Mathematics: New York State Core Curriculum: Number Sense and Operations Strand
Performance Indicators Organized by Grade Level and Band under Major Understandings

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.	
PK.N.1 Systems	Count the items in a collection and know the last counting word tells how many items are in the collection (1 to 10).
PK.N.2 Systems	Count out (produce) a collection of a specified size 1 to 10.
PK.N.3 Systems	Verbally count by 1's to 10.
PK.N.4 Systems	Explore the different representations of a group of objects.
PK.N.5 Systems	Draw pictures or other informal symbols to represent a spoken number up to 5.
PK.N.6 Systems	Draw pictures or other informal symbols to represent how many in a collection up to 5.
PK.N.7 Systems	Recognize numerals (0-5).
PK.N.8 Systems	Use and understand the terms *first* and l*ast*.
K.N.1 Systems	Count the items in a collection and know the last counting word tells how many items are in the collection (1 to 10).
K.N.2 Systems	Count out (produce) a collection of a specified size 1 to 10.
K.N.3 Systems	Numerically label a data set of 1 to 5.
K.N.4 Systems	Verbally count by 1's to 20.
K.N.5 Systems	Verbally count backwards from 10.
K.N.6 Systems	Represent collections with a finger pattern up to 10.
K.N.7 Systems	Draw pictures or other informal symbols to represent a spoken number up to 10.
K.N.8 Systems	Draw pictures or other informal symbols to represent how many in a collection up to 10.
K.N.9 Systems	Write numbers 1-10 to represent a collection.
K.N.10 Systems	Visually determine how many more or less, and then using the verbal counting sequence, match and count 1-10.
K.N.11 Systems	Use and understand verbal ordinal terms, *first* to *tenth*.
1.N.1 Systems	Count the items in a collection and know the last counting word tells how many items are in the collection (1 to 100).
1.N.2 Systems	Count out (produce) a collection of a specified size (10 to 100 items), using groups of ten.
1.N.3 Systems	Quickly see and label with a number, collections of 1 to 10.
1.N.4 Systems	Count by 1's to 100.
1.N.5 Systems	Skip count by 10's to 100.
1.N.6 Systems	Skip count by 5's to 50.
1.N.7 Systems	Skip count by 2's to 20.
1.N.8 Systems	Verbally count from a number other than one by 1's.
1.N.9 Systems	Count backwards from 20 by 1's.
1.N.10 Systems	Draw pictures or other informal symbols to represent a spoken number up to 20.
1.N.11 Systems	Identify that spacing of the same number of objects does not affect the quantity (conservation).
1.N.12 Systems	Arrange objects in size order (increasing and decreasing).
1.N.13 Systems	Write numbers to 100.
1.N.14 Systems	Read the number words *one*, *two*, *three*,…*ten*.
1.N.15 Systems	Explore and use place value.
1.N.16 Systems	Compare and order whole numbers up to 100.
1.N.17 Systems	Develop an initial understanding of the base ten system: 10 ones = 1 ten; 10 tens = 1 hundred
1.N.18 Systems	Use a variety of strategies to compose and decompose one-digit numbers.

