Kindergarten Math Overview

Instructional time should focus on two critical areas:

1. representing, relating, and operating on whole numbers, initially with sets of objects; and
2. describing shapes and space.

More learning time in Kindergarten should be devoted to number than to other topics. (*)

Overview of Content Strands

Counting and Cardinality (CC)*
- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking (OA)*
- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
- Identify and continue patterns.

Number and Operations in Base Ten (NBT)*
- Work with numbers 11–19 to gain foundations for place value.

Measurement and Data (MD)
- Describe and compare measurable attributes.
- Classify objects and count the number of objects in categories.

Geometry (G)
- Identify and describe shapes.
- Analyze, compare, create, and compose shapes.

Required Fluency

I. Count to 100 by ones and by tens
II. Write numbers from 0-20
III. Add/subtract numbers up to 5

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

1st Grade Math Overview

Instructional time should focus on four critical areas:

1. developing understanding of addition, subtraction, and strategies for addition and subtraction within 20;
2. developing understanding of whole number relationships and place value, including grouping in tens and ones;
3. developing understanding of linear measurement and measuring lengths as iterating length units; and
4. reasoning about attributes of, and composing and decomposing geometric shapes.

More learning time in Grade 1 should be devoted to number and operations than to other topics. (*)

Overview of Content Strands

Counting, Cardinality, and Ordinality

- Know ordinal names and counting flexibility.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking*

- Represent and solve problems involving addition and subtraction.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Add and subtract up to 20.
- Work with addition and subtraction equations.
- Identify and continue patterns.

Number and Operations in Base Ten*

- Extend the counting sequence.
- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure lengths indirectly and by iterating length units.
- Work with time and money.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Required Fluency

I. Add/subtract using numbers to 10
II. Identify place value in 2 digit numbers
III. Add using numbers up to 100

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

2nd Grade Math Overview

Instructional time should focus on four critical areas:

1. extending understanding of base-ten notation;
2. building fluency with addition and subtraction;
3. using standard units of measure; and
4. describing and analyzing shapes.

More learning time in Grade 2 should be devoted to number and operations than to other topics. (*)

Overview of Content Strands

Operations and Algebraic Thinking*

- Represent and solve problems involving addition and subtraction.
- Add and subtract up to 20.
- Work with equal groups of objects to gain foundations for multiplication.
- Identify and continue patterns.

Number and Operations in Base Ten*

- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data*

- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Required Fluency

I. Add/subtract up to 20 (know single digit sums from memory)
II. Add/subtract up to 100
III. Tell and write time

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

3rd Grade Math Overview

Instructional time should focus on four critical areas:

1. developing understanding of multiplication and division and strategies for multiplication and division within 100;
2. developing understanding of fractions, especially unit fractions (fractions with numerator 1);
3. developing understanding of the structure of rectangular arrays and of area; and
4. describing and analyzing two-dimensional shapes.

More learning time in Grade 3 should be devoted to operations and fractions than to other topics. (*)

Overview of Content Strands

Operations and Algebraic Thinking*

- Represent and solve problems involving multiplication and division.
- Understand properties of multiplication and the relationship between multiplication and division.
- Multiply and divide up to 100.
- Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten

- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions*

- Develop understanding of fractions as numbers.

Measurement and Data*

- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- Represent and interpret data.
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

- Reason with shapes and their attributes.

Required Fluency

I. Multiply/divide up to 100 (know single-digit products from memory)
II. Add/subtract up to 1000
III. Represent fractions with denominators 2, 3, 4, 6 and 8

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

4th Grade Math Overview

Instructional time should focus on three critical areas:

1. developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends;
2. developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; and
3. understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

More learning time in Grade 4 should be devoted to operations, fractions and measurement than to other topics. (*)

Overview of Content Strands

Operations and Algebraic Thinking*

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten

- Generalize place value understanding for multi-digit whole numbers.
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions*

- Extend understanding of fraction equivalence and ordering.
- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data*

- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data.
- Geometric measurement: understand concepts of angle and measure angles.

