

Mathletics

Missouri Program of Studies

Skill Quests

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

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 understandings of numbers to add and subtract rational numbers.	Add & subtract 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
Multiply and divide rational numbers.	Multiply & divide rational numbers	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
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 algebraic expressions with rational coefficients.	Linear expressions: properties	Simplifying algebraic expressions: add & subtract
		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 $p(x + q) = r$, where p , q and r are rational numbers, and interpret the meaning of the solution in the context of the problem.	Solve 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
		2-step equations, rational coefficients
		2-step equations, distributive property
Write, solve and/or graph inequalities of the form $px + q > r$ or	Solve 2-step inequalities	Creating & solving 2-step inequalities
		Representing inequalities

px + q < r, where p, q and r are rational numbers.		Graphing the solution of an 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 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.	Scale drawings	Scale drawings

4.2 Use a variety of tools to construct geometric shapes.

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

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

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

4.4 Understand the concepts of circles.

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

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

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

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

Outcome	Quests	Content
Find the area of triangles, quadrilaterals and other polygons composed of triangles and rectangles.	Area, volume & surface area	Area: polygons
		Solving real-life problems: area of polygons
Find the volume and surface area of prisms, pyramids and cylinders.	Volume & surface area	Volume: right prisms
		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 subset of a population.	Understand sampling	Understanding sampling
Understand that generalizations from a sample are valid only if the sample is representative of the population.	Draw inferences from samples	Drawing inferences from samples
Understand that random sampling is used to produce representative samples and support valid inferences.	Random sampling	Random sample to produce representative samples
Use data from multiple samples to draw inferences about a population and investigate variability in estimates of the characteristic of interest.	Inferences about populations	Making inferences about populations

5.2 Draw informal comparative inferences about two populations.

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

5.3 Investigate the probability of chance events.

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

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

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

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

Outcome	Quests	Content
Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.	Determine the probability of events	Theoretical probability
		Predicting outcomes of chance experiments
		Finding the complement of an event
Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.	Observe frequencies in data	Finding the approximate probability
		Comparing observed 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 compound event.	Probability: compound events	Investigating mutually exclusive events
		Calculating probabilities of compound events
		Representing sample spaces & identifying outcomes
Design and use a simulation to generate frequencies for compound events.	Independent & dependent compound events	Independent & dependent compound 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) Know the differences between rational and irrational numbers; b) Understand that all rational numbers have a decimal expansion that terminates or repeats; c) Convert decimals which repeat into fractions and fractions into repeating decimals.	Rational & irrational numbers	Describing properties of irrational numbers
		Classifying real numbers
		Converting repeating decimals to rational numbers
		Repeating & terminating decimals as fractions
Estimate the value and compare the size of irrational numbers and approximate their locations on a number line.	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 Expressions, Equations and Inequalities

2.1 Work with radicals and integer exponents.

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

Outcome	Quests	Content
Graph proportional relationships: a) Interpret the unit rate as the slope of the graph; b) Compare two different proportional relationships.	Proportional relationships	Graphing proportional relationships
		Comparing proportional relationships
Apply concepts of slope and y-intercept to graphs, equations and proportional relationships: a) Explain why the slope (m) is the same between any two distinct points on a non-vertical line in the Cartesian coordinate plane; b) 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.	Understand slope & 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		

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

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

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

3 Geometry and Measurement

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

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

by a transversal; d) Use the properties of similar figures to solve problems.		
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3.2 Understand and apply the Pythagorean Theorem.

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

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

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