RENAISSANCE
Star Math®

Algebra Readiness Skills

The math concepts and skills learned in elementary through middle school provide the foundation for studying high-school-level algebra. The Star Math™ Record Book Student Details page provides an Algebra Readiness Indicator to help teachers identify student progress through these foundational skills.

Research has identified the progression of skills needed for algebra readiness. The following table identifies the Core Progress Math skills associated with these algebra readiness skills. This list can help you identify the grade-level skills a student may need to practice to achieve expected grade-level progress.

Note: An asterisk (*) following a skill indicates that the skill develops fluency. Practicing the skill throughout the school year helps students achieve speed and accuracy.

Grade 3
Assess the reasonableness of the answer to a 2-step problem using any of the four operations
Compare two fractions with the same denominator using any method
Compare two fractions with the same numerator using any method
Demonstrate that the area of a rectangle is the same using tiling or multiplying side lengths
Demonstrate the distributive property using tiling in a rectangular array
Describe the total number of objects in a rectangular array using multiplication
Determine the unknown in a division equation
Determine the unknown in a multiplication equation
Estimate a liquid volume in liters
Estimate the mass of an object using grams or kilograms
Explain arithmetic patterns using properties of operations
Explain why two fractions are equivalent using a visual fraction model
Express a whole number as a fraction or a fraction as a whole number
Find an unknown side length of a polygon given the perimeter and the other side lengths to solve a real-world or mathematical problem
Find the area of a rectangle by multiplying side lengths
Find the area of a rectangle by multiplying side lengths to solve a problem

Grade 3 continued
Find the area of a rectangle with whole-number side lengths by tiling
Find the area of a rectilinear figure by decomposing it into non-overlapping rectangles and adding the areas of the non-overlapping parts
Find the area of a rectilinear figure in a real-world problem by decomposing it into non-overlapping rectangles and adding the areas of the non-overlapping parts
Find the perimeter of a polygon given the side lengths to solve a real-world problem
Fluently add within 1000*
Fluently divide within 100, using basic facts*
Fluently multiply within 100, using basic facts*
Fluently subtract within 1000*
Generate simple equivalent fractions
Identify arithmetic patterns
Interpret a multiplication fact as the sum of equal groups
Interpret the whole-number quotient of a division fact as a partitioning into equal shares
Justify the result of a comparison of two fractions with like numerators or denominators
Know basic multiplication facts within 100
Measure a liquid volume in liters
Measure a time interval in minutes
Measure length to the nearest half inch or quarter inch
Measure the mass of an object using grams or kilograms
Multiply whole numbers within 100 using strategies based on properties of operations
Recognize a non-unit fraction as the sum of unit fractions on a number line
Recognize area as an attribute of plane figures
Recognize equivalent fractions
Recognize that a comparison of fractions is valid only when the fractions refer to the same whole
Recognize that equally partitioning the interval between 0 and 1 on a number line creates unit fractions
Relate a fraction to a point on a number line
Relate area to the number of square units
Represent a 2-step problem using an equation with a letter standing for the unknown

Grade 3 continued
Represent a unit fraction on a number line
Represent a whole-number product as a rectangular area in mathematical reasoning
Represent the distributive property in mathematical reasoning using area models
Select and use an appropriate measurement tool
Solve a 1-step problem involving mass or volume
Solve a 2-step problem with whole numbers using any of the four operations
Solve a problem involving addition or subtraction of time intervals in minutes
Solve a problem within 100 involving arrays
Solve a problem within 100 involving equal groups
Solve a problem within 100 involving measurement quantities
Tell and write time to the nearest minute, including indication of a.m. and p.m.
Understand division as an unknown factor problem
Understand how the unit square is defined
Understand that area can be measured using unit squares
Understand the size of a fraction
Understand the structure of a fraction
Understand what it means for two fractions to be equivalent

