ACTON PUBLIC SCHOOLS

Grades Five and Six*

Math Benchmarks

Strand 1: Number Sense and Operations

Concepts

Students will understand:

- the value of each individual digit in a number;
- the relationship between the base and exponent;
- that powers of 10 can be represented using a base of ten and an exponent;
- that numbers can be classified;
- the relationships between addition/subtraction and multiplication/division;
- fractions as ratios of whole numbers, as parts of unit wholes, and as parts of a collection;
- that a percent is a part of a whole based on a denominator of 100.

Standard	Grade 5 Skills	Grade 6 Skills
6.N.2	Read, write, compare, order and identify place value in whole numbers to the hundred millions place (M)	Read, write, compare, order and identify place value in whole numbers to the hundred billions place (M)
APS	Round whole numbers to the hundred millions place (M)	Round whole numbers to the hundred billions place (M)
6.N.7	Read, write, compare, order and identify place value in decimal numbers to hundredths understand (M)	Read, write compare, order and identify place value in decimal numbers to thousandths understand (M)
APS	Round decimals to the hundredths place, to the tenths place, or the nearest whole number (M)	Round decimals to the thousandths place, to the nearest hundredth, or tenth (M)
6.N.6	Identify positive and negative integers, fractions, decimals, and mixed numbers on a number line (W)	Identify positive and negative integers, fractions, decimals, and mixed numbers on a number line (M)
6.N.16	Make reasonable estimates of quantities (W)	Make reasonable estimates of quantities (W)
6.N.16	Make reasonable estimates of results of computation with whole numbers, fractions, mixed numbers, decimals and percents (W)	Make reasonable estimates of results of computation with whole numbers, fractions, mixed numbers, decimals and percents (W)
6.N.3**	Convert between expanded and standard notation for numbers as large as hundred millions and as small as hundredths (Example: 9724 = 9000+700+20+4) (M)	Convert between expanded and standard notation for numbers as large as hundred millions and as small as thousandths (Example: 9724 = 9000+700+20+4) (M)
6.N.1	Model and identify square numbers (I/W)	Recognize and find the squares/square roots of numbers through 12 /144 (M)
6.N.1	Convert between standard and exponential notation (I/W)	Convert between standard and exponential notation for exponents larger than 2 (I/W)

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* This document, revised in 2003-2004, is organized conceptually – not numerically. Numbers refer to the Massachusetts State Framework for Mathematics, November, 2000. "APS" means that this is an Acton, not a Massachusetts, benchmark.

** This benchmark requires supplementary materials in most schools.

Strand 1: Number Sense and Operations (cont'd)

Standard	Grade Five Skills	Grade Six Skills
6.N.1	Represent large numbers to hundred million using powers of 10 (I/W)	Represent large numbers to hundred billions using powers of 10 (W)
APS	Multiply and divide by multiples of 10 (I/W)	Multiply and divide by multiples of 10 (W)
6.N.8	Identify prime and composite numbers (I/W)	Identify prime and composite numbers (M)
6.N.8	Find the prime factorization of a number (I/W)	Find the prime factorization of a number (M)
6.N.8	Find the least common multiple and greatest common factor (W)	Find the least common multiple and greatest common factor (M)
6.N.8	Apply divisibility rules (I/W)	Apply divisibility rules (W)
6.N.13	2- and 3-digit multiplication (M)	
6.N.13	Divide up to a 3-digit whole number with a 2-digit divisor (M)	
APS	Report division remainders as fractions (M)	Report division remainders as fractions and decimals (M)
6.N.15 APS		Add and subtract positive and negative integers (I/W)
APS	Recognize commutative, associative and identity (0 and 1) properties (I/W)	Recognize and apply commutative, associative and identity (0 and 1) properties (W)
6.N.11	Recognize and apply order of operations (I)	Recognize and apply order of operations (I/W)
6.N.5	Find equivalent fractions (M)	
6.N.14	Simplify fractions to lowest terms (I/W)	Simplify fractions to lowest terms (M)
6.N.5	Find decimal and percent equivalents for familiar fractions (W)	Find decimal and percent equivalents for fractions (M)
6.N.14	Add and subtract fractions with common denominators (M)	
6.N.14	Add and subtract fractions with unlike denominators (I/W)	Add and subtract fractions with unlike denominators (M)
6.N.14	Multiply fractions (I/W)	Multiply fractions (M)
APS	Find the reciprocal of a number (I/W)	Find the reciprocal of a number (M)
6.N.14	Divide fractions (I)	Divide fractions (W/concept) (M/algorithm)
6.N.5	Convert between improper fractions and mixed numbers (I/W)	Convert between improper fractions and mixed numbers (M)
6.N.14	Add mixed numbers with common denominators (M)	Add mixed numbers with unlike denominators (M)
6.N.14	Subtract mixed numbers with common denominators/borrowing (I)	Subtract mixed numbers with unlike denominators/borrowing (W)
6.N.4		Identify ratios (I/W)
APS		Solve proportions (I/W)
6.N.5	Find equivalent decimals (e.g., 0.750=0.75) (M)	
6.N.5	Find fraction and percent equivalents for decimals (W)	Find fraction and percent equivalents for decimals (M)

