

Fayette County Public Schools – Big Rocks for Elementary, Middle, and High School Mathematics

This document is a list of “big ideas” that are essential to mastery of grade-level content and is not to be interpreted as a complete list of all topics to be taught. Content vocabulary should be an emphasis at ALL grade levels. Math Practice Standards should be embedded throughout.

Kindergarten:

- 1) Know number names and the count sequence. Count (forward) to 100 by 1’s and 10’s and count forward or backward from a given number within 30.
- 2) Identify and write numbers 1 to 20.
- 3) Count to tell the number of objects to 20. Count out objects to represent a number to 20.
- 4) Compare numbers (greater than, less than, or equal to) another number within 20.
- 5) Tell the **next** number that is one more (or one larger) and the number **before** that is one less (or one fewer), within numbers to 20.
- 6) Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. **Required fluency: Add and subtract within 5 using mental math.**
- 7) Work with numbers 11–19 to gain foundations for place value.
- 8) Add to a given number to make 10 and record answer with drawings and equations.
- 9) Describe and compare measureable attributes.
- 10) Classify objects and count the number of objects in categories.
- 11) Identify, describe, create, compare, and compose 2D and 3D shapes (square, circle, rectangle, triangle, hexagon, cube, cone, cylinder, and sphere).

1st Grade:

- 1) Count to 120 starting at any given number.
- 2) Read, write, and represent any given numeral between 0 and 120.
- 3) Compare numbers (greater than, less than, or equal to) another number within 120.
- 4) Represent and solve problems involving addition and subtraction.
- 5) Understand and apply properties of operations and the relationship between addition and subtraction to add and subtract within 20. **Required fluency: Add and subtract within 10.**
- 6) Work with addition and subtraction equations within 100, using different strategies, including models. Work with 3 types of addition and subtraction problems: result unknown, change unknown, and start unknown. Model add-to, take-from, put-together, take-apart, with models.
- 7) Understand the position of each digit in a number impacts the quantity of a number.
- 8) Use place value understanding and properties of operations to add and subtract.
- 9) Measure lengths indirectly and by iterating length units. Order 3 objects by length.
- 10) Tell and write time, to the hour and half hour, using *both* analog and digital clocks.
- 11) Represent data in a chart or table and interpret data (up to 3 categories).
- 12) Recognize and understand patterns in a 0-99 chart and a hundreds chart.
- 13) Reason with shapes and their attributes (sort, compare, compose, decompose, and partition into equal parts (halves, fourths)).

Fayette County Public Schools – Big Rocks for Elementary, Middle, and High School Mathematics

This document is a list of “big ideas” that are essential to mastery of grade-level content and is not to be interpreted as a complete list of all topics to be taught. Content vocabulary should be an emphasis at ALL grade levels. Math Practice Standards should be embedded throughout.

2nd Grade:

- 1) Count to 1000 by 1s, 5s, 10s, and 100s.
- 2) Read, model, and write numbers to 1000 using base-ten numerals, number names, diagrams, number sentences, and expanded form.
- 3) Compare two 3-digit numbers based on the values of the hundreds, tens, and ones digits.
- 4) Use place value understanding and properties of operation to represent and solve problems involving addition and subtraction.
- 5) **Required fluency: Recall from memory all single-digit sums and differences within 20.**
- 6) **Required fluency: Fluently add and subtract 2-digit numbers within 100.**
- 7) Work with equal groups of objects to gain foundations for multiplication.
- 8) Explain the value of each digit in a 3-digit number including zeros in the tens or ones place. Understand the difference between place and value.
- 9) Measure and estimate lengths in standard units. Relate addition and subtraction to length.
- 10) Count and solve word problems with pennies, nickels, dimes, quarters, bills, symbols.
- 11) Use charts, tables, and surveys to collect and graph data on a bar graph or pictograph.
- 12) Describe plane figures (sides, corners, angles) and solid figures (faces, edges, vertices).
- 13) Identify and represent fractional parts of a whole (halves, thirds, fourths).

