

Common Core Math Curriculum Grade Algebra 1

ESSENTIAL QUESTIONS	DOMAINS AND CLUSTERS	Algebra 1 SKILL	VOCABULARY	MATHEMATICAL PRACTICES	ASSESSMENT
	<p><u>Counting and Cardinality</u></p> <p>OBJECTIVE A1.1 Know and use number names and the count sequence.</p> <p>OBJECTIVE A2.5 Multiply and divide</p> <p>OBJECTIVE A2.6 Solve problems using the four operations</p>	<p>Reviewed Skills</p> <p>Identify Roman Numerals</p> <p>Mastered Skills</p> <p>Apply the distributive property Divide multi-digit numbers</p> <p>Introduced Skills</p> <p>Use matrices to represent and manipulate data Multiply matrices by scalars to produce new matrices Add, subtract and multiply matrices of appropriate dimensions</p> <p>Reviewed Skills</p> <p>Solve multi-step word problems using the four operations Solve word problems in which remainders must be interpreted Assess the reasonableness of answers using mental computation and estimation strategies (including rounding)</p> <p>Mastered Skills</p> <p>Represent verbal statements of comparisons as equations Multiply and divide to solve word problems involving multiplicative comparisons Use parenthesis, brackets or braces in numerical expressions and evaluate expressions with these symbols Solve problems involving integers using the four operations</p>	<ul style="list-style-type: none"> • 		<p>http://www.nctm.org</p> <p>Performance Tasks</p> <p>Investigations</p> <p>Math Journaling</p>

	<p>OBJECTIVE A2.7 Explain and use factors and multiples</p> <p>OBJECTIVE A2.8 Generate and analyze patterns and relationships</p> <p>OBJECTIVE A2.9 Demonstrate an understanding of ratio concepts and use ratio reasoning to solve problems.</p>	<p>Mastered Skills Use distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor (i.e. express $36+8$ as $4(9+2)$)</p> <p>Reviewed Skills Write arithmetic and geometric sequences both recursively and with an explicit formula</p> <p>Reviewed Skills Solve problems involving finding the whole, given a part and the percent Use ratio reasoning to convert measurement units Convert and transform units appropriately when multiplying or dividing quantities Choose and interpret units consistently in formulas and multi- step problems Represent proportional relationships by equations Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane</p> <p>Mastered Skills Explain the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$. Use rate language in the context of a ratio relationship (i.e. “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger”) Use ratio and rate reasoning to solve real-world problems Use tables to compare ratios and unit rates Solve unit rate problems including those involving unit pricing and constant speed. Find a percent of a quantity as a rate per 100 (i.e. 30% of a quantity means 30/100 times the quantity) Solve problems involving finding the whole, given a part and the percent Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units Recognize and represent proportional relationships between quantities Decide whether two quantities are in a proportional relationship (i.e. test for equivalent ratios) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships</p>	<ul style="list-style-type: none"> • • 		
--	---	---	--	--	--

	<p>OBJECTIVE A2.10 Apply and extend previous understandings of numbers to the system of rational numbers.</p>	<p>Mastered Skills (cont) Use proportional relationships to solve multistep ratio and percent problems While focusing on proportions graph proportional relationships interpreting the unit rate as the slope of the graph Compare two different proportional relationships represented in different ways Apply proportional reasoning to solve problems involving scale and indirect measurement.</p> <p>Introduced Skills Explain why the sum or product of two rational numbers is rational Explain why the sum of a rational number and an irrational number are irrational in why the product of a nonzero rational number and irrational number is irrational Rewrite simple rational expressions in different forms Demonstrate how rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression Add, subtract, multiply and divide rational expressions</p> <p>Reviewed Skills Recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes Describe the absolute value of a rational number as its distance from 0 on the number line Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation Simplify rational expressions</p>	<ul style="list-style-type: none"> • 		