Standard	Grade 5 Skills	Grade 6 Skills
6.N.13	Add, subtract and multiply decimals (I/W)	Add, subtract and multiply decimals (M)
6.N.13	Divide decimals by a whole number (I)	Divide decimals by a decimal (I/W)
6.N.5	Find decimal and fraction equivalents for percentages (W)	Find decimal and fraction equivalents for percentages (M)
APS	Find the percent of a number (I)	Find the percent of a number (W)

Strand 2: Patterns, Relations and Algebra

Concepts

Students will understand:

- that a variable or icon can be used to represent and solve for unknown quantities in simple equations for addition, subtraction, multiplication and division;
- that mathematical situations and structures can be represented using algebraic symbols.

Standard	Grade 5 Skills	Grade 6 Skills
6.P.4	Solve simple, whole-number function problems (e.g.: input-out problems, what's my rule?) (M)	Solve multi-step function problems involving fractions and decimals (e.g.: input-out problems, what's my rule?) (I/W)
6.P.2	Translate words to expressions and/or sentences involving variables (W)	Translate words to expressions and/or sentences involving variables (M)
6.P.2	Given the value of a variable, evaluate a simple expression (e.g.: for N=5, evaluate 11*N) (W)	Given the value of a variable, evaluate a simple expression (M)
6.P.3	Identify the value of the variable in a simple equation (e.g.: for 11*N=55, find the value of N) (W)	Identify the value of the variable in a simple equation (M)
6.P.5	Solve linear equations using concrete models, tables, graphs, and paper and pencil methods (W)	Solve linear equations using concrete models, tables, graphs, and paper and pencil methods (W)
6.P.7		Model situations with proportional relationships/rate tables and solve problems (I/W)
6.P.1	Analyze and determine the rules for extending symbolic, arithmetic, and geometric patterns and progressions (e.g.: ABBCCC….) (W)	Analyze and determine the rules for extending symbolic, arithmetic, and geometric patterns and progressions (e.g.: ABBCCC….) (W)
6.P.5	See Strand 5	See Strand 5

Strand 3: Geometry

Concepts

Students will understand:

- that the characteristics and properties of two- and three-dimensional shapes can be used to classify the shapes and analyze them;
- that locations and spatial relationships can be represented using coordinate geometry.

Standard	Grade 5 Skills	Grade 6 Skills
APS	Measure angles using a protractor (I/W)	Measure angles using a protractor (M)
APS	Review identification of acute, right and obtuse angles	Identify straight and reflex angles (I)
APS		Analyze the relationship of angles formed by intersecting lines (e.g., complementary and supplementary) (I)
APS		Investigate tessellations/tilings (I)
6.G.1	Identify polygons (e.g. squares, rectangles, parallelograms, rhombuses, trapezoids and isosceles, equilateral and right triangles) based on their properties (e.g., types of interior angles, perpendicular and parallel sides and congruence) (W)	Identify polygons (e.g., squares, rectangles, parallelograms, rhombuses, trapezoids and isosceles, equilateral and right triangles) based on their properties (e.g., types of interior angles, perpendicular and parallel sides and congruence) (M)
6.G.2	Identify three-dimensional shapes (e.g. cubes, prisms, spheres, cones, and pyramids) based on their properties, such as edges and faces (W)	Identify three-dimensional shapes (e.g. cubes, prisms, spheres, cones, and pyramids) based on their properties, such as edges and faces (M)
6.G.9	Match three-dimensional objects and their two-dimensional representations (e.g., nets, projections and perspective drawings.)(W)	Match three-dimensional objects and their two-dimensional representations (e.g., nets, projections and perspective drawings.)(W)
6.G.3	Identify relationships between lines (e.g., intersecting, parallel and perpendicular) (M)	Identify relationships between planes (e.g., intersecting, parallel and perpendicular) (I/M)
6.G.4	Graph and read points on quadrant 1 (positives only) of the Cartesian coordinate grid (M)	Graph and read points on all four quadrants of the Cartesian coordinate grid (I/M)
6.G.5	See Strand 1	See Strand 1
6.G.6	Predict, describe and perform transformations on two dimensional shapes (e.g., translations, rotations, and reflections) (W)	Predict, describe and perform transformations on two-dimensional shapes (e.g., translations, rotations, and reflections) (M)
6.G.7	Identify types of symmetry, including line and rotational (W)	Identify types of symmetry, including line and rotational (W)
6.G.8	Determine if two shapes are congruent by measurement or transformation (W)	Determine if two shapes are congruent by measurement or transformation (M)

