

# Mathletics

## NWEA Common Core - Operations & Algebraic Thinking

Skill Quests

RIT Score Band  
May, 2022

Mathletics

# NWEA Common Core

Operations & Algebraic Thinking 3–8

Skill Quests

May 2022

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# RIT Score Band 189–200

## 1 Operations & Algebraic Thinking

### 1.1 Represent and solve problems involving multiplication and division

Outcome	Quests	Content
3.OA.A.1 Interpret products of whole numbers.	Introducing multiplication	Multiplying using arrays and repeated addition
3.OA.A.2 Interpret whole-number quotients of whole numbers.	Introducing division	Dividing by sharing (up to 50)
		Dividing by grouping (up to 50)
		Create and solve problems involving equal groups
		Using repeated subtraction to divide
3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.	Multiplication and division problems	Multiplication problems: fair share/equal grouping
		Multiplication/division problems: arrays
3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.	Multiply/divide: finding the unknown	Multiply/divide: finding the unknown

### 1.2 Understand properties of multiplication and the relationship between multiplication and division

Outcome	Quests	Content
3.OA.B.5 Apply properties of operations as strategies to multiply and divide.	Multiplication properties	Multiplication properties
3.OA.B.6 Understand division as an unknown-factor problem.	Division: unknown-factor problems	Understand division as an unknown-factor problem

### 1.3 Multiply and divide within 100

Outcome	Quests	Content
3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.	Multiplication and division facts	Multiplication facts: 2, 4, 8
		Multiplication facts: 5, 10
		Multiplication facts: 3, 6, 9
		Multiplication facts: 7
		Recalling multiplication facts to $5 \times 5$
		Recalling multiplication facts to $10 \times 10$
		Division facts: 2, 4, 8
		Division facts: 5, 10
		Division facts: 3, 6, 9
		Division facts: 7

### 1.4 Solve problems involving the four operations, and identify and explain patterns in arithmetic

Outcome	Quests	Content
3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	2-step word problems: 4 operations	2-step word problems with the 4 operations
3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.	Number patterns	Identifying and creating number patterns
		Identifying odd and even number patterns
		Exploring number patterns in tables and charts

# RIT Score Band 201–210

## 1 Operations & Algebraic Thinking

### 1.1 Use the four operations with whole numbers to solve problems

Outcome	Quests	Content
4.OA.A.1 Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations.	Interpret multiplication as a comparison	Describe comparisons using multiplication language
4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, distinguishing multiplicative comparison from additive comparison.	Solving comparison word problems	Solving comparison word problems
4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Solving word problems: 4 operations	Multi-step multiplication/division word problems
		Solving division word problems
		Solving multiplication word problems
		Two-step addition/subtraction word problems

### 1.2 Gain familiarity with factors and multiples

Outcome	Quests	Content
4.OA.B.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.	Factors, multiples and prime numbers	Finding multiples: whole numbers up to 100
		Finding factors: whole numbers up to 100
		Prime and composite numbers

### 1.3 Generate and analyze patterns

Outcome	Quests	Content
4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.	Generating number and shape patterns	Generate shape patterns from a given rule
		Generate addition patterns from a given rule
		Generate subtraction patterns from a given rule
		Generate multiplication patterns from a given rule



# RIT Score Band 211–217

## 1 Operations & Algebraic Thinking

### 1.1 Write and interpret numerical expressions

Outcome	Quests	Content
5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	Using grouping symbols	Order of operations with grouping symbols
5.OA.A.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.	Writing and interpreting expressions	Writing & interpreting expressions without solving
		Comparing numerical patterns
		Interpreting and creating a number pattern table
		Graphing ordered pairs from numerical patterns

# RIT Score Band 218–221

## 1 Expressions & Equations

### 1.1 Apply and extend previous understandings of arithmetic to algebraic expressions

Outcome	Quests	Content
6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.	Numerical expressions with exponents	Writing numerical expressions with exponents
		Evaluating numerical expressions with exponents
6.EE.A.2.A Write expressions that record operations with numbers and with letters standing for numbers.	Writing expressions: numbers & variables	Writing expressions with numbers and variables
6.EE.A.2.B Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.	Parts of an expression	Identifying parts of an expression
6.EE.A.2.C Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).	Evaluating algebraic expressions	Evaluating algebraic expressions
		Evaluating expressions using order of operations
6.EE.A.3 Apply the properties of operations to generate equivalent expressions.	Properties of operations: expressions	Properties of operations: equivalent expressions
6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).	Equivalent expressions	Identifying equivalent expressions

