

HADDONFIELD PUBLIC SCHOOLS

Mathematics Areas of Focus: Grade Four

New Jersey Core Curriculum Content Standard 4.1 Mathematics

All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways.

4.1.5A Number Sense:

Number sense is an intuitive feel for numbers and a common sense approach to using them. It is a comfort with what numbers represent that comes from investigating their characteristics and using them in diverse situations. It involves an understanding of how different types of numbers, such as fractions and decimals, are related to each other, and how each can best be used to describe a particular situation. It subsumes the more traditional category of school mathematics curriculum called numeration and thus includes the important concepts of place value, number base, magnitude, and approximation and estimation.

Areas of Focus:

- Use real life experiences, physical materials, and technology to construct meaning for numbers
- Whole numbers through millions
- Commonly used fractions as part of a whole, as a subset of a set, and as a location on a number line
- Place value
- Demonstrate a sense of the relative magnitudes of numbers
- Understand the various uses of numbers—counting, measuring, labeling, locating
- Use concrete and pictorial models to relate whole numbers, commonly used fractions, and decimals to each other, and to represent equivalent forms of the same number
- Compare and order numbers
- Explore settings that give rise to negative numbers

4.1.5B Numerical Operations

Numerical operations are an essential part of the mathematics curriculum, especially in the elementary grades. Students must be able to select and apply various computational methods, including mental math, pencil and paper techniques, and the use of calculators. Students must understand how to add, subtract, multiply, and divide whole numbers, fractions, decimals, and other kinds of numbers. With the availability of calculators that perform these operations quickly and accurately, the instructional emphasis now is on the understanding the meanings and uses of these operations, and on estimation and mental skills, rather than solely on the development of paper and pencil proficiency.

Areas of Focus:

- Develop the meanings of the four basic arithmetic operations by modeling and discussing a large variety of problems
- Develop proficiency with basic multiplication and division number facts using a variety of fact strategies and then commit them to memory
- Construct, use, and explain procedures for performing whole number calculations with pencil and paper, mental math, and calculators
- Count and perform simple computations with money
- Select pencil and paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers
- Check the reasonableness of results of computations
- Use concrete models to explore addition and subtraction with fractions
- Understand and use the inverse relationships between addition and subtraction and between multiplication and division

4.1.5C Estimation

Estimation is a process that is used constantly by mathematically capable adults, and one that can be easily mastered by children. It involves an educated guess about a quantity or an intelligent prediction of the outcome of a computation. The growing use of calculators makes it more important than ever that students know when a computed answer is reasonable; the best way to make that determination is through the use of strong estimation skills. Equally important is an awareness of the many situations in which an approximate answer is as good as, or even preferable to, an exact one. Students can learn to make these judgments and use mathematics more powerfully as a result.

Areas of Focus:

- Construct and use a variety of estimation strategies
- Recognize when an estimate is appropriate
- Use estimation to determine whether the result of a computation is reasonable

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New Jersey Core Curriculum Content Standard 4.2 Geometry and Measurement
All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe and analyze phenomena.

4.2.5 A Geometric Properties

This includes identifying, describing and classifying standard geometric objects, describing and comparing properties of geometric objects, making conjectures concerning them, and using reasoning and proof to verify or refute conjectures and theorems. Also included here are such concepts as symmetry, congruence, and similarity.

Areas of Focus:

- Identify and describe spatial relationships of two or more objects in space
- Use properties of standard three-dimensional and two-dimensional shapes to identify, classify, and describe them: Vertex, edge, face, side, angle; 3D figures (cube, rectangular prism, sphere, cone, cylinder, and pyramid; 2D figures—square, rectangle, circle, triangle, quadrilateral, pentagon, hexagon, octagon; Inclusive relationships—squares are rectangles, cubes are rectangular prisms
- Identify and describe relationships among two-dimensional shapes
- Understand and apply concepts involving lines, angles and circles

4.2.5 B Transforming Shapes

Shape and area can be conserved during mathematics transformations.

Areas of Focus:

- Use simple shapes to cover an area (tessellations)

4.2.5 C Coordinate Geometry

Coordinate geometry provides an important connection between geometry and algebra. It facilitates the visualization of algebraic relationships, as well as an analytical understanding of geometry.

Areas of Focus:

- Use coordinates to give or follow directions from one point to another on a map or grid

4.2.5 D Units of Measurement

Measurement helps describe our world using numbers. An understanding of how we attach numbers to real-world phenomena, familiarity with common measurement units, and a practical knowledge of measurement tools and techniques are critical for students' understanding of the world around them.