Mastered Skills

Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane
Find and position pairs of integers and other rational numbers on a coordinate plane
Explain ordering and absolute value of rational numbers
Apply and extend previous understandings to add and subtract rational numbers
Interpret the sums of rational numbers by describing real- world contexts
Explain that integers can be divided provided that the divisor is not zero and every quotient of integers is a rational number
Apply properties of operations as strategies to multiply and divide rational numbers in real world context
Know that numbers that are not rational are called irrational
Explain and informally that every number has a decimal expansion
Convert a rational number into a repeating decimal and vice versa
Use rational approximations of irrational numbers to compare the size of irrational numbers
Locate irrational numbers approximately on a number line, diagram and estimate the value of the numbers

	<p>OBJECTIVE A2.11 Apply and extend previous understandings of arithmetic to algebraic expressions</p>	<p>Introduced Skills Add, subtract and multiply polynomials</p> <p>Reviewed Skills</p> <p>Mastered Skills Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient) while viewing one or more parts of an expression as a single entity Evaluate expressions with specific values of their variables number exponents in the conventional order when there are no parentheses to specify a particular order Apply the properties of operations to generate equivalent expressions Identify when two expressions are equivalent Apply properties of operations to expressions with rational coefficients Solve multi-step real-life problems posed with positive and negative rational numbers in any form Apply properties of operations to calculate with numbers in any form Construct simple equations and inequalities to solve problems Solve word problems using equations and inequalities with rational numbers</p>	<ul style="list-style-type: none"> • • 		
--	---	--	--	--	--

	<p>OBJECTIVE A2.12 <i>Reason about and solve one-variable equations and inequalities.</i></p>	<p>Mastered Skills Explain solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true Use variables to represent numbers and write expressions when solving a real-world problem, and solve Explain that a variable can represent an unknown number, or, any number in a specified set Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world problem Recognize and represent in a number line diagram that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions Graph the solution set of the inequality and interpret it in the context of the problem</p>			
	<p>OBJECTIVE A2.13 <i>Work with radicals and integer exponents.</i></p>	<p>Introduced Skills Use properties of integer exponents to simplify rational exponents Explain and apply the properties of integer exponents to generate equivalent numerical expressions Use square root and cube root symbols to represent solutions to equations of the form $x^2=p$ and $x^3=p$ where p is a positive rational number</p> <p>Reviewed Skills Perform operations with numbers expressed in scientific notation Simplify radical expressions</p> <p>Mastered Skills Evaluate square roots of small perfect squares and cube roots of small perfect cubes Recognize that $\sqrt{2}$ is irrational Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities (scientific notation) Use scientific notation and appropriate units for measurements of very large or very small quantities Interpret scientific notation that has been generated by technology</p>			

	<p>OBJECTIVE A2.14 <i>Analyze and solve linear equations and pairs of simultaneous linear equations.</i></p>	<p>Introduced Skills Analyze and solve pairs of simultaneous linear systems Explain that solutions to a system of two linear systems in two variables correspond to points of intersection of their graphs Solve systems of two linear equations in two variables by substitution or elimination method Estimate solutions of linear systems by graphing the equations Analyze simple cases of linear systems (no solution) Solve real-world problems leading to two linear equations with two variables Represent constraints by equations or inequalities and by systems of equations and/or inequalities Interpret solutions as viable or non-viable options in a modeling context Solve systems of linear equations exactly and approximately Graph the solutions to a linear inequality in two variables as a half-plane Graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes Write linear equations in different forms (slope-intercept, point-slope, standard) Solve using slope-intercept, point-slope, and standard forms Write equations of parallel and perpendicular lines</p> <p>Mastered Skills Solve linear equations with one variable</p>			
	<p>OBJECTIVE A2.15 <i>Define, evaluate and compare functions.</i></p>	<p>Introduced Skills Construct a function to model a linear and exponential relationship between two quantities Describe qualitatively the functional relationship between two quantities by analyzing a graph Sketch a graph that exhibits the qualitative features of a function that has been described verbally Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines Solve simple rational and radical equations in one variable and give examples showing how extraneous solutions may arise Solve simple rational and radical equations in one variable and give examples showing how extraneous solutions may arise Solve quadratic equations in one variable Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context</p>			

