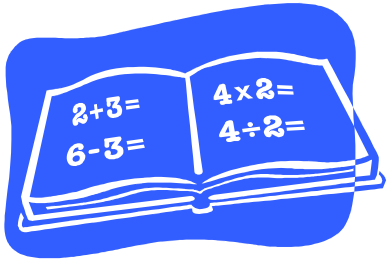
Mathematics
Grade 6



Niles Middle School Mathematics Department

SY2009-2010

September/October Grade: 6 Math

Essential Understanding: Students investigate and work with decimals using basic operations. Students use algebraic concepts and number properties to investigate patterns, write and use expressions, and write and solve one-step equations using basic operations.

Indicators:

6N13	13. Estimate reasonable solutions to problem situations involving fractions and decimals; e.g., 7/8 + 12/13 is about equal to 2 and 4.23 x 5.8 is about equal to 25.
6N11	11. Perform fraction and decimal computations and justify their solutions; e.g., using manipulatives, diagrams, mathematical reasoning.
6N8	8. Represent multiplication and division situations involving fractions and decimals with models and visual representations; e.g., show with pattern blocks what it means to take 2 2/3 ÷ 1/6.
6N10	10.Recognize that a quotient may be larger than the dividend when the divisor is a fraction; e.g., 6 ÷ 1/2 = 12.
6N12	12. Develop and analyze algorithms for computing with fractions and decimals, and demonstrate fluency in their use.
6N6	6. Use the order of operations, including the use of exponents, decimals and rational numbers, to simplify numerical expressions.
6P1	Represent and analyze patterns, rules and functions using physical materials, tables and graphs.
6P2	Use words and symbols to describe numerical and geometric patterns, rules and functions.
6P3	Recognize and generate equivalent forms of algebraic expressions, and explain how the commutative, associative, and distributive properties can be used to generate equivalent forms.
6P6	Evaluate simple expressions by replacing variables with given values, and use formulas and problem solving situations.
6N1	Decompose and recompose whole numbers using factors and exponents. Explain why squared means second power and cubed means third power.

AUTHENTIC ASSESSMENT

November/December **Grade 6** **Math**

Essential Understanding: Students investigate fraction concepts and properties, prime numbers and prime factorization. Students use GCF and LCM as they find equivalent fractions, simplify fractions, convert mixed numbers and improper fractions. Students estimate, add, and subtract fractions and mixed numbers with same and different denominators. Students solve one-step equations involving fractions.

Indicators:

6N2	Find and use the prime factorization of composite numbers.
6N2a	Use prime factorization to recognize the GCF.
6N2b	Use prime factorization to recognize the LCM.
6N2c	Apply the prime factorization to solve problems and explain solutions.
6N11	Perform fractions and decimal computations and justify their solutions; e.g. using manipulatives, diagrams, mathematical reasoning.
6N12	Develop and analyze algorithms for computing with fractions and decimals and demonstrate fluency in their use.
6N13	Estimate reasonable solutions to problem situations involving fractions and decimals; e.g. 7/8 + 12/13 =2 and 4.23 x 5.8 + 25.

AUTHENTIC ASSESSMENT

January/February **Grade 6** **Math**

Essential Understanding: Students multiply/divide fractions and mixed numbers; students write and equations using fractions. Students work with ratios and proportions in relation to scale drawings. Students explore the relationships between fractions, decimals, and percents; and find percents of numbers and estimate percents.

Indicators:

6N8,6N11, 6N12,6N13	Support and Review
6N9	Give examples of how ratios are used to represent comparisons; e.g. part to part, part to whole, whole to part.
6N5	Use models and pictures to relate concepts of ratio, proportions and percent including percents less than 1 and greater than 100.
6N14	Use proportional reasoning, ratios and percents to represent problem situations and determine the reasonableness of solutions.
6N15	Determine the percent of a number and solve related problems; e.g. find the percent of a markdown if the original price was $140 and the sale price was $100.
6G6	Draw similar figures that model proportional relationships; e.g. model similar figures with a 1 to 2 relationship by sketching two of the same figure, one with corresponding sides twice the length of the other.

AUTHENTIC ASSESSMENT

March /April **Grade 6 Math**

Essential Understanding: Students will identify points, lines, planes; measure angles and figure sides; identify and classify figures. Students will identify congruency, similarity and symmetry. Students will use metric system, compare different units and identify 3-dimensional figures.