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1.N.19 Systems	Understand the commutative property of addition.
1.N.20 Systems	Name the number before and the number after a given number, and name the number(s) between two given numbers up to 100 (with and without the use of a number line or a hundreds chart).
1.N.21 Systems	Use before, after, or between to order numbers to 100 (with or without the use of a number line).
1.N.22 Systems	Use the words higher, lower, greater, and less to compare two numbers.
1.N.23 Systems	Use and understand verbal ordinal terms, first to twentieth.
2.N.1 Systems	Skip count to 100 by 2's, 5's, 10's.
2.N.2 Systems	Count back from 100 by 1's, 5's, 10's using a number chart.
2.N.3 Systems	Skip count by 3's to 36 for multiplication readiness.
2.N.4 Systems	Skip count by 4's to 48 for multiplication readiness.
2.N.5 Systems	Compare and order numbers to 100.
2.N.6 Systems	Develop an understanding of the base ten system: 10 ones = 1 ten; 10 tens = 1 hundred; 10 hundreds = 1 thousand
2.N.7 Systems	Use a variety of strategies to compose and decompose two-digit numbers.
2.N.8 Systems	Understand and use the commutative property of addition.
2.N.9 Systems	Name the number before and the number after a given number, and name the number(s) between two given numbers up to 100 (with and without the use of a number line or a hundreds chart).
2.N.10 Systems	Use and understand verbal ordinal terms.
2.N.11 Systems	Read written ordinal terms (first through ninth) and use them to represent ordinal relations.
2.N.12 Systems	Use zero as the identity element for addition.
2.N.13 Systems	Recognize the meaning of zero in the place value system (0-100).
2.N.14 Theory	Use concrete materials to justify a number as odd or even.
3.N.1 Systems	Skip count by 25's, 50's, 100's to 1,000.
3.N.2 Systems	Read and write whole numbers to 1,000.
3.N.3 Systems	Compare and order numbers to 1,000.
3.N.4 Systems	Understand the place value structure of the base ten number system: 10 ones = 1 ten; 10 tens = 1 hundred; 10 hundreds = 1 thousand
3.N.5 Systems	Use a variety of strategies to compose and decompose three-digit numbers.
3.N.6 Systems	Use and explain the commutative property of addition and multiplication.
3.N.7 Systems	Use 1 as the identity element for multiplication.
3.N.8 Systems	Use the zero property of multiplication.
3.N.9 Systems	Understand and use the associative property of addition.
3.N.10 Systems	Develop an understanding of fractions as part of a whole unit and as parts of a collection.
3.N.11 Systems	Use manipulatives, visual models, and illustrations to name and represent unit fractions (1/2, 1/3, 1/4, 1/5, 1/6, and 1/10) as part of a whole or a set of objects.
3.N.12 Systems	Understand and recognize the meaning of numerator and denominator in the symbolic form of a fraction.
3.N.13 Systems	Recognize fractional numbers as equal parts of a whole.
3.N.14 Systems	Explore equivalent fractions (½, ⅓, ¼).

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3.N.15 Systems	Compare and order unit fractions (½, ⅓, ¼) and find their approximate locations on a number line.
3.N.16 Theory	Identify odd and even numbers.
3.N.17 Theory	Develop an understanding of the properties of odd/even numbers as a result of addition or subtraction.
4.N.1 Systems	Skip count by 1,000's.
4.N.2 Systems	Read and write whole numbers to 10,000.
4.N.3 Systems	Compare and order numbers to 10,000.
4.N.4 Systems	Understand the place value structure of the base ten number system: 10 ones = 1 ten; 10 tens = 1 hundred; 10 hundreds = 1 thousand; 10 thousands = 1 ten thousand
4.N.5 Systems	Recognize equivalent representations for numbers up to four digits and generate them by decomposing and composing numbers.
4.N.6 Systems	Understand, use, and explain the associative property of multiplication.
4.N.7 Systems	Develop an understanding of fractions as locations on number lines and as divisions of whole numbers.
4.N.8 Systems	Recognize and generate equivalent fractions (halves, fourths, thirds, fifths, sixths, and tenths) using manipulatives, visual models, and illustrations.
4.N.9 Systems	Use concrete materials and visual models to compare and order unit fractions or fractions with the same denominator (with and without the use of a number line).
4.N.10 Systems	Develop an understanding of decimals as part of a whole.
4.N.11 Systems	Read and write decimals to hundredths, using money as a context.
4.N.12 Systems	Use concrete materials and visual models to compare and order decimals (less than 1) to the hundredths place in the context of money.
4.N.13 Theory	Develop an understanding of the properties of odd/even numbers as a result of multiplication.
5.N.1 Systems	Read and write whole numbers to millions.
5.N.2 Systems	Compare and order numbers to millions.
5.N.3 Systems	Understand the place value structure of the base ten number system: 10 ones = 1 ten; 10 tens = 1 hundred; 10 hundreds = 1 thousand; 10 thousands = 1 ten thousand; 10 ten thousands = 1 hundred thousand; 10 hundred thousands = 1 million
5.N.4 Systems	Create equivalent fractions, given a fraction.
5.N.5 Systems	Compare and order fractions including unlike denominators (with and without the use of a number line).
5.N.6 Systems	Understand the concept of ratio.
5.N.7 Systems	Express ratios in different forms.
5.N.8 Systems	Read, write, and order decimals to thousandths.
5.N.9 Systems	Compare fractions using <, >, or =.
5.N.10 Systems	Compare decimals using <, >, or =.
5.N.11 Systems	Understand that percent means part of 100, and write percents as fractions and decimals.
5.N.12 Theory	Recognize that some numbers are only divisible by one and themselves (prime) and others have multiple divisors (composite).
5.N.13 Theory	Calculate multiples of a whole number and the least common multiple of two numbers.
5.N.14 Theory	Identify the factors of a given number.
5.N.15 Theory	Find the common factors and the greatest common factor of two numbers.

