify any expressions with exponents
3. Perform multiplication & division from left to right
4. Perform addition & subtraction from left to right

Several algebra textbooks teach one or both of the following mnemonics to remember the Order of Operations:

PEMDAS

Please **E**xcuse **M**y **D**ear **A**unt **S**ally

PRAXIS FLASHCARD #23

PARENTHESES

Parentheses are a way to group numbers. Other grouping symbols are braces { }, square brackets [ ], and the **vinculum** or fraction bar. To remove parentheses, we **distribute** the number immediately outside the parenthesis (with its sign). We distribute by multiplying by the number. If the outside **sign** is "hidden," it is understood to be positive (see Example 1 below). If the outside **number** is "hidden," it is understood to be a 1 (see Example 2 below). For example:

3(3x +1) = 9x + 3

-(2x – 5) = -2x + 5

PRAXIS FLASHCARD #24

4 WAYS TO INDICATE MULTIPLICATION

There are four ways to **indicate multiplication**:

1. Using a small "×", such as 3 × 5. Note that the "×" is not used to indicate multiplication in algebra because it might be confused with the variable "x".
2. Using a small, raised dot, such as 3 • 5
3. Using parenthesis, such as (3)(5) or 3(5) or (3)5
4. Using no symbol, such as 3y (which means 3 times y). Note that the "no symbol" is not used between two numbers because it might be confused – for example, 35 represents the number thirty-five, not 3 times 5.

PRAXIS FLASHCARD #143

EXPRESSION

An **expression** is a collection of terms that have been added or subtracted.
Equations and expressions are often confused. The equation has an equal symbol; whereas, the expression does not have a comparison symbol (merely a collection of terms). We solve an equation but we evaluate or simplify an expression.

PRAXIS FLASHCARD #249

COEFFICIENT

A **coefficient** is the number part of a term in an algebraic expression. For example, negative two is the coefficient of the following expression: $-2x^3$ The coefficient is a **factor** of the term—it is **multiplied** and is, therefore, a multiplicative factor.

PRAXIS FLASHCARD #257

ALGEBRAIC CONSTANT

As opposed to a variable, an **algebraic constant** is a known number that does not vary. In the trinomial $2x^2 - 3x + 5$, the 5 is a constant. A constant term is a term in a polynomial without a variable in it.

PRAXIS FLASHCARD #71

WRITING ALGEBRAIC EXPRESSIONS (FROM ENGLISH STATEMENTS)

To **write an algebraic expression** from an English statement, we convert each word or phrase to the equivalent algebraic symbol. For example, "of" means to multiply, "per" means to divide, "total" means addition, and "is" means equals. Other flashcards contain ALL common words that can be converted to algebra. Here's an example: The sum of two numbers is 16. One of the numbers is twice the other number: $x + y = 16$ $x = 2y$

PRAXIS FLASHCARD #359, #360, #361, #362, and #372

WORDS THAT SIGNAL …

ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	EQUALS
add	subtract	multiply	divide	will be
sum	subtracted from	multiplied by	divided by	is
increase	minus	product	quotient	
total	difference	times	per	
rise	take away	of	ratio	
plus	less than	twice	half	
grow	decreased by			
added to				
more than				
increased by				
gain				

Except for the phrases **more than**, **subtracted from**, and **less than**, the translation to algebraic expressions is virtually word for word. The three phrases listed in **red** the previous sentence are translated in reverse order.

PRAXIS FLASHCARD #72

SIMPLIFYING ALGEBRAIC EXPRESSIONS

To **simplify algebraic expressions**, use the distributive property and combine like terms. This can also be stated in step-by-step fashion:

1. Clear the parenthesis (by following the distributive property or the rules of exponents)
2. Add the coefficients of like terms
3. Add the constant terms

PRAXIS FLASHCARD #73

Evaluate Algebraic Expressions

To **evaluate an algebraic expression**, substitute the given values for each variable into the expression, and then follow the order of operations (PEMDAS) to simplify the expression.

1. Perform the operations inside a **parenthesis** first
2. Then follow rules for **exponents**
3. Then **multiplication and division**, from left to right
4. Then **addition and subtraction**, from left to right

PRAXIS FLASHCARD #142 & #145 & #137

Equations and Inequalities

An **equation** is a statement where an algebraic expression is equal to another algebraic expression or constant.
Equations and expressions are often confused. The equation has an equal symbol; whereas, the expression does not have a comparison symbol (merely a collection of terms). We solve an equation but we evaluate or simplify an expression. To solve an equation: clear parenthesis, clear exponents, clear fractions, and then apply the addition and multiplication principles.

An **inequality** is similar to an equation, but the two sides are NOT equal. Instead of an equal symbol, one of the following comparison symbols will be used:

< less than > greater than ≤ less than or equal to ≥ greater than or equal to

Each of these symbols can also be negated by putting a slash mark through them, such as not equal to: ≠
To solve an inequality, follow the same procedure as with an equation; however, reverse the comparison symbol if multiplying or dividing by a negative number.

PRAXIS FLASHCARD #363

Literal Equation

A **literal equation** is an equation made up of only known, measurable quantities. A literal equation is the same as a formula. With a literal equation, you are not solving for an unknown quantity that varies. Instead, you are manipulating the letters/variables in the equation to a different form to substitute values in it.

PRAXIS FLASHCARD #86

Algebraic Symbol Manipulation

To **solve for a variable in a formula** means to find an equivalent equation in which the desired variable is isolated. Follow the same general strategies as solving any equation.
Example: P = 2L + 2W, solve for W

P = 2L + 2W
-2L -2L Addition Property
P - 2L = 2W
P - 2L = 2W
2 2 Multiplication Property

$$W = \frac{P - 2L}{2}$$

PRAXIS FLASHCARD #159

Algorithm

An **algorithm** is a step-by-step process for solving a problem. An example of an addition algorithm is:

1. Line up the numbers
2. Add each column starting on the right
3. Carry any tens-place digits to the next column
4. Place commas between periods in the answer

An algorithm is often written as a **flowchart** showing steps, branches, and decisions.
