

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

GRADE 6

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 6 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 6 pertain to these sets of numbers as well). <ul style="list-style-type: none"> • All integers • All fractions as part of a whole, as a subset of a set, as a location on a number line, and as divisions of whole numbers • All decimals 				
2. Recognize the decimal nature of United States currency and compute with money.				
3. Demonstrate a sense of the relative magnitudes of numbers.				
4. Explore the use of ratios and proportions in a variety of situations.				
5. Understand and use whole-number percents between 1 and 100 in a variety of situations.				
6. Use whole numbers, fractions, and decimals to represent equivalent forms of the same number.				
7. Develop and apply number theory concepts in problem solving situations. <ul style="list-style-type: none"> • Primes, factors, multiples • Common multiples, common factors 				
8. Compare and order numbers.				
B. Numerical Operations				
1. Recognize the appropriate use of each arithmetic operation in problem situations.				
2. Construct, use, and explain procedures for performing addition and subtraction with fractions and decimals with: <ul style="list-style-type: none"> • Pencil-and-paper • Mental math • Calculator 				
3. Use an efficient and accurate pencil-and-paper procedure for division of a 3-digit number by a 2-digit number.				
4. Select pencil-and-paper, mental math, or calculator as the appropriate computational method in a given situation depending on the context and numbers.				
5. Find squares and cubes of whole numbers.				
6. Check the reasonableness of results of computations.				
7. Understand and use the various relationships among operations and properties of operations.				
8. Understand and apply the standard algebraic order of operations for the four basic operations, including appropriate use of parentheses.				
C. Estimation				
1. Use a variety of estimation strategies for both quantities and the results of computation.				
2. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.				
3. Determine the reasonableness of an answer by estimating the result of operations.				
4. Determine whether a given estimate is an overestimate or an underestimate.				

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STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PRPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA

BUILDING UPON KNOWLEDGE AND SKILLS GAINED IN PRECEDING GRADES, BY THE END OF GRADE 6 STUDENTS WILL:

A. Geometric Principles	MP 1	MP 2	MP 3	MP 4
1. Understand and apply concepts involving lines and angles. <ul style="list-style-type: none"> • Notation for line, ray, angle, line segment • Properties of parallel, perpendicular, and intersecting lines • Sum of the measures of the interior angles of a triangle is 180 				
2. Identify, describe, compare, and classify polygons and circles. <ul style="list-style-type: none"> • Triangles by angles and sides • Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi • Polygons by number of sides • Equilateral, equiangular, regular • All points equidistant from a given point form a circle 				
3. Identify similar figures.				
4. Understand and apply the concepts of congruence and symmetry (line and rotational).				
5. Compare properties of cylinders, prisms, cones, pyramids, and spheres.				
6. Identify, describe, and draw the faces or shadows (projections) of three-dimensional geometric objects from different perspectives.				
7. Identify a three-dimensional shape with given projections (top, front and side views).				
8. Identify a three-dimensional shape with a given net (i.e., a flat pattern that folds into a 3D shape).				
B. Transforming Shapes				
1. Use a translation, a reflection, or a rotation to map one figure onto another congruent figure.				
2. Recognize, identify, and describe geometric relationships and properties as they exist in nature, art, and other real-world settings.				
C. Coordinate Geometry				
1. Create geometric shapes with specified properties in the first quadrant on a coordinate grid.				
D. Units of Measurement				
1. Select and use appropriate units to measure angles and area.				
2. Use a scale to find a distance on a map or a length on a scale drawing.				
3. Convert measurement units within a system (e.g., 3 feet= ___ inches).				
4. Know approximate equivalents between the standard and metric systems (e.g., one kilometer is approximately 6/10 of a mile).				
5. Use measurements and estimates to describe and compare phenomena.				
E. Measuring Geometric Objects				
1. Use a protractor to measure angles.				
2. Develop and apply strategies and formulas for finding perimeter and area. <ul style="list-style-type: none"> • Triangle, square, rectangle, parallelogram, and trapezoid • Circumference and area of a circle 				
3. Develop and apply strategies and formulas for finding the surface area and volume of rectangular prisms and cylinders.				
4. Recognize that shapes with the same perimeter do not necessarily have the same area and vice versa.				
5. Develop informal ways of approximating the measures of familiar objects (e.g., use a grid to approximate the area of the bottom of one's foot.				

