

Algebra 1 Benchmarks

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Italic font style denotes benchmarks that should be covered but are not state goals for this course.

Students are expected to know content and apply skills from previous grades.

Mathematical reasoning and problem solving processes should be incorporated throughout all mathematics standards. Students should use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models to communicate mathematical information and to explain mathematical reasoning and concepts.

Standard 1: Number & Operations

Students will deepen their understanding of real numbers by applying properties of rational numbers and exponents and by identifying exact and approximate roots without simplification. Students use positive and negative numbers, absolute value, fractions, decimals, percentages, and scientific notation. Students use the proper order of operations and perform operations with rational numbers. Students apply number sense to everyday situations and judge reasonableness of answers.

Content Goal The student will:	Content Knowledge and Skills:	Benchmarks
1.1 Understand and perform computations accurately	1. Apply properties of the real number system.	i. Identify and apply properties: associative, commutative, distributive, identity, inverse, multiplicative property of negative one, substitution, and zero property of multiplication ii. Analyze real number relationships based on the position of numbers on a number line (e.g., using relative magnitude, absolute value). iii. Classify real numbers as whole, integer, rational, or irrational numbers and support the grouping iv. Compare and order real numbers.
	2. Understand and use positive and negative numbers, absolute value, fractions, decimals, percentages, and scientific notation, including real world situations.	i. Use integers in reality-based situations ii. Use and apply fractions. iii. Use and apply decimals. iv. Use percents to solve problems such as sales tax, commission, simple interest, discount, percent of change, total pay, time-and-a-half, sales price, mixtures, and tips. v. Use scientific notation to express large and small numbers in the context of real science situations. vi. Manipulate problems with time and a half and overtime wages.
	3. Apply properties of exponents.	i. Perform operations on numerical expressions containing exponents.

	4. Identify exact and approximate roots without simplification.	i. Perform operations on number sentences containing radicals.
	6. Use appropriate vocabulary.	See attached list
1.2. Perform computations accurately.	1. Use the proper order of operations. Perform operations with real numbers.	Use order of operations to simplify numerical expressions which include integers, rational numbers, exponents, radicals, etc..
	2. Use graphs, matrices, and sequences to represent and solve problems.	i. Compute compound interest from the number of compounding periods, principal, and annual interest rate. ii. Add, subtract, and multiply matrices.
1.3. Estimate and judge reasonableness of results.	1. Apply number sense to everyday situations.	i. Determine the reasonableness solutions to computation and word problems, choosing an appropriate method. ii. Estimate driving time to a given destination.
1.4. Use reasoning skills to recognize problems and express them mathematically.	1. Use a variety of methods, including common mathematical formulas, to solve problems drawn from daily life.	i. <i>Apply various methods, including common mathematical formulas, working backwards, drawing diagrams, guess and check, make a systematic list, make a model, make a table, solve a simpler problem, write an equation, use logical deduction, etc., to obtain problem solutions drawn from everyday life.</i> ii. <i>Analyze a problem to determine the purpose or goal and identify the unknowns.</i>
	a. Use inductive and deductive reasoning to set up a problem.	i. <i>Write a paragraph explaining a solution to a problem.</i> ii. <i>Use logic to predict outcomes.</i>
	b. Make and evaluate logical arguments.	Use logic to make a mathematical case (i.e. explain why it is not possible to divide by zero).

Standard 2: CONCEPTS AND PRINCIPLES OF MEASUREMENT.

(Review formulas: perimeter, area, surface area, volume)

Students will formulate and use proportions, ratios, and scaling. Students apply concepts of rates and direct and indirect measurements. Students evaluate given measurement formulas for two- and three- dimensional objects.

