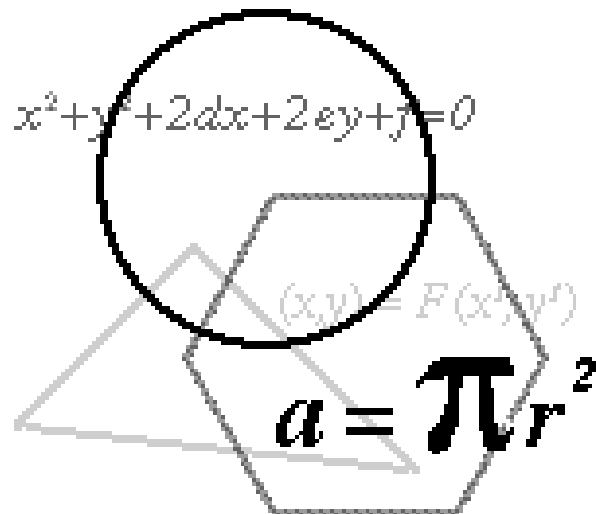


Planned Course of Study

Mathematics

Grade 8



NORTHWESTERN LEHIGH SCHOOL DISTRICT
6493 ROUTE 309
NEW TRIPOLI, PA 18066

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2020

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INTRODUCTION

The Grade 8 Mathematics curriculum guide contains planned course formats for the Northwestern Lehigh School District. The content of this document describes the objectives, activities, assessments, content, time frame, and standard alignment that serve as a guide to the specific units of study offered in Grade 8 Mathematics.

The Grade 8 Mathematics curriculum guide is the product of much diligent work on the part of the following staff members of the Task Force:

Mary Giannelli

Wendy Madouse

This document reflects their efforts to establish a well-defined and organized approach to teaching Mathematics in the Northwestern Lehigh School District.

Approved by Northwestern Lehigh School District Board of Education
May 2020

GRADE 8 CORE MATHEMATICS

Math Unit	The Number System
PA Core Standards:	M08.A-N.1 Demonstrate an understanding of rational and irrational numbers.
Curriculum Framing Questions:	Essential Questions: - What are numbers? - How do we use numbers? Unit Questions: - What types of numbers exist on a number line? Content Questions: - How do you determine whether a number is rational or irrational? - How can you show that the rational numbers' decimal expansion terminates or repeats? - How do you convert a terminating or repeating decimal into a rational number? - How can you estimate the value of irrational numbers without a calculator? - How do you use rational approximations of irrational numbers to compare and order irrational numbers? - How can you locate and/or identify rational and irrational numbers at their approximate locations on a number line?
Desired Results, Concepts, & Competencies	Students will: - Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths). - Convert a terminating or repeating decimal into a rational number (limit repeating decimals to thousandths). - Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). <i>Example: $\sqrt{5}$ is between 2 and 3 but closer to 2.</i> - Use rational approximations of irrational numbers to compare and order irrational numbers. - Locate/identify rational and irrational numbers at their approximate locations on a number line.
Materials:	- Textbook resources - Chromebooks - Teacher Created Materials

	• Khan Academy Instructional Resources • TeacherTube • YouTube EDU • TeachersPayTeachers Resources
Assessments:	• Quizzes • Test • CDT/PSSA Review • Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts
Predicted 2-3 Weeks	

Math Unit	Expressions and Equations
PA Core Standards:	M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.
Curriculum Framing Questions:	Essential Questions: - How can relationships be modeled symbolically? - Why is mathematical language important? Unit Questions: - What is the most appropriate way of communicating a mathematical idea in a particular situation? - How do exponents affect the value of a number? Content Questions: - How can you apply properties of integer exponents to generate answers without a calculator? - How do you 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? - How can you estimate very large or very small quantities by using numbers expressed in scientific notation? - How do you perform operations with numbers expressed in scientific notation?
Desired Results, Concepts, & Competencies	Students will: - Apply one or more properties of integer exponents to generate equivalent numerical expressions without a calculator (with final answers expressed in exponential form with positive exponents). Properties will be provided. <i>Example: $3^{12} \times 3^{-15} = 3^{-3}$</i> - 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. Evaluate square roots of perfect squares (up to and including 122) and cube roots of perfect cubes (up to and including 5^3) without a calculator. <i>Example: If $x^2 = 25$ then $x = \pm\sqrt{25}$.</i> - Estimate very large or very small quantities by using numbers expressed in the form of a single digit times an integer power of 10, and express how many times larger or smaller one number is than another. <i>Example: Estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine</i>