Indicators:

6G1	Classify and describe two-dimensional and three-dimensional geometric figures and objects by using their properties: e.g. interior angle measures, perpendicular/parallel sides, congruent angles/sides.
6G2	Use standard language to define geometric vocabulary: vertex, face, altitude, diagonal, isosceles, equilateral, acute, obtuse, and other vocab. as appropriate.
6G3	Use multiple classification criteria to classify triangles; e.g., right scalene triangle.
6G4	Identify and define relationships between planes; i.e., parallel, perpendicular and intersecting.
6G5	Predict and describe sizes, positions and orientations of two-dimensional shapes after transformations such as reflections, rotations, translations, and dilations.
6G6	Draw similar figures that model proportional relationships; e.g. model similar figures with a 1 to 2 relationship by sketching two of the same figure, one with corresponding sides twice the length of the other.
6G7	Build three-dimensional objects with cubes, and stretch the two-dimensional representations of each side; i.e.
6M1	Understand and describe the difference between surface area and volume.
6M2	Use strategies to develop formulas for finding circumference and area of circles, and to determine the area of sectors; e.g. ½ circle, 2/3 circle, 1/3 circle, ¼ circle.
6M3	Estimate perimeter or circumference and area for circles, triangles and quadrilaterals, and surface area and volume for prisms and cylinders by: a. Estimating lengths using string or links, areas using tiles or grid, and volumes using cubes; b. Measuring attributes (diameter, side lengths, or heights) and using established formulas for circles, triangles, rectangles, parallelograms, and rectangular prisms.
6M4	Determine which measure (perimeter, area, surface area, and volume) matches the context for a problem situation; e.g., perimeter is the context for fencing a garden, surface area is the context for painting a room.

AUTHENTIC ASSESSMENT

March /April - *continued* **Grade 6**

<u>Essential Understanding</u>: Students will identify points, lines, planes; measure angles and figure sides; identify and classify figures. Students will identify congruency, similarity and symmetry. Students will use metric system, compare different units and identify 3-dimensional figures.

Indicators:

6M5	Understand the difference between perimeter and area, and demonstrate that two shapes may have the same perimeter, but different areas or may have the same area, but different perimeters.
6M6	Describe what happens to the perimeter and area of two dimensional shape when the measurements of the shape are changed; e.g. length of the sides are doubled.

<u>AUTHENTIC ASSESSMENT</u>

May **Grade 6**

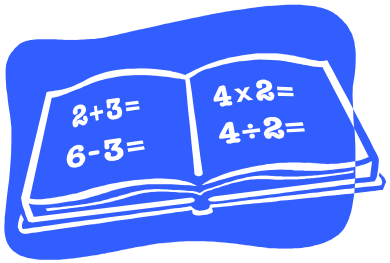
<u>Essential Understanding</u>: Students will explore theoretical and experimental probability, work with tree diagrams and the counting principle, and use permutations. Students will work with equations and algebraic concepts by exploring and solving inequalities, square roots, and rational numbers. Students will explore the Pythagorean Theorem.

Indicators:

6D1	Read, construct and interpret line graphs, circle graphs and histograms.
6D2	Select, create and use graphical representations that are appropriate for the type of data collected.
6D3	Compare representations of the same data in different types of graphs such as a bar graph and circle graph.
6D4	Understand the different information provided by measures of center (mean, mode, and median) and measures of spread (range).
6D5	Describe the frequency distribution of a set of data, as shown in a histogram or frequency table by general appearance of shape; e.g. number of modes, middle of data, level of symmetry, outliers.
6D6	Make logical inferences from statistical data.
6D7	Design an experiment to test the theoretical probability and explain how the results may vary.
6P4	Solve simple linear equations and inequalities using physical model, paper and pencil, tables and graphs.
6N3	Explain why a number is referred to as being "rational", and recognize that the expression a/b can mean a part of size 1/b each, and divided by b, or the ratio of a to b.
6N7	Use simple expressions involving integers to represent and solve problems; e.g. if a running back loses 15 yards on the first carry, but gains 8 yards on the second carry, what is the net gain/loss?

<u>AUTHENTIC ASSESSMENT</u>

Mathematics
Grade 7



Niles Middle School Mathematics Department

SY2009-2010

September **Grade: 7** **Math**

Essential Understanding: Real numbers are classified by their properties and manipulated using a set order.

Indicators:

7N1 Demonstrate an understanding of place value using powers of 10 and write large numbers in scientific notation.

7N2 Explain the meaning of exponents that are negative or 0.

