Mathletics Missouri Program of Studies Skill Quests



Grades 7 – 8



January, 2023

Mathletics

Missouri Program of Studies Skill Quests January 2023

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Grade 7

1 Ratios and Proportional Relationships

1.1 Analyze proportional relationships and use them to solve problems.

Outcome	Quests	Content
Compute unit rates, including those	Unit rates with	Solving unit rate problems
that involve complex fractions, with	fractions	involving fractions
like or different units.		
Determine when two quantities are	Identify proportional	Identifying proportional
in a proportional relationship.	relationships	relationships
Identify and/or compute the	Constant of	Identifying the constant of
constant of proportionality (unit	proportionality	proportionality
rate).		
Explain what a point (x, y) on the	Graphs of proportional	Interpreting graphs of
graph of a proportional relationship	relationships	proportional relationships
means in terms of the situation.		
Solve problems involving ratios,	Ratio & percent	Solving multi-step ratio &
rates, percentages and proportional	problems	percent problems
relationships.		

2 Number and Sense Operations

2.1 Apply and extend previous understandings of operations to add, subtract, multiply and divide rational numbers.

Outcome	Quests	Content
Apply and extend previous	Add & subtract rational	Describing situations involving
understandings of numbers to add	numbers	opposites
and subtract rational numbers.		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:
		Adding & subtracting rational
		Adding & subtracting rational
Multiply and divide rational	Multiply & divide	Multiplying rational numbers
numbers	rational numbers	Multiplying positive & pegative
numbers.		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
Solve problems involving the four arithmetic operations with rational numbers.	Rational numbers problems: 4 operations	Rational numbers problems: 4 operations

3 Expressions, Equations and Inequalities

3.1 Use properties of operations to generate equivalent expressions.

Outcome	Quests	Content
Apply properties of operations to simplify and to factor linear	Linear expressions: properties	Simplifying algebraic expressions: add & subtract
algebraic expressions with rational coefficients.		Distributive property: algebraic expressions
		Factoring algebraic expressions

3.2 Solve problems using numerical and algebraic expressions and equations.

Outcome	Quests	Content
Understand how to use equivalent expressions to clarify quantities in a problem.	Interpret expressions	Rearranging expressions to interpret quantities
Solve multi-step problems posed with rational numbers.	Problems with rational numbers	Solving problems with rational numbers
		Converting terminating decimals

3.3 Write and/or solve linear equations and inequalities in one variable.

Outcome	Quests	Content
Write and/or solve two-step equations of the form px + q = r and	Solve 2-step equations	Solving 2-step equations: word problems
p(x + q) = r, where p, q and r are rational numbers, and interpret the		2-step equations, positive integer coefficients
meaning of the solution in the context of the problem.		2-step equations, integer coefficients
		2-step equations, positive rational coefficients
		2-step equations, rational coefficients
		2-step equations, distributive property
Write, solve and/or graph	Solve 2-step	Creating & solving 2-step
inequalities of the form px + q > r or	inequalities	inequalities
		Representing inequalities

px + q < r, where p, q and r are	Graphing the solution of an	
rational numbers.	inequality	
	Solving 2-step inequalities	

4 Geometry and Measurement

4.1 Draw and describe geometrical figures and describe the relationships between them.

Outcome	Quests	Content
Solve problems involving scale	Scale drawings	Scale drawings
drawings of real objects and		
geometric figures, including		
computing actual lengths and areas		
from a scale drawing and		
reproducing the drawing at a		
different scale.		

4.2 Use a variety of tools to construct geometric shapes.

Outcome	Quests	Content
Determine if provided constraints	Construct triangles	Triangle inequality theorem
will create a unique triangle		Constructing triangles with
through construction.		given conditions

4.3 Draw and describe geometrical figures and describe the relationships between them.

Outcome	Quests	Content
Describe two-dimensional cross	Cross sections of 3-D	Describing cross sections of 3-
sections of pyramids, prisms, cones	figures	D figures
and cylinders.		

