

**TOWNSHIP OF FRANKLIN PUBLIC SCHOOLS
MATHEMATICS CURRICULUM
SEPTEMBER 2005**

GRADE 4

STANDARD 4.1 (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATION ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS

BUILDING UPON KNOWLEDGE AND SKILLS GAINED IN PRECEDING GRADES, BY THE END OF GRADE 4 STUDENTS WILL:

A. Number Sense	MP 1	MP 2	MP 3	MP 4
1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 4 pertain to these sets of numbers as well) <ul style="list-style-type: none"> • Whole numbers through millions • Commonly used fractions (denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 16) as part of a whole, as a subset of a set, and as a location on a number line • Decimals through hundredths 				
2. Demonstrate an understanding of place value concepts.				
3. Demonstrate a sense of the relative magnitudes of numbers.				
4. Understand the various uses of numbers. <ul style="list-style-type: none"> • Counting, measuring, labeling (e.g., numbers on baseball uniforms), locating (e.g., Room 235 is on the second floor) 				
5. 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.				
6. Compare and order numbers.				
7. Explore settings that give rise to negative numbers. <ul style="list-style-type: none"> • Temperatures below 0, debts • Extension of the number line 				
B. Numerical Operations				
1. Develop the meanings of the four basic arithmetic operations by modeling and discussing a large variety of problems. <ul style="list-style-type: none"> • Addition and subtraction: joining, separating, comparing • Multiplication: repeated addition, area/array • Division: repeated subtraction, sharing 				
2. Develop proficiency with basic multiplication and division number facts using a variety of fact strategies (such as “skip counting” and “repeated subtraction”) and then commit them to memory.				
3. Construct, use, and explain procedures for performing addition and subtraction calculations with: <ul style="list-style-type: none"> • Pencil-and-paper • Mental math • Calculator 				
4. Use efficient and accurate pencil-and-paper procedures for computation with whole numbers. <ul style="list-style-type: none"> • Addition of 3-digit numbers • Subtraction of 3-digit numbers • Multiplications of 2-digit numbers by 1-digit numbers • Division of 3-digit numbers by 1-digit numbers 				
5. Construct and use procedures for performing decimal addition and subtraction.				
6. Count and perform simple computations with money. <ul style="list-style-type: none"> • Standard dollar and cents notation 				
7. Select pencil-and-paper, mental math, or calculator as the appropriate computational method in a given situation depending on the context and numbers.				

8. Check the reasonableness of results of computations.				
9. Use concrete models to explore addition and subtraction.				
10. Understand and use the inverse relationships between addition and subtraction and between multiplication and division.				
C. Estimation				
1. Judge without counting whether a set of objects has less than, more than, or the same number of objects as a reference set.				
2. Construct and use a variety of estimation strategies (e.g., rounding and mental math) for estimating both quantities and the result of computations.				
3. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.				
4. Use estimation to determine whether the result of a computation (either by calculator or by hand) is reasonable.				

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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

BUILDING UPON KNOWLEDGE AND SKILLS GAINED IN PRECEDING GRADES, BY THE END OF GRADE 4 STUDENTS WILL:

A. Geometric Principles	MP 1	MP 2	MP 3	MP 4
1. Identify and describe spatial relationships of two or more objects in space. <ul style="list-style-type: none"> • Direction, orientation, and perspectives (e.g., which object is on your left when you are standing here?) • Relative shapes and sizes. • Shadows (projections) of everyday objects 				
2. Use properties of standard three-dimensional and two-dimensional shapes to identify, classify, and describe them. <ul style="list-style-type: none"> • Vertex, edge, face, side, angle. • 3D figures-cube, rectangular prism, sphere, cone, cylinder and pyramid • 2D figures-square, rectangle, circle, triangle, pentagon, hexagon, octagon • Inclusive relationships-squares are rectangles, cubes are rectangular prisms 				
3. Identify and describe relationships among two-dimensional shapes. <ul style="list-style-type: none"> • Congruence • Lines of symmetry 				
4. Understand and apply concepts involving lines, angles and circles. <ul style="list-style-type: none"> • Point, line, line segment, endpoint • Parallel, perpendicular • Angles-acute, right, obtuse • Circles-diameter, radius, center 				
5. Recognize, describe, extend, and create space-filling patterns.				
B. Transforming Shapes				
1. Use simple shapes to cover and area (tessellations).				
2. Describe and use geometric transformations (slide, flip, turn).				
3. Investigate the occurrence of geometry in nature and art.				
C. Coordinate Geometry				
1. Locate and name points in the first quadrant on a coordinate grid.				
2. Use coordinates to give or follow directions from one point to another on a map or grid.				
D. Units of Measurement				
1. Understand that everyday objects have a variety of attributes, each of which can be measured in many ways.				
2. Select and use appropriate standard units of measure and measurement tools to solve real-life problems. <ul style="list-style-type: none"> • Length-fractions of an inch (1/4, 1/2) mile, decimeter, kilometer • Area-square inch, square centimeter • Volume-cubic inch, cubic centimeter • Weight-ounce • Capacity-fluid ounce, cup, gallon, milliliter 				
3. Develop and use personal referents to approximate standard units of measure (e.g., a common paper clip is about an inch long).				
4. Incorporate estimation in measurement activities (e.g., estimate before measuring).				
5. Solve problems involving elapsed time.				

E. Measuring Geometric Objects				
1. Determine the area of simple two-dimensional shapes on a square grid.				
2. Distinguish between perimeter and area and use each appropriately in problem-solving situations.				
3. Measure and compare the volume of three-dimensional objects using materials such as rice or cubes.				