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Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.	
6.N.1 Systems	Read and write whole numbers to trillions.
6.N.2 Systems	Define and identify the commutative and associative properties of addition and multiplication.
6.N.3 Systems	Define and identify the distributive property of multiplication over addition.
6.N.4 Systems	Define and identify the identity and inverse properties of addition and multiplication.
6.N.5 Systems	Define and identify the zero property of multiplication.
6.N.6 Systems	Understand the concept of rate.
6.N.7 Systems	Express equivalent ratios as a proportion.
6.N.8 Systems	Distinguish the difference between rate and ratio.
6.N.9 Systems	Solve proportions using equivalent fractions.
6.N.10 Systems	Verify the proportionality using the product of the means equals the product of the extremes.
6.N.11 Systems	Read, write, and identify percents of a whole (0% to 100%).
6.N.12 Systems	Solve percent problems involving percent, rate, and base.
6.N.13 Systems	Define absolute value and determine the absolute value of rational numbers (including positive and negative).
6.N.14 Systems	Locate rational numbers on a number line (including positive and negative).
6.N.15 Systems	Order rational numbers (including positive and negative).
7.N.1 Systems	Distinguish between the various subsets of real numbers (counting/natural numbers, whole numbers, integers, rational numbers, and irrational numbers).
7.N.2 Systems	Recognize the difference between rational and irrational numbers (e.g., explore different approximations of π).
7.N.3 Systems	Place rational and irrational numbers (approximations) on a number line and justify the placement of the numbers.
7.N.4 Systems	Develop the laws of exponents for multiplication and division.
7.N.5 Systems	Write numbers in scientific notation.
7.N.6 Systems	Translate numbers from scientific notation into standard form.
7.N.7 Systems	Compare numbers written in scientific notation.
7.N.8 Theory	Find the common factors and greatest common factor of two or more numbers.
7.N.9 Theory	Determine multiples and least common multiple of two or more numbers.
7.N.10 Theory	Determine the prime factorization of a given number and write in exponential form.
A.N.1 Theory	Identify and apply the properties of real numbers (closure, commutative, associative, distributive, identity, inverse).

