

NCPS Mathematics Unit Map – Grade 8 Parent Guide

These **mathematical practices** are developed in each unit throughout the year:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the 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.

<i>Mathematical Unit</i>	<i>Student Learning Expectations</i>
<p>Unit 1 Real Number System and Pythagorean Theorem</p>	<p>In unit 1 students will explore rational and irrational numbers. They will learn how to convert a rational number into a decimal and will use this knowledge to estimate the decimal value of an irrational number. Students will learn about square root and cube root symbols and evaluate simple, perfect square and cube roots. Students will then use square roots when applying the Pythagorean Theorem to find triangle side lengths or distances between points on a coordinate plane.</p> <p>Students will:</p> <ul style="list-style-type: none"> <input type="checkbox"/> know that numbers that are not rational are called irrational and understand that every number has a decimal expansion. <input type="checkbox"/> convert between rational numbers and decimals (identifying when decimals repeat) <input type="checkbox"/> use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions <input type="checkbox"/> explain a proof of the Pythagorean Theorem and its converse <input type="checkbox"/> apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. <input type="checkbox"/> apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

	<ul style="list-style-type: none"> <input type="checkbox"/> use square root and cube root symbols to represent solutions to equations <input type="checkbox"/> evaluate square roots of small perfect squares and cube roots of small perfect cubes and know that $\sqrt{2}$ is irrational.
<p style="text-align: center;">Unit 2 Geometry</p>	<p>In unit 2 students will learn about congruent and similar figures and how to use transformations to create them. Students will also use informal arguments (not yet proofs) to give facts about angles in triangles and angles created when lines are cut by a transversal. They will relate slope to similar triangles in the coordinate plane and solve real-world problems involving the volume of spheres, cones and cylinders.</p> <p>Students will:</p> <ul style="list-style-type: none"> • use the properties of rotations, reflections, and translations to describe and analyze two-dimensional figures and solve problems • understand 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 • describe a sequence of transformations between two similar or congruent shapes • describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. • understand 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 • use informal arguments to establish facts about angles in triangles or created when parallel lines are cut by a transversal • 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 • know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
<p style="text-align: center;">Unit 3 Solving Linear Equations</p>	<p>Unit 3 is an extension of the sixth and seventh grade work related to solving equations and inequalities. In this unit students will solve equations with rational number coefficients and will be expected to use the distributive property or collect like terms when necessary. Students will also determine whether an equation has one solution, no solutions or infinitely many solutions.</p> <p>students will:</p> <ul style="list-style-type: none"> <input type="checkbox"/> solve linear equations in one variable.

	<ul style="list-style-type: none"> <input type="checkbox"/> give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions and show why that is the case by simplifying the equation until it is in the form $x = a$, $a = a$, or $a = b$ (where a and b are different numbers). <input type="checkbox"/> solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
<p style="text-align: center;">Unit 4 Linear Relationships</p>	<p>In unit 4 students will connect previous learning about ratios, equations and graphs to linear relationships and functions. Students will learn how to identify a function as a rule where each input is matched with exactly one output. They will analyze and compare functions, proportional and nonproportional relationships, and linear and nonlinear relationships using equations, graphs and tables. Students will determine the rate and change and initial value of a function from various representations of the relationship.</p> <p>Students will:</p> <ul style="list-style-type: none"> <input type="checkbox"/> derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. (moved this from unit 3) <input type="checkbox"/> graph proportional relationships, interpreting the unit rate as the slope of the graph <input type="checkbox"/> compare two different proportional relationships represented in different ways (Example: compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed) <input type="checkbox"/> 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 <input type="checkbox"/> understand that a function is a rule that assigns to each input exactly one output <input type="checkbox"/> compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions) <input type="checkbox"/> interpret equations that define linear functions, identify equations and graphs that represent linear functions <input type="checkbox"/> construct a function to model a linear relationship between two quantities. <input type="checkbox"/> determine and interpret the rate of change and initial value of the function from a description of a relationship, a table or from a graph. <input type="checkbox"/> sketch a graph that exhibits the qualitative features of a function that has been described verbally. <input type="checkbox"/> NOTE: Function notation is not required at this grade
<p style="text-align: center;">Unit 5 Systems of Equations</p>	<p>In unit 5 students will work with multiple equations (systems of simultaneous linear equations). Students will not only solve the systems of equations algebraically, but also by reasoning about the graphs of the equations, knowing that the intersection of the graphs is the solution.</p>

	<p>Students will:</p> <ul style="list-style-type: none"> <input type="checkbox"/> analyze and solve pairs of simultaneous linear equations. <input type="checkbox"/> understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. <input type="checkbox"/> solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. <input type="checkbox"/> solve real-world and mathematical problems leading to two linear equations in two variables.
<p style="text-align: center;">Unit 6 Laws of exponents and scientific notation</p>	<p>Unit 6 extends students' previous understanding of equivalent expressions and properties of operations to generating equivalent expressions using the properties of integer exponents. Students will use their knowledge of exponents to read and write numbers in scientific notation, to express how many times as much one number is than the other, and to estimate very large or small quantities. Students will be expected to use calculators and interpret numbers expressed in scientific notation on the calculator.</p> <p>Students will:</p> <ul style="list-style-type: none"> <input type="checkbox"/> know and apply the properties of integer exponents to generate equivalent numerical expressions. <input type="checkbox"/> use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. <i>For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger.</i> <input type="checkbox"/> perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. <input type="checkbox"/> use scientific notation and choose units of appropriate size for measurements of very large or very small quantities <input type="checkbox"/> interpret scientific notation that has been generated by technology
<p style="text-align: center;">Unit 7 Statistics</p>	<p>Unit 7 focuses on bivariate measurement data. Students construct and interpret scatter plots and two-way tables using the data, describe patterns in the data and use equations to solve problems in the context of the data. They will apply previous understandings of data analysis to problem solve and apply learning in new context.</p> <p>Students will:</p>

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| | <ul style="list-style-type: none"><input type="checkbox"/> construct and interpret scatter plots for bivariate measurement data to investigate patterns between two quantities<input type="checkbox"/> describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association<input type="checkbox"/> know that straight lines are widely used to model relationships between two quantitative variables<input type="checkbox"/> use equations to solve problems in the context of bivariate measurement data, interpreting the slope and intercept<input type="checkbox"/> understand that patterns can be seen in bivariate categorical data by displaying data in a two-way table.<input type="checkbox"/> construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects |
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