3rd Grade:

- 1) Represent and solve problems involving multiplication and division. **Required fluency: Single-digit products and quotients from memory by end of Grade 3.**
- 2) Understand properties of multiplication *and the relationship* between multiplication and division. **Required fluency: Multiply and divide within 100.**
- 3) Solve problems involving the four operations, and identify and explain patterns in arithmetic.
- 4) Use place value understanding and properties of operations to perform multi-digit arithmetic. **Required fluency: Add and subtract within 1000.**
- 5) Develop understanding of fractions as numbers (beginning with unit fractions).
- 6) Represent fractions on a number line.
- 7) Compare fractions of denominators 2,3,4,6, and 8 using a visual fraction model.
- 8) Generate equivalent fractions of denominators 2,3,4,6, and 8.
- 9) Solve problems involving measurement (nearest $\frac{1}{4}$ inch), elapsed time, liquid volumes, and masses of objects.
- 10) Collect, represent, and interpret data on line plots.
- 11) Understand concept of area. Relate area to multiplication and to addition through use of arrays.
- 12) Solve problems involving perimeters of polygons. Distinguish between perimeter and area.
- 13) Reason with two-dimensional shapes and their attributes (sort, compare, classify, describe examples, describe nonexamples).

Fayette County Public Schools – Big Rocks for Elementary, Middle, and High School Mathematics

This document is a list of “big ideas” that are essential to mastery of grade-level content and is not to be interpreted as a complete list of all topics to be taught. Content vocabulary should be an emphasis at ALL grade levels. Math Practice Standards should be embedded throughout.

4th Grade:

- 1) Generalize and use place value understanding and properties of operations to perform multi-digit arithmetic.
Required fluency: Add and subtract within 1,000,000.
- 2) Use the four operations with whole numbers to solve problems, including word problems.
- 3) Multiply 4x1 and 2x2 numbers and find quotients and remainders with up to 4-digit dividends and 1 digit divisors.
- 4) Find factors and multiples of a number.
- 5) *Extend* 3rd grade understanding of fraction equivalence and ordering to include denominators of 5, 10, 12, and 100 using visual fraction models.
- 6) Add and subtract proper fractions, improper fractions, and mixed numbers with **like denominators**, using visual fraction models and equations. Build fractions from unit fractions.
- 7) Multiply a fraction by a whole number using models and equations.
- 8) Understand decimal notation. Compare two decimals to hundredths.
- 9) Locate fractions and decimals on a number line.
- 10) Solve problems involving measurement *and conversion* of measurements from a larger unit to a smaller unit (including ALL standard measures, ALL metric measures, money, and time).
- 11) Represent and interpret data.
- 12) Use area and perimeter to solve for unknown measures.
- 13) Understand concepts of angle and measure angles. Draw and identify lines and angles; classify shapes by properties of their lines and angles (including parallel, perpendicular, and symmetry).
- 14) Generate both number and shape patterns that follow a rule and analyze patterns.

5th Grade:

- 1) Understand the place value system, including decimals to hundredths.
- 2) Perform all four operations with multi-digit whole numbers including order of operations (including parentheses and brackets). **Required fluency: Multi-digit multiplication (3- or 4-digit number multiplied by a 2- or 3-digit number).**
- 3) Add, subtract, multiply, divide decimals to hundredths.
- 4) Compare decimals to the thousandths place.
- 5) Round decimals to the thousandths place.
- 6) Add and subtract fractions and mixed numerals (including **unlike** denominators).
- 7) Multiply fractions and mixed numerals. Divide fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions).
- 8) Find area of a rectangle with fractional side lengths.
- 9) Convert like measurement units within a given measurement system.
- 10) Understand concepts of volume and relate volume to multiplication and to addition.
- 11) Graph points on the coordinate plane to solve real-world and mathematical problems.
- 12) Classify two-dimensional figures into categories based on their properties.
- 13) Generate 2 numerical patterns given two rules.

Fayette County Public Schools – Big Rocks for Elementary, Middle, and High School Mathematics

This document is a list of “big ideas” that are essential to mastery of grade-level content and is not to be interpreted as a complete list of all topics to be taught. Content vocabulary should be an emphasis at ALL grade levels. Math Practice Standards should be embedded throughout.

6th Grade:

- 1) Extend understanding of fractions, decimals, and percents.
- 2) Understand and use ratios, ratio reasoning and unit rates.
- 3) Solve algebraic expressions.
- 4) Solve and interpret 1-step equations and 1-step inequalities.
- 5) Construct, analyze and interpret data in a variety of graphical manners (number line, line plot, dot plot, histogram, box plot (box and whiskers)); compute mean, median, mode and range.
- 6) Find the area of complex 2-D figures (including composing or decomposing figures), review volume of 3-D figures with fractional side lengths, and calculate the surface area of 3-D figures.
- 7) Represent and understand integers and position on both horizontal and vertical number lines including ordering, comparing, and absolute value.
- 8) Extend understanding of the coordinate plane to all four quadrants.