7N3 Describe difference between rationale and irrational numbers: e.g. use technology to show that some numbers (rational) can be expressed as terminating or repeating decimals and others (irrational) as non-terminating and non-repeating decimals.

7N4 Use order of operation and properties to simplify numerical expressions involving integers, fractions and decimals.

7N5 Explain the meaning and effect of adding, subtracting multiplying and dividing integers (how adding two integers can result in a lesser value)

7N6 Simplify numerical expressions involving integers and use integers to solve real-life problems.

7N7 Solve problems using the appropriate form of a rational number (fraction, decimal, percent)

7N8 Develop and analyze algorithms for computing with % and integers and demonstrate fluency in their use.

AUTHENTIC ASSESSMENT

October **Grade: 7 Math**
Essential Understanding: Students understand the importance of being able to read and represent data and know what specific parts of data mean

Indicators:

7D3 Analyze a set of data by using and comparing combinations of measures of center (mean, mode, median) and measures of spread (range, quartile, interquarile range) and describe how the inclusion or exclusion of outliers affects those measures. (box & whisker & frequency)

7N9 Represent and solve problem situations that can be modeled by and solved using concepts of absolute value, exponents and square roots (for perfect squares)

AUTHENTIC ASSESSMENT

November **Grade: 7** **Math**

Essential Understanding: students evaluate and write algebraic expressions and write and solve both one-step and two-step equations. They will draw upon their understanding of expressions and equations to graph, write and solve inequalities.

Indicators:

7P7 Justify two forms of an algebraic expression are equivalent and recognize when an expression is simplified. (4m= m+m+m+m)

7P4 Create visual representations of equation-solving processes that model the use of inverse operations.

7P10 Analyze linear and simple nonlinear relationships to explain how a change in one variable results in the change of another.

7P11 Use graphing calculators or computers to analyze change (distance-time relationships)
, formula.

AUTHENTIC ASSESSMENT

December **Grade: 7** **Math**

Essential Understanding: students study patterns, sequences and functions as they interpret and use tables, rules, graphs and formulas

Indicators:

7P1 Represent and analyze patterns, rules and functions with words, tables, graphs and simple variable expressions.

7P2 Generalize patterns by describing in words how to find the next term.

7P3 Recognize and explain when numerical patterns are linear or nonlinear progressions; 1, 3, 5, 7 is linear and nonlinear is 1, 3, 4, 8, 16

7P5 Represent linear equations by plotting points in the coordinate plane

7P6 Represent inequalities on a number line or a coordinate plane.

7P9 Recognize a variety of uses for variable (placeholder for an unknown quantity in an equation, generalize for a pattern

AUTHENTIC ASSESSMENT

January **Grade: 7** **Math**

Essential Understanding: Students will build their knowledge of geometric concepts by estimating and finding the area of triangles, parallelograms and other polygons. They also find the area and circumference of circles, as well as surface area and volume of rectangular prisms and cylinders. In addition they learn about squares and square roots in preparation for Pythagorean theorem.

Indicators:

7M2 convert units of area and volume within the same measurement system using proportional reasoning and reference table when appropriate (sq. ft to sq. yds)

7M4 Solve problems involving proportional relationships and scale factors (scale models that require unit conversions within the same measurement system)

7M3 Estimate a measurement to a greater degree of precision than the tool provides.

7M6 Use strategies to develop formulas for finding area trapezoids and volume of cylinders and prisms.

7M7 Develop strategies to find the area of composite shapes using the areas of triangles, parallelograms

7M8 Understand the difference between surface area and volume and demonstrate that two objects may have the same surface area, but different volumes or may have the same volume, but different surface.

7M9 Describe what happens to the surface area of volume of a three-dimensional object when the measurements of the object are changes (length of sides are doubled)

7M5 Analyze problem situations involving measurement concepts, select appropriate strategies and use an organized approach to solve narrative and increasingly complex problems.

7P8 Use formulas in problem-solving situations

AUTHENTIC ASSESSMENT

February **Grade: 7** **Math**

Essential Understanding: Work to understand geometry concepts by learning about properties of lines and angles and measurements and other geometrical shapes.

Indicators:

7G2 Determine sufficient (not necessarily minimal) properties that define a specific two-dimensional figure or three-dimensional object

7G2a – determine when one set of figures is a subset of another (all squares are rectangles)

7G2b - develop a set of properties that eliminates all but the desired figure (only squares are quadrilaterals with all sides congruent and all angles congruent.)