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Students will understand meaning of operations and procedures, and how they relate to one another.	
PK.N.9 Operations	Develop addition and subtraction readiness with sums up to 4 and subtraction involving one to four items, using manipulatives.
K.N.12 Operations	Solve and create addition and subtraction verbal word problems (use counting-based strategies, such as counting on and to ten).
K.N.13 Operations	Determine sums and differences by various means.
1.N.24 Operations	Develop and use strategies to solve addition and subtraction word problems.
1.N.25 Operations	Represent addition and subtraction word problems and their solutions as number sentences.
1.N.26 Operations	Create problem situations that represent a given number sentence.
1.N.27 Operations	Use a variety of strategies to solve addition and subtraction problems with one- and two-digit numbers without regrouping.
1.N.28 Operations	Demonstrate fluency and apply addition and subtraction facts to and including 10.
1.N.29 Operations	Understand that different parts can be added to get the same whole.
2.N.15 Operations	Determine sums and differences of number sentences by various means (e.g., families, related facts, inverse operations, addition doubles, and doubles plus one).
2.N.16 Operations	Use a variety of strategies to solve addition and subtraction problems using one- and two-digit numbers with and without regrouping.
2.N.17 Operations	Demonstrate fluency and apply addition and subtraction facts up to and including 18.
2.N.18 Operations	Use doubling to add 2-digit numbers.
2.N.19 Operations	Use compensation to add 2-digit numbers.
2.N.20 Operations	Develop readiness for multiplication by using repeated addition.
2.N.21 Operations	Develop readiness for division by using repeated subtraction, dividing objects into groups (fair share).
3.N.18 Operations	Use a variety of strategies to add and subtract 3-digit numbers (with and without regrouping).
3.N.19 Operations	Develop fluency with single-digit multiplication facts.
3.N.20 Operations	Use a variety of strategies to solve multiplication problems with factors up to 12 x 12.
3.N.21 Operations	Use the area model, tables, patterns, arrays, and doubling to provide meaning for multiplication.
3.N.22 Operations	Demonstrate fluency and apply single-digit division facts.
3.N.23 Operations	Use tables, patterns, halving, and manipulatives to provide meaning for division.
3.N.24 Operations	Develop strategies for selecting the appropriate computational and operational method in problem solving situations.
4.N.14 Operations	Use a variety of strategies to add and subtract numbers up to 10,000.
4.N.15 Operations	Select appropriate computational and operational methods to solve problems.
4.N.16 Operations	Understand various meanings of multiplication and division.
4.N.17 Operations	Use multiplication and division as inverse operations to solve problems.
4.N.18 Operations	Use a variety of strategies to multiply two-digit numbers by one-digit numbers (with and without regrouping).
4.N.19 Operations	Use a variety of strategies to multiply two-digit numbers by two-digit numbers (with and without regrouping).
4.N.20 Operations	Develop fluency in multiplying and dividing multiples of 10 and 100 up to 1,000.
4.N.21 Operations	Use a variety of strategies to divide two-digit dividends by one-digit divisors (with and without remainders).
4.N.22 Operations	Interpret the meaning of remainders.
4.N.23 Operations	Add and subtract proper fractions with common denominators.
4.N.24 Operations	Express decimals as an equivalent form of fractions to tenths and hundredths.
4.N.25 Operations	Add and subtract decimals to tenths and hundredths using a hundreds chart.

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	Students will understand meaning of operations and procedures, and how they relate to one another.
5.N.16 Operations	Use a variety of strategies to multiply three-digit by three-digit numbers.
5.N.17 Operations	Use a variety of strategies to multiply three-digit by three-digit numbers.
5.N.18 Operations	Evaluate an arithmetic expression using order of operations including multiplication, division, addition, subtraction and parentheses.
5.N.19 Operations	Simplify fractions to lowest terms.
5.N.20 Operations	Convert improper fractions to mixed numbers, and mixed numbers to improper fractions.
5.N.21 Operations	Use a variety of strategies to add and subtract fractions with like denominators.
5.N.22 Operations	Add and subtract mixed numbers with like denominators
5.N.23 Operations	Use a variety of strategies to add, subtract, multiply, and divide decimals to thousandths.
6.N.16 Operations	Add and subtract fractions with unlike denominators.
6.N.17 Operations	Multiply and divide fractions with unlike denominators.
6.N.18 Operations	Add, subtract, multiply, and divide mixed numbers with unlike denominators.
6.N.19 Operations	Identify the multiplicative inverse (reciprocal) of a number.
6.N.20 Operations	Represent fractions as terminating or repeating decimals.
6.N.21 Operations	Find multiple representations of rational numbers (fractions, decimals, and percents 0 to 100).
6.N.22 Operations	Evaluate numerical expressions using order of operations (may include exponents of two and three).
6.N.23 Operations	Represent repeated multiplication in exponential form.
6.N.24 Operations	Represent exponential form as repeated multiplication.
6.N.25 Operations	Evaluate expressions having exponents where the power is an exponent of one, two, or three.
7.N.11 Operations	Simplify expressions using order of operations.
7.N.12 Operations	Add, subtract, multiply, and divide integers.
7.N.13 Operations	Add and subtract two integers (with and without the use of a number line).
7.N.14 Operations	Develop a conceptual understanding of negative and zero exponents with a base of ten and relate to fractions and decimals (e.g., 10^{-2} = .01 = 1/100).
7.N.15 Operations	Recognize and state the value of the square root of a perfect square (up to 225).
7.N.16 Operations	Determine the square root of non-perfect squares using a calculator.
7.N.17 Operations	Classify irrational numbers as non-repeating/non-terminating decimals.
8.N.1 Operations	Develop and apply the laws of exponents for multiplication and division.
8.N.2 Operations	Evaluate expressions with integral exponents.
8.N.3 Operations	Read, write, and identify percents less than 1% and greater than 100%.
8.N.4 Operations	Apply percents to: tax; percent increase/decrease; simple interest; sale price; commission; interest rates; and gratuities.
A.N.2 Operations	Simplify radical terms (no variable in the radicand).
A.N.3 Operations	Perform the four arithmetic operations using like and unlike radical terms and express the result in simplest form.
A.N.4 Operations	Understand and use scientific notation to compute products and quotients of numbers.
A.N.5 Operations	Solve algebraic problems arising from situations that involve fractions, decimals, percents (decrease/increase and discount), and proportionality/direct variation.
A.N.6 Operations	Evaluate expressions involving factorial(s), absolute value(s), and exponential expression(s).
A.N.7 Operations	Determine the number of possible events, using counting techniques or the Fundamental Principle of Counting.
A.N.8 Operations	Determine the number of possible arrangements (permutations) of a list of items.

