

Linking Algebra

with

Basic Math Skills

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ALGEBRA LINKAGES TO ELEMENTARY MATHEMATICS

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Linking allows teachers to introduce new concepts and skills using familiar language, to review and reinforce basic skills, to compare and contrast, and to teach those topics in a different context which the research indicates leads to greater understanding and comfort levels for the students resulting in increased student achievement.

For example, rather than introducing the topic of polynomials by name and using new terms such as monomial, binomial, and trinomial, students would be better served if the teachers introduced polynomials by reviewing place value and expanded notation (topics from 1st and 2nd grades), then showing the students how to add numbers from left to right. By reviewing and reinforcing these topics first, the transition to adding/subtracting polynomials will be much easier for the students in algebra.

When teaching students to solve linear equations in one variable, teachers might review the Order of Operations, using those examples in the $ax + b = c$ format, substitute n for one of the numbers, then using the gift wrapping analogy to show the students how to undo the expression to isolate the variable. Students should then be taught the general strategy to solve all linear equations is by using the Order of Operations in reverse and using the opposite operation to undo the expression. Then, when the students encounter problems containing parentheses or rational numbers, they first have to use the Properties of Real #'s to rewrite the equation in the $ax + b = c$ format then use the general strategy

Teachers could relate functions to buying cold drinks; one cold drink is \$.50, two is a dollar, three is a dollar fifty, etc. Writing these in ordered pairs, we'd have (1, .50), (2, 1.00), (3, 1.50), etc. By introducing functions by using concrete examples, it would make a great deal more sense to students. Having a teacher introduce a function by giving the following definition often results in eyes glazing over. *A function is a special relation in which no two ordered pairs have the same first coordinate.*

Teachers should take the time to link concepts and skills to previously learned mathematics and outside experiences. The Pythagorean Theorem, for instance, can be linked to areas of squares, similar triangles, the distance formula, equation of a circle, and the trig identity ($\cos^2x + \sin^2x = 1$). By introducing these concepts and skills using linkage, teachers can save instructional time by not completely re-teaching the Pythagorean Theorem in its different forms and they would be reviewing and reinforcing knowledge and skills teachers indicate the students do not possess.

This booklet links algebra to previously learned math. In order to create interest and enthusiasm in mathematics, teachers should also relate how concepts taught in the classroom are used in the real world, whether it be how the size (circumference) of tire effects the speedometer and odometer readings in a car or how it is used in pipefitting. Students might take a greater interest in math if they understood the topics they are learning can be used in decision-making, such as which phone company to use based on their rates when solving systems of equations.

LINKING ALGEBRA WITH BASIC MATH SKILLS

Algebra

Polynomials

Addition
Subtraction
Multiplication (FOIL)
Division (Trial Divisor)
Evaluating (Synthetic sub)
Algebra tiles (+, -, ×, ÷)
Combining like terms

Evaluating Algebraic Expressions
Literal Equations

Factoring

Properties of Real Numbers

Linear Equations

With absolute value
With radicals
Direct variation

Arithmetic sequences

Basic Math

Expanded notation
Addition: 1st & 2nd grades algorithm
Subtraction: 2nd & 3rd grades algorithm
Multiplication: 3rd & 4th grades algorithm
Division: 4th & 5th grades algorithm
Division algorithm
Base-ten blocks (+, -, ×, ÷)
Place Value
Distributive Property

Order of Operations: 4th grade
Formulas
Substitution

Rules of Divisibility
Prime Factorization
Base-ten blocks

Number sense & composition
Mental Math
Counting-on: Kindergarten

Number sentences
Missing addends
Order of Operations
Absolute value
Square roots
Equivalent fractions
Properties of Proportions
Skip counting

Algebra

Basic Math

Problem Solving

Definitions
Patterns
Tables
Simpler case
Sub goal
Related problem
Work backward
Picture
Guess & check
Indirect reasoning
Smaller sample space

Functions & Relations

Formulas
Charts
Ordered pairs
Patterns
Ratios
Menus
Skip counting

Arithmetic sequences

Graphing (Cartesian Coordinate System)

Bar graphs
Line graphs
Maps
Formulas

Domain & Range

Division by zero
Square roots

Exponentials/Logarithms

Exponentials

Transformations

Translations
Reflections
Rotations

Slides
Flips
Turns

Simplifying Rational Expressions

Reducing
Add/Subtract
Multiplication
Division

Reducing (GCF)
Add/subtract fractions (LCM)
Multiplying fractions
Dividing fractions

Slope

Ratios
Rate of change

Algebra

Equation of a Line

Equation of a Circle

Quadratic Equations

Zero Product Property

Systems of Equations

Simplifying Radicals

Basic Math

Order of Operations
Slope

Pythagorean Theorem
Distance Formula

Multi-digit multiplication
Base-ten blocks (area model)
Factoring
 $ax + b = c$ format

Multiplication Property of Zero

Point of Intersection
Charts
Line graphs
Substitution
Add Property of Equality

Square Roots
Exponentials

EXAMPLES OF LINKAGE

Polynomial

$$5x^2 + 6x + 7$$

Expanded Notation

$$5 \cdot 10^2 + 6 \cdot 10 + 7$$

Multiplication

$$\begin{array}{r} x+3 \\ x+4 \\ \hline 4x+12 \\ x^2+3x \\ \hline x^2+7x+12 \end{array}$$

Multiplication Algorithm

$$\begin{array}{r} 32 \\ \times 21 \\ \hline 32 \\ \underline{64} \\ 672 \end{array}$$

Algebraic Fractions

$$x + \frac{2}{y} = \frac{xy + 2}{y}$$

$$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$$

Fractions

$$5\frac{2}{3} = \frac{5 \cdot 3 + 2}{3}$$

$$\frac{1}{4} + \frac{3}{7} = \frac{1 \cdot 7 + 4 \cdot 3}{28}$$

Literal Equations

$$p = 2l + 2w$$

Formulas

$$A = \frac{1}{2}bh$$

Properties of Real Numbers

$$a(b + c) = ab + ac$$

Computation

$$25(98) = 25(100 - 2)$$