Common Core Math Curriculum – Grade 8

ESSENTIAL QUESTIONS	DOMAINS AND CLUSTERS	GRADE 8 SKILL	VOCABULARY	MATHEMATICAL PRACTICES	ASSESSMENT
	A. <u>Numbers, Operations and Algebraic Thinking</u>			Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.	
	A1. Counting and Cardinality Know and use number names and the count sequence	**Reviewed Skills** ❑ Identify Roman Numerals			
	A2. Operations and Algebraic Thinking Multiply and divide	**Reviewed Skills** ❑ Apply the distributive property [i.e. 8(5+2)=(8x5)+(8+2) = 40+16 = 56] **Reviewed/Mastered Skills** ❑ Divide multi-digit numbers			
	Solve Problems using the four operations	**Introduced Skills** ❑ Use matrices to represent and manipulate data **Reviewed Skills** ❑ 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) ❏ Represent verbal statements of comparisons as equations ❏ Multiply and divide to solve word problems involving multiplicative comparisons ❏ Use parentheses, brackets or braces in numerical expressions and evaluate expressions with these symbols **Mastered Skills** ❏ Solve problems involving integers using the four operations			

	Explain and Use Factors and Multiples	**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))			
	Generate and analyze patterns and relationships	**Reviewed Skills** ❏ Write arithmetic and geometric sequences both recursively and with an explicit formula **Mastered Skills** ❏ Generate two numerical patterns using two given rules ❏ Form ordered pairs consisting of corresponding terms from two patterns and graph the ordered pairs on a coordinate plane			
	Demonstrate an understanding of ratio concepts and use ratio reasoning to solve problems	**Introduced Skills** ❏ 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 **Reviewed Skills** ❏ Explain the concept of a unit rate a/b associated with a ratio a:b with b≠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”) ❏ Solve unit rate problems including those involving unit pricing and constant			

		speed. ❑ Use ratio reasoning to convert measurement units ❑ Convert and transform units appropriately when multiplying or dividing quantities ❑ Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units ❑ Choose and interpret units consistently in formulas and multi- step problems ❑ 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 ❑ Represent proportional relationships by equations ❑ 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(i.e.: graph and equation) ❑ Apply proportional reasoning to solve problems involving scale and indirect measurement. **Mastered Skills** ❑ Use ratio language to describe ratio relationship between two quantities ❑ Use ratio and rate reasoning to solve real-world problems ❑ Use tables to compare ratios and unit rates ❑ 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 **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 ❑ Explain why the product of a nonzero rational number and irrational number is irrational ❑ Rewrite simple rational expressions in different forms ❑ Add, subtract, multiply and divide rational expressions			
	Apply and extend previous understandings of numbers to	**Reviewed Skills**			

	the system of rational numbers	❑ Recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes ❑ Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation ❑ 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 ❑ Simplify rational expressions **Reviewed/Mastered Skills** ❑ Describe the absolute value of a rational number as its distance from 0 on the number line **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 ❑ Demonstrate p+q as the number located a distance /q/ from p in the positive or negative direction depending on whether q is positive or negative ❑ Interpret the sums of rational numbers by describing real- world contexts ❑ Demonstrate subtraction of rational numbers as using the additive inverse, p-q=p+(-q) ❑ Show that the distance between two rational numbers on the number line is the absolute value of their difference ❑ Apply and extend previous understandings of fractions to multiply and divide rational numbers ❑ 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 ❑ Convert a rational number to a decimal using long division ❑ Recall that the decimal form of a rational number terminates in 0s or eventually repeats ❑ Know that numbers that are not rational are called irrational ❑ Explain and informally prove that every number has a decimal expansion			

	Apply and extend previous understandings of arithmetic to algebraic expressions	**Reviewed Skills** ❏ 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 ❏ Solve word problems using equations and inequalities with rational numbers **Mastered Skills** ❏ Write and evaluate numerical expressions involving whole- number exponents ❏ 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 ❏ Perform arithmetic operations including those involving whole ❏ Apply the properties of operations to generate equivalent expressions ❏ Identify when two expressions are equivalent ❏ Construct simple equations and inequalities to solve problems			
	Reason about and solve one-variable equations and inequalities.	**Reviewed Skills** ❏ 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 **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			