4.4 Understand the concepts of circles.

Outcome	Quests	Content
Analyze the relationships among	Introduce parts of a	Introducing the parts of a
the circumference, the radius, the	circle	circle
diameter, the area and Pi in a circle.		
Know and apply the formulas for	Circles: area &	Finding the area of a circle
circumference and area of circles to	circumference	Finding the circumference of a
solve problems.		circle

4.5 Apply and extend previous understanding of angle measure, area and volume.

Outcome	Quests	Content
Use angle properties to write and	Use angle facts to solve	Supplementary angles
solve equations for an unknown	problems	Complementary angles
angle.		Adjacent angles
		Vertical angles

4.6 Understand the relationship between area, surface area and volume.

Outcome	Quests	Content
Find the area of triangles,	Area, volume & surface	Area: polygons
quadrilaterals and other polygons composed of triangles and rectangles.	area	Solving real-life problems: area of polygons
Find the volume and surface area of	Volume & surface area	Volume: right prisms
prisms, pyramids and cylinders.		Surface area: rectangular &
		triangular prisms

5 Data Analysis, Statistics and Probability

5.1 Use random sampling to draw inferences about a population.

Outcome	Quests	Content
Understand that a sample is a	Understand sampling	Understanding sampling
subset of a population.		
Understand that generalizations	Draw inferences from	Drawing inferences from
from a sample are valid only if the	samples	samples
sample is representative of the		
population.		
Understand that random sampling	Random sampling	Random sample to produce
is used to produce representative		representative samples
samples and support valid		
inferences.		
Use data from multiple samples to	Inferences about	Making inferences about
draw inferences about a population	populations	populations
and investigate variability in		
estimates of the characteristic of		
interest.		

5.2 Draw informal comparative inferences about two populations.

Outcome	Quests	Content
Analyze different data distributions	Compare data	Comparing data distributions
using statistical measures.	distributions	
Compare the numerical measures	Draw comparative	Drawing comparative
of center, measures of frequency	inferences	inferences
and measures of variability from		
two random samples to draw		
inferences about the population.		

5.3 Investigate the probability of chance events.

Outcome	Quests	Content
Determine probabilities of simple	Determine probabilities	Determining probabilities of
events.	of simple events	simple events
Understand that the probability of a	Introduction to	Introducing probability
chance event is a number between	probability	
0 and 1 that expresses the		
likelihood of the event occurring.		

5.4 Investigate the relationship between theoretical and experimental probabilities for simple events.

Outcome	Quests	Content
Predict outcomes using theoretical	Probability of chance	Probability of chance events:
probability.	events	relative frequency

5.5 Explain possible discrepancies between a developed probability model and observed frequencies.

Outcome	Quests	Content
Develop a uniform probability	Determine the	Theoretical probability
model by assigning equal	probability of events	Predicting outcomes of chance
probability to all outcomes, and use		experiments
the model to determine probabilities		Finding the complement of an
of events.		event
Develop a probability model (which	Observe frequencies in	Finding the approximate
may not be uniform) by observing	data	probability
frequencies in data generated from		Comparing observed
a chance process.		frequency & expected
		frequency

5.6 Find probabilities of compound events using organized lists, tables, tree diagrams and simulations.

Outcome	Quests	Content
Represent the sample space of a	Probability: compound	Investigating mutually
compound event.	events	exclusive events
		Calculating probabilities of
		compound events
		Representing sample spaces &
		identifying outcomes
Design and use a simulation to	Independent &	Independent & dependent
generate frequencies for compound	dependent compound	compound events
events.	events	

Grade 8

1 Number Sense and Operations

1.1 Know that there are numbers that are not rational, and approximate them by rational numbers.

Outcome	Quests	Content
Explore the real number system: a)	Rational & irrational	Describing properties of
Know the differences between	numbers	irrational numbers
rational and irrational numbers; b)		Classifying real numbers
Understand that all rational		Converting repeating decimals
numbers have a decimal expansion		to rational numbers
that terminates or repeats; c)		Repeating & terminating
Convert decimals which repeat into		decimals as fractions
fractions and fractions into		
repeating decimals.		
Estimate the value and compare	Approximate irrational	Comparing irrational numbers
the size of irrational numbers and	numbers	Locating irrational numbers on
approximate their locations on a		a number line
number line.		Approximating the value of an
		irrational number
		Finding square roots of non-
		perfect squares