Grade 4
Add or subtract fractions with like denominators
Add or subtract fractions with like denominators to solve a problem
Add two fractions with unlike denominators of 10 and 100 using equivalent fractions
Assess the reasonableness of a whole number answer to a multi-step problem
Classify a 2-dimensional figure
Compare two decimals through hundredths using standard symbols
Compare two fractions with different numerators and denominators using standard symbols
Compare two whole numbers up to 1,000,000
Convert a fraction in tenths to an equivalent fraction in hundredths
Decompose a fraction into a sum of fractions with the same denominator in more than one way
Distinguish between multiplicative and additive comparisons
Estimate the solution to a multiplication or division problem
Explain why two fractions are equivalent by relating visual fraction models to multiplying the numerator and denominator of a fraction by the same number
Express a fraction with a denominator of 10 or 100 as a decimal
Find a common denominator of two fractions
Generate equivalent fractions by multiplying the numerator and denominator of a fraction by the same number
Interpret a multiplication equation as a comparison
Interpret the remainder in a multi-step word problem
Justify the result of a comparison of two decimals through hundredths
Justify the result of a comparison of two fractions with unlike numerators and denominators
Know basic geometric elements: point, line, line segment, ray, angles (right, acute, obtuse), a set of perpendicular lines, and a set of parallel lines
Multiply a fraction by a whole number
Multiply a fraction by a whole number to solve a problem
Multiply or divide in a given situation involving multiplicative comparison
Read and write a whole number in expanded form up to 1,000,000
Read and write a whole number in standard form up to 1,000,000

Grade 4 continued
Read and write a whole number in word form up to 1,000,000
Recognize equivalent fractions by identifying common factors
Recognize that in a multi-digit whole number, a digit in any place represents ten times what it represents in the place to its right
Represent a situation using an equation with a letter standing for the unknown quantity
Represent a verbal statement of multiplicative comparison as a multiplication equation
Rewrite an expression involving multiplication of a fraction and a whole number
Round a decimal number to a specified place through hundredths
Round a whole number within 1,000,000 to a specified place
Show that one or more fraction decompositions are equivalent to a given fraction
Solve a multi-step problem with whole numbers involving the four operations
Solve a problem using the area or perimeter formulas for rectangles
Solve an addition or subtraction problem to find an unknown angle measure on a diagram
Understand a fraction as a multiple of a unit fraction
Understand a fraction as a sum of unit fractions
Understand a multiple of a fraction as a multiple of a unit fraction
Understand addition of fractions as joining parts referring to the same whole
Understand subtraction of fractions as separating parts referring to the same whole

Grade 5
Add decimals through hundredths using one of various strategies
Add decimals through hundredths using pictures or concrete models
Add or subtract fractions or mixed numbers with unlike denominators
Add or subtract mixed numbers with like denominators
Assess the reasonableness of an answer to an addition or subtraction problem involving fractions
Compare the size of a product of two fractions to the size of one factor based on the size of the other factor
Compare two decimals through thousandths
Define elements of the coordinate system
Demonstrate that the volume of a right rectangular prism is the same using either packing or multiplying edge lengths
Demonstrate the reasoning used in a division problem with a dividend of up to four digits and a 2-digit divisor
Demonstrate the reasoning used in solving a multiplication or division problem involving decimals through hundredths
Demonstrate the reasoning used in solving an addition or subtraction problem involving decimals through hundredths
Divide a unit fraction by a nonzero whole number
Divide a unit fraction by a nonzero whole number to solve a problem
Divide a whole number by a unit fraction
Divide a whole number by a unit fraction to solve a problem
Divide a whole number of up to four digits by a 2-digit whole number using one of various strategies
Divide decimals through hundredths using one of various strategies
Divide whole numbers to solve a problem, leading to an answer in the form of a fraction or a mixed number
Estimate a sum or difference of two fractions
Estimate the solution to a problem
Explain the pattern in the number of zeros of a product when multiplying numbers by powers of 10
Explain the pattern in the placement of the decimal point when multiplying or dividing decimals by powers of 10
Explain the result of multiplying a number by a fraction equal to 1, less than 1, or greater than 1

Grade 5 continued
Find the volume of a right rectangular prism by counting unit cubes
Find the volume of a right rectangular prism by multiplying edge lengths
Find the volume of a right rectangular prism to solve a problem, using a formula
Find the volume of a solid figure composed of right rectangular prisms by decomposing it into two non-overlapping parts and adding the volumes of the non-overlapping parts
Fluently multiply multi-digit whole numbers
Graph a point in the first quadrant of the coordinate plane
Interpret a fraction as division of the numerator by the denominator
Interpret coordinate values of points within a given context
Interpret division of a unit fraction by a nonzero whole number
Interpret division of a whole number by a unit fraction
Interpret the product of a fraction and a fraction or whole number as parts of a partition or a sequence of operations
Model multiplication of fractions by finding the area of a rectangle using tiling
Multiply a fraction by a fraction
Multiply decimals through hundredths using one of various strategies
Multiply decimals through hundredths using pictures or concrete models
Multiply fractional side lengths of a rectangle to find its area
Multiply fractions and mixed numbers in a given situation
Read and write a decimal through thousandths in any form
Recognize that in a multi-digit number, a digit in any place represents 1/10 of what it represents in the place to its left
Recognize volume as an attribute of solid figures
Relate a fraction product to a rectangular area model
Represent powers of 10 using whole-number exponents
Solve a problem by finding the volume of a solid figure composed of right rectangular prisms through decomposing it into two non-overlapping parts and adding the volumes of the non-overlapping parts
Solve a problem by graphing a point in the first quadrant of the coordinate plane