	Work with radicals and integer exponents.	**Introduced Skills** ❏ Perform operations with numbers expressed in scientific notation ❏ Simplify radical expressions **Reviewed Skills** ❏ Evaluate square roots of small perfect squares and cube roots of small perfect cubes ❏ Recognize that $\sqrt{2}$ is irrational ❏ Use scientific notation and appropriate units for measurements of very large or very small quantities ❏ Interpret scientific notation that has been generated by technology **Mastered Skills** ❏ 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)			
	Analyze and solve linear equations and pairs of simultaneous linear equations .Define, evaluate and compare functions.	**Introduced Skills** ❏ Solve using slope-intercept, point-slope, and standard forms **Reviewed Skills** ❏ Solve linear equations with one variable **Introduced Skills** ❏ 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 ❏ Construct a function to model a linear and exponential relationship between two quantities ❏ Factor a quadratic expression to reveal the zeros of the function it defines **Reviewed Skills** ❏ 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 ❑ 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 **Mastered Skills** ❑ Use variables to represent numbers and write expressions when solving a real-world problem, and solve			
	Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers Compare decimal, fraction and percent notations	**Mastered Skills** Interpret multiplication as scaling (resizing) Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and why multiplying a given number by a fraction less than 1 results in a product smaller than the given number Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions Solve problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions Compute quotients of fractions Demonstrate the use of reciprocals in dividing fractions **Reviewed Skills** ❑ Find the percent of a number including percent of change ❑ Find simple interest **Mastered Skills** ❑ Convert between percents, decimals and fractions			

	B. MEASUREMENT AND DATA **B1. Measurements** ***Measure and estimate lengths*** ***Solve problems using measurement*** **B5. Geometric Measurements** **Explain and use geometric measurements**	**Reviewed Skills** ❑ Choose a level of accuracy appropriate to limitations on measurement when reporting quantities **Mastered Skills** ❑ Measure and estimate liquid volumes and masses of objects using grams (g), kilograms (kg) and liters (l) ❑ Know relative sizes of measurement units within one system ❑ Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit (i.e. Express the length of a 4 ft snake as 48 in.) ❑ Generate a conversion table ❑ Convert among different-sized standard measurement units within a given measurement system ❑ Use conversions to solve multi-step real world problems ❑ Apply the area and perimeter formulas for rectangles in real world and mathematical problems (i.e. find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor) **Introduced Skills** ❑ 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 **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 ❑ 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 ❑ 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 ❏ Find the missing measurement in triangles and quadrilaterals **Mastered Skills** ❏ Find the areas of complex figures ❏ Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes while applying the context of real-world problems ❏ Know the formulas for the area and circumference of a circle and use them to solve problems ❏ Give an informal derivation of the relationship between the circumference and area of a circle ❏ Describe and use concepts of angle measurement ❏ Measure and sketch angles in whole-number degrees using a protractor ❏ Recognize angle measure as additive ❏ Solve addition and subtraction problems to find unknown angles on a diagram in real world ❏ 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 ❏ Recognize volume as an attribute of solid figures ❏ Describe and use concepts of volume measurement ❏ Measure volumes by counting unit cubes using cubic cm, in, ft and improvised units ❏ Relate volume to the operations of multiplication and addition with three dimensional figures ❏ Solve real world problems involving volume ❏ Find the volume of a right rectangular prism with whole- number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. ❏ Apply the formulas V = l x w x h and V = b x h for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems			

	C. Geometry **C1. Shapes** Analyze, compare, create, classify and compose shapes **C2. Graphing** Graph points on the coordinate plane to solve real-world and mathematical problems	**Reviewed 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 ❏ Draw geometric shapes with given conditions ❏ Describe the two-dimensional figures that result from slicing three-dimensional figures **Mastered Skills** ❏ 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) **Introduced Skills** ❏ Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often ❏ Find the slope of a line given 2 points on the coordinate plane **Reviewed 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 **Mastered 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		

	C3. Congruency Understand congruency and similarity using physical models, transparencies and geometry software	**Introduced Skills** ❑ Verify experimentally the properties of rotations, reflections and translations. ❑ Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections and translations ❑ Given two congruent figures, describe a sequence that exhibits the congruence between them. ❑ Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations ❑ Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them ❑ Use informal arguments to establish the angle-angle criterion for similarity of triangles **Reviewed 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			
	C4. Pythagorean Theorem Explain and apply the Pythagorean Theorem	**Introduced Skills** ❑ Apply the Pythagorean Theorem to find the distance between two points in a coordinate system **Reviewed Skills** ❑ Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three-dimensions			

	D. Statistics and Probability Develop understanding of statistical probability Summarize and describe statistical data	**Reviewed 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 ❏ Explain that a measure of variation describes how its values vary with a single number ❏ Generate multiple samples of the same size to gauge the variation in estimates or predictions **Mastered Skills** ❏ Explain that a measure of center for a numerical data set summarizes all of its values with a single number ❏ Explain that generalizations about a population from a sample are valid only if the sample is representative of the population ❏ Demonstrate that statistics can be used to gain information about a population by examining a sample of the population ❏ Explain that random sampling trends 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 **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 ❏ Develop a probability model by observing frequencies in data generated from a chance process ❏ Find probabilities of compound events using organized lists, tables, tree 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			

	Investigate patterns of association in bivariate data	❑ Choose and interpret the scale and the origin in graphs and data displays ❑ Explain the difference between theoretical and experimental probability **Mastered Skills** ❑ 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 al outcomes and use the model to determine probabilities of events **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			