### ALGEBRA 1

**Numbers and Operations Standard:** Understands and applies concepts of numbers and operations

**Power Benchmark 1:** Understands numbers, ways of representing numbers, relationships among numbers, and number systems

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</table>
| a. Simplifies expressions involving exponents | • Simplify  
• Exponent  
• Base  
• Power  
• Expanded form  
• Zero exponent  
• Negative exponent  
• Squared  
• Cubed  
• Scientific notation | • Knows an exponent tells how many times the base is used as a factor  
• Knows \( a^0 = 1 \)  
• Knows \( a^{-n} = \frac{1}{a^n} \)  
• Knows when multiplying exponents with the same base you add the exponents  
• Knows when dividing exponents with the same base you subtract the exponents | • Simplifies and expands algebraic expressions involving exponents, including zero and negative exponents (ITED, ACT, SAT)  
• Evaluates expressions involving exponents  
• Multiplies and divides expressions involving exponents (ITED, ACT, SAT) |
| ITED *  
ACT  
SAT | * ITED 1-3 items | | |

| b. Simplifies expressions involving radicals | • Simplify  
• Radical  
• Exact form  
• Approximate form  
• Perfect-square factors  
• Square root  
• Like/unlike radical  
• Negative square root  
• Conjugate  
• Rationalize denominators | • Knows \( \sqrt{ab} = \sqrt{a} \cdot \sqrt{b} \)  
• Knows \( \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} \)  
• Knows the distributive property can be used to combine radicals | • Writes radicals in simplest form (ITED, ACT, SAT)  
• Performs mathematical operations with radicals (ACT, SAT, ASVAB)  
• Express radicals in exact form and appropriate form  
• Simplifies by rationalizing denominators |
| ITED *  
ACT  
SAT  
ASVAB | * ITED 1-3 items | | |
**Numbers and Operations Standard: 1** Understands and applies concepts of numbers and operations

### Power Benchmark 2: Understands the meanings of operations and how they relate to one another

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| a. Uses the properties of operations to simplify computations and solve problems | • Identity property  
• Inverse property  
• Distributive property  
• Associative property  
• Commutative property  
• Squaring  
• Square root  
• Like terms  
• Order of operations  
• Grouping  
• Inverse operations | • Knows the identity properties of addition and multiplication  
• Knows the distributive, associative, and communicative properties of addition and multiplication  
• Knows squaring and square root are inverse operations  
• Knows the inverse operations undo each other  
• Recognizes like terms  
• Understands rules for combining variables  
• Knows the order of operations | • Explains the meaning of adding, subtracting, multiplying, and dividing integers  
• Uses inverse properties and relationships to solve problems (ACT, SAT)  
• Uses order of operations including grouping symbols to solve problems (ITED, ACT, SAT)  
• Simplifies equations using properties of operations (ACT, SAT) |

*** ITED more than 3 items

### Power Benchmark 3: Computes fluently and makes reasonable estimates

| a. Uses a variety of operations on expressions containing real numbers | • Simplify  
• Rational numbers  
• Irrational numbers  
• Real numbers | • Knows the algorithms of operations for real numbers | • Adds, subtracts, multiplies, divides, and simplifies expression of real numbers (ITED, ACT, SAT) |

*** ITED more than 3 items

| b. Determines reasonableness of answers | • Reasonableness | • Knows how to judge the reasonableness of the answer | • Checks answer to see if it is reasonable  
• States sensible answers to a problem |
### Algebra Standard: 2 Understands and applies concepts of algebra and functions