Areas of Focus:

- Select and use appropriate standard units of measure and measurement tools to solve real life problems

4.2.5 E Measuring Geometric Objects

This area focuses on applying the knowledge and understandings of units of measurement in order to actually perform measurement. While students will eventually apply formulas, it is important they develop and apply strategies that derive from their understanding of the attributes. In addition to measuring objects directly, students apply indirect measurement skills, using, for example, similar triangles and trigonometry.

Areas of Focus:

- Determine the area of simple two-dimensional shapes on a square grid
- Distinguish between perimeter and area and use each appropriately in problem-solving situations

New Jersey Core Curriculum Content Standard 4.3 Patterns and Algebra

All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concerns and processes.

4.3.5 A Patterns

Algebra provides the language through which we communicate the patterns in mathematics. From the earliest age, students should be encouraged to investigate the patterns they find in numbers, shapes and expressions, and by doing so, to make mathematical discoveries. They should have opportunities to analyze, extend, and create a variety of patterns and to use pattern-based thinking to understand and represent mathematical and other real-world phenomena.

Areas of Focus:

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- Recognize, describe, extend, and create patterns

4.3.5 B Functions and Relationships

The function concept is one of the most fundamental unifying ideas of modern mathematics. Students begin their study of functions in the primary grades, as they observe and study patterns. As students grow and their ability to abstract matures, students form rules, display information in a table or chart, and write equations which express the relationships they have observed. In high school, they use the more formal language of algebra to describe these relationships.

Areas of Focus:

- Use concrete and pictorial models to explore the basic concept of a function.
- Input/output tables, T-charts
- Combining two function machines
- Reversing a function machine

4.3.5 C Modeling

Algebra is used to model real situations and answer questions about them. This use of algebra requires the ability to represent data in tables, pictures, graphs, equations or inequalities, and rules. Modeling ranges from writing simply number sentences to help solve story problems in the primary grades to using functions to describe the relationship between two variables, such as the height of a pitched ball over time. Modeling also includes some of the conceptual building blocks of calculus, such as how quantities change over time and what happens in the long run (limits).

Areas of Focus:

- Recognize and describe change in quantities
- Construct and solve simple open sentences involving any one operation (e.g., $3 \times 6 = n = 15 \div 3$, $3x = 0$, $16 - c = 7$)

4.3.5 D Procedures

Techniques for manipulating algebraic expressions – procedures – remain important, especially for student who may continue their study of mathematics in a calculus program. Utilization of algebraic procedures includes understanding and applying properties of numbers and operations, using symbols and variables appropriately, working with expressions, equations, and inequalities, and solving equations in inequalities.

Areas Focus:

- Understand, name, and apply the properties of operations and numbers.
- Understand and use the concepts of equals, less than, and greater than in simple number sentences

New Jersey Core Curriculum Content Standard 4.4 Data Analysis, Probability and Discrete Mathematics
All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

4.4.5 A Data Analysis

In today's information based world, students need to be able to read, understand, and interpret data in order to make informed decisions. In the early grades, students should be involved in collecting and organizing data, and in presenting it using tables, charts, and graphs. As they progress, they should gather data using sampling, and should increasingly be expected to analyze and make inference from data, as well as to analyze data and inference made by others.

Areas of Focus:

- Read, interpret, construct, analyze, generate questions about, and draw inferences from displays of data.
- Pictograph, bar graph, line plot, line graph, table
- Average (mean), most frequent (mode), middle term (median)

4.4.5 B Probability

Students need to understand the fundamental concepts of probability so that they can interpret weather forecasts, avoid unfair games of chance, and make informed decisions about medical treatments whose success rate is provided in terms of percentages. They should regularly be engaged in predicting and determining probabilities, often based on experiments, but eventually based on theoretical discussion of probability that make use of systemic counting strategies.

Areas of Focus:

- Use every day events and chance devices, such as dice, coins, and unevenly divided spinners, to explore concepts of probability
- Determine probabilities of simple events based on equally likely outcomes and express them as fractions
- Predict probabilities in a variety of situations (e.g., given the number of items of each color in a bag, what is the probability that an item picked will have a particular color)

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4.4.5 C Discrete Mathematics – Systematic Listing and Counting

Development of strategies for listing and counting can progress through all grade levels, with middle and high school students using the strategies to solve problems in probability. Primary students, for example, might find all outfits that can be worn using two coats and three hats.

Areas of Focus:

- Represent all possibilities for a simple counting situation in an organized way and draw conclusions from this representation.
- Organized lists, charts, tree diagrams
- Dividing into categories (e.g., to find the total number of rectangles in a grid, find the number of rectangles of each size and add the results)

4.4.5 D Discrete Mathematics – Systematic Listing and Counting

Vertex-edge graphs consisting of dots and lines joining them can be used to represent and solve problems based on real-world situations. Students should learn to follow and devise lists of instructions, called “algorithms,” and use algorithmic thinking to find the best solution to problems like those involving vertex-edge graphs, but also to solve other problems.