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Students will understand meaning of operations and procedures, and how they relate to one another.	
A2.N.1 Operations	Evaluate numerical expressions with negative and/or fractional exponents, without the aid of a calculator (when the answers are rational numbers).
A2.N.2 Operations	Perform arithmetic operations (addition, subtraction, multiplication, division) with expressions containing irrational numbers in radical form.
A2.N.3 Operations	Perform arithmetic operations with polynomial expressions containing rational coefficients.
A2.N.4 Operations	Perform arithmetic operations on irrational expressions.
A2.N.5 Operations	Rationalize a denominator containing a radical expression.
A2.N.6 Operations	Write square roots of negative numbers in terms of i.
A2.N.7 Operations	Simplify powers of i.
A2.N.8 Operations	Determine the conjugate of a complex number.
A2.N.9 Operations	Perform arithmetic operations on complex numbers and write the answer in the form $a + bi$.
A2.N.10 Operations	Know and apply sigma notation.

Students will compute accurately and make reasonable estimates.	
1.N.30 Estimation	Estimate the number in a collection to 50 and then compare by counting the actual items in the collection.
2.N.22 Estimation	Estimate the number in a collection to 100 and then compare by counting the actual items in the collection.
3.N.25 Estimation	Estimate numbers up to 500.
3.N.26 Estimation	Recognize real world situations in which an estimate (rounding) is more appropriate.
3.N.27 Estimation	Check reasonableness of an answer by using estimation.
4.N.26 Estimation	Round numbers less than 1,000 to the nearest tens and hundreds.
4.N.27 Estimation	Check reasonableness of an answer by using estimation.
5.N.24 Estimation	Round numbers to the nearest hundredth and up to 10,000.
5.N.25 Estimation	Estimate sums and differences of fractions with like denominators.
5.N.26 Estimation	Estimate sums, differences, products, and quotients of decimals.
5.N.27 Estimation	Justify the reasonableness of answers using estimation.
6.N.26 Estimation	Estimate a percent of quantity (0% to 100%).
6.N.27 Estimation	Justify the reasonableness of answers using estimation (including rounding).
7.N.18 Estimation	Identify the two consecutive whole numbers between which the square root of a non-perfect square whole number less than 225 lies (with and without the use of a number line).
7.N.19 Estimation	Justify the reasonableness of answers using estimation.
8.N.5 Estimation	Estimate a percent of quantity, given an application.
8.N.6 Estimation	Justify the reasonableness of answers using estimation.

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