	<i>that the world population is more than 20 times larger than the United States population.</i> • Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g., interpret 4.7EE9 displayed on a calculator as 4.7×10^9).
Materials:	• Textbook resources • Chromebooks • Teacher Created Materials • Khan Academy Instructional Resources • TeacherTube • YouTube EDU • TeachersPayTeachers Resources
Assessments:	• Quizzes • Test • CDT/PSSA Review • Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts.
Predicted 3-4 Weeks	

Math Unit	Expressions and Equations
PA Core Standards:	M08.B-E.2 Understand the connections between proportional relationships, lines, and linear equations.
Curriculum Framing Questions:	Essential Questions: - How can relationships be modeled symbolically? - Why is mathematical language important? Unit Questions: - How can line graphs help us understand mathematical relationships? Content Questions: - How do you graph proportional relationships, interpreting the unit rate as the slope of the graph? - How can you use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane? - How do you write the equation for a given line in slope-intercept form?
Desired Results, Concepts, & Competencies	Students will: - Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i> - Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. - 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.
Materials:	- Textbook resources - Chromebooks - Teacher Created Materials - Khan Academy Instructional Resources - TeacherTube - YouTube EDU - TeachersPayTeachers Resources

Assessments:	• Quizzes • Test • CDT/PSSA Review • Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts.
Predicted 3-4 Weeks	

Math Unit	Expressions and Equations
PA Core Standards:	M08.B-E.3 Analyze and solve linear equations and pairs of simultaneous linear equations.
Curriculum Framing Questions:	Essential Questions: - How can relationships be modeled symbolically? - Why is mathematical language important? Unit Questions: - How do I create, solve, and interpret one-variable equations or inequalities in real world and mathematical problems? - How can real world problems be solved algebraically? - How can I write and solve two linear equations that represent a real-life problem? Content Questions: - How do you write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions? - How do you solve linear equations? - Do you understand how to interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs? - How can you solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations? - How can you use two linear equations in two variables to solve real world mathematical problems?
Desired Results, Concepts, & Competencies	Students will: - Write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). - Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. - Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. - Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. <i>Example: $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.</i> - Solve real-world and mathematical problems leading to two linear equations in two variables.

	<i>Example: Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</i>
Materials:	• Textbook resources • Chromebooks • Teacher Created Materials • Graphing Calculator • Khan Academy Instructional Resources • TeacherTube • YouTube EDU • TeachersPayTeachers Resources
Assessments:	• Quizzes • Test • CDT/PSSA Review • Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts
Predicted 4-5 Weeks	

Math Unit	Functions
PA Core Standards:	M08.B-F.1 - Analyze and interpret functions. M08.B-F.2 - Use functions to model relationships between quantities.
Curriculum Framing Questions:	Essential Questions: - How do we use patterns and relationships in our world? - How can relationships be expressed symbolically? Unit Questions: - What is a function? - How do you use functions to model relationships between quantities? Content Questions: - How do you determine whether a relation is a function? - How can you compare properties of two functions? - How do you interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line? - Can you give examples of functions that are not linear? - How do you construct a function to model a linear relationship between two quantities? - How do you determine and interpret the rate of change? - How do you describe qualitatively the functional relationship between two quantities by analyzing a graph? - How do you sketch the graph of a function that has been described verbally?
Desired Results, Concepts, & Competencies	Students will: - Determine whether a relation is a function. - Compare properties of two functions each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions). <i>Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</i> - Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear. - Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch or determine a graph that exhibits the qualitative features of a function that has been described verbally.
Materials:	- Textbook resources - Chromebooks - Teacher Created Materials - Khan Academy Instructional Resources - TeacherTube - YouTube EDU - TeachersPayTeachers Resources
Assessments:	- Quizzes - Test - CDT/PSSA Review - Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts
Predicted 3-4 Weeks	