2 Expressions, Equations and Inequalities

2.1 Work with radicals and integer exponents.

Outcome	Quests	Content
Know and apply the properties of	Properties of integer	Using exponent notation
integer exponents to generate	exponents	Product of powers, numerical
equivalent expressions.		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
		Zero exponents, algebraic
		base
		Negative exponents, numerical
		base
		Negative exponents, algebraic
		Dase
		simplifying expressions,
		Simplifying expressions
		algebraic base
Investigate concepts of square and	Square & cube roots	Investigating square roots &
cube roots: a) Solve equations of	Square & cube roots	cube roots
the form $x^2 = n$ and $x^3 = n$ where n		Squares & square roots
is a positive rational number: b)		Evaluating expressions with
Evaluate square roots of perfect		square & cube roots
squares less than or equal to 625		Square roots of fractions &
and cube roots of perfect cubes less		decimals
than or equal to 1000; c) Recognize		Cubes & cube roots
that square roots of non-perfect		
squares are irrational.		
Express very large and very small	Write numbers in	Introducing scientific notation
quantities in scientific notation and	scientific notation	Converting scientific notation
approximate how many times		to standard form
larger one is than the other.		Converting standard form to
		scientific notation
Use scientific notation to solve	Calculations in	Calculations in scientific
problems: a) Perform operations	scientific notation	notation

with numbers expressed in	
scientific notation, including	
problems where both decimal and	
scientific notation are used; b) Use	
scientific notation and choose units	
of appropriate size for	
measurements of very large or very	
small quantities.	

2.2 Understand the connections between proportional relationships, lines and linear equations.

Outcome	Quests	Content
Graph proportional relationships: a)	Proportional	Graphing proportional
Interpret the unit rate as the slope	relationships	relationships
of the graph; b) Compare two		Comparing proportional
different proportional relationships.		relationships
Apply concepts of slope and y-	Understand slope & y-	Using similar triangles to
intercept to graphs, equations and	intercept	understand slope
proportional relationships: a)		Writing equations of
Explain why the slope (m) is the		proportional relationships
same between any two distinct		Writing equations of
points on a non-vertical line in the		nonproportional relationships
Cartesian coordinate plane; b)		Identifying the slope in an
Derive the equation y = mx for a		equation or graph
line through the origin and the		Identifying the y-intercept on a
equation $y = mx + b$ for a line		graph
intercepting the vertical axis at b.		Graphing equations in slope-
		intercept form
		Graphing equations not in
		slope-intercept form
		Finding the y-intercept
		algebraically

2.3 Analyze and solve linear equations and inequalities and pairs of simultaneous linear equations.

Outcome	Quests	Content
Create and identify linear equations	Solution types of linear	Solution types of linear
with one solution, infinitely many	equations	equations
solutions or no solutions.		
Solve linear equations and	Solve linear equations	Solving 3-step linear
inequalities with rational number		equations

coefficients, including equations and inequalities whose solutions		Solving linear equations, variables on both sides
require expanding expressions		Solving linear equations,
using the distributive property and		distributive property
combining like terms.		Using substitution to check
		solutions
Analyze and solve systems of linear	Identify solutions,	Identifying solutions, systems
equations: a) Graph systems of	systems of equations	of equations
linear equations and recognize the	Solve systems of	Solving systems of equations
intersection as the solution to the	equations	graphically
system; b) Explain why solution(s)		Solving systems of equations
to a system of two linear equations		using elimination
in two variables correspond to		Solving systems of equations
point(s) of intersection of the		using substitution
graphs; c) Explain why systems of		Checking the solution of a
linear equations can have one		system of equations
solution, no solution or infinitely	Write & solve systems	Writing & solving systems of
many solutions; d) Solve systems of	of equations	equations
two linear equations.		