Content Goal- The student will:	Content Knowledge and Skills:	Benchmarks:
2.1. Understand and use U.S. customary and metric measurements.	1. Determine length, perimeter, circumference, area, surface area, volume, capacity, weight, time, and temperature. 2. Solve problems involving circumference, perimeter, or area of triangles, circles, and rectangles.	i. Calculate the area of a rectangle using algebra tiles. Relate algebra tiles to area and write an algebraic expression to represent the area represented by the tiles. ii. Given algebraic expressions as the dimensions for 2- or 3- dimensional figures, write an expression to represent perimeter, area, volume, etc.. iii. Calculate the length, perimeter, circumference, area, surface area, and volume of an object.
2.2 Apply the concepts	1. Use rates, ratios, proportions,	i. Use proportional relationships to determine

of rates, ratios, and proportions.	and map scales in problem-solving situations.	lengths of sides of a figure that are represented by algebraic relationships . ii. Use map scales to solve problems.
	2. Apply concepts of rates and direct and indirect measurements.	i. Solve direct and inverse variation problems
	3. Construct equivalent units, comparable units, and conversions.	i. Convert between units in a given measurement system. ii. Solve unit rate problems.
2.3. Apply dimensional analysis.	Understand units and their relationship to one another and to real world applications involving length, area, capacity, weight, time, temperature, and rate.	i. Check reasonableness of a calculation based on the resulting units. ii. Apply dimensional analysis to solve indirect measurement problems such as convert miles per hour to feet per second
2.4 Apply appropriate techniques and tools to determine measurements.	<i>Determine and use appropriate units.</i>	i. Make measurements using appropriate units. ii. Solve distance-rate-time problems where the units have to be converted before solving.
2.5. Understand and use a variety of problem-solving skills.	<i>Use a variety of methods, including common mathematical Formulas, to solve problems drawn from daily life.</i>	iii. Apply various methods, including common mathematical formulas, working backwards, drawing diagrams, guess and check, make a systematic list, make a model, make a table, solve a simpler problem, write an equation, use logical deduction, etc., to obtain problem solutions drawn from everyday life. iv. Analyze a problem to determine the purpose or goal and identify the unknowns.

Standard 3: CONCEPTS AND LANGUAGE OF ALGEBRA AND FUNCTIONS.

Students use appropriate procedures for manipulating and simplifying algebraic expressions involving variables, integers, rational numbers, and for solving multi-step, first-degree equations and inequalities. Students understand the concept and applications of functions and mathematical models. Given graphs, charts, ordered pairs, mappings, or equations, students determine whether a relation is a function. Students evaluate functions written in functional notation and, given a function, students identify domain and range.

Content Goal - The student will:	Content Knowledge and Skills:	Benchmarks:
3.1 Use algebraic symbolism as a tool to represent mathematical relationships.	1. Understand and use variables, expressions, equations and inequalities.	i. Translate sentences into algebraic equations and solve the equations. ii. Write equations and inequalities for real-world scenario problems.. iii. Describe intervals using symbols and/or graphs. iv. Identify an inequality on a graph. v. Find the correct mathematical expression to represent word problems.
3.2 Evaluate algebraic	1. Understand and use	i. Identify and use identity and inverse

expressions.	procedures for operating on algebraic expressions.	properties in algebraic expressions. ii. Use properties (associative, commutative, distributive, equality) to simplify algebraic expressions. iii. Use the distributive property to remove parentheses and collect like terms in algebraic expressions and equations. iv. Perform operations on numerical and algebraic expressions containing exponents.
3.3 Solve algebraic equations and inequalities.	1. Understand and use appropriate procedures to solve linear equations and inequalities such as $3x - 4 = 2$ or $3x - 4 > 2$	i. Use addition, subtraction, multiplication, or division in one variable equations and inequalities to determine the value of the variable. ii. Solve multi-step linear equations or inequalities. iii. Solve equations and inequalities with variables on both sides. iv. Solve equations and inequalities with grouping symbols. v. Solve equations and inequalities for a given variable. <i>vi. Solve and graph compound inequalities.</i> <i>vii. Solve and graph open sentences with absolute value.</i>
	2. Differentiate between linear and non-linear equations and graphs. 3. Use appropriate procedures to simplify and solve polynomial equations and inequalities such as $x^2 + 3x = 7$ or $x^2 + 3x < 7$	i. Solve problems involving regression equations. ii. Classify polynomials by degree and number of terms. iii. Perform basic operations to simplify polynomial expressions. iv. Multiply perfect squares and perfect square trinomials. v. Factor simple polynomials such as the difference of two squares and perfect square trinomials. vi. Simplify fractions with polynomials in the numerator and denominator by factoring and reducing to lowest terms. vii. Perform basic operations to simplify whole number and fractional expressions containing variables. viii. Evaluate an algebraic expression using rational numbers. ix. Solve systems of linear equations in real world situations by graphing, elimination method, or substitution method x. Solve a quadratic equation by factoring. xi. Solve a quadratic equation using the quadratic equation when the formula is provided.
3.4. Solve simple linear systems of equations or inequalities.	1.. Understand and use appropriate procedures to solve simple linear systems of equations and inequalities such as $x + y = 7$	i. Solve systems of linear equations and inequalities in real world situation by graphing, elimination method, or substitution method