7G3 Use and demonstrate understanding of properties of triangles

7G7 Identify the line and rotation symmetries of two-dimensional figures to solve problems.

7G8 Perform translations, reflection, rotations and dilations of two-dimensional figures using a variety of methods, paper-folding, tracing, graph paper)

7G9 Draw representations of three-dimensional geometric objects form different views.

AUTHENTIC ASSESSMENT

March **Grade: 7** **Math**

Essential Understanding: Use and understand proportional reasoning to identify missing measurements of geometrical figures.

Indicators:

7G1 Use proportional reasoning to describe and express relationships between parts and attributes of similar congruence.

7G4 Determine necessary conditions for congruence triangles.

7G5 Apply properties of congruence or similar triangles to solve problems involving missing lengths and angle measures.

7G6 Determine and use scale factors for similar figures to solve problems using proportional reasoning.

7D1 Read, create and interpret box and whisker plots, stem and leaf plots and other types of graphs when appropriate.

7D2 Analyze how decisions about graphing affect the graphical representation (scale, size of classes in a histogram, number of categories in a circle graph)

AUTHENTIC ASSESSMENT

April Grade: 7 Math

Essential Understanding: Using both theoretical and experimental probability. They find the probability of both simple and compound events.

Indicators:

7D7 Compute probabilities of compound events (multi-coin tosses or multiple rolls of number cubes such as methods organized lists, tree diagrams etc.

7D8 Make predictions based on theoretical probabilities, design and conduct an experiment to test the predictions, compare actual results to predict results and explain differences.

AUTHENTIC ASSESSMENT

May **Grade: 7** **Math**

Essential Understanding: Understand how to compare data from different types of graphs and charts. Identify data that is misused in graphs and charts.

Indicators:

7D4 Construct opposing arguments based on analysis of the same data, using different graphical representations.

7D5 Compare data from two or more samples to determine how sample selection can influence results.

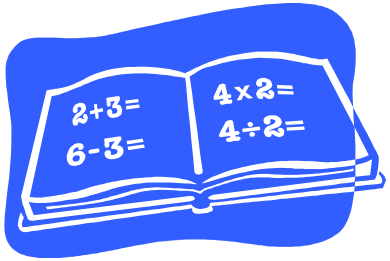
7D6 Identify misuse of statistical data in articles, advertisements and other media

AUTHENTIC ASSESSMENT

Mathematics

Fundamental

Grade 8



Niles Middle School Mathematics Department

SY2009-2010

September: 8th Grade Math
Essential Understanding: Data can be displayed as Measures of Central Tendency. Real numbers are manipulated using a set order.

Indicators:

8N3 Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals.

8N4 Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.

8P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

8D4 Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, interquartile range, percentiles).

8D5 Explain the mean's sensitivity to extremes and its use in comparison with the median and mode.

AUTHENTIC ASSESSMENTS

October 8th Grade Math
Essential Understanding: Algebra is interpreted with equations and graphs. Real numbers are classified by their properties.

Indicators:

8N4 Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.

8N5 Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.

8P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.

8P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

8P9 Solve linear equations and inequalities graphically, symbolically and using technology.

AUTHENTIC ASSESSMENTS

November **8th Grade Math**

Essential Understanding: Students graph points and equations in the coordinate plane. They will use graphing equations to solve problems and solve linear systems by graphing. In additions, they learn to translate, reflect, and rotate figures.

Indicators:

N5 Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.

G4 Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.

G5 Draw the results of translations, reflections, rotations and dilations of objects in the coordinate plane, and determine properties that remain fixed; e.g., lengths of sides remain the same under translations.

P4 Extend the uses of variables to include co-variants where *y* depends on *x*.

P6 Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and *y*-intercept in real-world problems.

P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

P9 Solve linear equations and inequalities graphically, symbolically and using technology.

P10 Solve 2 by 2 systems of linear equations graphically and by simple substitution.

P11 Interpret the meaning of the solution of a 2 by 2 system of equations; i.e., point, line, no solution.

P13 Compute and interpret slope, midpoint and distance given a set of ordered pairs.

P15 Describe and compare how changes in an equation affects the related graphs; e.g., for a linear equation changing the coefficient of *x* affects the slope and changing the constant affects the intercepts.

AUTHENTIC ASSESSMENTS

December **8th Grade Math**

Essential Understanding: Students use their prior knowledge of fractions and integers as they learn how to compare, order, and simplify rational numbers, and to add subtract, multiply and divide them. They also explore square roots and irrational numbers, and work with the Pythagorean theorem. Students learn about ratios, rates, and proportions. They use proportions to solve problems involving similar polygons, scale models, and indirect measurement.