7th Grade:

- 1) Analyze and use proportions and proportional reasoning including scale drawings.
- 2) Represent proportional relationships with the constant of proportionality in tables, graphs, equations and verbal descriptions.
- 3) Solve and apply percent problems including tax, gratuities, discount, simple interest and percent of change.
- 4) Perform operations on rational numbers including integers and positive/negative fractions & decimals.
- 5) Determine and analyze probabilities by constructing sample space and conducting sample and conducting experiments.
- 6) Solve problems involving area and circumference of circles.
- 7) Solve equations for unknown angle measures including complementary, supplementary, vertical and adjacent angles.
- 8) Use central tendency and variability to compare two sets of data.
- 9) Solve and interpret multi-step equations and inequalities.

8th Grade:

- 1) Work with irrational numbers, radicals and integer exponents.
- 2) Graph linear equations and extend understanding of slope as the rate of change.
- 3) Solve multi-step equations including those with variables on both sides, the distributive property, and combining like terms.
- 4) Solve systems of two linear equations in two variables algebraically and estimate solutions graphically (both by hand and on a graphing calculator).
- 5) Investigate and interpret patterns of association in bivariate data using scatterplots and lines of fit.
- 6) Define, evaluate and compare functions using tables, graphs, equations, and verbal descriptions.
- 7) Understand and apply the Pythagorean Theorem.
- 8) Work with transformations in a coordinate plane.
- 9) Work with parallel lines cut by a transversal.

Fayette County Public Schools – Big Rocks for Elementary, Middle, and High School Mathematics

This document is a list of “big ideas” that are essential to mastery of grade-level content and is not to be interpreted as a complete list of all topics to be taught. Content vocabulary should be an emphasis at ALL grade levels. Math Practice Standards should be embedded throughout.

Algebra 1:

- 1) Solve multi-step equations and inequalities in one variable and represent the solution on a number line.
- 2) Write and graph linear equations in two variables that model real world situations.
- 3) Solve systems of equations by multiple methods and interpret their solutions in real world context.
- 4) Use function notation to perform arithmetic operations; find the domain and range of functions.
- 5) Perform arithmetic operations on polynomials.
- 6) Use rational and irrational numbers in the appropriate context of a problem.
- 7) Factor quadratic functions; Solve and graph quadratic equations using multiple methods.
- 8) Summarize, represent and interpret one or two variable data.

Geometry:

- 1) Use logic and proof to reason mathematically; make conjectures about, points, lines, angles, planes, polygons and other geometric figures.
- 2) Use various methods to prove figures are congruent or similar.
- 3) Classify polygons by their properties and use those properties to solve problems (parallel, perpendicular, angle relationships, triangles, etc.).
- 4) Use coordinate geometry (midpoint, distance, circles, parabolas) to analyze figures and solve problems.
- 5) Use properties of circles to solve problems involving chords, secants, tangents, inscribed angle, arcs, etc.
- 6) Introduce basic concepts of trigonometry including Pythagorean Theorem, sine, cosine, tangent, 45-45-90 and 30-60-90 triangles and use trig ratios to solve real world problems.
- 7) Use surface area and volume to analyze three dimensional figures including cross sections and ratios of perimeter, area and volume.

Algebra 2:

- 1) Solve multistep linear equations and compound inequalities involving absolute value and graph the solution on a number line, when applicable.
- 2) Solve systems of equations and inequalities using multiple methods as appropriate.
- 3) Solve and graph quadratic equations using real and complex numbers; use the discriminant to determine the number and types of solutions; find domain and range.
- 4) Identify and graph conic sections.
- 5) Factor, solve, and graph polynomial equations. Determine the number and type of zeros for a polynomial; use maximums, minimums, zeros, intercepts to graph a polynomial; find domain range.
- 6) Use operations on radical expressions and solve equations. Include rational and negative exponents, nth roots and rationalizing denominators.
- 7) Use logarithms to simplify expressions and solve equations.
- 8) Perform operations on rational expressions and solve rational equations.
- 9) Expand knowledge of trigonometry to include all six trig functions, the unit circle, radian measure, Law of Sines and Law of Cosines, graphs of trigonometric functions including amplitude and period.
- 10) Use counting principle to find the number of ways an event can happen and find the probability of that event.
- 11) Find the nth term in an arithmetic or geometric sequence and find the sum of a series.