## 1.2 Reason about and solve one-variable equations and inequalities

Outcome	Quests	Content
6.EE.B.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	Testing solutions	Testing solutions: equations
		Testing solutions: inequalities
6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	Writing algebraic expressions	Writing algebraic expressions
6.EE.B.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which $p$ , $q$ and $x$ are all nonnegative rational numbers.	Solving 1-step equations	Preserving equality in equations
		Solving simple linear equations using models
		1-step equations: add/subtract, positive integers
		1-step equations: add/subtract, rational numbers
		1-step equations: multiply, positive integers
		1-step equations: multiply, rational numbers
		1-step equations: division, rational numbers
		Writing and solving 1-step equations
6.EE.B.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	Writing and representing inequalities	Writing inequalities
		Represent algebraic inequalities on a number line

### 1.3 Represent and analyze quantitative relationships between dependent and independent variables

Outcome	Quests	Content
<p>6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation <math>d = 65t</math> to represent the relationship between distance and time.</p>	Independent and dependent variables	Independent and dependent variables

# RIT Score Band 222–226

## 1 Expressions & Equations

### 1.1 Use properties of operations to generate equivalent expressions

Outcome	Quests	Content
7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	Linear expressions: properties	Simplify algebraic expressions: add/subtract
		Distributive property: algebraic expressions
		Factoring algebraic expressions
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.	Interpreting expressions	Rearranging expressions to interpret quantities

### 1.2 Solve real-life and mathematical problems using numerical and algebraic expressions and equations

Outcome	Quests	Content
7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.	Solving problems with rational numbers	Solving problems with rational numbers
		Converting terminating decimals
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,	Solving 2-step equations	Solving 2-step equations: word problems
		2-step equations, positive integer coefficients
		2-step equations, integer coefficients
		2-step equations, positive rational coefficients

identifying the sequence of the operations used in each approach.		2-step equations, rational coefficients
		2-step equations, distributive property
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.	Solving 2-step inequalities	Creating and solving 2-step inequalities
		Representing inequalities
		Graphing the solution of an inequality
		Solving 2-step inequalities

# RIT Score Band 227–228

## 1 Expressions & Equations

### 1.1 Work with radicals and integer exponents

Outcome	Quests	Content
8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.	Properties of integer exponents	Using exponent notation
		Product of powers, numerical base
		Product of powers, algebraic base
		Quotient of powers, numerical base
		Quotient of powers, algebraic base
		Power of a power, numerical base
		Power of a power, algebraic base
		Zero exponents, numerical base
		Zero exponents, algebraic base
		Negative exponents, numerical base
		Negative exponents, algebraic base
		Simplifying expressions, numerical base
		Simplifying expressions, algebraic base
8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$ , where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	Square and cube roots	Squares and square roots
		Evaluating expressions with square and cube roots
		Square roots of fractions and decimals
		Cubes and cube roots
8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.	Writing numbers in scientific notation	Introducing scientific notation
		Converting scientific notation to standard form
		Converting standard form to scientific notation

8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology	Calculations in scientific notation	Calculations in scientific notation
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## 1.2 Understand the connections between proportional relationships, lines, and linear equations

Outcome	Quests	Content
8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	Proportional relationships	Graphing proportional relationships
		Comparing proportional relationships
8.EE.B.6 Use similar triangles to explain why the slope $m$ is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at $b$ .	Understanding slope and y-intercept	Using similar triangles to understand slope
		Writing equations of proportional relationships
		Writing equations of nonproportional relationships
		Identifying the slope in an equation or graph
		Identifying the y-intercept on a graph
		Graphing equations in slope-intercept form
		Graphing equations not in slope-intercept form
Finding the y-intercept algebraically		



### 1.3 Analyze and solve linear equations and pairs of simultaneous linear equations

Outcome	Quests	Content
8.EE.C.7.A Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$ , $a = a$ , or $a = b$ results (where $a$ and $b$ are different numbers).	Solution types of linear equations	Solution types of linear equations
8.EE.C.7.B Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	Solving linear equations	Solving 3-step linear equations
		Solving linear equations, variables on both sides
		Solving linear equations, distributive property
		Using substitution to check solutions
8.EE.C.8.A Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	Identify solutions, systems of equations	Identify solutions, systems of equations
8.EE.C.8.B Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.	Solving systems of equations	Solving systems of equations graphically
		Solving systems of equations using elimination
		Solving systems of equations using substitution
		Checking the solution of a system of equations
8.EE.C.8.C Solve real-world and mathematical problems leading to two linear equations in two variables.	Writing and solving systems of equations	Writing and solving systems of equations

## 2 Functions

### 2.1 Define, evaluate, and compare functions

Outcome	Quests	Content
8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.	Identifying functions	Identifying functions
8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	Comparing functions	Comparing functions represented in different ways
8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.	Interpret $y = mx + b$ as linear	Represent linear relationships in different forms
		Equations of linear and non-linear relationships

### 2.2 Use functions to model relationships between quantities

Outcome	Quests	Content
8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two $(x, y)$ values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	Rate of change and initial value	Rate of change and initial value
8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	Distance-time graphs	Distance-time graphs





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