Grade 5 continued
Find the volume of a right rectangular prism by counting unit cubes
Find the volume of a right rectangular prism by multiplying edge lengths
Find the volume of a right rectangular prism to solve a problem, using a formula
Find the volume of a solid figure composed of right rectangular prisms by decomposing it into two non-overlapping parts and adding the volumes of the non-overlapping parts
Fluently multiply multi-digit whole numbers
Graph a point in the first quadrant of the coordinate plane

Grade 6
Convert measurement units using ratios
Describe a ratio relationship between two quantities
Determine a unit rate
Divide mixed numbers or fractions
Evaluate a numerical expression involving whole-number exponents
Evaluate an expression for specific values of its variables
Express the sum of two whole numbers in factored form using the distributive property
Find missing values in a ratio table
Find the area of polygons including special quadrilaterals composed of triangles and/or rectangles
Find the areas of parallelograms and triangles, including right triangles
Find the greatest common factor of whole numbers less than or equal to 100
Find the least common multiple of two whole numbers less than or equal to 12
Fluently add and subtract multi-digit decimals using the standard algorithm
Fluently divide multi-digit whole numbers
Fluently multiply and divide multi-digit decimals using the standard algorithm
Graph in the coordinate plane the values of a ratio table
Identify attributes of a 3-dimensional shape
Identify parts of an expression using mathematical terms
Identify the relationship between two variables using graphs and tables
Interpret an inequality between two rational numbers in context
Interpret the meaning of a positive number, a negative number, or zero in a given situation
Know and be able to apply the fact that the opposite of the opposite of a number is the original number
Know the difference between the ordering of rational numbers and their magnitudes
Model a situation involving division of a fraction by a fraction
Plot coordinates to form a polygon on the coordinate plane
Plot rational numbers on a horizontal or vertical number line
Recognize a constraint or condition in a mathematical problem

Grade 6 continued
Recognize a percent of a quantity as a part per 100
Recognize a percent of a quantity as a part per 100 in a given situation
Recognize that dividing by a rational number is the same as multiplying by its reciprocal
Recognize that opposite numbers are located on opposite sides of zero on a number line
Relate a graph or a table showing the relationship between two variables to an equation
Relate a statement of inequality to the relative positions of two rational numbers on a number line
Relate an input-output table to equivalent ratios
Relate an ordered pair to its location on a coordinate plane
Relate the locations of two ordered pairs that differ only by signs
Represent a quantity using a positive or negative number in a given situation
Represent the solution of an inequality of the form $x > c$ or $x < c$ on a number line diagram
Solve a problem by evaluating an expression or formula for specific values of its variables
Solve a problem by finding a side length of a polygon on the coordinate plane
Solve a problem involving an equation of the form $x + p = q$ or $px = q$ with nonnegative rational numbers
Solve a problem involving division of a fraction by a fraction
Solve a problem involving parts, wholes, and percentages
Solve a problem using a formula to find the volume of a right rectangular prism with fractional-edge lengths
Solve a problem using absolute value to describe magnitude
Solve a real-world or mathematical problem by graphing points in all four quadrants
Solve a unit rate problem
Substitute to determine whether a given number is a solution to an equation or an inequality
Understand ordering of rational numbers
Understand signs of numbers in ordered pairs as indicating locations in the quadrants of the coordinate plane
Understand that a rational number is represented by a point on the number line
Understand that a variable can represent an unknown number or any number in a specified set
Understand that positive and negative numbers are used to represent quantities having opposite directions or values

Grade 6 continued
Understand the absolute value of a rational number as its distance from zero on a number line
Understand the concept of a ratio
Understand the concept of a unit rate
Understand what constitutes a solution in an equation or inequality with variables
Use tables to compare ratios in a given situation
View one or more parts of an expression as a single entity
Write a numerical expression involving whole-number exponents
Write an equation of the form x + p = q or px = q to represent a situation involving nonnegative rational numbers
Write an equation with two variables to express one quantity in terms of another in a given situation
Write an expression containing variables to model a situation
Write an expression using one or more operations that involves variables
Write an inequality of the form x > c or x < c to represent a constraint or condition
Write an inequality to describe the relationship between two rational numbers
Write equivalent expressions using variables and properties of operations