Geometry and Measurement

3.1 Understand congruence and similarity using physical models, transparencies or geometry software.

Outcome	Quests	Content
Verify experimentally the	Introduction to rigid	Translating points on the
congruence properties of rigid	transformations	coordinate plane
angle measure, betweeness.		Reflecting points across the x- or v-axis
collinearity and distance are		Rotating points about the
preserved under rigid		origin
transformations; b) Investigate if	Preserved properties:	Preserved properties: length
orientation is preserved under rigid	length	
transformations.	Preserved properties:	Preserved properties: angles
	angles	-
	Preserved properties:	Preserved properties: parallel
	parallel lines	lines Consumeration rigid
Understand that two-dimensional	Congruency: rigid	Congruency: rigid
rigid transformations can be	uansionnauons	transformations
performed to map the pre-image to		
the image: a) Describe a possible		
sequence of rigid transformations		
between two congruent figures.		
Describe the effect of dilations,	Transformations,	Dilations, coordinates
translations, rotations and	coordinates	Translations, coordinates
reflections on two-dimensional		Rotations, coordinates
figures using coordinates.		Reflections, coordinates
		Sequences of transformations
Understand that two-dimensional	Similarity:	Introducing similarity
figures are similar it a series of	transformations	Similarity: transformations
transformations (rotations,		
dilations) can be performed to man		
the pre-image to the image: a)		
Describe a possible sequence of		
transformations between two		
similar figures.		
Explore angle relationships and	Triangles & angle	Angle sum theorem
establish informal arguments: a)	relationships	Exterior angle theorem
Derive the sum of the interior		Angle relationships: parallel
angles of a triangle; b) Explore the		lines, transversal
relationship between the interior		Using scale to analyze similar
and exterior angles of a triangle; c)		triangles
created when parallel lines are cut		laentifying similar triangles

by a transversal; d) Use the	
properties of similar figures to solve	
problems.	

3.2 Understand and apply the Pythagorean Theorem.

Outcome	Quests	Content
Use models to demonstrate a proof	The Pythagorean	Identifying the hypotenuse,
of the Pythagorean Theorem and	Theorem & its converse	right triangles
its converse.		Identifying right triangles,
		Pythagorean Theorem
		Pythagorean triples
Use the Pythagorean Theorem to	Apply the Pythagorean	Pythagorean Theorem:
determine unknown side lengths in	Theorem	missing short side
right triangles in problems in two-		Pythagorean Theorem:
and three-dimensional contexts.		missing hypotenuse
		Pythagorean Theorem:
		missing side
		Pythagorean Theorem in 2-D
		& 3-D
Use the Pythagorean Theorem to	Distance between two	Finding the distance between
find the distance between points in	points	two points
a Cartesian coordinate system.		

3.3 Solve problems involving volume of cones, pyramids and spheres.

Outcome	Quests	Content
Solve problems involving surface	Volume: cones,	Volume: cones
area and volume: a) Understand	cylinders & spheres	Volume: cylinders
the concept of surface area and		Volume: spheres
find surface area of pyramids; b)		
Understand the concepts of volume		
and find the volume of pyramids,		
cones and spheres.		

4 Data Analysis, Statistics and Probability

4.1 Investigate patterns of association in bivariate data.

Outcome	Quests	Content
Construct and interpret scatter plots of bivariate measurement data to investigate patterns of association between two quantities.	Use & interpret scatter plots	Using & interpreting scatter plots
Generate and use a trend line for bivariate data, and informally assess the fit of the line.	Estimate the line of best fit	Estimating the line of best fit
Interpret the parameters of a linear model of bivariate measurement data to solve problems.	Interpret the line of best fit	Interpreting the line of best fit
Interpret the parameters of a linear model of bivariate measurement data to solve problems: a) Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects; b) Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	Two-way tables	Constructing & interpreting two-way tables



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