	$2x + 3y = 21$ or $x + y < 7$ $2x + 3y > 21$	
3.5 Understand the concept of functions.	a. Solve problems that involve varying quantities with variables, expressions, equations, inequalities, and absolute values. 1. Given graphs, charts, ordered pairs, mappings, or equations, determine whether a relation is a function. 2. Evaluate functions written in function notation. 3. Find the domain and range of a function given its graph, or its function rule.	Find the value of a function for given value in the domain.
3.6. Apply functions to a variety of problems.	1. Model real-world phenomena using polynomial, rational, and basic exponential functions, 2. Use graphs and sequences to represent and solve problems.	i. Apply functions to various types of problems such as represent revenue as a function of items sold, velocity as a function of time, and wage as a function of hours worked.

Standard 4: CONCEPTS AND PRINCIPLES OF GEOMETRY.

Students represent linear relationships using tables, graphs, and mathematical symbols. Students interpret attributes of linear relationships such as slope, rate of change, and intercepts.

Content Standard - The student will:	Content Knowledge and Skills:	Benchmarks
4.1 Apply concepts of size, shape, and spatial relationships.	1a Recognize congruency and similarity of two-dimensional figures. 1b Understand congruence and similarity as they apply to reflection, rotation, and translation.	i. Solve practical word problems involving perimeter and area of a square, rectangle, triangle, and circle.
	2. Understand scaling as it relates to size variations in one, two, and three-dimensional objects, while shape is maintained.	
4.2. Apply the geometry of right triangles.	a. Understand the basic concepts of right triangle trigonometry (e.g., basic trigonometry ratios such as sine, cosine, and tangent).	i. Find the sine, cosine, or tangent of a given angle in a right triangle.
	b. Use trigonometric ratio methods to solve problems.	
	c. Know and apply the Pythagorean Theorem to solve real world problems.	i. Find the lengths of the sides of a right triangle using the Pythagorean Theorem.

4.3 Apply graphing in two dimensions.	1. Understand concepts of the Cartesian Coordinate System.	<ul style="list-style-type: none"> i. Graph linear equations and inequalities. ii. Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line. iii. Find the slope of a line. iv. Represent experimental data with graphs. v. Identify quadrants, origin, and axes.
	2. Graph scatter plots and identify informal trend lines (e.g. eyeball fit lines).	
	3. Identify positive and negative correlations.	
4.4 Represent and graph linear relationships.	1. Create graphs and equations for linear relationships.	
	2. Represent linear relationships using tables, graphs, and mathematical symbols.	
	3. Interpret attributes of linear relationships such as slope, rate of change, and intercepts.	
4.5 Use reasoning skills	a. Use a variety of methods, including common mathematical formulas, to solve problems drawn from daily life.	<ul style="list-style-type: none"> i. Apply various methods, including common mathematical formulas, working backwards, drawing diagrams, guess and check, make a systematic list, make a model, make a table, solve a simpler problem, write an equation, use logical deduction, etc., to obtain problem solutions drawn from everyday life. ii. Analyze a problem to determine the purpose or goal and identify the unknowns.