#### Power Benchmark 1: Understands patterns, relations and functions

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| **a.** Uses patterns and relationships to analyze mathematical situations SAT ASVAB | • Patterns  
• Term  
• Prediction  
• Sequence | • Knows patterns can be described in a variety of ways  
• Knows how to use the pattern to predict change from one term to the next | • Describes patterns using words, tables, and graphs  
• Finds the terms in a sequence ASVAB  
• Generates equations to describe linear patterns SAT |
| **b.** Describes functions and their properties using function notation ITED * | • Function  
• Domain  
• Range  
• One-to-one correspondence  
• Function notation  
• Function rule  
• Relation  
• Vertical Line Test | • Knows for every value in the domain of a function, there is one and only one corresponding value in the range  
• Understands the concept of a function as the correspondence between the elements of two sets  
• Understands the definition of a function: domain, range, function, relation | • Identifies the domain, range, and rule of a function -  
• Describes functions and their properties using function notation  
• Recognizes the graphs of non-linear functions  
• Describes from a graph the relationship between two variables ITED |

*ITED 1-3 items

#### Power Benchmark 2: Represents and analyzes mathematical situations and structures using algebraic symbols

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| **a.** Represents linear and quadratic functions in a variety of ways ITED * | • Standard Form  
• Linear function  
• Quadratic function  
• Parabola | • Knows a function can be represented in a variety of ways  
• Understands a family of functions has similar characteristics | • Describes functions using words, tables, graphs and equations -  
• Graphs linear and quadratic functions -  
• Recognizes a linear and quadratic function from its graph (ITED)  
• Writes the equation of a linear function given the table of values, graph, two points on the line, and slope and y-intercept - |

*ITED 1-3 items
### Algebra Standard: Understands and applies concepts of algebra and functions

#### Power Benchmark 2: Represents and analyzes mathematical situations and structures using algebraic symbols (con’t)

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<td>b. Interprets graphical representations of linear functions ACT</td>
<td>Rate of change • Slope • Direct Variation • Slope-Intercept Form</td>
<td>Understands change can be described mathematically • Understands how rate of change can be described numerically and graphically • Knows a linear graph has a constant rate of change</td>
<td>Interprets slope as the amount of one quantity (y) per unit of another quantity (x) • Defines slope as a rate of change • Finds the slope, x-intercept, and y-intercept of a line given its graph, equation, or two points on the line (ACT) • Uses slope to differentiate between lines that are parallel, perpendicular, horizontal, or vertical • Compares the rates of change of two different graphs</td>
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### Algebra Standard: Understands and applies concepts of algebra and functions

### Power Benchmark 3: Uses mathematical models to represent and understand quantitative relationships

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| a. Rewrites algebraic expressions in equivalent forms ITED *** ACT SAT ASVAB | • Variable  
• Algebraic expression  
• Like terms  
• Coefficient  
• Terms  
• Equivalent forms  
• Unit analysis/ Dimensional analysis | • Recognizes like terms  
• Knows rules to simplify expressions  
• Knows the order of operations  
• Understands the concept of equivalent forms of expressions | • Simplifies algebraic expressions by combining like terms and applying appropriate properties (ITED)  
• Evaluates simple algebraic expressions (ACT, SAT, ASVAB)  
• Translates words into algebraic expressions (ITED, ACT, ASVAB)  
• Uses unit/dimensional analysis to organize conversions and computations (ITED, ACT) |
| *** ITED more than 3 items | | | |
| b. Simplifies polynomial expressions ACT SAT ASVAB | • Degree  
• Standard form  
• Monomial  
• Binomial  
• Trinomial  
• Polynomial  
• Constant  
• Linear  
• Quadratic  
• Cubic  
• Greatest monomial factor  
• Difference of squares  
• Perfect square trinomial | • Knows the meaning of like terms  
• Knows how to factor a number  
• Know how to find the GCF of numbers | • Names polynomials by degree and number of terms  
• Writes polynomials in standard form  
• Adds, subtracts, and multiplies polynomials (ACT, SAT, ASVAB)  
• Applies basic factoring techniques to second and simple third degree polynomials (ACT, SAT) |
**Algebra Standard:** Understands and applies concepts of algebra and functions