Geometry

- Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Required Fluency

I. Add/subtract up to 1,000,000
II. Multiply/divide 4-digit numbers by 1-digit numbers
III. Add/Subtract fractions
IV. Use decimal notation for fractions

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

5th Grade Math Overview

Instructional time should focus on three critical areas:

1. developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions);
2. extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and
3. developing understanding of volume.

More learning time in Grade 5 should be devoted to operations, fractions and geometry than to other topics. (*)

Overview of Content Strands

Operations and Algebraic Thinking
- Write and interpret numerical expressions.
- Analyze patterns and relationships.

Number and Operations in Base Ten
- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations—Fractions*
- Use equivalent fractions as a strategy to add and subtract fractions.
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data*
- Convert like measurement units within a given measurement system.
- Represent and interpret data.
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Geometry*
- Graph points on the coordinate plane to solve real-world and mathematical problems.
- Classify two-dimensional figures into categories based on their properties.

Required Fluency

I. Multi-digit multiplication
II. Add/subtract fractions
III. Convert measurements within a system (1'=12")

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

6th Grade Math Overview

Instructional time should focus on four critical areas:

1. connecting ratio and rate to whole-number multiplication and division and using concepts of ratio and rate to solve problems;
2. completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers;
3. writing, interpreting, and using expressions and equations; and
4. developing understanding of statistical thinking.

More learning time in Grade 6 should be devoted number systems to than to other topics. (*)

Overview of Content Strands

Ratios and Proportional Relationships (RP)

- Understand ratio concepts and use ratio reasoning to solve problems.

The Number System (NS)*

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations (EE)*

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

Geometry (G)*

- Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability (SP)

- Develop understanding of statistical variability.

Summarize and describe distributions.

Required Fluency

I. Multi-digit division
II. Multi-digit decimal operations
III. Mult/Divide fractions

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

7th Grade Math Overview

instructional time should focus on four critical areas:

1. developing understanding of and applying proportional relationships;
2. developing understanding of operations with rational numbers and working with expressions and linear equations;
3. solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and
4. drawing inferences about populations based on samples.

More learning time in Grade 7 should be devoted to ratios and proportions than to other topics. (*)

Overview of Content Strands

Ratios and Proportional Relationships (RP)*

- Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System (NS)*

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations (EE)*

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry (G)

- Draw, construct, and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability (SP)

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use, and evaluate probability models.

Required Fluency

I. Use operations with integers
II. Convert between decimals, fractions and percents
III. Use proportional relationships to solve problems

Fluency with addition, subtraction, multiplication and division of rational numbers using a standard algorithm is expected from this grade forward.

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

8th Grade Math Overview

Instructional time should focus on three critical areas:

1. formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations;
2. grasping the concept of a function and using functions to describe quantitative relationships; and
3. analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

More learning time in Grade 8 should be devoted to expressions, equations and function than to other topics. (*)

Overview of Content Strands

The Number System (NS)

- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations (EE)*

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions (F)*

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry (G)

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability (SP)*

- Investigate patterns of association in bivariate data.

Required Fluency

I. Simplify algebraic expressions
II. Solve 1-step inequalities and equations with rational numbers.
III. Use the Pythagorean Theorem to solve problems

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Algebra I Overview

Instructional time should focus on four critical areas:

1. developing fluency writing, interpreting and translating between various forms of linear equations and inequalities and using them to solve problems
2. find and interpret solutions of systems of equations involving quadratic expressions, inequalities, arithmetic and geometric sequences as exponential functions
3. use geographical representations and knowledge of context to make judgments about the appropriateness of linear models
4. explore specialized functions, absolute value, step and piecewise.

More learning time in Algebra I should be devoted to expressions, equations and function than to other topics. (*)

Overview of Content Strands

Number and Quantity (NQ)

- Extend the properties of exponents to rational exponents.
- Use properties of rational and irrational numbers.
- Reason quantitatively and use units to solve problems.