Standard 5: DATA ANALYSIS, PROBABILITY, AND STATISTICS.

Students interpret and use basic statistical concepts including mean, median, mode, range, and distribution of data, including outliers. Students make predictions and draw conclusions based on statistical measures and students make predictions based on randomness, chance, equally likely events, and probability.

Students find probabilities based on dependent, independent, and compound events.

Content Goal The student will:	Content Knowledge and Skills:	Benchmarks
5.1 Represent data with a variety of formats.	1. Read, interpret, and analyze tables, charts, and graphs (e.g., scatter plots, line graphs, 3-dimensional graphs, box-and-whisker plot, and pie charts).	<ul style="list-style-type: none"> i. Read and interpret information presented in tables, charts, and graphs. ii. Use the line of best fit for a scatter plot to solve a problem.
5.2 Collect, organize, and display data.	1. Collect and organize data, and display the data in tables, charts, and graphs (e.g., scatter diagrams, frequency tables, bar graphs, or pie charts).	i. Collect data and select the appropriate means to communicate the information.
5.3 Apply simple statistical measurements.	1. Interpret and use basic statistical concepts including mean (average), median, mode, range, and standard deviation.	<ul style="list-style-type: none"> i. Compute and use mean, median, mode, and range for a give set of data. ii. Use measures of variance.
	2. Make predictions and draw conclusions based on statistical	

	measures.	
5.4 Understand basic concepts of probability.	<ol style="list-style-type: none"> 1. Find probabilities based on dependent, independent, and compound events. 2. Contrast experimental and theoretical probability. 3. Know that probability ranges from 0% to 100%. Understand randomness and chance. 	<ol style="list-style-type: none"> i. Analyze card games, dice games, and lotteries as chance events. ii. Calculate basic probability theoretically and use the results to make predictions. iii. Apply the concept of dependent and independent events to real world situations.
5.5 Make predictions or decisions based on data.	1. Make predictions based on randomness, chance, equally likely events, and probability.	i. Use given data to predict future trials and use relative frequency or the equal fractions property to predict or estimate future events.
	2. Use appropriate technology to employ simulation techniques, curve fitting, correlation, and graphical models to make predictions or decisions based on data.	
	3. Design, conduct, and interpret results of statistical experiments.	
	4. Analyze the effect of biased data on statistical predictions.	

Mathematics Vocabulary By RIT Score

RIT Scores 211 – 220

acute angle
arranged
average
below zero
Celsius
century
centimeters per inch
centuries
combinations
common factor
common multiples
commutative
congruent angle
corresponding parts
counting number
decades
decimal
decimal form
decimal point
degrees
dice
dilation
dividend
enlargement
equivalent
expression
factor tree
fastest
fitted line
fractional part
fractions
gallons
geometric solid
graph
greatest common denominator
highest mean
hour
input
interest
likelihood
line of best fit
line plot
lowest terms
mean
measure of angle
micrometer
minutes
nearest dollar
negative
not prime
number cube
number sequence

obtuse angle
order
ounces
outcome
output
perpendicular
perpendicular line
portion
positive
positive linear relationship
prime factorization
probability
proof
protractor
ray
reciprocal
rectangular prism
rectangular solid
reduce
region
rotation
scatter plot
scientific notation
smaller
smallest
solve
square meter
square numbers
squares
standard form
straight angle
supplementary
symmetrical
systematic list
tails
tenth
three-dimensional
transformation
translation
triangular prism
triple
union
vertex
vertical angle
what shape
yards