Math Unit	Geometry
PA Core Standards:	M08.C-G.1 Demonstrate an understanding of geometric transformations.
Curriculum Framing Questions:	Essential Questions: - How can math help me understand my world? - How can relationships be expressed symbolically? Unit Questions: - How do I use dilation, translation, reflection and rotation to understand 2 dimensional figures? Content Questions: - Can you identify and apply properties of rotations, reflections and translations? - Given two congruent figures, can you describe a sequence of transformations that exhibits the congruence between them? - Given a two-dimensional figure on a coordinate plane, can you describe the effect of dilations, translations, rotations, and reflections? - Given two similar two-dimensional figures, can you describe a sequence of transformations that exhibits the similarity between them?
Desired Results, Concepts, & Competencies	Students will: - Identify and apply properties of rotations, reflections, and translations. <i>Example: Angle measures are preserved in rotations, reflections, and translations.</i> - Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them. - Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures, using coordinates. - Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them.
Materials:	- Textbook resources - Chromebooks - Teacher Created Materials - Khan Academy Instructional Resources - TeacherTube - YouTube EDU - TeachersPayTeachers Resources
Assessments:	- Quizzes - Test - CDT/PSSA Review

	• Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts.
Predicted 3-4 Weeks	

Math Unit	Geometry
PA Core Standards:	M08.C-G.2 Understand and apply the Pythagorean theorem.
Curriculum Framing Questions:	Essential Questions: - How can math help me understand my world? - How can relationships be expressed symbolically? Unit Questions: - How are the lengths of the sides of a right triangle related? - How do I use the Pythagorean theorem in real life? Content Questions: - How do you apply the converse of the Pythagorean theorem to show a triangle is a right triangle? - Can you apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems? - How do you apply the Pythagorean theorem to find the distance between two points in a coordinate system?
Desired Results, Concepts, & Competencies	Students will: - Apply the converse of the Pythagorean theorem to show a triangle is a right triangle. - Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Figures provided for problems in three dimensions will be consistent with Eligible Content in grade 8 and below.) - Apply the Pythagorean theorem to find the distance between two points in a coordinate system.
Materials:	- Textbook resources - Chromebooks - Teacher Created Materials - Khan Academy Instructional Resources - TeacherTube - YouTube EDU - TeachersPayTeachers Resources
Assessments:	- Quizzes - Test - CDT/PSSA Review - Class sharing/discussions about activities they completed and the strategies used.

Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts.
Predicted 2-3 Weeks	

Math Unit	Geometry
PA Core Standards:	M08.C-G.3 Solve real-world and mathematical problems involving volume
Curriculum Framing Questions:	Essential Questions: - How can math help me understand my world? - How can relationships be expressed symbolically? Unit Questions: - How can we use models and/or formulas to find specific measures of selected 3D figures? Content Questions: - How do you apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems?
Desired Results, Concepts, & Competencies	Students will: Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. Formulas will be provided.
Materials:	- Textbook resources - Chromebooks - Teacher Created Materials - Khan Academy Instructional Resources - TeacherTube - YouTube EDU - TeachersPayTeachers Resources
Assessments:	- Quizzes - Test - CDT/PSSA Review - Class sharing/discussions about activities they completed and the strategies used.
Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts.
Predicted 3-4 Weeks	

Math Unit	Statistics and Probability
PA Core Standards:	M08.D-S.1 Investigate patterns of association in bivariate data.
Curriculum Framing Questions:	Essential Questions: - How can data help me organize my world? Unit Questions: - How do I display, analyze, and summarize numerical data? - How can two sets of data be displayed in order to understand if a relationship exists between them? Content Questions: - Can you construct and interpret scatter plots for bivariate measurement data? - Can you describe patterns such as clustering, outliers, positive or negative correlation, linear association, and nonlinear association? - Can you draw a line of best fit? - How do you use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept? - Can you construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects?
Desired Results, Concepts, & Competencies	Students will: - 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 correlation, linear association, and nonlinear association. - For scatter plots that suggest a linear association, identify a line of best 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. <i>Example: In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.</i> - Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible associations between the two variables. <i>Example: Given data on whether students have a curfew on school nights and whether they have assigned chores at home, is there evidence that those who have a curfew also tend to have chores?</i>

Materials:	• Textbook resources • Chromebooks • Teacher Created Materials • Khan Academy Instructional Resources • TeacherTube • YouTube EDU • TeachersPayTeachers Resources
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Differentiated Instruction Strategies:	Assessments contain differentiated material based on group mastery of the concepts.
Predicted 4-5 Weeks	