Algebra (A)*

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.
- Perform arithmetic operations on polynomials.
- Create equations that describe numbers or relationships.
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable.

Functions (F)*

- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of a context.
- Build a function that models a relationship between two quantities.
- Build new functions from existing functions
- Construct and compare linear, quadratic and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

Statistics and Probability (S)

- Summarize represent and interpret data on a single count or measurement variable.
- Summarize, represent and interpret data on two categorical and quantitative variables.
- Interpret linear models.

Required Fluency

I. Add/subtract/multiply polynomials
II. Write equations of lines
III. Factor polynomials
IV. Solve equations and inequalities

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Geometry Overview

Instructional time should focus on these critical areas:

1. apply similarity in right triangles to understand right triangle trigonometry and develop the Laws of Sines and Cosines in order to find missing measures of general triangles
2. apply knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line
3. use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines
4. prove basic theorems about triangles, quadrilaterals, other polygons, circles, inscribed angles, chords, secants and tangents
5. compute and interpret theoretical and experimental probabilities for compound events , mutually exclusive events, independent events and conditional probability

More learning time in Geometry should be devoted to proofs than to other topics. (*)

Overview of Content Strands

Geometry (G)*

- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Prove geometric theorems.
- Make geometric constructions.
- Understand similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles.
- Understand and apply theorems about circles.
- Find arc lengths and areas of sectors of circles.
- Translate between the geometric description and the equation for a conic section.
- Use coordinates to prove simple geometric theorems algebraically.
- Explain volume formulas and use them to solve problems.
- Visualize the relationship between two-dimensional and three-dimensional objects
- Apply geometric concepts in modeling situations.

Statistics and Probability (S)

- Understand independence and conditional probability and use the to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.
- Use probability to evaluate outcomes of decisions.

Required Fluency

I. Use triangle congruence and similarity criteria to solve problems
II. Use coordinates to establish geometric results, calculate length and angle
III. Construct geometric models

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Algebra II Overview

Instructional time should focus on these critical areas:

1. understand the Fundamental Theorem of Algebra and identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations
2. use the coordinate plane to extend trigonometry to model periodic phenomena
3. identify appropriate types of functions to model a situation, adjust parameters to improve the model and compare models by analyzing appropriateness of fit and making judgments about domain over which a model is a good fit
4. see how visual displays and summary statistics relate to different types of data and to probability distributions and the role that randomness and careful design play in the conclusions that can be drawn.

Overview of Content Strands

Number and Quantity (NQ)

- Perform arithmetic operations with complex numbers.
- Use complex numbers in polynomial identities and equations.

Algebra (A)*

- Interpret the structure of expressions.
- Write expressions n equivalent forms to solve problems
- Perform arithmetic operations on polynomials.
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems.
- Rewrite rational expressions.
- Create equations that describe numbers or relationships.
- Understand solving equations as a process of reasoning and explain the reasoning.
- Represent and solve equations and inequalities graphically.

Functions (F)*

- Interpret functions that arise in applications in terms of a context.
- Analyze functions using different representations.
- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.
- Construct and compare linear, quadratic and exponential models and solve problems.
- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities.

Statistics and Probability (S)

- Summarize, represent, and interpret data on a single count or measurement variable.
- Understand and evaluate random processes underlying statistical experiments.
- Make inferences and justify conclusions from sample surveys, experiments and observational studies.

Required Fluency

I. Divide polynomials with remainder
II. Operations on matrices
III. Use Quadratic Formula to solve problems
IV. Simplify expressions with complex numbers

Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Trigonometry Overview

Instructional time should focus on these critical areas:	Overview of Content Strands	Required Fluency
		Mathematical Practices (MP) 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Pre-Calculus Overview

Instructional time should focus on these critical areas:	**Overview of Content Strands**	**Required Fluency** **Mathematical Practices (MP)** 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.