**Power Benchmark 3:** Uses mathematical models to represent and understand quantitative relationships (con’t)

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| c. Solves multi-step equations | • Multi-step problems  
• Literal equations  
• Inverse Operations | • Recognizes like terms  
• Understands rules for combining variables  
• Knows the order of operations  
• Knows the inverse relationship between addition and subtraction and multiplication and division  
• Understands the process of working backwards to solve equations (strategy of undoing) | • Solves equations for a specified variable (ITED, ACT, SAT, ASVAB)  
• Solves multi-step equations involving like variables on the same side of the equal sign, like variables on both sides of the equal sign, and the distributive property (ITED, ACT, SAT, ASVAB)  
• Writes an equation for a specific problem (ITED, SAT, ASVAB) |
|                       |            |                                   | *** ITED more than 3 items |
| d. Solves single variable inequalities | • Inequality  
• Compound inequality  
• Solution of an inequality  
• Open dot  
• Closed dot | • Understands the process of working backwards to solve equalities (strategy of undoing)  
• Knows the meaning of the inequality symbols | • Solves multi-step single variable inequalities involving like variables on the same side of the equal sign, like variables on both sides of the equal sign, and distributive property (ACT, SAT, ASVAB)  
• Graphs solutions of inequalities on a number line |
**Algebra Standard:** Understands and applies concepts of algebra and functions

**Power Benchmark 4:** Analyzes change in a variety of situations

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| a. Solves systems of equations by graphing, substitution, and elimination | • Systems of equations  
• Graphing method  
• Substitution method  
• Elimination method  
• No solution  
• Infinitely many solutions  
• One solution | • Knows how to graph a linear equation.  
• Knows how to solve a literal equation. | • Uses graphing to solve a systems of equations (ACT, SAT, ASVAB)  
• Uses substitution to solve a systems of equations (ACT, SAT, ASVAB)  
• Uses elimination to solve a systems of equations (ACT, SAT, ASVAB) |
| ACT  
SAT  
ASVAB | | | |
| b. Solves quadratic equations by quadratic formula, factoring, and square roots | • Quadratic equation  
• Standard form  
• Quadratic formula  
• Factoring  
• Square roots  
• Zero-product property | • Knows order of operations.  
• Knows how to find square root of a number  
• Know how to write the Standard Form of any polynomial | • Solves quadratic equations by quadratic formula, factoring, and square roots (ACT, SAT, ASVAB)  
• Analyzes quadratic equations to decide which method of solving is appropriate |
| ACT  
SAT  
ASVAB | | | |
**Data Analysis and Probability:** Understands and applies concepts of data analysis and probability

**Power Benchmark 4:** Understands and applies concepts of probability

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| a. Experiment and analyze simple probabilities | • Outcomes  
• Sample space  
• Event  
• Probability  
• Theoretical Probability  
• Experimental Probability  
• Independent Events  
• Dependent Events | • Know the difference between Theoretical and Experimental Probability | • Demonstrates finding probability of an event, both independent and dependent  
• Defines a sample space |
**Problem Solving Standard:** Understands and applies problem solving strategies

**Power Benchmark 1:** Uses a variety of strategies to solve problems

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| a. Applies and adapts a variety of appropriate strategies to solve problems | • Try, test, revise  
• Make a model  

• Knows the general problem solving strategies  
• Knows the same situation can often be represented in more than one way  
• Knows different problems may be solved using the same method | • Chooses appropriate strategies to solve problems in the context of the problem situation (ITED)  
• Uses previous learned strategies, skills, knowledge, and concepts to solve problems (ITED)  
• Translates words to numbers to symbolic expressions (ITED) |                                                        |

**ITED Focus Lessons:** Ratios, Proportions, Matrices (adding and subtracting), Fractions, Decimals, Percents, Absolute Value (simplify and solve problems), range of rounded numbers, write equations for specific problem but do not solve, Pythagorean Theorem