		<p>Introduced Skills (cont) Graph functions expressed symbolically and show key features of the graph Graph linear and quadratic functions and show intercepts, maxima and minima Graph square roots, cube roots, and piecewise-defined functions, including step functions and absolute value functions Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values and symmetry of the graph Use the properties of exponents to interpret expressions for exponential functions Compare properties of two functions each represented in a different way Distinguish between situations that can be modeled with linear functions and with exponential functions Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically or as a polynomial function Define the scale and interval of a linear or exponential function based on the context of the problem</p> <p>Reviewed Skills Factor a quadratic expression to reveal the zeros of the function it defines</p> <p>Mastered Skills Use variables to represent two quantities in a real-world problem that change in relationship to one another Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable Analyze the relationship between the dependent and independent variables using graphs and tables and relate these to the equation Explain that a function is a rule that assigns to each input exactly one output Compare properties of two functions each represented in a different way Interpret the equation $y=mx+b$ as defining a linear function whose graph is a straight line Determine the rate of change and initial value of the function from a description of a relationship or from two values Interpret the rate of change and initial value of a linear function in terms of the situation it models Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters</p>			
--	--	--	--	--	--

	<p>OBJECTIVE <i>A4.3 Compare decimal, fractions and percent notations</i></p> <p>OBJECTIVE <i>B1.2 Measure and estimate lengths</i></p> <p>OBJECTIVE <i>B1.3 Solve problems using measurement.</i></p> <p>OBJECTIVE <i>B5.1. Explain and use geometric measurements</i></p>	<p>Mastered Skills Find the percent of a number including percent of change Find simple interest</p> <p>Mastered Skills Choose a level of accuracy appropriate to limitations on measurement when reporting quantities</p> <p>Mastered Skills Use conversions to solve multi-step real world problems</p> <p>Reviewed Skills Find volumes of solid (3D) figures composed of two non- overlapping right rectangular prisms by adding the volumes of the non-overlapping parts Solve real-world problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms Use the formulas to determine the volumes and surface areas of cones, cylinders and spheres and use them to solve real- world and mathematical problems Find the missing measurement in triangles and quadrilaterals</p> <p>Mastered Skills Use facts about supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure Apply the formulas $V=lwh$ and $V=bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems</p>			
--	---	---	--	--	--

	<p>OBJECTIVE C1.2 Analyze, compare, create, classify and compose shapes</p> <p>OBJECTIVE C2.1 Graph points on the coordinate plane to solve real-world and mathematical problems.</p> <p>OBJECTIVE C4.1 Explain and apply the Pythagorean Theorem.</p> <p>OBJECTIVE D1. Develop understanding of statistical variability.</p>	<p>Reviewed Skills Describe the two-dimensional figures that result from slicing three-dimensional figures</p> <p>Introduced Skills Explain why the x-coordinates of the points where the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equation $f(x)=g(x)$</p> <p>Reviewed Skills Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve Find the slope of a line given 2 points on the coordinate plane</p> <p>Mastered Skills While graphing points, include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate Graph equations on coordinate axes with labels and scales</p> <p>Introduced Skills Apply the Pythagorean Theorem to find the distance between two points in a coordinate system</p> <p>Mastered Skills Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three-dimensions</p> <p>Reviewed Skills Show that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread and overall shape Explain that a measure of variation describes how its values vary with a single number</p>			
--	---	--	--	--	--

	<p>OBJECTIVE D2. Summarize and describe statistical data.</p>	<p>Introduced Skills Use permutations and combinations to find the possible number of outcomes in a given situation</p> <p>Reviewed Skills Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations diagrams and simulation Demonstrate that the probability of a compound event is the fraction of the outcomes in the sample space for which the compound event occurs Design and use a simulation to generate frequencies for compound events Choose and interpret the scale and the origin in graphs and data displays Explain the difference between theoretical and experimental probability</p> <p>Mastered Skills Find probabilities of compound events using organized lists, tables, tree</p>			
	<p>OBJECTIVE D3. Investigate patterns of association in bivariate data.</p>	<p>Introduced Skills Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities Describe patterns such as clustering, outliers, positive or negative association, linear association and nonlinear association Know that straight lines are widely used to model relationships between two quantitative variables For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model fit by judging the closeness of the data points to the line Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept Understand that the data (i.e. bivariate categorical data) that has been collected can be put into a table to help see the relationship between the data/variables</p>			