Indicators:

N2 Recognize that natural numbers, whole numbers, integers, rational numbers and irrational numbers are subsets of the real number system.

N4 Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.

N5 Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.

N6 Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.

N7 Find the square root of perfect squares, and approximate the square root of non-perfect squares as consecutive integers between which the root lies; e.g., _1_3_0_ is between 11 and 12.

M6 Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.

M9 Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)

AUTHENTIC ASSESSMENTS

December ***Continued*** **8th Grade Math**

Essential Understanding: Students use their prior knowledge of fractions and integers as they learn how to compare, order, and simplify rational numbers, and to add subtract, multiply and divide them. They also explore square roots and irrational numbers, and work with the Pythagorean theorem. Students learn about ratios, rates, and proportions. They use proportions to solve problems involving similar polygons, scale models, and indirect measurement.

Indicators:

P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.

P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

M1 Compare and order the relative size of common U.S. customary units and metric units; e.g., mile and kilometer, gallon and liter, pound and kilogram.

M2 Use proportional relationships and formulas to convert units from one measurement system to another; e.g., degrees Fahrenheit to degrees Celsius.

M3 Use appropriate levels of precision when calculating with measurements.

M7 Apply proportional reasoning to solve problems involving indirect measurements or rates.

G3 Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).

G4 Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.

P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.

P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

AUTHENTIC ASSESSMENTS

January **8th Grade Math**

Essential Understanding: **Students learn about percents and solve a variety of percent problems using different methods. They estimate percents and find percents using proportions and equations and apply skills to real-world situations as they find discounts and markups and work with both simple and compound interest. They investigate probability. Students use scientific notation and will simplify equations with exponents.**

Indicators:

N5 Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.

N6 Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.

P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.

P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

P16 Use graphing calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.

D11 Demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another can be found by multiplying the probabilities.

N1 Use scientific notation to express large numbers and small numbers between 0 and 1.

N8 Add, subtract, multiply, divide and compare numbers written in scientific notation.

P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.

P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.

AUTHENTIC ASSESSMENTS

February **8th Grade Math**

Essential Understanding: Students will solve problems by learning and using the properties of pairs of angles, of parallel lines, and polygons and circles. They will find areas of parallelograms, triangles, trapezoids, and circles, and make constructions.

Indicators:

G2 Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.

P2 Generalize patterns and sequences by describing how to find the *n*th term.

P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.

M8 Find the sum of the interior and exterior angles of regular convex polygons with and without measuring the angles with a protractor.

M9 Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)

AUTHENTIC ASSESSMENTS

March 8th Grade Math

Essential Understanding: Students continue their study of geometric concepts as they identify and draw different solid figures. They apply formulas to find the surface area and volume of prisms. Pyramids, cylinders, and cones.

Indicators:

G1 Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three dimensional objects.

G3 Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).

G6 Draw nets for a variety of prisms, pyramids, cylinders and cones.

M4 Derive formulas for surface area and volume and justify them using geometric models and common materials. For example, find:

a. the surface area of a cylinder as a function of its height and radius;
b. that the volume of a pyramid (or cone) is one-third of the volume of a prism (or cylinder) with the same base area and height.

M5 Determine surface area for pyramids by analyzing their parts.

M9 Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)

M10 Use conventional formulas to find the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones to a specified level of precision.

AUTHENTIC ASSESSMENTS

April 8th Grade Math

Essential Understanding: Students learn to read graphs critically and to make various kinds of graphs. They work with stem-and-leaf plots, box-and-whisker plots, scatter plots, and circle graphs. They draw upon their understanding of graphs to choose the appropriate graph for a given set of data.

Indicators:

D1 Use, create and interpret scatter plots and other types of graphs as appropriate.

D2 Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose; e.g., line graph for change over time, circle graph for part-to-whole comparison, scatter plot for relationship between two variants.

D4 Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, interquartile range, percentiles).

D6 Make conjectures about possible relationship in a scatterplot and approximate line of best fit.

D9 Construct convincing arguments based on analysis of data and interpretation of graphs.

AUTHENTIC ASSESSMENTS

May 8th Grade Math

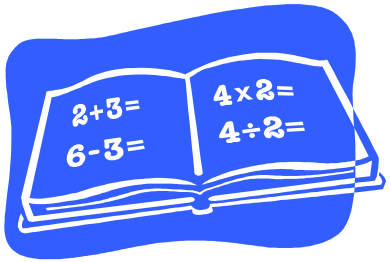
Essential Understanding: Students investigate the concepts of permutations and combinations, theoretical and experimental probability, and explore the distinction between independent and dependent events. Students will count outcomes by investigating the concepts of permutations and combinations. They will learn about theoretical and experimental probability and explore the distinction between independent and dependent events.