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STANDARD 4.3 (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS AND ALGEBRAIC CONCEPTS AND PROCESSES

BUILDING UPON KNOWLEDGE AND SKILLS GAINED IN PRECEDING GRADES, BY THE END OF GRADE 4 STUDENTS WILL:

A. Patterns	MP 1	MP 2	MP 3	MP 4
1. Recognize, describe, extend, and create patterns. <ul style="list-style-type: none"> • Descriptions using words and number sentences/expressions, graphs, tables, variables (e.g., shape, blank, letter) • Sequences that stop or that continue infinitely • Whole number patterns that grow or shrink as a result of repeatedly adding, subtracting, multiplying by , or dividing by a fixed number (e.g., 5, 8, 11, ...or 800, 400, 200,...) • Sequences can often be extended in more than one way (e.g., the next term after 1, 2, 4, ...could be 8, or 7, or...) 				
B. Functions and Relationships				
1. Use concrete and pictorial models of function machines to explore the basic concept of a function. <ul style="list-style-type: none"> • Input/output tables, T-charts • Combining two function machines • Reversing a function machine 				
C. Modeling				
1. Recognize and describe changes in quantities. <ul style="list-style-type: none"> • Graphs representing change over time (e.g., temperature, height) • How change in one physical quantity can produce a corresponding change in another (e.g., pitch of a sound depends on rate of vibration) 				
2. Construct and solve simple open sentences involving addition or subtraction (e.g., $3+6=$ __, $n=15-3$, $3+$ __=3, $16-c=7$).				
D. Procedures				
1. Understand and apply the properties of operations and numbers. <ul style="list-style-type: none"> • Commutative (e.g., $3 \times 7 = 7 \times 3$) • Identity element for multiplication is 1 (e.g., $1 \times 8 = 8$) • Associative (e.g., $2 \times 4 \times 25$ can be found by first multiplying wither 2×4 or 4×25) • Division by zero is undefined • Any number multiplies by zero is zero) 				
2. Understand and use the concepts of equals, less than, and greater than to describe. <ul style="list-style-type: none"> • Symbols (=, <, >) 				

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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

BUILDING UPON KNOWLEDGE AND SKILLS GAINED IN PRECEDING GRADES, BY THE END OF GRADE 4 STUDENTS WILL:

A. Data Analysis	MP 1	MP 2	MP 3	MP 4
1. Collect, generate, organize and display data in response to questions, claims, or curiosity. <ul style="list-style-type: none"> • Data collected from classroom environment 				
2. Read, interpret, construct, analyze, generate questions about, and draw inferences from displays of data. <ul style="list-style-type: none"> • Pictograph, bar graph, line plot, line graph, table • Average (mean), most frequent (mode), middle term (median) 				
B. Probability				
1. Use everyday events and chance devices, such as dice, coins, and unevenly divided spinners, to explore concepts of probability. <ul style="list-style-type: none"> • Likely, unlikely, certain, impossible, improbable, fair, unfair • More likely, less likely, equally likely • Probability of tossing "heads" does not depend on the outcomes of previous tosses 				
2. Determine probabilities of simple events based on equally likely outcomes and express them as fractions.				
3. Predict probabilities in a variety of situations (e.g., given the number of items of each color in a bag, which is the probability that an item picked will have a particular color). <ul style="list-style-type: none"> • What students think will happen (intuitive) • Collect data and use that data to predict the probability (experimental) • Analyze all possible outcomes to find the probability (theoretical) 				
C. Discrete Mathematics-Systematic Listing and Counting				
1. Represent and classify data according to attributes, such as shape or color, and relationships. <ul style="list-style-type: none"> • Venn diagrams • Numerical and alphabetical order 				
2. Represent all possibilities for a simple counting situation in an organized way and draw conclusions from this representation. <ul style="list-style-type: none"> • 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) 				
D. Discrete Mathematics-Vertex-Edge Graphs and Algorithms				
1. Follow, devise, and describe practical sets of directions (e.g., add two 2-digit numbers).				
2. Play two-person games and devise strategies for winning the games (e.g., "make 5" where players alternately add 1 or 2 and the person who reaches 5, or another designated number is the winner).				
3. Explore vertex-edge graphs. <ul style="list-style-type: none"> • Vertex, edge, neighboring/adjacent, number of neighbors • Path, circuit (i.e., path that ends at its starting point) 				
4. Find the smallest number of colors needed to color a map.				

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STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS

A. Problem Solving	MP 1	MP 2	MP 3	MP 4
1. Learn mathematics through problem solving, inquiry, and discovery.				
2. Solve problems that arise in mathematics and in other contexts (cf. Workplace readiness standard 8.3). <ul style="list-style-type: none"> • Open-ended problems • Non-routine problems • Problems with multiple solutions • Problems that can be solved in several ways 				
3. Select and apply a variety of appropriate problem-solving strategies (e.g., “try a simpler problem” or “make a diagram”) to solve problems.				
4. Pose problems of various types and levels of difficulty.				
5. Monitor their progress and reflect on the process of their problem solving activity.				
B. Communication				
1. Use communication to organize and clarify their mathematical thinking. <ul style="list-style-type: none"> • Reading and writing • Discussion, listening and questioning 				
2. Communicate their mathematical thinking coherently and clearly to peers, teachers and others, both orally and in writing.				
3. Analyze and evaluate the mathematical thinking and strategies of others.				
4. Use the language of mathematics to express mathematical ideas precisely.				
C. Connections				
1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra and geometry).				
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).				
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.				
4. Apply mathematics in practical situations and in other disciplines.				
5. Trace the development of mathematical concepts over time and across cultures (cf. World languages and social studies standards).				
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.				