	<p>OBJECTIVE C1.2 Analyze, compare, create, classify and compose shapes</p>	<p>Introduced Skills Draw geometric shapes with given conditions Describe the two-dimensional figures that result from slicing three-dimensional figures</p> <p>Review Skills Represent three-dimensional figures using nets made up of rectangles and triangles Use nets to find the surface area of figures in the context of solving real-world and mathematical problems Solve problems involving scale drawings of geometric figures (i.e. compute actual lengths and areas from a scale drawing and reproduce a scale drawing at a different scale)</p> <p>Mastered Skills Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or angles of specified size Identify line-symmetric figures and draw lines of symmetry Classify two-dimensional figures in a hierarchy based on properties</p>			
	<p>OBJECTIVE C2.1 Graph points on the coordinate plane to solve real-world and mathematical problems.</p>	<p>Introduced Skills While graphing points, include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate Graph equations on coordinate axes with labels and scales</p> <p>Reviewed Skills Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane Interpret coordinate values of points in the context of the situation Draw polygons in the coordinate plane given coordinates for the vertices Use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate in the context of solving real-world and mathematical problems</p> <p>Mastered Skills Use a pair of perpendicular number lines (axes) to define a coordinate system with the intersection of the lines (origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers (coordinates) Explain that the first number in a coordinate indicates how far to travel from the origin in the direction of one axis and the second number indicates how far to travel in the direction of the second axis</p>			

	<p>OBJECTIVE C3.1 <i>Understand congruency and similarity using physical models, transparencies and geometry software.</i></p>	<p>Introduced Skills Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates Use informal arguments to establish facts about the single sum and exterior angle of triangles Use informal arguments to establish facts about the angles created when parallel lines are cut by a transversal</p>			
	<p>OBJECTIVE C4.1 <i>Explain and apply the Pythagorean Theorem.</i></p>	<p>Introduced Skills Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three-dimensions</p>			
	<p>OBJECTIVE D1. <i>Develop understanding of statistical variability.</i></p>	<p>Introduced Skills Solve a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers Show that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread and overall shape</p> <p>Reviewed Skills Explain that a measure of center for a numerical data set summarizes all of its values with a single number Explain that a measure of variation describes how its values vary with a single number Demonstrate that statistics can be used to gain information about a population by examining a sample of the population Explain that generalizations about a population from a sample are valid only if the sample is representative of the population Explain that random sampling tends to produce representative samples and support valid inferences Use data from a random sample to draw inferences about a population with an unknown characteristic of interest Generate multiple samples of the same size to gauge the variation in estimates or predictions</p>			

	<p>OBJECTIVE D2. Summarize and describe statistical data.</p>	<p>Introduced Skills Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations Develop a probability model by observing frequencies in data generated from a chance process Demonstrate that the probability of a compound event is the fraction of the outcomes in the sample space for which the compound event occurs Design and use a simulation to generate frequencies for compound events Choose and interpret the scale and the origin in graphs and data displays Explain the difference between theoretical and experimental probability</p> <p>Reviewed Skills Display numerical data in plots on a number line, including dot plots, histograms and box plots Summarize numerical data sets in relation to their context (i.e. report the number of observations; describe the nature of the attribute under investigation; give quantitative measure of center and variability, describe the overall pattern and deviations, relate choice of measure to the data distribution) Demonstrate that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency (i.e. figure out the probability of an event and test it) Compare probabilities from a model of observed frequencies Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of events (i.e. probability of rolling a die, each has Find probabilities of compound events using organized lists, tables, tree diagrams and simulation</p>			
--	--	--	--	--	--