Grade 7
Add integers
Add or subtract to simplify a linear expression with rational coefficients
Add rational numbers
Assess the reasonableness of an answer to a multi-step problem involving rational numbers
Compare fractions, decimals, and percents
Compare how to solve a word problem algebraically to solving it arithmetically
Compute the unit rate associated with a ratio of fractions
Convert between rational numbers in any form
Describe a real-world situation using a linear inequality
Describe a situation in which opposite quantities combine to make zero
Determine if the decimal form of a rational number terminates or repeats
Determine the distance between two rational numbers on a number line
Determine the measure of an unknown angle in a geometric figure
Divide integers
Divide rational numbers
Expand a linear expression with rational coefficients
Factor a linear expression with rational coefficients
Fluently solve equations of the form $px + q = r$ or $p(x + q) = r$
Graph the solution set of an inequality involving rational numbers
Identify a common irrational number
Identify the constant of proportionality
Illustrate the concept of additive inverse on a number line
Interpret the meaning of an ordered pair on a graph that shows a proportional relationship in a given situation
Multiply integers
Multiply rational numbers
Solve a multi-step percent problem involving a proportional relationship
Solve a multi-step problem involving rational numbers

Grade 7 continued
Solve a multi-step ratio problem involving a proportional relationship
Solve a problem involving a scale drawing of a geometric figure
Solve a problem involving the surface area or volume of a 3-dimensional object
Solve a problem leading to a 2-step linear inequality involving rational numbers
Solve a problem with rational numbers involving any of the four operations
Subtract integers
Subtract rational numbers
Understand p + q as a number located a distance |q| from p on a number line
Understand subtraction of rational numbers as adding the additive inverse
Understand that different forms of an expression can show how its various quantities are related
Understand that multiplication is extended from fractions to rational numbers
Understand that the division of two integers always results in a rational number, provided that the divisor is not zero
Understand that the negative sign in a rational number may apply to the numerator or the denominator
Understand the rules for multiplying signed numbers
Use the product of two rational numbers to describe a real-world situation
Use the quotient of two rational numbers to describe a real-world situation

Grade 8
Compare the relative size of two numbers written in scientific notation
Compare two linear functions each represented in a different way
Compare two proportional relationships each represented in a different way
Convert between standard decimal notation and scientific notation
Demonstrate similarity between two figures by listing a sequence of transformations
Derive the equation y = mx + b for a line intercepting the vertical axis at b
Derive the equation y = mx for a line through the origin
Describe a functional relationship that is modeled by a graph
Determine if a relation is a function
Determine if the variables in a situation are in a proportional or linear non-proportional relationship given a table, a graph, or an equation
Determine the rate of change or initial value of a function from a description of a relationship or from two (x, y) values
Estimate the solution to a system of two linear equations by graphing
Evaluate the cube root of a perfect cube up to 1000
Evaluate the roots of a perfect square up to 144
Explain why the slope of a line is the same between any two distinct points using similar triangles
Find an unknown side length of a right triangle, using the Pythagorean theorem
Find the distance between two points, using the Pythagorean theorem
Generate an equivalent expression using properties of integer exponents
Give an example of a linear equation in one variable with one solution, infinitely many solutions, or no solution
Graph a proportional relationship
Identify a function that is not linear
Identify the number of solutions for a linear equation in one variable
Interpret a unit rate as the slope of a graph
Interpret scientific notation that has been generated by technology
Interpret the rate of change or initial value of a linear function in terms of the situation it models
Know the properties of integer exponents

Grade 8 continued
Perform operations with numbers written in scientific notation
Recognize the equation y = mx + b as defining a linear function whose graph is a straight line
Represent a quantity using scientific notation and units of the appropriate size
Sketch a graph to model a function given a verbal description
Solve a linear equation with rational coefficients
Solve a problem by finding an unknown side length of a right triangle, using the Pythagorean theorem
Solve a problem leading to two linear equations in two variables
Solve a real-world or mathematical problem involving the volume of a cone, cylinder, or sphere
Solve a simple quadratic or cubic equation
Solve a simple system of two linear equations by inspection
Solve a system of two linear equations in two variables algebraically
Understand similarity through transformations
Understand that a function is a rule that assigns to each input exactly one output
Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs
Understand that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output
Use scientific notation to estimate a very large or a very small quantity
Write a function to model a linear relationship between two quantities