Indicators:

D7 Identify different ways of selecting samples, such as survey response, random sample, representative sample and convenience sample.
D8 Describe how the relative size of a sample compared to the target population affects the validity of predictions.
D10 Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important.
D11 Demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another can be found by multiplying the probabilities.
P1 Relate the various representations of a relationship; i.e., relate a table to graph, description and symbolic form.
P2 Generalize patterns and sequences by describing how to find the *n*th term.
P3 Identify functions as linear or nonlinear based on information given in a table, graph or equation.
P4 Extend the uses of variables to include covariants where y depends on x.
P5 Use physical models to add and subtract monomials and polynomials, and to multiply a polynomial by a monomial.
P7 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.
P8 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.
P12 Solve simple quadratic equations graphically; e.g., $y = x2 - 16$.
P13 Compute and interpret slope, midpoint and distance given a set of ordered pairs.
P14 Differentiate and explain types of changes in mathematical relationships, such as linear vs. nonlinear, continuous vs. non-continuous, direct variation vs. inverse variation.
D3 Differentiate between discrete and continuous data and appropriate ways to represent each.

AUTHENTIC ASSESSMENTS

Mathematics
Grade 8
PRE-ALGEBRA



Niles Middle School Mathematics Department

SY2009-2010

September **Grade: 8** **Math**

Essential Understanding: Real #'s are classified by their properties and manipulated using a set order.)

Indicators:

8N2 recognize that natural numbers, whole numbers, integers, rational numbers and irrational numbers are subsets of the real number system.

8N3 Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals.

8N4 Explain and use inverse and indentify properties and use inverse relationships (adding/subtracting, multiplying/dividing, squaring/square roots in problem-solving situations.

8N5 Determine when an estimate is sufficient and when an exact answer is needed in problem solving situations, and evaluate estimates in relation to actual answers (very close, less than, greater than.)

8P2 Generalize patterns and sequences by describing how the find the Nth term.

8P8 Write, simplify and evaluate algebraic expressions (including formulas to generalize situations and solve problems.

8M3 Use appropriate levels of precision when calculating with measurement

8N7 Find the square root of perfect squares and approximate the square root of non-perfect squares as consecutive integers between which the root lies (sq. rt of 130 is between 11 and 12)

AUTHENTIC ASSESSMENT

October **Grade: 8 Math**
Essential Understanding: Algebra is interpreted with equations and graphs.

Indicators:

8P7 Use symbolic algebra (equations and inequalities) graphs and tables to represent situations and solve problems.

8P9 Solve linear equations and inequalities graphically and using technology

8P3 Identify functions as linear or nonlinear based on information given in a table, graph or equation.

8P4 Extend the uses of variables to include co-variants where y depends on x.

8D3 Differentiate between discrete and continuous data and appropriate ways to represent each other.

8P16 Use graphing calculators or computers to analyze change (interest compounded over time as a nonlinear growth pattern.)

AUTHENTIC ASSESSMENT

November Grade: 8 Math

Essential Understanding: Data can be displayed as measures of central tendency. Unknown quantities are compared with known units.

Indicators:

8D4 Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, interquartile range, percentiles).

8D5 Explain the mean's sensitivity to extreme and its use in comparison with the median mode.

8M1 Compare and order the relative size of common U.S. customary units and metric units (mile-kilometer, gallon-liter, pound-kilogram)

8M2 Use proportional relationships and formulas to convert units from one measurement system to another (degrees Fahrenheit to degrees Celsius)

AUTHENTIC ASSESSMENT

December/January **Grade: 8** **Math**

Essential Understanding: Scientific notation simplifies large and small #'s. Equations are described and compared using different forms.

Indicators:

8N1 Use scientific notation to express large numbers and small numbers between 1 and 0

8N8 Add, subtract, multiply, divide and compare numbers written in scientific notation.

8P13 Compute and interpret slope, midpoint and distance given a set of ordered pairs.

8P14 Differentiate and explain types of changes in mathematical relationships such as linear vs. nonlinear, continuous vs. non-continuous, direct variations vs. inverse variation.

8D1 Use, create and interpret scatter plots and other types of graphs as appropriate.