Areas of Focus:

- Find the smallest number of colors needed to color a map or a graph.

New Jersey Core Curriculum Content Standard 4.5 Data Mathematical Processes

All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.

4.5 A Problem Solving

Problem posing and problem solving involve examining situations that arise in mathematics and other disciplines and in common experiences, describing these situations mathematically, formulating appropriate mathematics questions, and using a variety of strategies to find solution. Through problem solving, students experience the power and usefulness of mathematics. Problem solving is interwoven throughout the grades to provide a context for learning and applying mathematical ideas.

Areas of Focus:

- Solve problems that arise in mathematics and in other contexts
- Select and apply a variety of appropriate problem-solving strategies (e.g., “try a simpler problem” or “make a diagram”) to solve problems.
- Monitor their progress and reflect on the process of their problem solving activity

4.5 B Communication

Communication of mathematical ideas involves students’ sharing their mathematical understandings in oral and written form with their classmates, teachers, and parents. Such communication helps students clarify and solidify their understanding of mathematical and develop confidence in them as learners. It also enables teachers to better monitor student progress.

Areas of Focus:

- Use communication to organize and clarify mathematical thinking
- Communicate mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing

4.5 C Connections

Making connections involves seeing relationships between different topics, and drawing on those relationships in future study. This applies within mathematics, so that students can translate readily between fractions and decimals or between algebra and geometry to other content areas so that students understand how mathematics is used in the sciences, the social sciences, and the arts.

Areas of Focus:

- Apply mathematics in practical situations and in other disciplines

4.5 D Reasoning

Mathematical reasoning is the critical skill that enables a student to make use of all other mathematical skills. With the development of mathematical reasoning, students recognize that mathematics makes sense and can be understood. They learn how to evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions, and recognize how those solutions can be applied.

Areas of Focus

- Use reasoning to support their mathematical conclusions and problem solutions
- Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions

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4.5 E Representations

Representations refers to the use of physical objects, drawing, charts, graphs, and symbols to represent mathematical concepts and problem situations. By using various representations, students will be better able to communicate their thinking and solve problems. Using multiple representations will enrich the problem solver with alternative perspectives on the problem.

Areas of Focus:

- Create and use representations to organize, record, and communicate mathematical ideas

4.5 F Technology

Calculators and computers need to be used along with other mathematical tools by students in both instructional and assessment activities. These tools should be used, not to replace mental math and paper and pencil computational skills, but to enhance understanding of mathematics and the power to use mathematics. Students should explore both new and familiar concepts with calculators and computers and should also become proficient in using technology as it is used by adults (e.g. for assistance in solving real-world problems).

Areas of Focus:

- Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions)

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Secure Skills by Trimester

1st Trimester

- Know addition and subtraction facts
- Subtract multidigit numbers
- Add multidigit numbers
- Read and write numerals to hundred-millions; give the value of the digits in numerals to hundred- millions
- Find equivalent names for numbers
- Solve addition and subtraction number stories
- Know multiplication facts
- Understand the relationship between multiplication and division
- Name, draw, and label line segments, lines and rays
- Name, draw, and label angles, triangles, and quadrangles
- Identify and describe right angles, parallel lines, and line segments

2nd Trimester

- Know addition and subtraction facts
- Subtract multidigit numbers
- Read and write numerals to hundred-millions; give the value of the digits in numerals to hundred- millions
- Find equivalent names for numbers
- Solve addition and subtraction number stories
- Know multiplication facts
- Understand the relationship between multiplication and division
- Name, draw, and label line segments, lines and rays
- Name, draw, and label angles, triangles, and quadrangles
- Identify and describe right angles, parallel lines, and line segments
- Identify the whole for fractions
- Identify the fractional parts of a collection of objects
- Identify fractional parts of regions

3rd Trimester

- Convert between hundredths-fractions, decimals, and percents
- Use a calculator to rename any fraction as a decimal or percent
- Rename fractions with denominators of 10 and 100 as decimals
- Find the area of a figure by counting unit squares and fractions of unit squares inside the figure
- Use rate tables, if necessary, to solve rate problems
- Use a transparent mirror to draw the reflection of a figure
- Identify lines of symmetry, lines of reflection, reflected figures and figures with line symmetry

Resources

- o Everyday Mathematics, Homelinks, Student Journals, Game Kit, Calculators, Manipulatives

Technology

- o Variety of software programs to enhance learning, appropriate internet resources

Assessment

- o Units Assessments, Chapter Quizzes, Rubrics, Projects, Collaborative work, Teacher observation

Parent Involvement

- o Dialogue and discussion are at the heart of Everyday Mathematics. Family Letters are provided at the beginning of the year, at the end of every unit, and with selected Home Links to establish a partnership between home and school, while explaining upcoming content and activities.