RIT Scores 221 – 230

absolute value
addends
algebraic sentence
always true
area
arithmetic progression
base

between
chord
circumference
commission
common denominator
compute
cubic feet
cubic inch
cubic meter
cubic milter
cubic yard
deducted
depreciate
diameter
discount
divide
equality
equation of a line
equilateral
evaluate
even numbers
expanded notation
experimental probability
exponent
formula
frequency
frequency table
gallons
heaviest
identity element
if – then
integer
intersection
label (units)
least common denominator
less than sum
less than twice
lightest
linear graph
lowest common denominator
lowest terms
magic square
mathematical sentence
matrix
mean
median
metric units
mode
mortality
most
multiply
obtuse angle
odometer
origin
perimeter
Pi

polygon
product
proportion
quadrant
quarts
quotient
radius
radius squared
rate
ratio
real number
reasonable
rectangle
rectangular box
rectangular shape
regression equation
regression line
representative sample
scientific notation
segment BC
shorter
similar
slide
standard numeral
straight angle
survey
table
ten million
ten thousandth
tens digit
theoretical probability
thousandths
trapezoid

RIT Scores 231 – 240

acute triangle
algebraic expression
algebraic sentence
alternate interior angles
amount of sales
arithmetic progression
base
box-and-whiskers plot
car purchase
checking account
chord
columns
commission
coordinates of points
corresponding side
cubed
data point
depreciate
discount
edge
equality

equation of a line
equiangular triangle
fractional part
height
hypotenuse
identity element
if-then statement
inequality
isosceles
linear graph
mathematical sentence
matrix
mean salary
meters per minute
middle
miles per second
minus
negative coefficient
outlier
possibility
prime factor
prime factorization
rectangular house
regression equation
regression line
representative sample
rows
scalene triangle
scientific notation
secant
similar trapezoids
simple interest
solve for n
square numbers
square pyramid
square region
successive
sum of angles in triangle
tangent
tenth power
term in sequence
transformation
translation
tripled
vertex

RIT Scores 241 – 250

adjacent angle
algebra tiles
alternate exterior angle
alternate interior angle
angle bisector
base ten
circular
complementary angles
congruent triangle

construction
converse
coordinate
correlation
corresponding angles
corresponding parts of congruent triangles
cylindrical tank
decimal
diameter
discount
domain
doubled
endpoints
equilateral pyramid
factor (used with equations)
feet per second
fractions
function table
greatest decrease
hyperbolic
incline
infinite
inscribed
least common multiple
linear foot
linear pair
matrix
midpoint
mileage table
number sequence
opposite
point of intersection
polynomial
prime factors
Pythagorean theorem
quadrupled
radius
rectangular area
rectangular solid
regression equation
sales tax
sample space
semicircle
simultaneous equations
slope of parallel lines
solution set
solution to system
square kilometer
square yard
squared
symmetric
symmetrical halves
system of equations
tangent
time-and-a-half
transversal

tripled
varies inversely as the square
Venn diagram
x-axis
y-axis
y-intercept

RIT Scores 251 – 260

adjacent angles
bisect
centroid
circumscribed
collinear
complex
conclusion of if-then statement
conditional
conditional statement
congruent angles
coordinate plane
cosine
counterexample
cross-section area
difference of two squares
discriminant
distance formula
empty set
endpoint
equals 180 degrees
exterior angle
factor completely
geometric series
imaginary solutions
intercepts
interior of angles
isosceles trapezoid
line symmetry
linear
midpoint
nonhorizontal
nonvertical
number of solutions
pair
parabola
perpendicular bisector
point symmetry
quadratic equation
read solution set from graph
reflected
regular hexagon
regular pentagon
relation
right cylinder
right pyramid
rotational symmetry
similar cylinders
similar trapezoids

similar triangles
simultaneous equations
sin A
slant height
slope
solution set
sum of opposites
tangent
undefined
vertical angles
wider
x-coordinate
x-intercept
y-coordinate

RIT Scores 261 – 270

infinite non-repeating decimal
Postulate
Compound Interest
Semi-annual
Trigonometric function
Trigonometric relationship
Opposite side
Decagon
Adjacent side
Non-repeating decimal
Rational number
Repeating
Repeating decimal

RIT Scores > 270

HL
rate of interest
successive discounts
bisector