8D6 Make conjectures about possible relationships in scatter plots and approximate line of best fit.

8P1 Relate the various representations of a relationship (relate a table to graph, description and symbolic form)

8P6 Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and Y-intercept in real-world problems.

8P15 Describe and compare how changes in an equation affects the related graphs (for a linear equation changing the coefficient of X affects the slope and changing the constant affects the intercepts.

AUTHENTIC ASSESSMENT

February **Grade: 8** **Math**

Essential Understanding: A solution of a system of equations can take many representations. Lines form a variety of shapes and angles.

Indicators:

8P10 Solve 2 by 2 systems of linear equations graphically and by simple substitution.

8P11 Interpret the meaning of a solution of a 2 by 2 system of equations (point line no solution)

8G1 Make and test conjectures about characteristics and properties (sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.

8G2 Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.

8G5 Draw the results of translations, reflections, rotations and dilations of object in the coordinate plane, and determine properties that remain fixed (lengths of sides remain the same under translations.)

8G6 Draw nets fro a variety of prisms, pyramids, cylinders and cones.

8G4 Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex

AUTHENTIC ASSESSMENT

March **Grade: 8 Math**

Essential Understanding: Students continue their study of geometric concepts as they identify and draw different solid figures. They apply formulas to find the surface area and volume of prisms. Pyramids, cylinders, and cones

Indicators:

8M8 Find the sum of the interior and exterior angles of regular convex polygons with and without measuring the angles with a protractor.

8M9 Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones) Only volume should be calculated for spheres and cones.

8M4 Derive formulas for surface area and volume and justify them using geometric models and common materials. For example: FIND…

- **8M4a** the surface area of a cylinder as a function of its height and radius
- **8M4b** that the volume of a pyramid (or cone) is one-third of the volume of a prism (or cylinder) with the same base area and height.

8M5 Determine surface area for pyramids by analyzing their parts.

8M10 Use conventional formulas to find the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones to a specified level of precision.

8D2 Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose (line graph for change over time, circle graph for part-to-whole comparison, scatter plot for relationship between two variants.

AUTHENTIC ASSESSMENT

April **Grade: 8** **Math**

Essential Understanding: Rational #'s have many properties and uses. Analyze and interpret data utilizing different representations.

Indicators:

8N6 Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent and judge reasonableness of solutions.

8M6 Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.

8M7 Apply proportions reasoning to solve problems involving indirect measurements or rates.

8G3 Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures.

8D7 Identify different ways of selecting samples, such as survey response, random sample, representative sample, and convenience sample.

8D8 Describe how the relative size of a sample compared to the target population affects the validity of the prediction

8D9 Construct convincing arguments based on analysis of data and interpretation of graphs.

8D10 Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important

8D11 demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another ca be found by multiplying the probabilities.

AUTHENTIC ASSESSMENT

May Grade: 8 Math

Essential Understanding: Rational #'s have many properties and uses. Analyze and interpret data utilizing different representations.

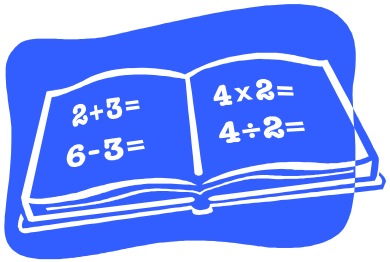
Indicators:

8P5 Use physical models to add and subtract monomials and polynomials and to multiply a polynomial by a monomial.

8P12 Solve simple quadratic equations graphically $y = x^2 - 16$

AUTHENTIC ASSESSMENT

Mathematics
Grade 8
ALGEBRA



Niles Middle School Mathematics Department

SY2009-2010

September Grade: 8 – Algebra I

Essential Understanding: Real numbers are classified by their properties and manipulated using a set order.

Indicators:

9N1 Identify and justify whether properties (closure, identity, inverse, commutative and associative) hold for a given set of operations (even integer and multiplication)

9N2 Compare order and determine equivalent forms for rational and irrational numbers.

9N3 Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities.

9N4 Demonstrate fluency in computations using real numbers.

9N5 Estimate the solutions for problem situations involving square and cube roots.

9P1 Define function with ordered pairs in which each domain element is assigned exactly one range element.

9P5 describe and compare characteristics of the following families of functions: linear, quadratic, and exponential functions – general shape, number of roots, domain, range, rate of change, maximum or minimum.

9M1 Convert rates within the same measurement system (miles per hour to feet per second, kilometers per hour to meters per second.)

