Mathletics

Pennsylvania Program of Studies

Skill Quests

Grades 7 – 8

January, 2023

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Grade 7

1 Numbers and Operations

1.1 Ratios and proportional relationships

Outcome	Quests	Content
Analyze proportional relationships and use them to model and solve real-world and mathematical problems.)	Proportional relationships	Solving unit rate problems involving fractions
		Identifying proportional relationships
		Identifying the constant of proportionality
		Representing proportional relationships: equations
		Interpreting graphs of proportional relationships
		Solving multi-step ratio & percent problems

1.2 The number system

Outcome	Quests	Content
Apply and extend previous understandings of operations with fractions to operations with rational numbers.	Rational numbers	Describing situations involving opposites
		Opposites & absolute value
		Adding rational numbers
		Adding positive & negative fractions
		Adding positive & negative decimals
		Adding integers
		Subtracting rational numbers: adding the inverse
		Subtracting positive & negative fractions
		Subtracting positive & negative decimals
		Subtracting integers
		Subtracting rational numbers: absolute value
		Adding & subtracting rational numbers: properties
		Multiplying rational numbers

		Multiplying positive & negative fractions
		Multiplying positive & negative decimals
		Multiplying integers
		Products of rational numbers: real-world contexts
		Dividing integers
		Quotients of rational numbers: real-world contexts
		Multiply & divide rational numbers: properties
		Use long division to convert rationals to decimals
		Rational numbers problems: 4 operations

2 Algebraic Concepts

2.1 Expressions and equations

Outcome	Quests	Content
Apply properties of operations to generate equivalent expressions.	Equivalent expressions	Simplifying algebraic expressions: add & subtract
		Distributive property: algebraic expressions
		Factoring algebraic expressions
		Rearranging expressions to interpret quantities
Model and solve realworld and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.	Expressions, equations & inequalities	Solving problems with rational numbers
		Converting terminating decimals
		Solving 2-step equations: word problems
		2-step equations, positive integer coefficients
		2-step equations, integer coefficients
		2-step equations, positive rational coefficients
		2-step equations, rational coefficients
		2-step equations, distributive property
		Creating & solving 2-step inequalities
		Representing inequalities
		Graphing the solution of an inequality
		Solving 2-step inequalities

3 Geometry

3.1 Geometry

Outcome	Quests	Content
Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.	Geometry	Finding the area of a circle
		Introducing the parts of a circle
		Finding the circumference of a circle
		Supplementary angles
		Complementary angles
		Adjacent angles
		Vertical angles
		Area: polygons
		Solving real-life problems: area of polygons
		Volume: right prisms
		Surface area: rectangular & triangular prisms
Visualize and represent geometric figures and describe the relationships between them.	Visualize & represent geometric figures	Scale drawings
		Triangle inequality theorem
		Constructing triangles with given conditions
		Describing cross sections of 3-D figures

4 Measurement, Data and Probability

4.1 Statistics and probability

Outcome	Quests	Content
Draw inferences about populations based on random sampling concepts.	Draw inferences about populations	Understanding sampling
		Drawing inferences from samples
Draw informal comparative inferences about two populations.	Draw informal comparative inferences	Comparing data distributions
		Drawing comparative inferences
Investigate chance processes and develop, use, and evaluate probability models.	Probability	Introducing probability
		Probability of chance events: relative frequency
		Theoretical probability
		Predicting outcomes of chance experiments
		Finding the complement of an event
		Finding the approximate probability
		Comparing observed frequency & expected frequency
		Investigating mutually exclusive events
		Calculating probabilities of compound events
		Representing sample spaces & identifying outcomes
		Independent & dependent compound events

Grade 8

1 Numbers and Operations

1.1 The number system

Outcome	Quests	Content
Distinguish between rational and irrational numbers using their properties.	Rational & irrational numbers	Describing properties of irrational numbers
		Classifying real numbers
		Converting repeating decimals to rational numbers
		Repeating & terminating decimals as fractions
Estimate irrational numbers by comparing them to rational numbers.	Approximate irrational numbers	Comparing irrational numbers
		Locating irrational numbers on a number line
		Approximating the value of an irrational number
		Finding square roots of non-perfect squares

2 Algebraic Concepts

2.1 Expressions and equations

Outcome	Quests	Content
Apply concepts of radicals and integer exponents to generate equivalent expressions.	Radicals and 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
		Investigating square roots & cube roots
		Squares & square roots
		Evaluating expressions with square & cube roots
		Square roots of fractions & decimals
		Cubes & cube roots
		Introducing scientific notation
		Converting scientific notation to standard form
		Converting standard form to scientific notation
Understand the connections between proportional relationships, lines, and linear equations.	Proportional relationships	Calculations in scientific notation
		Graphing proportional relationships

		Comparing proportional relationships
		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
Analyze and solve linear equations and pairs of simultaneous linear equations.	Linear equations	Solution types of linear equations
		Solving 3-step linear equations
		Solving linear equations, variables on both sides
		Solving linear equations, distributive property
		Using substitution to check solutions
		Identifying solutions, 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
		Writing & solving systems of equations

3 Algebraic Concepts

3.1 Functions

Outcome	Quests	Content
Define, evaluate, and compare functions.	Functions	Identifying functions
		Comparing functions represented in different ways
		Represent linear relationships in different forms
		Equations of linear & non-linear relationships
Use concepts of functions to model relationships between quantities.	Use functions as models	Rate of change & initial value
		Distance-time graphs

4 Geometry

4.1 Geometry

Outcome	Quests	Content
Apply the concepts of volume of cylinders, cones, and spheres to solve real world and mathematical problems.	Volume: cones, cylinders & spheres	Volume: cones
		Volume: cylinders
		Volume: spheres
Understand and apply congruence, similarity, and geometric transformations using various tools.	Congruence, similarity, transformations	Translating points on the coordinate plane
		Reflecting points across the x- or y-axis
		Rotating points about the origin
		Preserved properties: length
		Preserved properties: angles
		Preserved properties: parallel lines
		Congruency: rigid transformations
		Dilations, coordinates
		Translations, coordinates
		Rotations, coordinates
		Reflections, coordinates
		Sequences of transformations
		Introducing similarity
		Similarity: transformations
		Angle sum theorem
		Exterior angle theorem
		Angle relationships: parallel lines, transversal
		Using scale to analyze similar triangles
		Identifying similar triangles
Understand and apply the Pythagorean Theorem to solve problems.	The Pythagorean Theorem & its converse	Identifying the hypotenuse, right triangles
		Identifying right triangles, Pythagorean Theorem
		Pythagorean triples
		Pythagorean Theorem: missing short side
		Pythagorean Theorem: missing hypotenuse
		Pythagorean Theorem: missing side

		Pythagorean Theorem in 2-D & 3-D
		Finding the distance between two points

5 Measurement, Data and Probability

5.1 Statistics and probability

Outcome	Quests	Content
Analyze and/or interpret bivariate data displayed in multiple representations.	Analyze bivariate data	Using & interpreting scatter plots
		Estimating the line of best fit
		Interpreting the line of best fit
Understand that patterns of association can be seen in bivariate data utilizing frequencies.	Two-way tables	Constructing & interpreting two-way tables

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