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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 6 STUDENTS WILL:

A. Patterns	MP 1	MP 2	MP 3	MP 4
1. Recognize, describe, extend, and create patterns involving whole numbers and rational numbers. <ul style="list-style-type: none"> • Descriptions using tables, verbal rules, simple equations, and graphs • Formal iterative formulas (e.g., NEXT=NOW*3) • Recursive patterns including Pascal's Triangle (where each entry is the sum of the entries above it) and the Fibonacci Sequence: 1, 1, 2, 3, 5, 8, ... (where NEXT=NOW + PREVIOUS) 				
B. Functions and Relationships				
1. Describe the general behavior of functions given by formulas or verbal rules (e.g., graph to determine whether increasing or decreasing, linear or not).				
C. Modeling				
1. Use patterns, relations, and linear functions to model situations. <ul style="list-style-type: none"> • Using variables to represent unknown quantities • Using concrete materials, tables, graphs, verbal rules, algebraic expressions/equations/inequalities 				
2. Draw freehand sketches of graphs that model real phenomena and use such graphs to predict and interpret events. <ul style="list-style-type: none"> • Changes over time • Rates of change (e.g., when is plant growing slowly/rapidly, when is temperature dropping the most rapidly/slowly) 				
D. Procedures				
1. Solve simple linear equations with manipulatives and informally. <ul style="list-style-type: none"> • Whole-number coefficients only, answers also whole • Variables on one side of equation 				
2. Understand and apply the properties of operations and numbers. <ul style="list-style-type: none"> • Distributive property • The product of a number and its reciprocal is 1 				
3. Evaluate numerical expressions.				
4. Extend understanding and use of inequity. <ul style="list-style-type: none"> • Symbols (\geq, \neq, \leq) 				

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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 6 STUDENTS WILL:

A. Data Analysis	MP 1	MP 2	MP 3	MP 4
1. Collect, generate, organize and display data. • Data generated from surveys				
2. Read, interpret, construct, analyze, generate questions about, and draw inferences from displays of data. • Bar graph, line graph, circle graph, table, histogram • Range, median, mean • Calculators and computers used to record and process information				
3. Respond to questions about data and generate their own questions and hypotheses.				
B. Probability				
1. Determine probabilities of events. • Event, complementary event, probability of an event • Multiplication rule for probabilities • Probability of a certain event is 1 and of impossible event is 0 • Probabilities of event and complementary event add up to 1				
2. Determine probability using intuitive, experimental, and theoretical methods (e.g., using model of picking items of different colors from a bag). • Given numbers of various types of items in a bag, what is the probability that an item of one type will be picked • Given data obtained experimentally, what is the likely distribution of items in the bag.				
3. Explore compound events.				
4. Model situations involving probability using simulations (with spinners, dice) and theoretical models.				
5. Recognize and understand the connections among the concepts of independent outcomes, picking at random, and fairness.				
C. Discrete Mathematics-Systematic Listing and Counting				
1. Solve counting problems and justify that all possibilities have been enumerated without duplication. • Organized lists, charts, tree diagrams, tables • Venn diagrams				
2. Explore the multiplication principle of counting. • Simple situations (e.g., you can make $3 \times 4 = 12$ outfits using 3 shirts and 4 skirts). • Number of ways a specified number of items can be arranged in order (concept of permutation). • Number of ways of selecting a slate of officers from a class (e.g., if there are 23 students and 3 officers, the number is $23 \times 22 \times 21$).				
3. List the possible combinations of two elements from a given set (e.g., forming a committee of two from a group of 12 students, finding how many handshakes there will be among ten people if everyone shakes each other person's hand once).				
D. Discrete Mathematics-Vertex-Edge Graphs and Algorithms				
1. Devise strategies for winning simple games (e.g., start with two piles of objects, each of two players in turn removes any number of objects from a single pile, and the person to take the last group of objects wins) and				

express those strategies as sets of directions.				
2. Analyze vertex-edge graphs and tree diagrams. <ul style="list-style-type: none"> • Can a picture or a vertex-edge graph be drawn from a single line? (degree of vertex) • Can you get from any vertex to any other vertex (connectedness) 				
3. Use vertex-edge graphs to find solutions to practical problems. <ul style="list-style-type: none"> • Delivery route that stops at specified sites but involves least travel • Shortest route from one site on a map to another 				

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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				
4. 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.				