9M2 Use unit analysis to check computations involving measurement.

9M5 Solve problems involving unit conversion for situations involving distances, areas, volumes, rates within the same measurement system.

AUTHENTIC ASSESSMENT

October **Grade: 8 – Algebra I**

Essential Understanding: Linear equations can be solved using different methods.

Indicators:

9M3 Use ratio of lengths in similar two-dimensional figures or three-dimensional objects to calculate the ratio of their areas or volumes respectively.

9G2 Apply proportions and right triangles trigonometric ratios to solve problems involving missing lengths and angle measures in similar figures.

9D1 Classify data as univaritate (single variable) or bivariate (two variables) and as quantitative (measurement) or qualitative (categorical) data.

AUTHENTIC ASSESSMENT

November **Grade: 8 – Algebra I**
Essential Understanding: Equations and inequalities have different forms and representations.

Indicators:

9P6 Write and use equivalent forms of equations and inequalities in problem situations; e.g. changing a linear equation to the slope-intercept form.

9P13 Model and solve problems involving direct and inverse variations using proportional reasoning.

9P14 Describe the relationship between slope and the graph of a direct variation and inverse variation.

9P15 Describe hoe a change in the value of a constant in a linear or equadratic equation affects the related graphs.

AUTHENTIC ASSESSMENT

December/January **Grade: 8 – Algebra I**

Essential Understanding: Equalities are represented in various forms (graph symbols).

Indicators:

9P2 Generalize patterns using functions or relationships (linear, quadratic and exponential) and freely translate among tabular, graphical and symbolic representations.

9P3 Describe problem situations (linear, quadratic and exponential) by using tabular, graphical and symbolic representations.

9P4 Demonstrate the relationship among zeros of a function, roots of equations, and solutions of equations graphically in words.

9P8 Find linear equations that represent lines that pass through a given set of ordered pairs, and find linear equations that represent lines parallel or perpendicular to a given line through a specific point.

9D2 Create a scatter plot for a set of bivariate data, sketch the line of best fit and interpret the slope of the line of best fit.

AUTHENTIC ASSESSMENT

February **Grade: 8 – Algebra I**
Essential Understanding: There are multiple methods for solving systems of equations.

Indicators:

9P9 Solve and interpret the meaning of 2 by 2 systems of linear equations graphically, by substitution and by elimination, with and without technology.

9D2 Create a scatter plot for a set of bivariate data, sketch the line of best fit and interpret the slope of the line of best fit.

AUTHENTIC ASSESSMENT

March Grade: 8 – Algebra I
Essential Understanding: Data is described and analyzed through probability, combinations, and plots. equations

Indicators:

9D3 Analyze and interpret frequency distributions based on spread, symmetry, skewness, clusters and outliers.

9D4 Describe and compare various types of studies (survey, observation, experiment) and indentify possible misuses of statistical data.

9D5 Describe characteristics and limitations of sampling methods and analyze the effect of random versus biased sampling (determine and justify whether the sample is likely to be representative of the population).

9D6 Make inferences about relationships in bivariate data and recognize the difference between evidence of relationship (correlation) and causation.

9D7 Use counting techniques and the Fundamental Counting principle to determine between evidence of relationship (correlation) and causation.

9D8 Describe, create and analyze a sample space and use it to calculate probability.

9D9 Identify situations involving independent and dependent events and explain differences between and common misconceptions about probabilities associated with those events

9D10 Use theoretical and experimental probability, including simulations or random numbers to estimate probabilities and to solve problems dealing with uncertainly (compound events, independent events, simple dependent events.

9P7 Use formulas to solve problems involving exponential growth and decay.

AUTHENTIC ASSESSMENT

April Grade: 8 – Algebra I
Essential Understanding: Evaluate quadratic equations by algebraic manipulation and graphing.

Indicators:

9G3 Analyze two-dimensional figures in coordinate plane (use slope and distance formulas to show that a quadrilateral is a parallelogram.

9P10 Solve quadratic equations with real roots by factoring, graphing, using the quadratic formula with and without technology.

AUTHENTIC ASSESSMENT

May **Grade: 8 – Algebra I**
Essential Understanding: Unknown measurements are found by using trig ratios. Polynomials can be simplified.

Indicators:

9M4 Use scale drawing and right triangle trigonometry to solve problems that include unknown distances and angle measurers.

9G1 Define the basic trigonometric ratios in right triangles: sine, cosine and tangent.

AUTHENTIC ASSESSMENT