Strand 4: Measurement

Concepts

Students will understand:

- attributes such as length, area, weight, volume and size of angle;
- the need for measuring with standard units;
- that measurements are approximations;
- how differences in units affect precision;
- the difference between metric and conventional systems of measurement;
- relationships among units;
- select and use units of appropriate size and type to measure angles, perimeter, area, surface area and volume.

Standard	Grade 5 Skills	Grade 6 Skills
APS	Select and apply appropriate conventional and/or metric units and tools to measure length, area, volume, weight, time, temperature and the size of angles (W)	Select and apply appropriate conventional and/or metric units and tools to measure length, area, volume, weight, time, temperature and the size of angles (W)
APS	Use a ruler to measure length to nearest 1/8 of an inch and 1/2 of a centimeter (M)	Use a ruler to measure length to nearest 1/16 of an inch and nearest millimeter (W)
6.M.3	Solve problems involving proportional relationships and units of measure (e.g., same-system unit conversions, scale models, maps and speed) (W)	Solve problems involving proportional relationships and units of measure (e.g., same-system unit conversions, scale models, maps and speed) (W)
6.M.2	Use a protractor to measure and construct angles (W)	Use a protractor to measure and construct angles, triangles and quadrilaterals (W)
6.M.1	Find the perimeter of all polygons (M)	
6.M.1 **6.M.4**	Explore various models for finding the area of a square, rectangle, triangle and parallelogram (W)	Know and apply the formulas for the area of rectangles, squares, triangles and parallelograms (W/M)
6.M.7	Find the sum of angles in triangles and quadrilaterals (W)	Find the sum of angles in triangles and quadrilaterals (M)
6.M.7	Find the sum of angles in polygons with more than four sides (I)	Find the sum of angles in polygons with more than four sides (W)
6.M.6	Find the volumes and surface areas of rectangular prisms (I)	Find the volumes and surface areas of rectangular prisms (W)
6.M.6		Investigate volumes and surface areas of cylinders, cones, spheres, pyramids and triangular prisms (I)
6.M.5	Identify and measure the radius and diameter of a circle (W/M)	
6.M.5	Explore the relationship between the diameter and circumference of a circle; the value of pi (I)	Given the formula, find the circumference of a circle (W)
6.M.5		Explore various models and the formula for finding the area of a circle (I/W)
6.M.5	Use a compass to draw a circle (I)	Use a compass to draw a circle (W)
APS	Explore the use of a balance scale (W)	Explore the use of a balance scale (W)

Strand 5: Data Analysis, Statistics and Probability

Concepts

Students will understand:

- how the nature of data collection affects the data set;
- how increasing the number of trials affects experimental results;
- the differences in representing categorical and numerical data;
- the correspondence between data sets and their graphic representations;
- what constitutes a fair game of chance.

Standard	Grade 5 Skills	Grade 6 Skills
6.D.1	Identify the mode, median, mean, range and outlier in a given set of data (W)	Given a set of data, identify the mode, median, mean, range and outlier (M)
6.D.2	Construct and interpret tally charts, bar graphs, line graphs and pictographs (M)	
APS	Read and interpret scales on a graph (M)	Read and interpret intervals on graph (M)
APS		Select appropriate scale/intervals and construct graphs for a set of data (I/W)
6.D.2	Construct and interpret line plots and stem-and-leaf plots (W)	Construct and interpret line plots and stem-and-leaf plots (W)
6.D.2	Interpret circle graphs (W)	Interpret circle graphs (M)
6.D.2		Construct circle graphs (I)
6.D.2		Construct and interpret frequency graphs (I)
6.D.4	Predict the probability of simple experiments (tossing coins, rolling dice, spinning a spinner) and test the predications (W)	Predict the probability of simple experiments (tossing coins, rolling dice, spinning a spinner) and test the predications (M)
6.D.4	Use appropriate ratios between 0 and 1 (fractions or percents) to represent the probability of an outcome (W)	Use appropriate ratios between 0 and 1 (fractions or percents) to represent the probability of an outcome (M)
6.D.3	Use tree diagrams and other models (e.g., lists and tables) to represent and analyze possible actual outcomes of trials (I)	Use tree diagrams and other models (e.g., lists and tables) to represent and analyze possible actual outcomes of trials (W)