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

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## 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 $2 D$ and $3 D$ shapes (square, circle, rectangle, triangle, hexagon, cube, cone, cylinder, and sphere).

## $1^{\text {st }}$ 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).

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## $\mathbf{2}^{\text {nd }}$ Grade:

1) Count to 1000 by $1 \mathrm{~s}, 5 \mathrm{~s}, 10 \mathrm{~s}$, and 100 s .
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).

## $3^{\text {rd }}$ 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 $1 / 4$ 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).

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## $4^{\text {th }}$ 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 $4 \times 1$ and $2 \times 2$ 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 $3^{\text {rd }}$ 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.

## $5^{\text {th }}$ 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.

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## $6^{\text {th }}$ 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.

## $7^{\text {th }}$ 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.

## $8^{\text {th }}$ 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.

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## 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.
